MATH2011 ANALYSIS OF PARTIAL DIFFERENTIAL EQUATIONS
(1 unit) Second Semester 2005

Lecturer

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Consultation Times: 9-10am, Mon. & Tues.

Timetable: for 3L, 1T
Lectures: Monday 8–8.50am *(42-216) [Prentice]*
Tuesday 12-12.50pm *(42-216)*
Friday 9–9.50am *(42-216)*
Tutorials: Thursday 12–12.50pm *T1 (67-343), T2 (67-342) [Priestley].*
Friday 8–8.50am *T3 (67-342).*
Friday 1–1.50pm *T4 (67-342).*
Friday 2–2.50pm *T5 (67-342).*
Friday 3–3.50pm *T6 (67-342).*
THIS COURSE COMMENCES IN 7th WEEK OF SEMESTER

Purpose of the course:
The course will introduce elementary concepts and techniques of Fourier Series and Linear Partial Differential Equations (PDEs). These will be introduced via illustrative examples and applicable models.

Many important applications are described by PDEs, and we look at some of these to introduce the three main types of linear PDEs in two independent variables: heat conduction and molecular diffusion, waves on a stretched string, and steady temperature distributions in 2-dimensions. In particular, we will introduce Fourier's method of separation of variables and superposition as a key solution method in each case. Further, series solutions of second order ODEs are discussed, Bessel functions introduced and the Fourier-Bessel expansion for solving vibration of circular membranes explained.

Course outline:
The course deals with Chapters 10 and 11 (approximately) of the book by E. Kreyszig, Advanced Engineering Mathematics (8th Edition). Chapters 1, 2, 8 and 9 cover the background knowledge assumed for the course.

Textbook:
The prescribed textbook is
Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley, 1999 (8th Ed).

Copies of the OHPs can be found on my webpage
www.maths.uq.edu.au/∼pmd

Assignments and Assessment There will be weekly assignments which will count 30% towards the final result. These will contain practice problems to reinforce and develop the lecture material. These problem sheets are a primary means of preparing for the final examination, so you should make a serious attempt at them all. Solutions will be provided at a later date, on my webpage.

There will be an assignment to be handed in most weeks. Your attempts at these are to be handed direct to the tutors by the end of the tutorial at which they are due. They will be marked and returned to you the following week. Solutions will be available when the assignments are returned.
These assignments will count for 30% of the assessment
There is no provision for late assignments. Late assignments are deemed to be missed assignments. If you wish to submit an assignment after the due date, it may be marked, but **no credit** will be given. However, note "Exemptions" below.

Exemptions
In case of illness (or bereavement) you may be exempted from an assignment if a medical certificate

the assignment. If you are exempted from any assignment, then an average for the other assignments is taken and a total mark out of 5% (for each half) will be returned. Please note that *ad hoc* excuses (car trouble, and similar!) will not be accepted; only *documentation* in connection with *illness* or *bereavement*. If you enrolled late, then exemption will automatically be granted for any assignments missed before the date of enrolment.

Medical certificates
If you are concerned about privacy with regard to medical certificates, please contact the University Health Service. With your permission, the Director will contact your treating practitioner to clarify the extent of your medical condition or other incapacity, and provide us with a report — the Director is bound by confidentiality obligations. In any case, we prefer this course of action, as we are not qualified to assess medical evidence. The procedure outlined here accords with the University's policy on student privacy and confidentiality.

Assessment
The SUMMATIVE ASSESSMENT for this subject is:

30% for assignment work
70% from an end-of-semester examination, of length ONE HOUR.
The end-of-semester examination will be centrally timetabled.

Plagiarism
Plagiarism involves the use of others' ideas and words without clearly acknowledging the source of that information. Plagiarism is *not allowed*, and a mark of 0 (zero) will be given for any assignment which is found to be plagiarised. See also "Stopping Plagiarism" at
`http://www.library.uq.edu.au/useit/` .

Disabled Students
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.

Assumed background: Students are assumed to have undertaken introductory courses in Calculus and Multivariate Calculus (such as MATH1051, MATH1052 and MATH2000) and to have expertise in solving first and second order ordinary differential equations (ODEs). It is possible to do MATH2000 concurrently with MATH2011. General background is in Chapters 1, 2, 8 and 9 of the textbook.

Course goals/rationale: On completing this course, students will:

Be able to use Fourier Series to expand an arbitrary periodic signal in terms of harmonics.

Be able to solve separable PDEs, with appropriate boundary conditions, in terms of a superposition of eigenvalue solutions, incorporating Fourier Series and one-dimensional ODEs.

Be able to solve second order ODEs by series expansions, in particular that for Bessel functions.

Be able to solve vibration problems for circular membranes, in tems of superposition of eigenvalue solutions, using Fourier series and Bessel's second order ODE and the Fourier-Bessel expansion.

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.

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 select and use the appropriate level, style and means of communication.

Independence and Creativity:

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.

For more information on the University policy on development of graduate attributes in courses, refer to the web

$http://www.uq.edu.au/hupp/contents/view.asp?s1=3\&s2=20\&s3=5$.

Teaching and Learning Methods:

(1) Come to lectures and take notes.

(2) Do the assignments and study the lecture notes.

(3) Come to Tutorials and ask questions on matters which interest or puzzle you (relating to the course).

There are copies of the OHP slides for the course on the web.

MATH2010 ASSESSMENT CRITERIA:

Work will be marked for accuracy, appropriateness of mathematical techniques and clarity of presentation, as demonstrated by examples presented in lectures and tutorials.

- To earn a Grade of 7, a student would normally achieve a final mark of 85–100% and demonstrate an excellent understanding of the course material. This includes clear expression of nearly all their deductions and explanations, the use of appropriate and efficient mathematical techniques and accurate answers to nearly all questions and tasks with appropriate justification. They will be able to apply mathematical techniques to completely solve both theoretical and practical problems.
- To earn a Grade of 6, a student would normally achieve a final mark of 75–84% and demonstrate a comprehensive understanding of the course material. This includes clear expression of most of their deductions and explanations, the general use of appropriate and efficient mathematical techniques and accurate answers to most questions and tasks with appropriate justification. They will be able to apply mathematical techniques to partially solve both theoretical and practical problems.
- To earn a Grade of 5, a student would normally achieve a final mark of 65–74% and demonstrate an adequate understanding of the course material. This includes clear expression of some of their deductions and explanations, the use of appropriate and efficient mathematical techniques in some situations and accurate answers to some questions and tasks with appropriate justification. They will be able to apply mathematical techniques to solve fundamental problems.
- To earn a Grade of 4, a student would normally achieve a final mark of 50–64% and demonstrate an understanding of the basic concepts in the course material. This includes occasionally expressing their deductions and explanations clearly, the occasional use of appropriate and efficient mathematical techniques and accurate answers to a few questions and tasks with appropriate justification. They will have demonstrated knowledge of techniques used to solve problems and applied this knowledge in some cases.
- To earn a Grade of 3, a student would normally achieve a final mark of 45–49% and demonstrated some knowledge of the basic concepts in the course material. This includes occasional expression of their deductions and explanations, the use of a few appropriate and efficient mathematical techniques and attempts to answer a few questions and tasks accurately and with appropriate justification. They will have demonstrated knowledge of techniques used to solve problems.
- To earn a Grade of 2, a student would normally achieve a final mark of 20–44% and demonstrate some knowledge of the basic concepts in the course material. This includes attempts at expressing their deductions and explanations and attempts to answer a few questions accurately.
- To earn a Grade of 1, a student would normally achieve a final mark between 0–19%, demonstrating an extremely poor knowledge of the basic concepts in the course material. This includes possible attempts at answering some questions but showing an extremely poor understanding of the key concepts.