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- 1st or 2nd Term of the Diploma of Graduate Studies**
Date	**2nd Term 2014/2015**
Semester (based on final exam timing)	☐ Fall √ Spring

A- Basic Information

1. Title:	**Advanced Applications of Hydraulic Circuits in Automatic Control Systems**						**Code:**	**MEP 566**	
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 is an advanced elective course as one of the 4 elective courses requirements of the Diploma. Part (I) of this course is designed to give the students more advanced skills and additional knowledge relevant to both Hydraulic and Pneumatic circuits through various types of examples and virtual labs applications. Part (II) is designed to introduce study and examine more advanced types of Hydraulic control systems and components. These advanced circuits include various types of both proportional hydraulic systems & Servo-hydraulic control systems.

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:

-Analogy and Difference between essential components, operation, and functions of Hydraulic and Pneumatic circuits.

-Basics of Pneumatic logic circuits and Pneumatic control processes and using of an advance and applied virtual labs to study & analyze the performance of various pneumatic control circuits.

-Basics of proportional hydraulic control system as compared to on-off hydraulic control systems -Basics and essentials of proportional hydraulic valves and circuits, electric input, and feed-back of a proportional solenoid.

-Basics and various types of Servo-hydraulic valves and circuits, electric requirements for input, feed-back signals of servo-valves, and practical applications of servo-hydraulic circuits.

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 and compare the component effects, performance, and efficiency of different types of Hydraulic and Pneumatic on-off automatic control systems.

-Analyze and compare the component effects, performance, and efficiency of different types of proportional hydraulic automatic control systems.

-Analyze and compare the component effects, performance, and efficiency of different types of Servo-hydraulic automatic control systems.

-Apply the concept of software simulation for analysis, diagnostics & operation of various types of Hydraulic and Pneumatic systems.

-Compare between various types of Hydraulic and Pneumatic components, and complete systems.

-Apply scientific and engineering analysis for proportional & Servo hydraulic circuits/systems.

c) Professional and Practical Skills:

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

-Identify several types of on-off Hydraulics and Pneumatics and Proportional and Servo Hydraulics automatic control problems which are essential for the design and operation of mechanical power systems and energy transfer processes.

-Perform professional design and modelling for different Hydraulics and Pneumatics automatic control systems.

-Suggest possible alternative solutions for various types of Hydraulics&Pneumatics components.

-Diagnose efficiency and performance of different types of Hydraulic control circuits/systems.

- Analyze different types of Hydraulic & Pneumatic processes on virtual labs.

d) General and Transferable Skills:

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

-Performeng. assemblyof differentHydraulic and Pneumatic 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, compare between different technologies for Hydraulic/Pneumatic automatic control systems.

-Organise & manage time & resources effectively; for short-term and longer-term commitments.

3. Contents

Topics:	Total hrs	Lectures hours	Tutorial/ Practical hrs
Part I: Examine, Study and Practice How to Operate some new and practical Hydraulic Circuits by *Using a new Virtual Lab: THW-12* (the manual for this Virtual Lab is used as self-learning part). **-Review total of 16 different components of Hydraulic Systems (using same Virtual Lab:THW-12 or an introductory Virtual Lab: THW-11: Hydraulic Circuits components).From MEP562, students must know everything &symbols used for: Positive Displacement Pumps, Actuators, Pressure Control Valves, Directional Control Valves, Flow Control Valves, Filters, Flow Meters, Accumulators, Pressure Switches, Tanks, Pipes, Manifolds, Heat Exchangers, etc. Also From MEP562 students must know how to read and understand some practical Hydraulic circuits or Hydraulic Schematics.** **Part II: Review & examine Analogy & Difference between components, operation, and functions of Hydraulic and Pneumatic circuits – Examine Basics of Pneumatic logic circuits and processes and using of virtual labs for analysis of pneumatic control circuits - Examine Basics of various proportional hydraulic valves and circuits, electric input, and feed-back of a proportional solenoid- Basics and various types of Servo-hydraulic valves and circuits, electric requirements for input, feed-back signals of servo-valves, and practical applications of servo-hydraulic circuits.**	**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

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-Virtual Lab program by "NEW-TRONIC S.r.l.–Via Thures", 36– 10142 TORINO (ITALY)- Tel.: 0039-4.68 – Fax: 411.09.39

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 Ashraf S. Sabery**