هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Fluid Machinery
Course Code:	443-MEC-3
Program:	Bachelor of Science in Engineering
Department:	Mechanical Engineering
College:	College of Engineering
Institution:	Najran University
Version:	1.0
Last Revision Date:	27 February 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Fifth Year \ Level 10)					
4. Course general Description:					
Laminar Flow: Differential Analysis of Laminar Flow, Governing Equations, Continuity Equation, Navier Stokes Equations, Reynolds Number, Turbulent Flow: Phenomenological Theories of Turbulence, Prandtl Number and Eddy Viscosity Concepts, Smooth and Rough Pipes. Boundary Layer Theory: Boundary Layer Thickness, Displacement and Momentum Thickness, Laminar Boundary Layer, Effect of Pressure Gradient, Boundary Layer Control. Impact of Jet: Impulse Momentum Equation, Jet Propulsion, Moment of Momentum Equation, Euler's Equation for Turbo Machines. Hydraulic Pumps: Centrifugal Pumps, Main Components and Working Principle, Efficiency and Performance Characteristics, Reciprocating Pumps, Working Principle, Slip of Pump, Indicator Diagrams. Hydraulic Turbines: Introduction and Classification of Hydraulic Turbines, Pelton, Francis and Kaplan Turbines, Propeller Turbines, Governing of Turbines, Draft Tube, Cavitation in Pumps and Turbines.					
5. Pre-requirements for this course (if any)**:**					
331-MEC-3 (FLUID MECHANICS)					
6. Co-requisites for this course (if any)**:**					
NIL					
7. Course Main Objective(s):					
1.Develop the understanding of laminar flow of fluid and its related governing equations for practical use in daily life. 2.Illustrate the concept of boundary layer flow and determine the effect of different factors in its flow. 3.Simulate the impact of jet on hydraulic machines and related equations.					

4.Illustrate the working principle and guiding equations for hydraulic pumps with indicator diagrams.
5.Discriminate the working of hydraulic turbines and their performance characteristics under different heads in practical life.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	30
2.	**Laboratory/Studio**	15
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

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	Learning and applying principles	1	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based	-Test performance evaluation -Evaluation of participation in discussion and

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes by the each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	group assignments -Written Assessment.
1.2	Design of pumps and turbines.	1	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Giving more assignment by the each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	-Test performance evaluation -Evaluation of participation in discussion and group assignments -Practical Assessment
2.0	**Skills**			
2.1	Revision and recapitulating in the beginning of class and asking students	6	TS:1-Interactive lectures using PowerPoint slides	•Locally Developed Exams such as Quiz, Mid &

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	to recall the contents of previous class		TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes for each chapter TS: 5 – Discussion with the students in the class hours	Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
2.2	Involving the students to solve problems	2	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes for each chapter TS: 5 – Discussion with the students in the class hours	•Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	Motivating through Group discussions among the students	5	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam for each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	•Assignments involving critical and logical thinking questions •Quizzes
3.2	Motivating through Group discussions among the students	5	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam for each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes

C. Course Content

No	List of Topics	Contact Hours
1.	Navier Stokes Equations, Reynolds Number, Turbulent Flow.	8
2.	Boundary Layer Theory	8
3.	Impact of Jet: Impulse Momentum Equation, Jet Propulsion	8
4.	Euler's Equation for Turbo Machines	6
5.	Hydraulic Pumps: Centrifugal Pumps	15
6.	Hydraulic Turbines	15
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-12	10%
2.	Quizzes	1-12	10%
3.	Mid-term	6-12	20%
4.	labs	2-10	10%
5.	Final exam	15	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	Mechanical Vibrations, 5th Edition, S.S. Rao, (2011), Pearson-Prentice hall,
Supportive References	1. William J. Palm III, (2007), Mechanical Vibration, John Wiley & Sons, Inc. 2. William J. Bottega, (2014), Engineering Vibration, Second Edition, CRC Press. 3. W. T. Thomson, (1998), Theory of Vibration with Applications, Fourth Edition, Chapman & Hall,
Electronic Materials	1.www.pearsonhighered.com/rao. 2.http://www.me.mtu.edu/courses/meem3700/index.htm. 3.www.howstuffworks.com.
Other Learning Materials	NA

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and laboratories
Technology equipment (projector, smart board, software)	--
Other equipment (depending on the nature of the specialty)	--

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders and Peer Reviewer	Direct and Indirect
Effectiveness of Students assessment	Students & Faculty	Direct and Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT OF MECHANICAL ENGINEERING**
REFERENCE NO.	
DATE	**27/02/2024**