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	**2nd Term 2016/2017 or Summer 2017**
Semester (based on final exam timing)	☐ Fall √ Spring √ Summer

A- Basic Information

1. Title:	**Advanced Applications of PLC in Automatic Control Systems**						**Code:**	**MEP 567**
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 advanced practical elective course is one of the 4 elective courses requirements of the Diploma. It is designed to review, more effectively, all Basic design Concepts and Fundamental Aspects of the hardware and software components of many practical PLC systems. This is done by full understanding and deep examining of actual & industrial PLC Systems. This course covers many applied and detailed examples for all working steps showing how to design, build, configure, program, test, trouble-shooting and finally to run a PLC project. These projects show typical LAD, FBD & STL programs to give the participants skills and knowledge to solve some practical and actual PLC examples and control projects.

Upon completion of course the students should be able to:

- **Identify terminology of Hardware and Accessories of several types of industrial PLCs.**
- **Identify several types of discrete or analog Input/output signals and associated I/O modules.**
- **Identify operation and technical differences between PLC systems and expansion parts/devices.**
- **Select proper PLC expansion module for analog/digital system and special functions parts.**
- **Identify terminology of Software and Simulators for PLC automatic control systems.**
- **Get proper reference and technical manual for selection, programming, configuration and for installation of PLC unit and accessories.**
- **Identify various parts of PLC languishes for LAD, FBD, STL programs & Block functions.**
- **Perform actual working and detailed steps to plan, design, install, build, configure, program, test, debug, trouble-shooting and finally to run a practical PLC project.**

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:

- **Advanced hardware and software components of many practical and industrial PLC systems.**
- **Advanced applications and detailed examples for all working steps showing how to design, build, configure, program, test, trouble-shooting and finally to run a PLC project.**
- **Typical PLC design projects to show the LAD, FBD and STL programs and to give the students skills and knowledge to solve some practical and actual PLC examples and control projects.**

	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 advanced PLC automatic control systems.** **-Analyze and compare the component effects, performance, and efficiency of different types of advanced PLC automatic control systems.** **-Analyze and compare the component effects, performance, and efficiency of different types of advanced PLC automatic control systems.** **-Apply the concept of software simulation for analysis, diagnostics & operation of various types of advanced PLC automatic control systems.** **-Compare between various types of advanced PLC components, and complete systems.** **- Apply scientific and engineering analysis for advanced PLC circuits/systems.**
	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 using advanced PLC circuits/systems 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 using advanced PLC circuits/systems** **-Suggest possible alternative solutions for various types of components for automatic control problems using advanced PLC circuits/systems.** **-Diagnose efficiency and performance of different types of advanced PLC automatic control circuits/systems.** **- Analyze different types of automatic control problems using advanced PLC circuits/systems.**
	d) General and Transferable Skills: **Having successfully completed this course, the student should have the ability to do:** **-Performeng. assemblyof differentadvanced PLC circuits & 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 advanced PLC circuits for 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
Review of terminology of Hardware and Accessories of several types of industrial PLCs –Review of several types of discrete or analog Input/ output signals and associated I/O modules- Review of operation modes &technical differences between PLC systems & expansion parts/ devices. Selection of proper PLC expansion module for analog/digital system and special functions parts- Review of terminology of Software & Simulators for PLC automatic control systems- Getting proper reference&technical manual for selection, programming, configuration and for installation of PLC unit and accessories- Review of various parts of PLC languishes for	**42 hrs**	**3hrs/week for 14 weeks before the final term exam**	---

LAD, FBD, STL programs&Block functions-Performing actual working and detailed steps to plan, design, install, build, configure, program, test, debug, trouble-shooting and finally to run a practical PLC project. Applications and Practical Examples for using PLC units in Automatic Control of Mechanical Power Systems- Various Examples and Applications for the Ladder Diagrams, Function Charts, and Statement Lists-Applications on PC using PLC simulation & Computer Programs.			

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- Digital Book: "Automating Manufacturing Systems with PLCs", Version 4.2, April, 2003, copyright(c) , Hugh Jack (jackh@gvsu.edu).

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 January 2017