



Course Specifications

Program on which this course is given:	Diploma of Applications of Automatic Control of Mech. Power Systems
Department offering the program:	Mechanical Power Engineering Department - ACC control Lab
Department offering the course:	Mechanical Power Engineering Department - ACC control Lab
Academic Level:	Elective Course- Summer Term of the Diploma of Graduate Studies
Date	1 st and 2 nd Term 2024/2025
Semester (based on final exam timing)	√ Fall √ Spring

A- Basic Information

1. Title:	Applications of Industrial Pipe lines: Types, Design, Construction, Installation & Maintenance						Code:	MEP 579
2. Units/Credit hrs per week:	Lectures	3 Credit hours per week	Tutorial	--	Practical	--	Total	3

B- Professional Information

1. Course description	Overall Aims: This practical elective course is one of the 4 elective courses requirements of the Diploma. It is designed to review, effectively, all Basic design Concepts & Fundamental Aspects of Fluid Flow in Piping Systems and Types and components of Pipe-Networks. The Course aims are to give students the skills & knowledge to: - Basic fundamentals of fluid flow in various components of pipeline systems. - Fluid viscosity, characteristics of laminar & turbulent flow, critical Reynolds# - Careful examination of how to calculate major pressure/head losses and types of minor losses in different pipeline fittings & components. - Understanding basics about types of manual, control & industrial valves as essential parts of pipelines. This include their various functions, materials, sizes, geometry considerations & most essential flow characteristics through each type -Examine the pressure drop relations and flow coefficient calculations for each valve type. How to select the proper valve size for a given flow is also considered. - Investigate the various international standards for pipes, valve rating, material selection and methods for the correct valve sizing for different type of fluids. - Careful examination of various types of emergency and pressure relief valves and ruptured disks.-Careful examination of various types of automatic control valves and water hammer protection valves. - Care-full examination of various types of pipelines fluid flow measurement components and equipments.- Modern Technology of Using Computer Software in design of Piping systems - Various types of pipelines supporting, hanging and fixing elements & equipments. Some calculations for forces & moments acting on those supporting elements.
	2. Intended Learning Outcomes of Course (ILOs): a) Knowledge and Understanding: Having successfully completed this course, the post-graduate student should have knowledge and understanding of: -Fundamental Aspects of Pipe-Lines, Types and components of Piping Systems, Review of Hydraulic considerations, Major and Minor Losses in Piping Systems. -Types of Pipe line Fittings, Piping System Design and pipe-networks calculations problems. -Using Computer Software & numerical calculation methods in design & analysis of Piping systems. -Types of industrial Valves (functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts/parameters-Manual Valves (types, selection, and operation). -Hydraulic & Pneumatic control valves (Pressure, Directional, check), and Types of Flow Meters. -Water Hammer Problems in Pipe lines.



b) Intellectual Skills:

Having successfully completed this course, the student should have the ability to do:

- Select and apply appropriate technical and optimum method in doing engineering design and analysis of automatic control problems.
- Searching for scientific information and adopting automatic control self-E-learning capabilities.
- Analyze & compare component effects, performance, and efficiency of different pipe line systems.
- Apply the concept of using software for design, simulation, analysis, diagnostics & operation of various types of pipe line systems and networks.
- Compare between various types of pipe line systems and networks components, and parts.
- Apply scientific and engineering analysis for pipe line systems and networks.

c) Professional and Practical Skills:

Having successfully completed this course, the student should have the ability to do:

- Identify several types of automatic control problems in pipe line systems and networks which are essential for the design and operation of mechanical power systems and energy transfer processes.
- Perform professional design and modelling for automatic control problems of pipe line systems and networks.
- Suggest possible alternative solutions for various types of components for automatic control problems in pipe line systems and networks .
- Diagnose efficiency and performance of different types of automatic control circuits/systems in pipe line systems and networks.
- Analyze different types of automatic control problems in pipe line systems and networks.

d) General and Transferable Skills:

Having successfully completed this course, the student should have the ability to do:

- Perform engineering assembly of different pipe line system fittings and networks components in one control system.
- Transfer knowledge, Work in group and Communicate in written and oral forms, in English.
- Use IT & evolutionary technological tools & PC applications (Excel, Mat lab, Virtual labs, .etc).
- Prepare & write reports, Manipulate & sort data, Think logically, and continuous self-E-learning.
- Identify practical problems and compare between different technologies used for pipe line systems and networks.
- Organise & manage time & resources effectively; for short-term and longer-term commitments.

3. Contents

Topics:	Total hrs	Lectures hours	Tutorial/ Practical hrs
Introduction and Basic Concepts: Fundamental Aspects of Fluid Flow in Piping Systems, Types and components of Pipe-Networks, Review of some Hydraulic considerations, Major and Minor Losses in Piping Systems, Various Types of Pipe Fittings, Solved Examples. Piping System Design and Calculations: Many Practical Cases and Numerical Solved examples. Using Computer Software in design of Piping systems: Many Practical programs. Types of industrial Valves (basic functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts/parameters - Manual Valves (types, selection, connections, operation) - Check Valves (types, selection, design and installation factors) - Reducing and Pressure Relief Valves (direct acting, characteristics) - Automatic Control Valves (spool types, single/multi-stage controls) - Valve Maintenance - Examples for automatic Valves. Various Types of Flow Meters. Water Hammer in Piping systems	42 hrs	3hrs/week for 14 weeks before the final term exam	---



4. Teaching and Learning Methods

Lectures (√)	Practical/ Training (√)	Seminar/ Workshop ()	Class Activity (√)	Case Study (√)	Projects ()	Laboratory ()	E-learning (√)	Assignments /Homework (√)	Other: Submitting reports
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5. Student Assessment Methods

Assessment Schedule						Week
-Assessment 1; Report # A						Week # 1
-Assessment 2; Report # B						Week # 2
-Assessment 3; Report # C						Week # 4
-Assessment 4; Report # 1						Week # 6
-Assessment 5; Report # 2						Week # 8
-Assessment 6; Report # 3						Week # 10
-Assessment 7; Report # 4						Week # 12
-Assessment 8; Report # 5						Week # 13
-Assessment 9; – General course Report						Week # 14
• Weighting of Assessments						
-All in-term works, sheets and reports					30 %	
-Final-term formal, written Examination					70 %	
-Project					--	
-Class Test					--	
-Presentation					--	
-Total					100 %	

6. List of References:

- 1- Several class notes, presentations & Special Reports prepared by Assoc. Professor Dr. Mohsen S. Soliman.
- 2- “Fluid Mechanics”, 4th ed., Frank M. White, MCGRAW-HILL, N.Y.
- 3- “Mechanical Engineering HandBook”, CRCnetBase1999, Frank Kreith, CRC Press.
- 4- “Pump HandBook”, 3^{ed} ed., Igor J. Karassik, Joseph P. Messina, Pual Cooper, Charles C. Heald, MCGRAW-HILL, N.Y.
- 5- “Piping Hand Book”, Mohinder L.N., 7th Edition, MCGRAW-HILL, N.Y.

7. Facilities Required for Teaching and Learning: Data Show & Laptop Computer to run the Virtual Lab.

Course Coordinator:	Associate Professor Dr. Mohsen S. Soliman
Head of Department:	Professor Sayed Ahmed Kaseb

Date September 2024