MA3520: APPLICABLE ANALYSIS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Applicable Analysis

Subject Code
MA - Mathematics
Course Number
3520

Academic Unit
Mathematics (MA)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA2508 Multi-variable Calculus

Precursors
MA3511 Ordinary Differential Equations

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course introduces some concepts and techniques of analysis, which are important in applications but not covered (at least in any details) in other mathematics courses offered by the department. It develops students' ability in solving more sophisticated mathematical problems with knowledge from classical analysis.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	apply basic mathematical tools, such as inequalities, in proving classic results of real analysis.	10	x		
2	formulate a function as a trigonometric Fourier series and investigate convergence and other analytic properties of such a series.	10	x		
3	explain at high level concepts from (uniform) approximation and interpolation of functions.	20	x	x	
4	describe mathematical properties of some special functions and orthogonal polynomials which are used in connection with practical problems.	20	x	x	x
5	construct best approximations of functions in terms of special functions/polynomials or other explicit formulae.	20		x	
6	the combination of CILOs 1-5	20	x	x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5, 6	39 hours in total

2	Take-home assignments	Learning through take-home assignments helps students understand basic concepts and techniques of classical real analysis, including Fourier series, best approximation and special functions.	1, 2, 3, 4, 5	after-class
3	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2, 3, 4, 5	after-class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test	2, 3	20	Questions are designed for the first part of the course to see how well students have learned concepts of Fourier series and polynomial interpolation.
2	Hand-in assignments	1, 2, 3, 4, 5	20	These are skills based assessment which enables students to apply basic concepts and techniques of classical real analysis to a range of mathematical problems.
3	Formative take-home assignments	1, 2, 3, 4, 5	0	The assignments provide students chances to demonstrate their achievements on techniques of applicable analysis learned in this course.

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

Additional Information for ATs

40% Coursework
60% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task
1. Test

Criterion
Ability to understand the concepts of Fourier series and polynomial interpolation

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
2. Hand-in assignments

Criterion
Ability to apply basic concepts and techniques of classical real analysis to a range of mathematical problems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
4. Examination

Criterion
Ability to solve problems in the classical real analysis and the methods of analysis

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
5. Formative take-home assignments

Criterion
Ability to demonstrate students' achievements on techniques of applicable analysis learned in this course

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
Inequalities. Fourier Series. Approximation and Interpolation. Bessel functions. Orthogonal polynomials.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Nil