PARTIAL DIFFERENTIAL EQUATIONS

MATH4403

DR Jan Chabrowski

Course Code: math4403
Course Title: Partial Differential Equations
Semester 2 2005

Brief description of course content (e.g. handbook description)

The purpose of this course is to provide an introduction to partial differential equations of the second order. The course provides physical motivation, mathematical method and physical application. Major emphasis is placed on techniques on solving partial differential equations found in physics and engineering, but discussions on existence and uniqueness are also included.

Staff: Dr Jan Chabrowski

Lecturers

Name: Dr Jan Chabrowski
Room number: 347/ Priestley Building (67)
Phone number: 33653259
Email: jhc@maths.uq.edu.au
Consultation hours or Office hours

Tutorial Coordinator: Dr Jan Chabrowski

Web page The course profile and course material can be found on the web at the following address: http://www.maths.uq.edu.au/course/MATH4403. This also contains up-to-date news about the course material and announcements for students. Please check this regularly during the semester.

Class contact hours:
The lectures are scheduled for:
Monday 9.00 Room 67 – 342
Monday 2.00 Room 67 – 343
Friday 12.00 Room 67-- 342

Tutorial classes will be held on Wednesday 9.00 in room 9--538

Assumed background: familiarity with mathematical analysis (MATH2400) and basic knowledge of ordinary differential equations. It is a student’s own responsibility to fill any gaps in their assumed knowledge.
Course goals/rationale:

On completing this course students will:

- Obtain a sound knowledge of the theory of partial differential equations of the second order
- Be able to undertake studies in many branches of the modern mathematic like: nonlinear analysis, variational calculus and mathematical physics
- Be able to pursue further studies in applied sciences requiring knowledge of partial differential equations

Graduate Attributes:

The following graduate attributes will be developed in the course –

In-Depth Knowledge of the Field of Study

- A comprehensive and well-founded knowledge of the field of study.
- An understanding of how other disciplines relate to the field of study.
- An international perspective on the field of study.

Effective Communication

- The ability to collect, analyse, and organise information and ideas, and to convey those ideas clearly and fluently, in both written and spoken forms.
- The ability to interact effectively with others in order to work towards a common outcome.
- The ability to select and use the appropriate level, style and means of communication.
- The ability to engage effectively and appropriately with information and communication technologies.

Independence and Creativity

- The ability to work and learn independently.
- The ability to generate ideas and adapt innovatively to changing environments.
- The ability to identify problems, create solutions, innovate and improve current practices.

Critical Judgement

- The ability to define and analyse problems
- The ability to apply critical reasoning to issues through independent thought and informed judgement
- The ability to evaluate opinions, make decisions and to reflect critically on the justifications for decisions.
Ethical And Social Understanding

- An understanding of social and civic responsibility
- An appreciation of the philosophical and social contexts of a discipline
- A knowledge and respect of ethics and ethical standards in relation to a major area of study
- A knowledge of other cultures and times and an appreciation of cultural diversity.

For more information on the University policy on development of graduate attributes in courses, refer to the web [http://www.uq.edu.au/hupp/contents/view.asp?s1=3&s2=20&s3=5](http://www.uq.edu.au/hupp/contents/view.asp?s1=3&s2=20&s3=5).

Teaching and Learning Methods

Three hours of lectures and one hour of tutorials per week.

There are no tutorials in week 1 and week 13. Since parts of this course are based on quite complicated mathematical constructions, it is necessary to study lecture notes from previous lectures prior to attending each subsequent lecture. By following this procedure, you will find this course both enjoyable and informative.

Tutorial sheets will be handed out in lectures each week. Solutions to the tutorial problems will be available in the following week at tutorials. You should aim to do as many problems as possible on the tutorial sheet before the tutorial and ask anything you do not understand at the tutorial and lecture.

ASSESSMENT

Required assessment tasks:

The assessment for this course will be based on two assignments, a mid semester exam and an end of semester examination. Both assignments are worth 10 marks, the mid semester exam 25 marks and the final exam 65 marks. The mid semester exam will be held in week 7 during lecture time. The actual date will be announced on the web and in lectures as soon as possible.

Due dates for assignments:
1st assignment - 09 September
2nd assignment - 28 October

The mid semester exam will be based on the material covered in the first 6 weeks.

The final two hours examination will cover the material from the entire semester.

Any pocket calculators are permitted but contents of memory must be erased.
Grades will be awarded according to the following scale:

1 - 19 marks grade 1
20 - 44 marks grade 2
45 - 49 marks grade 3
50 - 64 marks grade 4
65 - 74 marks grade 5
75 - 84 marks grade 6
85 - 100 marks grade 7

Assessment criteria

Answers to written assignments and examination questions for both mid semester and final examinations will be assessed in terms of the extent to which they demonstrate the ability of the student to:

- Define, explain and interrelate main concepts involved in the course.
- Present proofs of the key theorems developed in the course.
- Apply the theory to solve some practical problems.

Criteria for the award of grades

Your grade for this course will be determined by which of the following levels of achievement that you consistently display in the items of summative assessment.

Grade of 7: (86% - 100%) the student demonstrates an excellent understanding of the theory of the topics listed in the course outline and is highly proficient in applying the techniques to solve both theoretical and practical problems.

Grade of 6: (75% - 85%) the student demonstrates a comprehensive understanding of the theory of the topics listed in the course outline and is proficient in applying the techniques to solve both theoretical and practical problems.

Grade of 5: (65% - 74%) the student demonstrates a good understanding of the theory of the topics listed in the course outline and can apply the techniques to solve problems.

Grade of 4: (50 – 64%) the student demonstrates an understanding of the theory of the topics listed in the course outline and demonstrates a knowledge of the techniques used to solve problems.

Grade of 3: (45% - 49%) the student demonstrates some understanding of the theory of the topics listed in the course outline and demonstrates a knowledge of the techniques used to solve problems.

Grade of 2: (25 – 44%) the student demonstrates limited understanding of the theory of the topics listed in the course outline and demonstrates limited knowledge of the techniques used
to solve problems. This includes attempts at expressing their deductions and explanations and attempts to answer a few questions accurately.

Grade of 1: (1 – 24%) the student demonstrates very limited understanding of the theory of the topics listed in the course outline and of the basic concepts in the course material. This includes attempts at answering some questions but demonstrating very limited understanding of the key concepts.

Assessment policy

Students who miss the mid semester exam through bereavement or ill health should document their problems and discuss this with the lecturer of the course. An alternative assessment scheme may be negotiated between student and lecturer of the course.

Allowance cannot be made for reason such as sporting or social commitments, or overwork in other courses.

Students should be familiar with the rules which relate to assessment in their degrees as well as general university policy such as found in the General Award Rules. These are all set out on the myAdvisor page on the UQ website


Plagiarism:

The University has adopted the following definition of plagiarism:

“Plagiarism is the action or practice of taking and using as one’s own the thoughts or writings of another, without acknowledgment. The following practices constitute acts of plagiarism and are a major infringement of the University’s academic values:

- Where paragraphs, sentences, a single sentence or significant parts of a sentence are copied directly, and are not enclosed in quotation marks and appropriately footnoted;

- Where direct quotations are not used, but are paraphrased or summarised, and the source of the material is not acknowledged either by footnoting or other simple reference within the text of the paper; and

- Where an idea which appears elsewhere in printed, electronic or audio-visual material is used or developed without reference being made to the author or the source of that material.”

When a student knowingly plagiarises someone’s work, there is intent to gain an advantage and this may constitute misconduct.

Students are encouraged to study together and to discuss ideas, but this should not result in students handing in the same or similar assessment work. Do not allow another student to copy your work. While students may discuss approaches to tackling a tutorial problem, care must be taken to submit individual and different answers to the problem. Submitting the same or largely similar answers to an assignment or tutorial problem may constitute misconduct.
Supplementary examinations

A supplementary examination may be awarded in one course to students who obtain a grade of 2 or 3 in the final semester of their program and require this course to finish their degree. You should check the rules for your degree program for information on the possible award of supplementary examinations. Applications for supplementary examinations must be made to the Director of Studies in the Faculty.

EPSA Faculty policy on the award of supplementary exams may be found via the Faculty Guidelines on Examinations from the EPSA student page

Special examinations

If a student is unable to sit a scheduled examination for medical or other adverse reasons, she/he can and should apply for a special examination. Applications made on medical grounds should be accompanied by a medical certificate; those on other grounds must be supported by a personal declaration stating the facts on which the application relies.

Applications for special examinations for central and end-of-semester exams must be made through the Student Centre. Applications for special examinations in school exams are made to the course coordinator.

More information on the University’s assessment policy may be found

EPSA Faculty policy on the award of special exams may be found via the Faculty Guidelines on Examinations from the EPSA student page

Feedback on assessment

You may request feedback on assessment in this course progressively throughout the semester from the course coordinator. Feedback on assessment may include discussion, written comments on work, model answers, lists of common mistakes and the like.

Students may peruse examinations scripts and obtain feedback on performance in a final examination provided that the request is made within six months of the release of final course results. After a period of six months following the release of results, examination scripts may be destroyed.

Information on the University’s policy on access to feedback on assessment may be found at

EPSA Faculty policy on assessment feedback and re-marking may be found at
Textbook and references

There is no recommended textbook. However students can consult the following reference books:


Library contact

The liaison librarian for the physical sciences disciplines is located in the Physical Sciences and Engineering Library in the Hawken Building and may be consulted for assistance in the course:

Leith Woodall
Email: l.woodall@library.uq.edu.au
Extension: 52367

Students with disabilities

Any student with a disability who may require alternative academic arrangements in the course is encouraged to seek advice at the commencement of the semester from a Disability Adviser at Student Support Services.

Assistance for Students

Students with English language difficulties should contact the course coordinator or tutors for the course.

Students with English language difficulties who require development of their English skills should contact the Institute for Continuing and TESOL Education on extension 56565.

The Learning Assistance Unit located in the Relaxation Block in Student Support Services. You may consult learning advisers in the unit to provide assistance with study skills, writing assignments and the like. Individual sessions are available. Student Support Services also offers workshops to assist students. For more information, phone 51704 or on the web http://www.sss.uq.edu.au/index.html.
Student Liaison Officer

The School of Physical Sciences has a Student Liaison Officer as an independent source of advice to assist students with resolving academic difficulties.

The Student Liaison officer during 2005 will be Dr Peter Adams, Room 547 Priestley building, (email pa@maths.uq.edu.au)

Program of work for the semester

1. Maximum principle for ODE
2. Classification of partial differential equations of the second order
3. Maximum principle for elliptic equations
4. Hopf’s maximum principle
5. Sub and super-harmonic functions
6. Dirichlet problem
7. Harnack inequality
8. Perron method
9. Regular and irregular boundary points
10. Maximum principle for parabolic equations
11. Cauchy problem
12. Boundary value problems for hyperbolic equations