MA8011: METHODS FOR APPLIED MATHEMATICS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Methods for Applied Mathematics

Subject Code
MA - Mathematics
Course Number
8011

Academic Unit
Mathematics (MA)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Part II Course Details

Abstract
This course includes two topics: real analysis and differential geometry. It will help students to develop a logical and systematic understanding of the core material of real analysis and differential geometry.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	develop a systematic understanding of elementary properties of measures	10%	x	x	x
2	develop a systematic understanding of simple functions and apply them to integration	10%	x	x	x

3	develop a logical and systematic understanding of positive Borel measure	20%	x	x	x
4	apply the approximations by continuous functions	10%	x	x	
5	explain basic properties of curves including their curvature and torsion	10%	x	x	x
6	develop a systematic understanding of the tangent plane and the first fundamental form of surfaces; the concept of local charts is included	20%	x	x	x
7	develop a systematic understanding of the Gauss map and its fundamental properties	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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Learning through teaching is primarily based on lectures	1, 2, 3, 4, 5, 6, 7	
2	Assignments	Learning through take-home assignments helps students understand basic mathematical concepts and fundamental theory of this course, and develop the ability of proving mathematical statements rigorously.	1, 2, 3, 4, 5, 6, 7	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Test	1, 2, 3, 4, 5, 6, 7	20	-	No
2	Hand-in assignments	1, 2, 3, 4, 5, 6, 7	10	-	No

Continuous Assessment (%)
30

Examination (%)
70

Examination Duration (Hours)
2

Assessment Rubrics (AR)

Assessment Task
Test

Criterion
Ability to prove mathematical statements rigorously

Excellent
High

Good
Significant

Marginal
Basic

Failure
Not even reaching marginal levels

Assessment Task
Hand-in assignments

Criterion
Demonstration of the understanding of the basic materials

Excellent
High

Good
Significant

Marginal
Basic

Failure
Not even reaching marginal levels

Assessment Task
Examination

Criterion
Demonstration of skills and versatility in this course

Excellent
High

Good
Significant

Marginal
Basic

Failure
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
#-algebra, topological space, metm’ s space, measurable sets, Borel sets, the Riesz representation Theorem, tangent plane, the first fundamental form, Gauss map, the second fundamental form.

Reading List

Compulsory Readings

	Title
1	“Real and Complex Analysis” by Walter Rudin

Additional Readings

	Title
1	“Differential Geometry of Curves and Surfaces” by Manfredo P. Do Carmo