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| **1. Course title/number, number of credit hours** | | |
| EOC 4612C – Introduction to Electronics &  Programming | | 3 credit hours |
| **2. Course pre-requisites, co-requisites, and where the course fits in the program of study** | | |
| **Prerequisites**:   1. Introduction to Programming in C – COP 2220 2. Circuits 1 – EEL 3111   **Co-requisite**   1. OE Lab – EOC 3130L   All with a minimum grade of C | | |
| **3. Course logistics** | | |
| *Term*: Fall 2018 (TR 3:30-4:50pm)  Boca Raton Campus (EW 162) | | |
| **4. Instructor contact information** | | |
| *Instructor’s name*  *Office address*  *Office Hours*  *Contact telephone number*  *Email address* | Dr. An  Rm 174, Building 36, Boca Raton Campus  WF 1-3pm (or walk-ins)  561−297−2792  pan@fau.edu | |
| **5. TA contact information** | | |
| *TA’s name*  *Office address*  *Office Hours*  *Contact telephone number*  *Email address* | TBD | |
| **6. Course description** | | |
| Introduction to basic electronics and programming by means of lectures, laboratory assignments and a term project. Laboratory assignments include simple switching and filtering circuits using transistors and op-amp, sensor and actuator interfaces, data communication and Arduino programming. The term project involves designing a marine vehicle that incorporates many components covered in class. | | |
| **7. Course objectives/student learning outcomes/program outcomes** | | |
| *Course objectives* | This course is designed to provide ocean engineering students with hands-on laboratory experiences 1n 1) designing simple ocean engineering systems with basic electronics and software programming; and 2) developing simple electronics and software interfaces with simple sensors and actuators that are needed for such systems. | |
| *Student learning outcomes*  *& relationship to ABET a-k objectives* | 1. An ability to design and implement simple analog passive and active filters. (a, c, e, k) 2. An ability to work with DC motors. (a, c, e ,k) 3. An ability to work with analog and digital sensor interface. (a, c, e, k) 4. An ability to develop simple software programs for Arduino micro-controllers. (k) 5. An ability to design basic circuits using op-amps (a, c, e, k) 6. An ability to communicate effectively in writing a report (g) | |
| **8. Course evaluation method** | | |
| Labs – 20% (pre-lab, in-lab and post-lab work), Quizzes – 20% (The lowest quiz score will be dropped), Exam #1 –10%, Exam #2 – 20% or Final Exam – 20%, Term Project – 30% (Performance – 20%, group technical report – 5%, group presentation – 5%).  If the overall grade by the last day of class is maintained at 70% or above, the final exam can be waived, and the course grade will be computed without the final exam score. Otherwise, the final exam will be required. The final exam score, if only higher than that of Exam #2, will replace the Exam #2 score. Otherwise, the final exam score will be dropped. | | |
| **9. Course grading scale** | | |
| > 90.0 A  86.7-90.0 A-  83.3-86.7 B+  80.0-83.3 B  76.7-80.0 B-  73.3-76.7 C+  70.0-73.3 C  66.7-70.0 C-  63.3-66.7 D+  60.0-63.3 D  56.7-60.0 D-  < 56.7 F | | |
| **10. Policy on makeup tests, late work, and incompletes** | | |
| *Makeup tests* are given only if there is solid evidence of a medical or otherwise serious emergency before the tests that prevented the student of participating in the exam. Makeup exams should be administered and proctored by department personnel unless there are other pre-approved arrangements  ***Late work* without verifiable justification will NOT be graded.**  *Incomplete grades* are against the policy of the department. Unless there is solid evidence of medical or otherwise serious emergency situation incomplete grades will not be given. | | |
| **11. Special course requirements** | | |
| N/A | | |
| **12. Classroom etiquette policy** | | |
| University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones, are to be turned off in class sessions. | | |
| **13. Disability policy statement** | | |
| In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU’s campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. | | |
| **14. Honor code policy** | | |
| Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at  [www.fau.edu/regulations/chapter4/4.001\_Code\_of\_Academic\_Integrity.pdf](http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf) | | |
| **15. Required texts/reading** | | |
| Not required. Students are required to purchase an official Arduino basic kit  <https://www.arduino.cc/en/Main/ArduinoBasicKit> | | |
| **16. Supplementary/recommended readings** | | |
| Online Textbooks:  <http://faculty.weber.edu/snaik/EE2260/alexander_sadiku_fundamentals_of_electric_circuits_4thed.pdf>  <http://www.ece.mtu.edu/faculty/ljbohman/onlinetext/elint200.pdf> | | |
| **17. Course topical outline, including dates for exams/quizzes, papers, completion of reading** | | |
| **Tentative Course Topics**:   1. Basic analog RC filter circuits 2. Basic impedance matching circuits 3. Basic op amp circuits 4. Basic switching circuits 5. Basic Arduino micro-controller functions and C programming 6. Basic analog to digital conversion 7. Data communication and parsing 8. Basic analog to digital conversion and analog sensor interface 9. Basic interfaces with DC stepper and servo motors   **Tentative Lab Topics**   |  | | --- | | **Lab 1** (Basic Resistor Circuits) | | **Lab 2** (Arduino digital I/O) | | **Lab 3** (Switching circuit using FET) | | **Lab 4** (DC Servo motor interface) | | **Lab 5** (Stepper Motor Interface) | | **Lab 6** (Ultrasonic sensor interface) | | **Lab 7** (Arduino ADC and analog sensor interface) | | **Lab 8** (Op-amp circuits) | | **Lab 9** (RC circuits) |   **NOTE:** Each student is assumed to have a laptop for all the lab work. Fritzing software tool will be used.  **Important Dates**  **The last day to drop the course without receiving an F in the course:**  **Quiz**: Only on Thursdays (about 10-15 minutes each, at the beginning of class). Tentatively, there is approximately 1 quiz per week (except the exam weeks).  Exam #1:  Exam #2:  Final Exam:  Project Competition:  Presentation:  Report: | | |
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**Lab Policy**

Lab work is a big part of the course, and is 20% of the course grade. Be serious about the lab work as it will help you gain the necessary knowledge and skills for the senior design project. Do not sit back and let others do your lab work. For every lab, there are pre-lab (5%), in-lab (10%) and post-lab (5%) components. The pre-lab work generally involves going over components’ data sheets, doing basic analysis to predict what the measurements should be, and perform simple circuit design and software programming needed for the lab work. The in-lab work involves performing a significant amount of hands-on work on wiring, programming and troubleshooting. This will build up your confidence and competence needed in tackling the senior design project. Whereas the post-lab work involves comparing the experimental results with the predicted results from the pre-lab work.

Pre-Lab Work

In every lab handout, there is a pre-lab section that specifies the required work. Unless otherwise stated, complete all the pre-lab assignments given in every lab handout before coming to the lab. The assignments must not be hand written, submitted at the beginning of every lab. The content must be legible and organized, and follows the order listed in each handout. Points will be deducted if you fail to meet the above requirements.

In-Lab Work

Show up in every lab on time! Since most of the labs are performed in groups, being tardy or absent will greatly jeopardize your group from completing the lab work within an allotted time period. **If you are late for more than 5 minutes for a given lab, you will receive 0% for that lab.** During any lab period, you must not do anything not related to the lab content (e.g. surfing online, listen to music, texting, talking about unrelated topics, etc). If there is an emergency and you cannot make it to a lab, you must inform the instructor ahead of time (email, phone call). If the excuse is valid and there are evidences that support your claim, you may make up the lab at a later time or day. You must bring a hardcopy of the lab handout in every lab. At the end of every lab, you must turn in all the lab measurements written in the lab hand-out. Make sure the measurements are legible, and contain proper values and units. Points will be deducted if you fail to meet these requirements. Make sure you make a copy of the measurements in every lab so you can complete the post-lab assignments.

Post-Lab Work

In every lab handout, there is a post-lab section that specifies the required work. The post-lab assignment is normally due one week after every lab (unless otherwise stated), and will be collected at the beginning of the class when the post-lab assignment is due. The assignments must not be hand written, and the content must be legible and organized, and follows the order listed in each handout. Points will be deducted if you fail to meet the above requirements.

**Term Project Description**

Design and build an autonomous ground vehicle (AGV) that can

1. Automatically sense and avoid the walls of an enclosed area in the EW lobby with at least 1 ft separation over a duration of at least 10 minutes. The sensing will be based on an ultrasonic sensor (HCSR04), and the avoidance will be based on a well-designed steering function. The initial position will be chosen at random.
2. Requirement 1 + avoid other stationary obstacles placed in random locations in the enclosed area.
3. Requirement 1 + perform wall following for the entire mission.

**Technical Performance Scores**

The performance score of any system will be evaluated using three levels of requirements:

70% Achievement of Level 1 Challenge

90% Achievement of Level 2 Challenge

100% Achievement of Level 3 Challenge

**Project Team and Tasking Requirements**

* Three students in a team
* In each team, at least one student will be accountable for each of the following responsibilities:
  + Sensor and Actuator Interface: design, build and test the mechanical, electrical and software interfaces with the ultra-sonic sensor and the motors, and prepare full documentation.
  + Controller Design: design, implement and test the control software for the stepper motor, and two DC brushed motors based on sensor feedback, and prepare full documentation.
  + Mission Programming: design, implement and test the mission software for the flow control, and prepare full documentation.
* In each team, every student will be responsible for
  + Designing and building a mechanical platform for housing all the components.
  + Preparing a final group presentation.
  + Integrating individual documentation into a final group report.