ACE Network Subject Information Guide

Advanced Numerical Analysis

Semester 2, 2022

Administration and contact details

Host Department	Mathematics
Host Institution	University of Newcastle
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Subject details

Handbook entry URL	Click here to enter text.
Subject homepage URL	Click here to enter text.
Honours student hand-out URL	Click here to enter text.
Start date:	July 19, 2022
End date:	Oct 29, 2022
Contact hours per week:	2
Lecture day and time:	Thursday 10am-12pm AEST
Description of electronic access arrangements for students (for example, WebCT)	Course materials will be shared via DropBox

Subject content

1. Subject content description

Data interpolation and fitting, numerical differentiation and integration, numerical solutions of ordinary and partial differential equations (ODEs and PDEs)

2. Week-by-week topic overview

Week 1-2: Data interpolation and fitting
Week 3: Numerical integration and differentiation
Week 4: Boundary value problem for ODEs: Shooting method
Week 5: Finite difference method for linear and non-linear ODEs
Week 6-7: Finite difference method for partial differential equations
Week 8: Weak formulation of partial differential equations
Week 9: Sobolev spaces, existence and uniqueness of the solution
Week 10-12: Finite element method and its implementation

3. Assumed prerequisite knowledge and capabilities

Second year level analysis and differential equations. MATLAB.

4. Learning outcomes and objectives

1. Apply numerical techniques to approximate functions, their derivatives and integrals arising from problems in science, mathematics and engineering.
2. Develop numerical algorithms for differential equation problems, implement them in a computer, visualise and interpret their solutions.
3. Apply the idea of accuracy, consistency, stability and convergence in numerical approximation techniques.

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
Insert Program Learning Outcome here	Choose from list below
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Insert Program Learning Outcome here	Choose from list below
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Insert Program Learning Outcome here	Choose from list below
Insert Program Learning Outcome here	Choose from list below

5. Learning resources

R.L. Burden and J.D. Faires, Numerical Analysis, 9th edition, Brooks and Cole

Lecture notes will be provided for the course.

6. Assessment

Exam/assignment/classwork breakdown					
Exam	50 %	Assignment	50%	Class work	Enter 0%
Assignment due dates		Week 5	Week 9		
Approximate exam date				8 Nov - 26 Nov	

Institution Honours program details

Weight of subject in total honours assessment at host department		Click here to enter text.	
Thesis/subject split at host department		Click here to enter text.	
Honours grade ranges at host department:			
H1	85-100	H2a	75-84
H2b	65-74	H3	50-64