Course Syllabus

RAM155 – Microcontroller Programming

FALL 2025

Northwestern Michigan College

Class Schedule

Section	Days	Times	Room Location
2048	**Monday, Wednesday**	**1:00 PM – 3:00 PM**	**Zoom Virtual** – See Canvas for link
2049	**Tuesday, Thursday**	**1:00 PM – 3:00 PM**	**Zoom Virtual** – See Canvas for link

Instructor Information

Instructor: Keith E. Kelly
Office: Virtual – use Zoom link provided
Phone: 231-995-1312
E-mail: kkelly@nmc.edu

Office Hours:
Virtual Zoom office hours to be determined – see course discussions

Course Description:
This course introduces students to microcontroller systems and programming using Python language. Students construct a wheeled robot and learn to program the device. Standard coding structures including statements, loops, and functions are used to control the unit. Debugging and troubleshooting skills are developed as robot capabilities are implemented. The robot is used in subsequent Engineering Technology courses. Group 2 course. (3 Credit Hours /4 Contact Hours)

Prerequisite Courses / Placement:
MTH 111-may be taken concurrently

Teaching Methods
We'll use lectures, homework, exercises, activities, and projects to understand course content. In the first section you will build a Raspberry Pi robot system and then learn the basics of Python programming. Later, we'll integrate, continuing to learn Python coding by programming the Raspberry Pi rover (piRover). By the end of the course, you'll be controlling your piRover using your smart phone.

This is an online synchronous course. This means that the course uses a video conferencing format using the Zoom video conferencing software. You are required to attend virtual class sessions and attendance will be tracked. You will need access to a computer, quality Internet connection, a microphone, and a video camera. You are expected to have your camera on during class sessions. A smart phone (iPhone or Android) is required. Please contact Keith if you do not have access to a smart phone. You will need to take pictures. Access to a cell phone camera is assumed.

You will be building and coding a small rover robot. Find a suitable location to complete your builds and rover experiences. The NMC Makerspace and labs are available, but you can also complete work at home or in another educational classroom or setting.

This is a livestreamed class and video cameras are required. You must participate by having your camera on. This will be randomly checked twice during the semester and points awarded. If this is a barrier for you, please contact me to discuss.

Required Course Material:
Textbook: A textbook is not required for this course
piRover kit with Raspberry Pi (provided – pick up in the NMC Makerspace during the first week of class)
Toolkit (provided – pick up in the NMC Makerspace during the first week of class)
Computer
Internet connection
Video camera
Microphone
Smart phone
Wi-Fi connection (EngTech Wi-Fi is on NMC campus. Password is skynet2023)
Ethernet connection (this may require a USB adapter cable for your laptop)

Course Objectives / Learning Outcomes:
- Assemble mechanical and electrical systems from documentation
- Create and test Python programs
- Control input and output with code
- Interpret documentation and solve input/output control problems

Course Outcomes:

Area	Learning Outcome	Assessment Tool
Knowledge	Assemble components Write code to capture input and control output Utilize code libraries Utilize data types to meet specific criteria Access devices remotely Control hardware with code.	piRover builds and coding solutions
Application	Build rover control system Determine problem requirements Implement coding solutions	Final Rover Demo/Video
Integration	Interpret documentation (CT) Use resources to solve problems	Final Rover Demo/Video
Human Dimension	Recognize their ability to solve common problems using technology	Build/Coding reflections
Caring – Civic Learning	Appreciate the creative process	Build/Coding reflections
Learning How to Learn	Recognize various solutions to the same problem	Final Rover Demo/Video

General Education Outcomes:

Critical Thinking:

Students will skillfully conceptualize, apply, analyze, synthesize, and evaluate information gathered from observation, experience, reflection, reasoning, or communication.

Grade Determination:

Final grades will be determined as follows: Total of all deliverables including tests, quizzes, worksheets, homework, lab scores, and tests divided by the total possible points x 100%

Grading Scale:

4.0 = 93% or above
3.5 = 85 – 92%
3.0 = 80 – 84%
2.5 = 75 – 79%
2.0 = 70 – 74%
1.5 = 65 – 69%
1.0 = 60 – 64%
0.0 = below 60%

Proposed Assignments / Grading Criteria:

Assignment	***Points***	***Percentage of Final Grade***
Weekly production work	280	56%
Projects (3)	200	40%
Reflections	20	4%
TOTAL	500	100%

Attendance/Participation
You are expected to attend each class session. Students are expected to actively participate in class by asking questions, working on in-class exercises, giving presentations as individuals or as part of their team projects, and sharing experiences and opinions related to the topics discussed. Students who do not participate in class or miss more than four in-class hours without a pre-approved excuse will have their final grades reduced by one grade (i.e. 4.0 to 3.5). Be sure to contact me BEFORE you miss a class, if possible. Extended or initial absence can result in the instructor dropping you from the course.

Let me know about last minute emergencies via email or phone as soon as you can.

Late Work
Work must be submitted by the stated deadline. There is an opportunity to make-up missed points at the end sprints 1 and 2. The instructor will discuss the concept of technical debt and the process for making up points. This policy applies only to production and project work. Test points cannot be made-up. See the course web site for descriptions of homework assignments. If you have a special circumstance, let me know in advance.

Makeup Tests and Presentation Date Changes
Requests for makeup tests or presentation date changes must be made in advance with the instructor or the student will get no credit for that item.

Honesty
I'm very aware of how easy it is to share your work when it is in electronic form. Be sure you are aware of the Student Code of Conduct found in the Student Handbook. Assisting others with assignments and coding is expected. Providing copies of your work for others to copy is cheating. If you cheat, you fail the course.

How to Get the Most Out of This Learning Experience
Below are a few simple steps that will make this learning experience even better:

- Take charge of your own learning. Raise questions, prove, explore, go after what you need
- Be open. Use your imagination, consider new possibilities, and create something new
- Give as well as receive. Give liberally to co-learners and be prepared to receive a great deal from them
- Have fun!! Plan to thoroughly enjoy this opportunity to learn and to grow in your professional competence and satisfaction
- Take advantage of all the great equipment we have in the lab and your chance to experiment.

Syllabus Changes:
- The instructor reserves the right to revise the syllabus and will inform the class of any changes.

College-wide Syllabus:
- Visit the college syllabus available on the Syllabus page of Canvas to view college policies and learning services information.

Tentative Course Itinerary: (subject to change)

The specific day-to-day activities, assignments and topics are located on the Canvas course page.

Week	Topic	Assignments
1	Introductions	Weekly assignments – see Canvas
2	piRover Build	
3	Test and deploy, Linux and Python introductions	
4	piRover evaluation, Raspberry Pi configuration and preparation	
5	Sprint 1 assessments	Project 1 – piRover Evaluation Debt Retrospection
6	Python programming and Visual Studio Code	
7	GPIO programming	
8	Python structures	
9	GPIO Solutions	
10	Sprint 2 assessments	Project 2 Debt Retrospection
11	Motion/PWM	
12	Modules and Drive Code	
13	Smartphone Bluetooth	
14	Smartphone App, Final Project	
15	Sprint 3 assessments	Project 3 Debt Retrospection
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