



Course Specification

(Bachelor)

Course Title: Fluid Machinery

Course Code: ME4233

Program: Mechanical Engineering

Department: Mechanical Engineering Department

College: College of Engineering and Architecture

Institution: Umm Al-Qura University

Version: 1

Last Revision Date: 12/2024

Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:	4
C. Course Content:	4
D. Students Assessment Activities:	5
E. Learning Resources and Facilities:	5
F. Assessment of Course Quality:	5
G. Specification Approval:	6



A. General information about the course:

1. Course Identification

1. Credit hours: (.....)

2. Course type

- A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
- B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (.....)

4. Course General Description:

- The course involves basic concepts and techniques used in fluid machines such as turbines, compressors, fans and pumps. A plan for using more engineering applications, examples and increased reliance on self-study through assignments using different types of machines and components might improve teaching effectiveness
- In some details, this course will cover some topics such as Introduction on the types of turbines, compressors and pumps, Basics, Classification- Major components, Efficiencies, Performance concepts, Performance, Velocity triangle, Performance characteristics- Performance computations, compressors and pumps, characteristic curves of the compressors and pumps, selection, Cavitation, Surge.

5. Pre-requirements for this course (if any):

Heat Transfer Equipment (ME4232)

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

Course Main Objective

- The main objective of this course
 - To give sufficient knowledge about the turbomachines, such as turbines, compressors, Fans, pumps and blowers.
 - Figure out a comprehensive knowledge and critical understanding of the main types of turbines, compressors and pumps.
 - Apply continuously theoretical and practical knowledge to select different machines.
 - Practice knowledge and skills to identify, independently and responsibly, the real problem in the field.
 - To equip students in working with projects and to take up research work in connected areas

2. Teaching mode (mark all that apply)





No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5	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	45
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		75

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in Fluid machinery	K1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.2	Understand deeply of	K1	Lectures, tutorials	Homework,



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	Fluid machinery , research and professional practice in Fluid machinery		and independent study assignments	Quizzes, Midterm and Exam
1.3	Understand how modern knowledge in Fluid machinery is composed and how it is applied, as well as the impact of modern research on knowledge stocks in Fluid machinery and related professional practices	K2	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.0	Skills			
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available	S2	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in	S1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	the development of results and proposals related to its academic field.			
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.	S3	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
3.0	Values, autonomy, and responsibility			
3.1	Practice knowledge and skills to identify, independently and responsibly, the real problem by realizing a given problem statement, perform Literature Review to establish the need to solve the problem, define the real problem and develop technical objectives and a mission statement based on assumptions and realistic constraints to guide him / her to solve the problem Fluid machinery	V1	Study presentation and report preparation	Oral presentation and minor projects.
3.2	Communicate individual work well in written / oral form for diversified audience.	V2	Study presentation and report preparation	Oral presentation and minor projects.
...				



C. Course Content

No	List of Topics	Contact Hours
1.	INTRODUCTION.	
1	- BASIC CONSERVATION EQUATIONS OF FLUID MECHANICS - APPLIED TO CONTROL VOLUME. - BASIC CONCEPTS OF INCOMPRESSIBLE FLUID FLOW.	10
2.	Turbomachines and aerothermodynamics, Efficiencies, Dimensionless analysis, Performance	10
3	Centrifugal compressor concepts, Performance, Compressor surge – Axial flow compressor	15
4	Radial-inflow turbines, Theory, Turbine design considerations, Performance characteristics – Axial flow turbines, turbine geometry, Reaction turbines Blades cooling concepts, Turbine aerodynamics –Performance computations.	15
5	PHYSICAL PRINCIPLES OF CENTRIFUGAL PUMPS - ENERGY CONVERSION IN CENTRIFUGAL PUMPS - POWER, LOSSES AND EFFICIENCY - THE TOTAL HEAD REQUIRED BY A PUMPING PLANT - THE TOTAL HEAD REQUIRED BY A PUMPING PLANT	10
6	- CENTRIFUGAL PUMPS OPERATION - CHARACTERISTICS OF CENTRIFUGAL PUMPS - HEAD-CAPACITY CURVES (Q–H CURVES) - CONTROL OF CENTRIFUGAL PUMPS - PIPING SYSTEM CHARACTERISTIC - PUMP CONTROL	10
7	Pipeline networks - Series and parallel operation of pumps - Cavitation physical principles	5





	- Net positive suction head (NPSH) - Available NPSH	
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1. 1	Quizzes and Exercise	3-6, 10-13	40%
2. 2	Report, homework & Presentation	4-8, 11-14	10%
3. 3	Mid-term	8	10%
4	Final exam	17/18	40%

*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	- Turbomachinery: Basics, Theory and Applications, by E.Jr. Logan, John Wiley, 1993. - Compressors Performance: Selection, operation and testing of axial & centrifugal compressors, By Theodore Gresh, Butterworth Heineman, 1990. - Igor J. Karassik, Joseph P. Messina, Paul Cooper, Charles C. Heald, Pump Handbook, third ed., McGRAW-HILL, 2001.
Supportive References	
Electronic Materials	All the lecture notes
Other Learning Materials	

2. Required Facilities and equipment

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



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz, midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct analysis
The extent to which CLOs have been achieved	Program Coordinator	Direct analysis
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ME Graduate Studies Committee
REFERENCE NO.	
DATE	Dec. 24, 2024

