Course Syllabus

offered by Department of Mathematics
with effect from Semester A 2022/23

Part I Course Overview

Course Title:	Continuum Mechanics
Course Code:	MA8017
Course Duration:	One Semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to

- present the mathematical theory and applications of continuum media;
- provide a mathematical foundation for further studies in mechanics, material sciences and other branches of science and engineering.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Introduce tensor and its algebra	10%	✓	✓	
2.	Describe basic kinematics of continuum bodies	20%	✓	✓	
3.	Describe the general stress-strain for elastica and the restrictions imposed by frame indifference and material symmetry	20%	✓	✓	
4.	Derive (Einstein) field equations in conjunction with their relevance as a tensor equation and in Newtonian mechanics	30%		✓	✓
5.	Solve certain problems in nonlinear elasticity; describe the continuum theory for a linearly viscous fluid and solutions of the associated Navier-Stokes equations	20%	✓	✓	✓
		100%			

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 self-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.

3. Teaching and Learning Activities (TLAs)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lectures	Learning through teaching is primarily based on lectures	✓	✓	✓	✓	✓	3 hours/week
Assignments	Learning through take-home assignments helps students implement mathematical theory and techniques in analysing structures of isotropic elastic solids and modelling Newtonian fluids	✓	✓	✓	✓	✓	After-class

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: 30%							
Test	✓	✓	✓			15-30%	Questions are designed for the first part of the course to see how well students have applied field equations in Newtonian mechanics and formulated problems of isotropic elastic mathematically.
Hand-in assignments	✓	✓	✓	✓	✓	0-15%	These are skills based assessment to help students manipulate mathematical theory and techniques to analyse structures of isotropic elastic solids and model Newtonian fluid.
Examination: 70% (duration: 3 hours)	✓	✓	✓	✓	✓	70%	Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in mathematical formulation of continuum mechanics.
						100%	

5. Assessment Rubrics

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-,C+,C)	Failure (F)
1. Test	DEMONSTRATION of the understanding of the first part of the course	High	Significant	Basic	Not even reaching marginal levels
2. Hand-in assignments	DEMONSTRATION of the understanding of the basic materials	High	Significant	Basic	Not even reaching marginal levels
3. Examination	DEMONSTRATION of skills and versatility in continuum mechanics	High	Significant	Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	DEMONSTRATION of the understanding of the first part of the course	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	DEMONSTRATION of the understanding of the basic materials	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	DEMONSTRATION of skills and versatility in continuum mechanics	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Tensors, stress and deformation, derivation of field equations, linear isotropic elastic solids, nonlinear isotropic elastic solids, Newton fluid.

2. Reading List

2.1 Compulsory Readings

1.	Continuum Mechanics, P. Chadwick, Dover: New York, 1999.
2.	
3.	
…	

2.2 Additional Readings

1.	
2.	
3.	
…	