

**Pro-Green Diploma**  
**PRGR 664 Water Instrumentation – Spring 2018**

**Instructor: Barbar Akle, PhD**

**Email:** barbar.akle@lau.edu.lb

**Phone:** +961 9 547262 ext 2850

**Skype:** barbar.akle@lau.edu.lb

**Office Hours:** MTF 11:00am till noon in Bassil 405

**Online Office Hours:** Every Monday at 11:00 a.m. (UTC+02:00) or by appointment

**Catalog description: Water Instrumentation (1 credits)**

This course offers an introduction to the instrumentation and process control of water/wastewater treatment plants. Topics discussed include types of instruments and control equipment, process measurement and control principles, and terminology. This course is designed from the viewpoint of plant designers and operators, so they can effectively plan the design of plant controls and instrumentation, and monitor the treatment process, water production, and plant wastes.

Pre-requisite: Acceptance into the Pro-Green program

**Textbook:** American Water Works Association. Instrumentation and Control. Denver, CO: American Water Works Association, 2003.

**References:** Hammer, M.J., and Hammer, M.J., Jr., "Water and Wastewater Technology," 7th Edition, Prentice- Hall, Inc., Englewood Cliffs, New Jersey, 2012

**Educational Objectives**

This course is designed to introduce students to the most common instrumentation and controls used in the water/wastewater treatment processes and explain basic operating principles, installation considerations and maintenance. It also introduces students to the requirements of a good control design and a successful instrument installation and process monitoring.

**Learning Outcomes**

Students that successfully complete this course will be able to:

- Comprehend the functional blocks of an automated control system, types of control loops, and continuous vs. discrete control.
- Distinguish the types of PLC control systems as well as basic requirements for good operator interface.

- Differentiate the different types of sensors, their principles of operation, their advantages and disadvantages and the application of the different types of sensors for flow, level, pressure, temperature, and water quality measurements.
- Comprehend the different actuating systems such as control valves, blowers, dozers, AC and DC motors along with their speed control techniques.
- Define the requirements for a successful installation, controller tuning, and maintenance scheduling.

### **Resources for the course**

- The online course materials
- The University Libraries
- The reference books
- The instructor

### **Computer usage**

Basic usage of office, and basic computer programming skills.

### **Delivery Format and Rationale:**

This is an online course and will use Moodle as the Learning Management System (LMS). Online Learning aims at bringing new and powerful dimensions to the learning experience.

- Logistics flexibility: location & time are no longer a limitation on learning. Whether all together in a classroom or scattered over many countries, students can still tap into the same course materials.
- Courses are delivered more efficiently, providing opportunities to teach students in more flexible ways.
- Reaching optimum learning with increasingly fewer resources.
- Immediate Results and Feedback: Most online learning technologies integrate online quizzes and other tools to more rapidly evaluate the pace of learning.

### **Technical support:**

This course is uses a Learning Management system called Moodle.

Your student account will allow you access to the course, by logging into:

<http://moodle.progreendiploma.com/>

Technical assistance for online courses is available Monday-Friday from 8 a.m. until 5:00 p.m. (UTC+02:00) through:

- Sending an e-mail to: [moodle@aub.edu.lb](mailto:moodle@aub.edu.lb)
- Calling: 00961-1-350000, extension 3515/3518/3599/3586

## **Grade Distribution and Assessment Tools and Plans:**

### **Grading Policy**

<b>Assessment Type</b>	
Knowledge checks (Quizzes)	20 %
Wiki Assignments	20 %
Final Project	50 %
Participation (Discussion forums)	10 %
<b>Total</b>	<b>100 %</b>

The grades in this class break down as follows:

<b>Assessment Item</b>	<b>Due Date</b>	<b>Grade</b>
Ice-Breaker Activity (Participation)	Week 1	1
Discussion and Q/A for general information of water plants and control systems (Participation)	Week 2	1
Knowledge check – Chapter One	Week 2	3
Discussion and Q/A for general information of Hydraulics and Electric Circuits (Participation)	Week 3	1
Knowledge check – Chapter Two	Week 3	3
Wiki: Motor Controls	Week 5	10
Discussion and Q/A for Motor Controls (Participation)	Week 5	3
Knowledge check – Chapter Three	Week 5	5
Wiki: Sensors in water plants	Week 7	10
Discussion and Q/A for Sensors (Chapters 4 and 5) (Participation)	Week 7	3
Knowledge check – Chapter Four	Week 7	3
Knowledge check – Chapter Five	Week 6	3
Discussion and Q/A for PLC programming (Participation)	Week 7	1
Knowledge check – Chapter Six	Week 9	3
Project	Week 12	50
<b>Total Points</b>		<b>100</b>

### **Instructor feedback:**

I will be providing both individual and group feedback. I will reply within 48 hours to the questions/concerns that you post in the Discussion Forums.

### **Description of Course Requirements (assessments)**

### *Online Quizzes/Knowledge Checks*

You will take quizzes (Knowledge checks) throughout the semester, all delivered via Moodle. These quizzes include multiple-choice questions. The quiz content will be largely based on the video lectures and readings. Consider this as a self-assessment, a formative evaluation!

### *Discussion Forum*

There is a discussion forum set for each chapter of the course. You will be using these spaces to post your questions and answer your colleague's questions. Also the forums could be used to post links to interesting relevant articles/videos.

Discussion forums are very useful learning tools, especially when students answer each other's questions. Teaching others is proven to be the most effective learning methods. I will be monitoring the forums, however his intervention will be provided when necessary.

### *Wikis*

There are two Wikis in this course, one on motors in chapter 3 and the other on sensors in chapters 4 and 5. The purpose of the Wikis is for students to research and present a state of the art device; this info will be available for the remaining of the class. Students may edit and comment on each other's wikis.

### *Final Project*

The purpose of the final project is to apply the topics learned on a real-life example: Using an actual or hypothetical water facility plan (waste water treatment, drinking water treatment, desalination plant, or similar), design an automation system for it. The design should include the type and location of all sensors, actuators and controllers. Please justify your selection, and it is preferred that you select an actual model (could be found on the Internet). For the controller, write a ladder logic code to control the plant and make sure to include alarms and safety shutdown features. The report should be submitted in either .docx or .pdf format, I am expecting the reports to be in the order of 5 to 10 pages.

## **Internet Etiquette**

Netiquette (short for "network etiquette" or "Internet etiquette") is a set of social conventions that facilitate interaction over networks.

### *General Rules*

1. Make your messages easier to read by making your paragraphs short and to the point.
2. TYPING IN ALL CAPS IS CONSIDERED SHOUTING ON THE INTERNET.
3. Messages in all lowercase letters can be difficult to read, instead, use normal capitalization.
4. \*Asterisks\* surrounding a word can be used to make a stronger point.
5. Be careful when using sarcasm and humor. Without face-to-face communications your joke may be viewed as criticism. When being humorous, use emoticons to express humor. (Tilt your head to the left to see the emoticon smile) :- ) = happy face for humor
6. Never give your user ID or password to another person. System administrators that need to access your account for maintenance or to correct problems will have full privileges to your account.

**Make-up Policy**

With the exception of illness requiring hospitalization or the death of an immediate family member, no make-ups for exams will be conducted.