Mechatronics 4

Basic Course Information

Course Number	01005113	**Subject Category**	Compulsory (M)
Class Format	Lecture	**Credit Type and Number of Credits**	2
Department	Mechatronics	**Student Category**	Year 4
Period of Study	Semester 2	**Classes per Week**	4
Required Materials	Pneumatic or Hydrulic simmulation application, Personal computer or Labtop		
Instructor	Wutsorng Preechaphonkul	Vorapong Sutthiaksorn	

Course Objective

The course provides students with introduction and basic knowledge of mechatronics. Topics covered in this course: Pneumatic actuators, hydraulic actuators, ultrasonic motors and so on. In addition, it is necessary to understand the knowledge of fluid mechanics for this subject, therefore this subject covered with fluid statics, fluid Kinematics, bernoulli's equation etc.

Evaluation (Rubric)	Ideal Level of Achievement (Very Good)	Standard Level of Achievement (Good)	Unacceptable Level of Achievement (Fail)
Understanding the fundamentals, characteristics, construction, and applications of pneumatic actuators, hydraulic actuators, and ultrasonic motors	Demonstrates a comprehensive and in-depth understanding of all components and applications. Able to explain complex scenarios where these actuators and motors can be applied innovatively	Shows a firm grasp of the fundamentals and applications but may lack in-depth understanding. Able to apply knowledge in familiar contexts but struggles with novel applications	Shows gaps in basic understanding and cannot effectively describe or apply the principles of these actuators and motors
Developing proficiency in designing mechatronic systems that integrate pneumatic actuators, hydraulic actuators, and ultrasonic motors effectively	Demonstrates exceptional skills in designing complex mechatronic systems. Shows innovative problem-solving skills and can optimize systems for efficiency and effectiveness	Adequate skills in system design but may require guidance for complex scenarios. Demonstrates a good understanding of integration but might lack optimization skills	Struggles with basic design principles and cannot integrate actuators and motors into a functional mechatronic system effectively
understanding and apply the fundamental principles of fluid mechanics, and to provide them with the analytical skills needed to explain various fluid phenomena	Displays comprehensive understanding and application skills in fluid mechanics. Exceptionally proficient in analytical problem-solving and can explain complex fluid phenomena with ease	Demonstrates a satisfactory level of understanding and application but may struggle with complex fluid systems. Shows basic analytical skills	Lacks the fundamental understanding and analytical skills necessary to explain or solve problems related to fluid mechanics

Relationship with Learning Outcomes

M(1) Ability to design, propose and develop robotic/ mechatronic systems to solve specific problems
M(2) Ability to design, propose and develop electrical and electronic systems for robotic/ mechatronic systems
M(4) Ability to design and develop the software for control robotic/ mechatronic systems.

Teaching Method

Outline:	This course is to equip students with a comprehensive understanding of the
Class Format:	Lecture
Please Note :	All materials will be posted on the Google classroom.

Course Plan

Semester 2	**Contents and Method of Course**	**Goals**	**Related MOC**
1st Week	Pneumatic actuator I : Advantage and disadvantages, System configulation, Symbols, Industrial standard Introduction and Fundamental Concepts	Can explain advantages and disadvantage for pneumatic system, and understand the scope and importance of fluid mechanics in various engineering fields.	V-A 4 84
2nd Week	Pneumatic actuator II : Air-compressor, Pneumatic cylinder, Pneumatic control valve and Pneumatic system circuit Fluid Properties and Units	Can explain the function of each parts for pneumatic system, the basic properties of fluids including density, viscosity, and compressibility.	V-A 4 84
3rd Week	Pneumatic III : Pneumatic system circuit and its applications Fluid Statics: Pressure	Can explain application of pneumatic systems using pneumatic system circuit, and the concept of pressure in static fluids and its applications.	V-A 4 85 V-A 4 86
4th Week	Hydraulic actuator I : Advantages and disadvantages, System configulation, Parts selection Fluid Statics: Buoyancy	Can explain advantages and disadvantage for hydraulic actuator, the principles of buoyancy and Archimedes' principle.	V-A 4 88
5th Week	Hydraulic actuator II : Hydraulic pumps, Types of hydraulic actuators, Hydraulics control valves, Dynamic characteristics of hydraulic Manometry & Pressure Measurement	Can explain the function of each parts for hydraulic system, and learn methods and instruments for measuring fluid pressure.	V-A 4 86
6th Week	Hydrostatic Forces on Surfaces	Understand and calculate the hydrostatic forces on submerged surfaces.	V-A 4 87
7th Week	Hydraulic actuator III : Connstruction and application of hydraulic systems Fluid Kinematics: Streamlines	Can explain application of hydraulic systems, the basic principles of fluid motion, including concepts like streamlines and pathlines.	V-A 4 90
8th Week	Excerise and warp-up for 1st-half	Review and summarize learning	
9th Week	Holiday / Midterm Exam	Evaluate understanding and application of concepts in fluid statics and properties.	
10th Week	Return Midterm Exam papers and Feedback	Review learning	
11th Week	Installation and Introduction Simulator program Basic Equations of Fluid Flow	Can understand tool in the simulator application and can use it to design pneumatic circuit, and learn about the conservation laws for mass, energy, and momentum in fluid flow.	V-A 4 89 V-A 4 91 V-A 4 94
12th Week	Motion Diagram : Displacement - Step, Displacement - Time Diagram Bernoulli's Equation	Can explain Displacement-Step diagram and Displacement-Time diagram, and Bernoulli's principle in various fluid systems.	V-A 4 93
13th Week	Excerise 1: Write motion diagram from pneumatic circuit and check correction by simulator Flow in Pipes	Can write motion diagram from pneumatic circuit, and understand the principles of fluid flow in pipes	V-A 4 97 V-A 4 98
14th Week	Excerise 2 : Design pneumatic circuit from motion diagram and check correction by simulator	Can design pneematic circuit from motion diagram.	
15th Week	Assignment 1 : Write motion diagram from pneumatic circuit from Real-world application topic Laminar and Turbulent Flow	Can write motion diagram from pneumatic circuit in Real-world topic. Differentiate between laminar and turbulent flows.	V-A 4 95
16th Week	Assignment 2 : Design pneumatic circuit from motion diagram from Real-world application topic. Flow Over Bodies: Lift and Drag	Can design pneumatic circuit from motion diagram in Real-world topic. Understand the concepts of lift and drag, and how they affect fluid flow over bodies.	V-A 4 100 V-A 4 101
17th Week	Compressible Flow	Understand the basics of compressible fluid flow and its implications.	V-A 4 99
18th Week Mar 4	Excerise and warp-up for 2nd-half Fluid Machinery	Review and summarize learning Learn about the basic types of fluid machinery like pumps and turbines.	
19th Week Mar 11	Final Exam	Evaluate understanding and application of concepts in fluid statics and properties.	
20th Week Mar 18	Final Exam / Return and Feedback, Date TBA	Review and summarize learning	

Do not

	Examination	**Quiz**	**Mutual Evaluations between students**	**Report**	**Portfolio**	**Other**
Basic Ability	30	20				
Technical Ability	25	10				
Interdisciplinary Ability	10					