

FACULTY OF SCIENCE
SCHOOL OF SCIENCE
2223SCE PHYSICAL MATHEMATICS IIA
COURSE OUTLINE

1.0 IDENTIFYING INFORMATION

Catalogue Number:	2223SCE
Course Title:	Physical Mathematics IIA
Discipline Code:	010101
Program(s) for which course is designed:	1210 Bachelor of Science; 1211 Bachelor of Science with Advanced Studies; 1051 Bachelor of Education - Secondary. 1240 Bachelor of Photonics and Nanoscience
School:	Science
Faculty:	Science
Status of course within program:	Second Year, major core course.
Credit point value:	10 CP
Prerequisites:	1201SCE/SCE1201 Mathematics 1A 1210SCE/SCE1210 Mathematics 1B
Prior Assumed:	1301SCE Physics A
Incompatible:	2610SCE/SCE2610 Continuous Mathematics, SCE2223 Physical Mathematics IIA
Year and semester:	Second, Semester 1
Year of offer:	2005
Course Convenor:	Associate Professor Hans Gottlieb Office Location: N34 0.22 Office Phone: 57556 Email address: H.Gottlieb@griffith.edu.au
Teaching team members:	Assoc Prof Hans Gottlieb, Ms Chris Grigg

2.0 OBJECTIVES

This course provides essential mathematical techniques to mathematicians and physical scientists, and applies them to physical problems. It is a compulsory course for the Physical Mathematics major, and is the fundamental supporting mathematics course (prior assumed) for many courses in the Physics major. The purpose of this course is to provide students with some fundamental mathematical tools used for the physical sciences. It provides the mathematical techniques needed for the courses for which it is the sole mathematical prior assumed course, and provides the basic mathematics for other courses requiring further mathematics.

3.0 BRIEF DESCRIPTION

This course investigates aspects of vector analysis, Fourier series and integrals, differential equations and special functions, and studies their applications to physical problems. Assessment is by mid and end of semester examinations.

4.0 CONTENT

Vector Analysis (Line, surface and volume integrals. Cylindrical and spherical polar co-ordinates. Vector Spaces. Gradient, divergence and curl; Laplacian. Gauss' and Stokes' theorems.) This topic is concerned with the continuously-varying spatial extent of systems.
Fourier Analysis (Fourier series and integrals. Dirac delta-function.) The description of curves in space or in time in terms of their harmonic content is very important in many applications. The delta-function provides a mathematical description of a singularity (infinity) at a point.

Differential Equations (Series solutions. Partial differential equations. Separation of variables. Wave equation, Heat equation, Laplace equation, Schrödinger equation.) A large number of physical phenomena of both classical and quantum nature are described by second-order differential equations. Various solution techniques are presented.

Special Functions (Legendre polynomials, spherical harmonics. Applications to physical problems. Hermite polynomials, associated Laguerre polynomials. The Hydrogen atom.) Special functions arise in the solution of differential equations which describe many phenomena, such as vibrations, potential-type theories, and quantum-mechanical systems.

5.0 RATIONALE FOR CONTENT

The course covers some of the most important mathematics at second year level required for an appreciation and utilization of the mathematics required for the physical sciences.

6.0 ORGANISATION AND TEACHING METHODS

Lectures, at the rate of about three per week during the semester. (approx 3 hours)

Problem classes, at the rate of about one per week, based on problem sheets. (approx 1 hour)

7.0 RATIONALE FOR TEACHING METHODS

Lectures allow the students to see the mathematics as actually worked out, and give them necessary practice in writing out mathematical symbols and formats.

The problem classes give the Lecturer time to work through some problems from the problem sheets or past exams, and provide students with the opportunity to ask further questions.

8.0 ASSESSMENT

Part 1 is a sixty-five minute mid semester examination (in Teaching Week 6) on the Vector Analysis section, and Part 2 is a two hour end of semester examination on the remainder of the course to be held in the standard University end of semester examination period. The marking treats these as a single overall assessment with a 100% weighting.

Item	Length	Worth	Focus	Due
Mid Semester Exam	65 Minutes	100% together	Individual	In Teaching Week 6
Final Examination	2 hours		Individual	Final Exam Period

9.0 RATIONALE FOR ASSESSMENT

The examinations test students' understanding of, and facility with, the mathematical techniques presented during the course, and examine their ability to apply these methods in solving physically motivated problems. The mid semester examination covers about the first third of the course, and reduces student study load for the end of semester examination.

10.0 TEXTS AND SUPPORTING MATERIALS

Recommended Reading:

Boas, M.L. Mathematical Methods in the Physical Sciences, 2nd edn, New York Wiley, 1983.

or,

Spiegel, M.R. Vector Analysis and an Introduction to Tensor Analysis, Schaum, McGraw-Hill, and

Spiegel, M.R. Fourier Analysis with Applications to Boundary Value Problems, Schaum, McGraw-Hill.

11.0 COURSE EVALUATION FOCUS

Feedback is obtained from students during the Problem Classes.

A brief questionnaire may be handed out near the end of the course.

Convenor will discuss report of evaluation with teaching team.

12.0 ADMINISTRATION

12.1 The administration of this course conforms to the general practice adopted by the School of Science.

12.2 **Pre-requisite/Prior Assumed Requirements**

Enrolment in this course is granted on the basis that a grade of P (Pass) or better has been achieved in any Pre-requisite or Prior Assumed requirement in this course as listed under section 1 of this outline. Failure to meet this requirement may result in you having difficulty with the course and not being able to complete it successfully. **Any additional support or special assistance cannot be expected nor requested if the prerequisite and/or prior assumed requirements have not been met.**

Signed: _____ Date _____
Course Convenor

Signed: _____ Date _____
Head of School (SCE)

Signed: _____ Date _____
Chair (Faculty Board)