هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Fluid Mechanics**
Course Code:	**2023204-3**
Program:	**Bachelor in Mathematics.**
Department:	**Mathematics and Statistics Department**
College:	**Faculty of sciences**
Institution:	**Taif university**

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 9th level / 3th year
4. Pre-requisites for this course (if any)**:** **Mechanics 2022203-4**
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**5Hr /Week**	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	50
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description

The course provides an introduction to fundamental concepts of fluid mechanics. Provides an understanding of potential velocity and vortex. Establishes the equations of motion for viscous and perfect fluids in terms of stress. Introduces the equation of motion for Newtonian fluids if the body force is conservative. Study the motion of the fluid in two dimensions and define the stream function. Study and analyze the complex potential in Cartesian coordinates and polar coordinates. Deduce a complex potential for a source, sink and dipole.

2. Course Main Objective

The student will be taught as follows:

1. Introducing the fundamental concepts in fluid mechanics and compare between the incompressible fluid and compressible fluid.
2. Explaining the velocity potential and the sufficient and necessary conditions for the potential motion, and recognize the motion in two dimensions, stream function, complex potential and Source and Sink.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding:**	
1.1	Recognize the difference between the steady state and unsteady state.	K2
1.2	Outline the differential equation of stream lines and convey the interpret the flow of fluid.	K2
2	**Skills:**	
2.1	Demonstrate the difference between the perfect fluid and viscous fluid.	S2
2.2	Explain a fundamental physical and mathematical understanding of Fluid mechanics.	S2
2.3	Plan the difference between Newtonian fluid and non-Newtonian fluid.	S2
3	**Values:**	
3.1	Work effectively within groups and independently.	V1
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Kinematics: fundamental s concepts – velocity and acceleration of fluid particle- definition of ideal and viscous fluid, incompressible fluid-steady motion. Definition of stream lines and path lines	5
2	Differential equation of stream lines and path lines- Derivation of continuity equation - Examples-Equation of continuity for incompressible fluid.	5
3	Velocity potential – Rotational and irrotational motion-circulation – vortex- Equations of motion: stress tensor	5
4	Equation of motion for incompressible fluid in terms stress-Newtonian and Non-Newtonian fluids- Equations of motion for ideal fluid	5
5	Navier-Stock's equations- applications- - Euler equation- kinetic energy for irrotational fluid	5
6	**Midterm exam,** Equations of motion of incompressible fluid if the body forces conservative –Applications-Motion in two dimensions –	5
7	Stream function- velocity in the polar coordinates-Relation between stream function and velocity potential.	5
8	Applications- Definition of a complex potential -Examples	5
9	Relations of Cauchy-Rema-n Complex velocity- uniform stream in a straight line-The stream in a right angle.	5
10	Sources and sinks in two dimensions – complex potential of a source in two dimensions. Doublet in two dimensions.	5
Total		50

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding:**		
1.1	Recognize the difference between the steady state and unsteady state.	• Lectures • Group discussions	• Exams • Assignments
1.2	Outline the differential equation of stream lines and convey the interpret the flow of fluid.	• Lectures • Group discussions	• Exams • Assignments
2.0	**Skills**		
2.1	Demonstrate the difference between the perfect fluid and viscous fluid.	• Interactive classes • Group discussions	• Quizzes • Assignments
2.2	Explain a fundamental physical and mathematical understanding of Fluid mechanics.	• Lectures • Self-learning through the website	• Exams • Quizzes
2.3	Plan the difference between Newtonian fluid and non-Newtonian fluid.	• Lectures • Group discussions	• Exams • Quizzes • Assignments
3.0	**Values**		
3.1	Work effectively within groups and independently	Projects.	Through the oral presentation of the projects.
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	Interactive classes	• Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Quizzes + Home works**	**Continues**	**10 %**
2	**Midterm exam**	**5^{th}-6^{th}**	**30 %**
3	**Class Work (Homework- report- class test….)**	**8^{th}**	**10 %**
4	**Final exam**	**11^{th}**	**50 %**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:
6 hours per week (as defined in the teaching schedule of the faculty member) for academic advice and consultations.
Teaching staff is also available using Blackboard web site and Taif University "Edugate" System.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Munson, Yong, Okiishi. Fundamental of Fluid Mechanics(4thEdition)- (2002).**

Essential References Materials	**P. P. Gupta, Hydrodynamics: India (1969).**
Electronic Materials	https://en.wikipedia.org/wiki/Fluid_mechanics
Other Learning Materials	**SDL, Calculous programming (Mathematica, Mathcad, Mathlab)**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	**Classrooms, which can accommodate up to 50 students and equipped with e-podiums, and internet access.**
Technology Resources (AV, data show, Smart Board, software, etc.)	**Laptop, smart board and projector.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**Wi-Fi internet connections**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Peer Reviewer Students	Direct Indirect
Extent of achieving the course learning outcomes	Peer Reviewer Students	Direct Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department of Mathematics and Statistics
Reference No.	11
Date	12-7-1443 H

قسم الرياضيات والإحصاء
Mathematics and Statistics Department
TU
جامعة الطائف
TAIF UNIVERSITY