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Spring 1-1-2020

ECET 311-002: Embedded Systems I

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NEWARK COLLEGE OF ENGINEERING

SYLLABUS AND COURSE INFORMATION

Course Name: Embedded Systems I

Course Number: ECET 311

Course Structure: 2-2-3 (lecture hr/wk – lab hr/wk – course credits)

Course Description: Develops a working knowledge of the characteristics and applications of devices used in embedded systems such as microcontrollers. Emphasis is put on the architecture, instruction sets, and assemblers. Representative data handling problems and interfacing are studied and tested in the laboratory using state-of-the art hardware.

Prerequisites: (CPT 315 or ECE 251) and ECET 215

Corequisites: None

**Required, Elective,
or Selected Elective:** Required

Required Materials: **Text:** Name: The AVR Microcontroller and Embedded Systems
Author: Mazidi, Naimi, Naimi
Year: 2010
ISBN: 978-0-13-800331-9

Course Outcomes: By the end of the course students are able to:

1. Convert numbers from one numbering systems to another.
2. List and describe the fundamental parts of a microcontroller and explain the difference between a microcontroller and a microprocessor.
3. Explain the relationship between hardware and software and how they work together to accomplish a task.
4. Employ knowledge of system architecture, digital logic elements, and processor schematics to develop instruction level solutions to problems.
5. Express instruction level programs using assembly language.
6. Use hardware peripherals such as timers, PWM, A/D, serial, IO ports, and interrupts to develop robust and full-featured microcontroller programs.
7. Utilize an Integrated Development Environment and a development board to assist in project design, troubleshooting, and debugging.
8. Develop and analyze flow charts and hardware schematics to deduce or describe the operation and functions of an embedded system.
9. Synthesize an embedded system and program from a real-life problem statement.

Class Topics: Microcontrollers Embedded Systems
Numbering Systems Assembly Language & Instructions

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Interfacing, I/O, & Delays Flow Charts
Schematics

Student Outcomes: The Course Learning Outcomes support achievement of the following Student Outcomes from the ETAC of ABET Criterion 3 requirements.

Student Outcome a: An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

Related Course Learning Outcomes: 8

Student Outcome d: An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

Related Course Learning Outcomes: 4, 5, 6, & 9

Student Outcome f: An ability to identify, analyze, and solve broadly-defined engineering technology problems.

Related Course Learning Outcomes: 9

Student Outcome i: The application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers, and engineering standards to the building, testing, operation, and maintenance of electrical/electronic(s) systems.

Related Course Learning Outcomes: 4, 5, 6, 7, 8, & 9

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Modification to Course: The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course Outline.

Prepared By: Daniel Brateris

Course Coordinator: Daniel Brateris

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Instructor Information:

Name: Mohammad Rabie
Email: mrabie@njit.edu **Phone:** 973-596-5775
Office: GITC 2108
Office Hours: Wednesday 1:00 pm – 4:00 pm

Course Information:

Semester: Spring 2020
Course Name: Embedded Systems I
Course Number: ECET 311
Course Section: 002

Meeting Times:	Day	Meeting Time	Building	Room
	Monday	10:00 am – 12:05 pm	GITC	2308
	Wednesday	10:00 am – 12:05 pm	GITC	2308

Grading Policy

Your final grade will be determined according to the following scale:

Final Grade	Range
A	100% – 92%
B+	91% – 88%
B	87% – 82%
C+	81% – 77%
C	76% – 70%
D	69% – 60%
F	59% – 0%

Assignments will be weighted towards your final grade by these percentages:

Attendance and Professionalism:	5%
Homework and Quizzes:	10%
Labs:	35%
Exam 1:	15%
Exam 2:	15%
Final Assessments:	20%

Study Material:

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All study material will be released via Canvas. No particular textbook is required for this class. Instead, notes and slides will be provided for study. Publicly available and/or proprietary articles, videos, tutorials, and datasets will be used in this class.

While not required, if you would like to purchase a textbook, we recommend “Beginning Arduino Programming by Brian Evans”, ISBN13: 9781430237778.

Students will be required to purchase hardware components for this class instead of the textbook. The hardware list will be provided in the classroom.

Course Structure:

Students will work in pairs for the class. Pairs should be formed by the end of Week 2 of the term. Each working week, I will upload learning material in the content folders – videos, open source articles, technical manuals, etc. Accompanying this material will be reading, writing, and coding assignments, and technical questions about software and/or hardware related to embedded systems. Each assignment will have a deadline mentioned in the Canvas system.

Exam and Quiz Policy

- Cannot pass course if you having failing grades on tests and final exam There are three tests during the semester. The lowest grade will be dropped. However, if you achieve an A for all three tests, you will not be excused from the final.
- There will be no makeup tests – if you miss one test, then that is the test you will drop.
- tests tentatively scheduled for weeks **5, 9, and 13**.

Tentative Course Schedule

Topic 1	C++ Programming: Basics
Topic 2	Control Structures (If/Else)
Topic 3	Control Structures (For, While, Do)
Topic 4	Arduino Projects: Introduction, Anatomy, IDE Installation
Topic 5	Add Libraries, Open Serial Monitor, LED, Digital Write
Topic 6	RGB LED, Analog Write, PWM, Delay
Topic 7	Digital Inputs, Digital Read, Input Pullup, Making Sounds, Passive Buzzer
Topic 8	Ball Switch, Servo, Ultrasonic Sensor, Temperature and Humidity Sensors
Topic 9	Analog Joystick, IR Receiver
Topic 10	LCD Display, Thermometer Final Project Demo / Assessment

Policies

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1. No late submissions/presentations will be accepted, except for valid medical reasons or prior arrangement with the instructor.
2. Plagiarism will result in zero (0) points. Additionally, all academic policies set forth by NJIT University will be followed. NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. Please visit the Dean of Students website at <http://www.njit.edu/doss> for a list of student policies relating to academic integrity and student conduct.
3. All NJIT policies regarding adding, dropping, and withdrawing from courses will be followed. In order to insure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline (end of the 9th week of classes) will not be permitted unless extenuating circumstances are documented. The course instructor and the Dean of Students are the principal points of contact for students considering withdrawing from a course.
4. When a student invokes extenuating circumstances for any reason (late withdrawal from a course, request for a make-up exam, request for an Incomplete grade) the student will be referred to the Dean of Students Office. The Dean of Students will be making the determination of whether extenuating circumstances exist or not and will be notifying the instructor accordingly. Instructors will never request or accept medical or other documents from students; such documents need to be submitted by the student to the Dean of Students.
5. Student with disabilities requesting accommodations and services at NJIT need to present a current Letter of Accommodation Eligibility from the Disability Support Services office authorizing student accommodations to faculty before accommodations can be made.
 - For additional information, contact The Disability Support Services office (<http://www.njit.edu/studentsuccess/disability-support-services-0/>)
6. Final letter grades will depend on the final numerical grades and will follow letter grade cutoffs provided below. The final numerical grades will be ascertained based on the statistical analysis performed at the end of the term.