2023
TPG-153

Course Specification
(Postgraduate)

Course Title:	**Fluid Mechanics**
Course Code:	**202619-3**
Program:	**Master of Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Taif university**
Version:	1
Last Revision Date:	**20/10/2023**

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☒ Required		☐ Elective	
3. Level/year at which this course is offered: Level 1/First Year				
4. Course general Description:				
This is a 3 credit postgraduate course introducing advanced topics in Fluid Mechanics. The course comprises approximately comprising 45 hours of lectures. The role of the course is to introduce the mechanics of various Non-Newtonian Fluids. It is assumed that students entering this course have previously taken courses in Fluid Mechanics.				
5. Pre-requirements for this course (if any)**:**				
None				
6. Pre-requirements for this course (if any)**:**				
None				
7. Course Main Objective(s):				
The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Fluid Mechanics and its applications.				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	NA
3.	**Field**	NA
4.	**Tutorial**	NA
5.	**Others (specify)……**	NA
	Total	**45**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recognize** the difference between the viscous fluid and non-viscous fluid.	K1	Lectures, group discussion `	Exams, Quizzes, Assignments
1.2	**Identify** Euler equation, constitutive equation and Navier Stokes equations.	K2	Lectures, group discussion	Exams, Quizzes, Assignments
2.0	**Skills**			
2.1	**Apply** the learned material of the course in flow viscous fluids in channels and pipes in porous medium.	S1	Lectures, group discussion	Exams, Quizzes, Assignments, report
2.2	**Demonstrate** the difference between Newtonian fluid and non-Newtonian fluid.	S2	Lectures, group discussion	Exams, Quizzes, Assignments, report
3.0	**Values, autonomy, and responsibility**			
3.1	**Participate** effectively within groups and independently.	V1	Lectures, group discussion	Exams, Quizzes, Assignments, report
3.2	**Give** theorems and develop lemmas using different techniques.	V2	Lectures, group discussion	Exams, Quizzes, Assignments, report

C. Course Content:

No	List of Topics	Contact Hours
1.	Physical properties in fluids – Kinematics of fluids	6
2.	Stresses in fluids- Basic equations for a viscous fluid - rotational and irrotational fluids	3
3.	Newtonian and Non-Newtonian fluids – Navier-Stocks equations-applications	6
4.	Equations of motion for ideal fluid- Euler equation- kinetic energy for irrotational fluid.	6
5.	Ideal fluids in 2 D and potential flow – Constitutive equation	3
6.	Viscous fluids in channels and pipes for different coordinates	6
7.	flow in porous medium- Dimensionless theory	3
8.	The stability analysis for an incompressible viscous fluid confined to a finite region.	6
9.	The general constitutive expression for a stress tensor that depends on fluid density and velocity gradients alone. Particularize the model to incompressible fluids.	3
10.	Surface waves for fluids.	3
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes and HomeWorks	Continues	10 %
2.	Midterm exam	8^{th} -9^{th}	20 %
3.	Final exam	16^{th}	70%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	• G. Astarita and G. Marrucci, Principles of Non-Newtonian Fluid Mechanics, McGraw Hill Book Company Ltd. (1974). • J. Betten, Creep Mechanics, Springer Berlin Heidelberg (2008). •
Supportive References	Munson, Yong, Okiishi.Fundamental of Fluid Mechanics(4thEdition)-(2002).
Electronic Materials	https://en.wikipedia.org/wiki/Fluid_mechanics
Other Learning Materials	SDL, Calculous programming (Mathematica, Mathcad, Mathlab)

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Properly equipped classroom
Technology equipment (Projector, smart board, software)	- Projectors and related items. - Numerical packages. - Compilers
Other equipment (Depending on the nature of the specialty)	Wi-Fi internet connections

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students assessment	Students	Indirect
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Peer reviewer	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Department of Mathematics and Statistics
REFERENCE NO.	
DATE	20/10/2023

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