



The University of Southern Queensland

Course Specification

Description: Low-Dimensional Modelling in Hydrodynamics

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MAT	4104	10374	1, 2002	ONC	1.00	TWMBBA

Academic Group:	FOSCI
Academic Org:	FOS003
HECS Band:	2
ASCED Code:	010101

STAFFING

Examiner: Tony Roberts
Moderator: David Mander

RATIONALE

Most physical situations of interest in the world around us have an enormous number of fine details which are of little concern in many situations. The practical equations which scientists deal with are simplifications of the 'true' but intractable or overly-complicated equations that describe all the fine detail. The process of creating simple model approximations for otherwise intractably detailed dynamical descriptions, sometimes called dimensional reduction, is addressed in this course.

SYNOPSIS

This course combines both fluid dynamics and modern dynamical systems theory. We develop methods to derive relatively simple dynamical models in the application of the techniques to important classes of fluid flows. The principles of the modelling process that are developed apply universally to any evolving system. The triple aim is to explore: algebraic techniques; fluid applications; and general modelling principles.

OBJECTIVES

On successful completion of this course students will be able to:

- understand the dynamics of viscous fluid flow and contaminant transport;
- use the rationale of discarding dynamical modes to form a simple model of dynamical system;
- implement the algebraic analysis needed to construct a model;
- understand and interpret models of fluid dynamics.

TOPICS

Description	Weighting (%)
1. A selection of the following topics will be covered:	0.00
2. Fluid dynamics: Navier-Stokes equation; boundary conditions; heat and mass transfer.	0.00
3. The centre manifold - Taylor-Couette problem: Couette flow; stability; existence, relevance and approximation of the centre manifold model; Landau equations; computer algebra iteration.	0.00
4. Hopf bifurcation in salty water: overstability in double convection; the homological equation; chaos in triple convection.	0.00
5. Slow variations in space - dispersion and films: Poiseuille flow; dispersion in pipes and the slowly- varying approximation; thin fluid films; global models.	0.00
6. Initial conditions: forecasting, dispersion, relevance, asymptotic completeness.	0.00

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at <http://bookshop.usq.edu.au> by entering the author or title of the text.

To be advised.

REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

To be advised.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	40
Examinations	3
Lectures	39
Private Study	80

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	20.00	5.00	Y	04 Mar 2002 (see note 1)
ASSIGNMENT 2	20.00	5.00	Y	04 Mar 2002 (see note 2)
ASSIGNMENT 3	20.00	5.00	Y	04 Mar 2002 (see note 3)
ASSIGNMENT 4	20.00	5.00	Y	04 Mar 2002 (see note 4)
3 HOUR RESTRICTED EXAM	100.00	80.00	Y	END S1 (see note 5)

NOTES:

1. Further details about the due dates are detailed in the assessment section of the Course Specifications.
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4. Further details about the due dates are detailed in the assessment section of the Course Specifications.
5. Examination dates will be available during the Semester. Please refer to Examination timetable when published.

OTHER REQUIREMENTS

- 1 Attendance Requirements: It is the students' responsibility to participate in classes to ensure that they have the best chance to meet the objectives of the course and to be informed of course- related activities and administration.
- 2 Minimum Requirements to Pass the Course: To be certain of obtaining a passing grade in this course, students must: (a) obtain an overall mark of at least 40%; (b) obtain at least 40% in the examination(s); and (c) obtain at least 50% in the assignments as a whole.
- 3 Grading: A final grade will be allocated as follows: raw marks for the assessments will be summed with weightings specified in the Assessment Details; performance demonstrated in the examination will be reviewed with reference to the course's objectives and a scaling decided; the scaled marks will determine the final grade.
- 4 Supplementary and Deferred Examinations: If a student obtains an overall passing mark, but does not perform satisfactorily in the examination, the student may, at the discretion of the examiner, be granted a supplementary examination. A student will normally not be granted a deferred examination unless he/she performs satisfactorily in the other components of the assessment. Any supplementary or deferred examinations for this course will normally be held at the end of the semester of the next offering of this course.

- 5 Assignments: The due date for assessments is the date by which a student must despatch an assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. Students must retain a copy of all assignments which must be produced within five days if and when required by the Examiner. In accordance with the University's Policy on Assignments (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. This policy may be found in the USQ Handbook, the Distance Education Student Guide and the Faculty of Sciences' Orientation Handbook for on-campus students. All students are advised to study and follow the guidelines associated with this policy. An assignment, submitted after the due date without an extension approved by the examiner, will attract a penalty of 20 percent of the assigned mark for each working day (or part thereof) that the assignment is late.
- 6 Examinations: Restricted Examination: only specific materials may be brought into a restricted examination. The only materials that students may bring into the examination room and use in the restricted examination are normally: (a) writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); (b) calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination). Students should be aware that the University has policies and regulations about the use of unfair means and electronic devices in an examination and they should refer to them to determine whether or not actions they intend to take are acceptable to the University.
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