



University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Mechanical Engineering
Bachelor of Science in Mechanical Engineering



Course Syllabus

| |
|--|
| 1. General Information: Alpha-numeric codification: INME 4235 Course Title: Mechatronics Laboratory Number of credits: 2 Contact Period: One hour of lecture and three hours of laboratory per week |
| 2. Course Description: English: Experiments and exercises in instrumentation, calibration, statistical analysis, data acquisition, and computer interfacing to design, and monitor systems with the use of control theory, electronics and computing. Spanish: Experimentos y ejercicios en instrumentación, calibración, métodos estadísticos y adquisición de data en conjunto con el uso de computadoras utilizando teorías de controles, electrónica y computación para diseños y monitoreo de sistemas. |
| 3. Pre/Co-requisites and other requirements: Prerequisites: INME 4210 and INME 4011 and INME 4002 and INEL 4076 Corequisites: INME 4015 and INME 4012 |
| 4. Course Objectives: Upon successful completion, students will be able to: <ul style="list-style-type: none">• Identify, formulate, and solve mechatronics problems by applying principles of engineering, science, and mathematics and using sensors, actuators and transducers (1);• Use engineering knowledge to generate a mechatronic design that meet specified needs (2);• Make clear and effective technical presentations, both in terms of form as well as content, of his/her work and write clear technical reports describing his/her work (3);• Use project management tools such as Gantt charts, Pareto charts, critical path analysis, and action items for planning, prioritizing, and scheduling tasks in a design project work effectively. Work on projects in teams in both member and leader roles (5);• Develop and conduct appropriate experimentation in the area of closed-loop real-time mechatronics control systems prototyping using a dedicated embedded system platform and MATLAB/Simulink and interpret data, and use engineering judgment to draw conclusions (6);• Decide sampling frequency based on sampling theorem and understand consequences of sampling, aliasing effect, and anti-aliasing filtering;• Proper implementation of sensors in general and motion sensors in particular;• Proper implementation of actuators in general and motion actuators in particular. |
| 5. Instructional Strategies: <input checked="" type="checkbox"/> conference <input type="checkbox"/> discussion <input type="checkbox"/> computation <input checked="" type="checkbox"/> laboratory <input checked="" type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring |

research other, please specify:

6. Minimum or Required Resources Available:

Arduino microcontrollers, electronic components for prototyping, project sensors and materials.

7. Course time frame and thematic outline

| General Topics | Contact Hours |
|---|----------------------|
| Basic Electrical Components | 4 |
| Basic Electrical Circuits | 4 |
| Introduction to Microcontrollers | 8 |
| Static Calibration of Analog Temperature Sensors | 4 |
| Dynamic Calibration of Analog Temperature Sensors | 4 |
| Pulse Width Modulation | 4 |
| Control of Servo and DC motors | 4 |
| Closed Loop Motor Control Using Analog Distance Sensor | 4 |
| On/Off Temperature Control in Air-Cooled Open Loop System | 4 |
| Ladder Logic Programming using PLCs | 8 |
| Final Project (during final week) | 12 |
| Total hours: (equivalent to contact period) | 60 |

8. Grading System

Quantifiable (letters) Not Quantifiable

9. Evaluation Strategies

| | Quantity | Percent * |
|---|-----------------|----------------------------|
| <input checked="" type="checkbox"/> Exams | 1-3 | 15-25 |
| <input type="checkbox"/> Final Exam ** | | |
| <input checked="" type="checkbox"/> Short Quizzes | 0-10 | 0-25 |
| <input checked="" type="checkbox"/> Oral Reports | 0-10 | 0-25 |
| <input type="checkbox"/> Monographies | | |
| <input type="checkbox"/> Portfolio | | |
| <input checked="" type="checkbox"/> Projects | 0-1 | 0-25 |
| <input type="checkbox"/> Journals | | |
| <input checked="" type="checkbox"/> Other, specify: Written Reports Attendance | 3-10 | 0-50 0-25 |
| TOTAL: | | 100% |

*All evaluation strategies will add to 100%

** In design courses a capstone project may replace the final exam.

10. Bibliography:

Textbook:

Figliola, R. S., & Beasley, D. E. (2015). *Theory and design for mechanical measurements*. Hoboken: Wiley.

11. Law 51: The Comprehensive Educational Services Act for People with Disabilities:

States that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information, contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

12. Academic Integrity

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.—

13. Certification 06-43 of the Academic Senate

"The academic guidelines for offering online courses," defines: Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 06-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

14. Sexual Harassment: Certification 130-2014-2015 states:

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

Revised: February, 2019