

MCHE 414 Applied Mechatronics

Course Syllabus – Fall 2014-2015

"I am always doing that which I cannot do, in order that I may learn how to do it." Pablo Picasso

What you learn can never hurt you and no one can take away from you...Learn and control your life!

Course/Instructor Information

| | | | |
|--------------------------------|---|---------------|--|
| Course Code & Title | MCHE 414: Applied Mechatronics | | |
| Section I | | | |
| Lecture | Time: 12:30 - 01:30 | Date: TTH | Room: B228 |
| Laboratory | | | |
| Iconnect Link | http://iconnect.bau.edu.lb/ | | |
| Instructor Name | Mohamad Darwish | Office | |
| Phone | | Email | m.darwich@bau.edu.lb |
| Office Hours | MO/ WE - 9:00-12:00 | | |
| Term/Year | Spring 2015-2016 | | |

Course Description

Course-in-brief

The course provides a broad knowledge of power electronics, and measurement systems, principally sensors and their utilities. The relentless advancement in computer and information processing technologies and communications systems is influencing the way products and systems are designed and built. Mechatronics is an interdisciplinary field. At its core is the synergistic integration of mechanical systems, electronics, and computer technologies to create products and systems that are simpler, multi-functional, flexible, reliable, intelligent, and competitive.

A fundamental principle of mechatronics is that the integration of the various elements of the system begins from the conceptual design phase and threaded throughout the design process.

Prerequisites by courses

1. POWE333 – Electric Machines and Drives.
2. MCHE302 – Measurement and Instrumentation

Course Resources

Resources for the course include the instructor, textbook and references; class notes and handouts; the library; products catalogues; the web.

Office Hours

Support is always available for those who seek it. You are encouraged to come into my office and ask questions, consult, provide feedback, or give suggestions anytime during the day. Although I adopt an open-office policy, best times to find me in the office this semester are those recorded as office hours on my schedule.

Please take full advantage of office hours. Students are encouraged to send me enquiries by emails at m.darwich@bau.edu.lb or via <http://iconnect.bau.edu.lb/>

Textbook

Applied Mechatronics.

Useful Websites

There are various websites that can be browsed where very useful information and applications in the domain can be found.

Recommended Reading Resources

- A number of articles by using any search engine.

Topics

The subject matter for this course includes the material in various Chapters of the Text Book and additional material in the form of lecture notes and handouts to cover the following topics:

| Date | Topic | Chapter |
|---------|--|------------|
| 1 week | Introduction to Mechatronics: | Ch. 1 |
| 8 weeks | ❖ Arduino Architecture ❖ Programming the Arduino | Ch. 6 - 12 |
| 3 weeks | Review of electrical, electronics and digital components and practical circuits | Ch. 2 - 5 |
| 2 weeks | Sensors and Indicators for Mechatronics | Ch. 13 |
| 2 weeks | Actuators for Mechatronics | Ch. 14 -15 |

Notes:

1. Coverage of topics may deviate from this plan as necessary
2. The homework component includes the learning projects

Educational Aims

Applied Mechatronics is a major topic related measurement and instrumentations, and power electronics. A mechatronics student is one who views a system as a whole and offers optimum, solutions to a multivariable problem. To perform correctly, contemporary systems and products rely on harmonious interactions between mechanical systems, sensors, actuators, and computers to realize multifunctional, flexible, smart, and precision machines. Therefore, the students must be able to transcend barriers that existed in the past between various engineering disciplines and acquire the necessary skills and expertise that enable them to select, design, and integrate mechanical components and drives; select sensors, design, and implement appropriate signal-conditioning (SC) circuits; select and drive appropriate actuators; develop mathematical models of the processes involved; design and implement appropriate control schemes, and use microprocessor software and hardware to build target systems and interfaces.

Intended Learning Outcomes

At the end of this course, the student is expected to:

1. Learn about Elements of a mechatronic system, big picture, and control of mechatronic systems.
2. Learn about components of mechatronic systems, inputs (sensor types, signal conditioning) and output (actuators...).
3. Be able to specify procedure for target system hardware development, Switches, Display, Sensors, DC motor, Solenoids, Light switch.
4. Identify types of sensors and transducers in terms of structure, time response, circuit requirements, signal amplification (Op-Amps), impedance effect and signal conditioning.
5. Learn the Arduino programming and designing circuits, analogue inputs/outputs, digital inputs/outputs, control circuits.
6. Learn about SFC for mechatronic systems, logic gates and logic families, sequential circuits.
7. Team project experience to formulate and develop Mechatronics systems.

Assessment and Evaluation

Many aspects of the course will receive on-going, real-time assessments and feedback to help improve students' performance. This will be done by discussing performance in class and by arranging individual meetings when possible.

Assessment in the following areas will be converted to points, to compute your final grade in the course:

| Assessment Item | Tentative Date | Marks |
|------------------------|-----------------------------|--------------|
| <i>Lab Work</i> | As assigned | 30% |
| <i>Midterm</i> | Eighth week of the semester | 30% |
| <i>Final Exam</i> | Exams period | 40% |

Note: *All of the required course-specific written reports/assignments/labs will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through them.*

Assessment Strategy

- In addition to Homework and projects assessments, midterm and final examinations test the student's overall ability to apply problem-solving, design and critical-thinking skills.