Definitive Module Document (DMD)

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Module Code:MAAD0019

Title of Module
Full Title: CFD Fundamentals
Short Title: CFD Fundamentals

MODULE

MAAD0019 (A 05/6)

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Version: 1

Credit Points: 15

Level / ECTS Level: M

First Offered: 26/9/2005 00-00-00

6. Home Department:
AAD

7. Departments(s) contributing to teaching:

9. Module Aims:
- apply CFD to the analysis of aerospace aerodynamics

- deepen and broaden their knowledge of aerodynamics

10a. Learning Outcomes: Knowledge and Understanding:
- the application of CFD to turbulent, incompressible flows

- the numerical methods underpinning CFD

10b. Learning Outcomes: Skills and Attributes:
- evaluate the relative merits of different techniques to handle viscous incompressible flows

- evaluate the appropriateness of different meshing procedures and discretisation methods

11. Module Content
11a Module Content:
This module develops the student's knowledge of aerodynamic applications of CFD. It comprehensively reviews the incompressible Navier-Stokes, Euler and Boundary Layer equations and their area of application. The major numerical methods of solution are introduced, together with turbulence modelling. Meshing procedures are introduced, including physical measures of adequate meshing, solution adaptive meshing, multi-block and multi-grid methods.

11b. Further details on how the learning outcomes of the module will be achieved:
The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures, tutorials, individual assignments and experimental work using software packages. These activities will be supported by the module team and by encouraging the students to access a variety of resources, eg Studynet, electronic databases, relevant professional and academic text and cases and journals.

- Incompressible Navier-Stokes, Euler and Boundary Layer equations - A comprehensive introduction to the equations and their area and range of application. Conservation form of equations and the hyperbolic, elliptical and parabolic forms. Important dimensionless parameters.

- Discretisation methods. FEM, FD and FV methods. Numerical stability, artificial viscosity and diffusion. Upwinding procedures and relaxation methods. Boundary conditions.

- Shock capturing methods.

- Turbulence and turbulence modelling - Comprehensive introduction to time averaging of Navier-Stokes and Boundary-Layer equations. Derivation of Reynolds stresses. LES methods and space averaging.

12. Language of Delivery:
English

13. Language of Assessment:
English

14. Assessment Details (Academic):
Coursework: 40

Exam: 60

Other: Typically, in-course assessment will consist of-

- 1 mid course assessment test to assess learning outcomes 1 - 4 (20%)

- 1 Aerodynamics assignment to assess learning outcomes 1 - 4 (20%)

There will be a 3 hour written examination (60%)

Assessment Notes:
There is no overall requirement for passes in both elements of assessment.

15. Locations(s):
UH HATFIELD

16. Pre and Co-Requisite:
Pre-Requisite

Co-Req

Prohibited

17. Subject Board of Examiner/s:

18. Comments