

# King Fahd University of Petroleum and Minerals

## *Electrical Engineering Department*

### *EE446: Programmable Logic Controllers*

*Dr. Mahmoud Kassas*

*Spring Semester 2006-2007 (062)*

#### A. Course Information

<b>Text Book:</b>	Material provided by the Instructor				
	Name, Email address	Office	Phone	Office Hours	Sections
Instructors:	Dr. Mahmoud Kassas <i>mkassas@kfupm.edu.sa</i>	59/1081	2271	Su-Tu 11:00-11:50AM & M 13:10-14:00	1 & 2
<b>Grading:</b>	Attendance, Assignments and Quizzes	Project	One Major	Lab	Final
	20% (3% & 17%)	15%	15%	20	30%
	Midterm Exam	Lab Exam	Project Due Date	Final	
Exams Dates:	<b>Mon. April 23</b>	<b>May 19-23</b>	<b>Saturday May 26, 2007</b> At 4:00PM	<b>Tuesday June 5</b>	
Exams Times:	6:30-8:00 pm	Lab Time		At 7:30AM	
Exams Places:		<b>PLC Lab</b>			
Important Dates:	Last day to drop the course <b>without</b> a permanent record	Last day to drop the course with “W” grade		Last day to drop <b>all courses</b> with “W” Thru Registrar’s office.	
	<b>Feb. 27, 2007</b>	<b>April 29, 2007</b>		<b>May 27, 2007</b>	
Field Trip	<b>Tentative date April 17, 2007</b>				

**Note #1:** Final Exam is comprehensive (i.e. covers all chapters as described in the syllabus). It is common to all sections.

**Note #2:** According to the rules and regulations of KFUPM, attendance is **MANDATORY**. More than **6** unexcused absences will be reported to the registrar office and result in a **GRADE of DN** regardless of the student’s grade.

**Note #3:** It is your responsibility to solve the homework as soon as the material is covered in the class. Homework solution will be published on WebCT. Quizzes will be given regularly based on the homework problems.

**Note #4:** You are urged to use **your instructor’s** office hours whenever is possible. To help you further I will arrange for some problem solving sessions. Date and time will be announced in class.

**Note #5:** You can access the homework solutions and any other supplement material, communication items, and any **course information** at your instructor’s WebCT course page.

## B. Course Goals Related to Program Education Objectives:

The overall course objective is to teach electrical engineering, system engineering and computer engineering students the fundamental concepts, methods of analysis, and design of programmable logic controllers and systems. Specific objectives include the following:

- Design a PLC system, component, or process to meet a set of specifications.
- Design, conduct, and interpret a validation test of a PLC system.
- Students gain an understanding of the role of PLCs in safety critical systems.
- Demonstrate effective communication through writing proficiency at the level expected for a senior engineering student and the use of engineering graphics.
- Identify the benefits of trade journals and web-based PLC resources of information for life-long learning.
- Recognize the need to use modern tools to assist solving problems.
- Identify and apply appropriate modern technologies to an assigned task.
- Students gain proficiency with Siemens, a PLC simulation software package, and utilize this software package to solve problems on a wide-range of PLC problems.
- Students gain proficiency with Siemens, a PLC programming package, and utilize this software package to solve problems on a wide-range of PLC problems.
- Problem and examination solutions and background material are given on a course Web site. Students are required to access that information.

## C. Tentative Course Outline and Schedule

Week	Date	Topics	Labs
1	Feb. 17-21	Basic Concepts of Programmable Logic Controllers.	No Lab
2	Feb. 24-28		<b>Lab1:</b> Introduction to Lab Equipments and Siemens Trainer System.
3	Mar. 3-7	<ul style="list-style-type: none"> <li>• The Structure of Programmable Logic Controllers.</li> <li>• Basic Functions:               <ol style="list-style-type: none"> <li>Binary Logic Operations.</li> <li>Memory Operations.</li> <li>Timer &amp; Counter Operations.</li> <li>Data Types &amp; Data Transfer Functions.</li> </ol> </li> <li>• Digital Functions:               <ul style="list-style-type: none"> <li>○ Compare Functions.</li> <li>○ Arithmetic Functions.</li> <li>○ Math Functions.</li> <li>○ Conversion Functions.</li> <li>○ Logic Functions.</li> </ul> </li> </ul>	<b>Lab2:</b> Hardware Configuration for Training Station.
4	Mar. 10-14		<b>Lab3:</b> Boolean Operation and Their Applications.
5	Mar. 17-21		<b>Lab4:</b> Timer Functions with Exercises.
6	Mar. 24-28		<b>Lab5:</b> Loading and Transferring Data & Counter Functions with Applications.
7	Mar. 31-April 4		<b>Lab6:</b> Conversion Operation & Basic Mathematical Functions.
8	Apr. 7-11		<b>Lab7:</b> PLC Programming Application
<b>Spring Break Holiday (April 12-15)</b>			
9	Apr. 16-18	<ul style="list-style-type: none"> <li>• Program Flow Control:               <ul style="list-style-type: none"> <li>○ Status Bits.</li> <li>○ Jump Functions.</li> <li>○ Master Control Relays.</li> <li>○ Block Functions.</li> </ul> </li> <li>• Analog Processing:               <ul style="list-style-type: none"> <li>○ Digital-to-Analog Conversion.</li> <li>○ Analog-to-Digital Conversion.</li> </ul> </li> </ul>	<b>Field Trip April 17</b>
10	Apr. 21-25		<b>Midterm Exam</b>
11	Apr. 28-May 2		<b>Lab8:</b> PLC Programming Application II Flashing and Traffic Lights.
12	May 5-9		<b>Lab9:</b> Using Function "FC".
13	May 12-16		<b>Lab10:</b> Solenoid Valve.
14	May 19-25	Project Lab Work	<b>Lab Final Exam</b>
15	May 26-June 3	Project Presentation	Project Presentation

\* Notes can be downloaded from your WebCT course pages.

## D. Term Project:

Each two to three students must form a group to design and implement a class project. The project must be presented in the class at the end of the semester. Alternative form the project is to present existing industrial plant automation systems.