1. Course number and name
   **EML 3811 Mechatronics I**

2. Credits and contact hours
   2 cr, 3.5 contact hours (50 min lecture, 2 hr. 45 min lab)

3. Instructor’s or course coordinator’s name
   Instructor: Dr. Camilo Ordonez, Coordinator: Dr. Jonathan Clark

4. Text book, title, author, and year
   Learning by Example using C: Programming the DRAGON 12-Plus Using Code

5. Specific course information
   a. *brief description of the content of the course (catalog description)*
      This course is an introduction to Mechatronics through lab experience of interfacing
      mechanical and electrical systems. Focus is on embedded controllers (Motorola
      HCS12) and their programming, power and interfacing, electronics, actuators,
      sensors, and integration of these components to create a complete functional
      mechatronic system. Instruction and practical exercises are in: microcontroller
      programming; interfacing microcomputers with sensors and actuators; hybrid
      (analog/digital) design; digital logic and analog circuitry; data acquisition and control;
      microcomputer architecture, assembly language programming; signal conditioning,
      filters, analog-to-digital and digital-to-analog conversion
   b. *prerequisites or corequisites*
      Prerequisites: MAC 2312 and PHY 2049
   c. *indicate whether a required, elective, or selected elective course in the program*
      Required course

6. Specific goals for the course
   a. *Course Outcomes*
      1. The ability to generate code in the C programming language [2]
      2. The ability to implement a microprocessor-based motor controller [1]
      3. The ability to control a robot capable of navigation using external stimuli [1, 2, 3,
         4]
      4. Use flow charts, truth tables, Boolean algebra, and state machines to create
         structured solutions to logic problems [3]
      5. The ability to process and convert sensor data using electronics and a
         microprocessor [1, 4]
      6. Use interrupts, timers, and standard communication protocols [1, 2]
      Numbers refer to Course Objectives below, e.g. for course outcome 1, [2] refers to
      course objective 2.
   b. *Course Objectives and Relation to Student Outcomes*
      1. Ability to design and program electro-mechanical systems [3]
      2. Command of fundamental concepts of structured programming [10]
      3. Develop the ability to formulate logic expressions to solve problems [1]
      4. Ability to process and convert raw sensor data to a useful form [2]
      Numbers refer to Departmental Student Outcomes, e.g. for course objective 2, [10]
      refers to student outcome 10.

7. Brief list of topics to be covered
   • Introduction to Programming in C: IDE installation, programming, and debugging
• Intel platform (Code::Blocks);
• Algorithm development and implementation, Flowcharts
• Developing for Embedded Devices HCS12 (CodeWarrior)

- Basic Sequential Logic and Conditional Statements for Problem Solving with Computers, State Machines
- Microprocessor (68HC12) Architecture and Programming: Registers, Memory interrupts input/output channels, Basic C Instruction Set, Code and Libraries, I/O
- I/O programming: Displays, Sensors, and Actuators
  - LEDs, LCD, and Switches;
  - Temperature, light and voltage sensors; and
  - Signal conditioning: A/D conversion, PWM
- Timers, Interrupts and Interrupt service routines
- Robot Project: Student teams will program robots using available sensors and actuators to achieve a certain task