

Subject Information Guide

Introduction to Nonlinear Partial Differential Equations

Semester 2, 2018

Administration and contact details

Host Department	School of Mathematical and Physical Sciences
Host Institution	The University of Newcastle
Name of lecturer	A/Prof Michael Meylan
Phone number	+61249216792
Email Address	mike.meylan@newcastle.edu.au
Homepage	https://www.newcastle.edu.au/profile/mike-meylan
Name of Honours coordinator	Dr Andrew Morris
Phone number	(02) 4921 5515
Email Address	andrew.morris@newcastle.edu.au

Subject details

Handbook entry URL	To be decided
Subject homepage URL	http://www.wikiwaves.org/Category:Nonlinear_PDE%27s_Course
Honours student hand-out URL	To be decided
Start date:	Monday 30 July 2018
End date:	Friday 9 November 2018
Contact hours per week:	2
Lecture day and time:	To be decided
Description of electronic access arrangements for students (for example, WebCT)	Notes will be on the web

Subject content

1. Subject content description

This course is an introduction to nonlinear partial differential equations, focusing on nonlinear wave phenomena. We will consider applications from physics, ocean engineering, chemical engineering, civil engineering and biology. The underlying partial differential equations will be derived and the properties of the solutions will be investigated. Simulations of the PDEs will be obtained using MATLAB.

2. Week-by-week topic overview

SCHEDULE

Week	Topic	Learning Activity	Assessment Due
1	Linear Equations	Lectures	
2	Traffic Waves	Lectures,	
3	Traffic Waves/Nonlinear Shallow Water Waves	Lectures,	
4	Nonlinear Shallow Water Waves	Lectures	
5	KdV	Lectures	
6	KdV	Lectures,	
7	KdV	Lectures,	Assignment 1
8	KdV	Lectures,	
9	Reaction-Diffusion Systems	Lectures	In-class Quiz
10	Reaction-Diffusion Systems	Lectures	Assignment 2
11	Reaction-Diffusion Systems	Lectures	
12	Burgers Equations	Lectures	
13	Review		Assignment 3

3. Assumed prerequisite knowledge and capabilities

A previous course on partial differential equations.

4. Learning outcomes and objectives

Enter learning outcomes/objectives/capability development goals here

AQF specific Program Learning Outcomes and Learning Outcome Descriptors (if available):

AQF Program Learning Outcomes addressed in this subject	Associated AQF Learning Outcome Descriptors for this subject
Understanding of nonlinear PDES	K1, K2
Ability to solve nonlinear PDES analytically	S1, S2, A1, A2
Ability to solve nonlinear PDES numerically	S1, S2, A1, A2
Ability to solve nonlinear PDES qualitatively	S1, S2, A1, A2

Learning Outcome Descriptors at AQF Level 8

Knowledge

K1: coherent and advanced knowledge of the underlying principles and concepts in one or more disciplines

K2: knowledge of research principles and methods

Skills

S1: cognitive skills to review, analyse, consolidate and synthesise knowledge to identify and provide solutions to complex problem with intellectual independence

S2: cognitive and technical skills to demonstrate a broad understanding of a body of knowledge and theoretical concepts with advanced understanding in some areas

S3: cognitive skills to exercise critical thinking and judgement in developing new understanding

S4: technical skills to design and use in a research project

S5: communication skills to present clear and coherent exposition of knowledge and ideas to a variety of audiences

Application of Knowledge and Skills

A1: with initiative and judgement in professional practice and/or scholarship

A2: to adapt knowledge and skills in diverse contexts

A3: with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters

A4: to plan and execute project work and/or a piece of research and scholarship with some independence

5. Learning resources

Notes will be provided and are available on the internet at
http://www.wikiwaves.org/Category:Nonlinear_PDE%27s_Course

6. Assessment

Exam/assignment/classwork breakdown					
Exam	60%	Assignment	40%	Class work	0



Assignment due dates	Weeks 8, 10 and 13	Click here to enter a date.	Click here to enter a date.	Click here to enter a date.
Approximate exam date		November 2018		

Institution Honours program details

Weight of subject in total honours assessment at host department	1/8 of a year
Thesis/subject split at host department	3/8
Honours grade ranges at host department:	
H1	85-100
H2a	75-84
H2b	65-74
H3	50-64