Course Specification

(Postgraduate)

Course Title:	**Fluid Dynamics**
Course Code:	**Math611**
Program:	**Mathematics**
Department:	**Mathematics**
College:	**College of Science and Humanities, Alkharj**
Institution:	**Prince Sattam Bin Abdulaziz University**
Version:	**1/2024**
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (2 hours)				
2. Course type				
A.	☐University	☐College	☒ Department	☐Track
B.	☒ Required		☐Elective	
3. Level/year at which this course is offered: (: 2 (2,2,0))				
4. Course general Description:				
Fundamental concepts. Basic equation for incompressible flow. Navier-Stokes equations. Boundary Layer. Flow about an immersed body.				
5. Pre-requirements for this course (if any)**: Math620**				
6. Pre-requirements for this course (if any)**: None**				
7. Course Main Objective(s):				
The main purpose of this course to prepare the students get better understanding about various concepts and theories of fluid dynamics and find simple analytical solutions of various types fluid flow including Boundary Layer flow				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 hours a week	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	**E-learning**: In case of suspension of regular classes due to any unforeseen eventualities	Not applicable
4	Distance learning		

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

No	Activity	Contact Hours
1.	**Lectures (16 X 2)**	**32**
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial (16 X 1)**	**16**
5.	**Others (specify).....Office Hours (16 X 1)**	16
	Total	**64**

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	Acquire knowledge on various basic concepts of fluid flow and associated theories	K1	1. Class Room Lectures 2.Interactive sessions 3.Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2.At least two Quiz 3.End Semester Exam
1.2	Recall various physical laws on conservation such as mass, momentum, energy and their effect in motion of fluids			
1.3	Describe concept of incompressible flow of fluids and the use of Navier Stoke equations for incompressible flow			
1.4	Reproduce the theories and concept of Boundary Layer flow			
2.0	**Skills**			
2.1	Able to derive the equations for incompressible flow	S1	Application oriented exercises during lecture and tutorial session	1.Homework 2.Assignments 3.Quiz 4.Mid Term and Final Exam
2.2	Able to find simple analytical solutions of fluid flow			
2.3	Able to formulate mathematical problem on	S1		

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	immersed flow and Boundary layer flow			
2.4	Able to make presentation on a given topic	**S3**	Interactive session	Continuous assessment Assignments
3.0	**Values, autonomy, and responsibility**			
3.1	Work independently and in groups	V1	Group Discussion Brain Storming Group and Individual Task	Continuous Assessment Oral Presentation
3.2	Appreciate the contribution of mathematics to the society in various fields.			

C. Course Content:

No	List of Topics	Contact Hours
1.	Basic Information, Dimensions, Units, and Physical Quantities, Gases and Liquids, Pressure and Temperature, Properties of Fluids, Thermodynamic Properties and Relationships.	6
2.	Fluid Statics, Pressure Variation, Manometers, Forces on Plane and Curved Surfaces, Accelerating Containers.	6
3.	Fluids in Motion, Fluid Motion, Classification of Fluid Flows, Bernoulli's Equation.	6
4.	The Integral Equations, System-to-Control-Volume Transformation, Conservation of Mass, The Energy Equation, The Momentum Equation.	6
5.	Differential Equations, Introduction, The Differential Continuity Equation, The Differential Momentum Equation, The Differential Energy Equation.	6
6.	Dimensional Analysis and Similitude, Dimensional Analysis, Similitude.	6
7.	Internal Flows, Introduction, Entrance Flow, Laminar Flow in a Pipe, Laminar Flow Between Parallel Plates, Laminar Flow between Rotating Cylinders.	9
8.	Revision	3
Total		**48**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Term Exam I	6	15%
2.	Quiz (At least 2 quiz)	4 & 10	10%
3.	Mid Term Exam II	13	15%
4.	Continuous Assessment – Homework, Assignment, Attendance etc.	--	10%
5.	End Semester Exam	17	50%

*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	-Schaum's Outline Series, Fluid Mechanics McGRAW-HILL MERLE C. POTTER, Ph.D., Professor Emeritus of Mechanical Engineering, Michigan State University, DAVID C. WIGGERT, Ph.D., Professor Emeritus of Civil Engineering, Michigan State University -Fluid Mechanics, Fourth Edition, Frank M. White, University of Rhode Island
Supportive References	
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms with Smartboards with seating facilities for at least 30 students
Technology equipment (Projector, smart board, software)	• Smartboard, Internet Connection for Blackboard
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students Peer Review/Classroom Observation	Indirect
Effectiveness of students assessment	Independent member teaching staff	Check marking by an independent member teaching staff of samples of student work.
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Faculty Member Quality Unit of College and department	Direct Learning outcomes assessment.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	