INQ 250   Take a Dive – The way things work   FALL 2020

Dr. Rama Bala
Phone: 540-375-2057
E-mail: bala@roanoke.edu:
Zoom Office Hours: MW-2-4pm and by appointment

Course Overview:

The focus of this scientific reasoning course is to understand the way things work in our natural world though experimentation. While we will cover many traditional topics of an introductory physics course, the format of the course will be quite different than the traditional approach. Very little formal lecturing will take place. Instead, we will attempt to have a very hands-on class approach where the students will learn about experimentation, design and prototyping through using cellphones, 3D printing, designing electronic circuits using Arduino microcontroller.
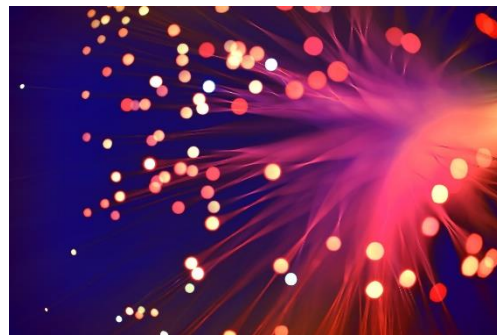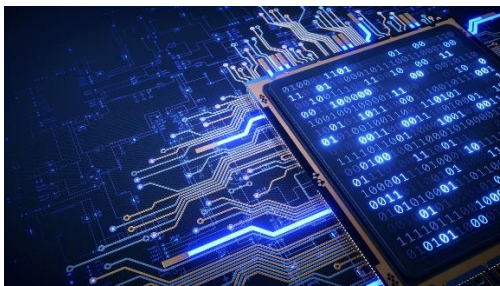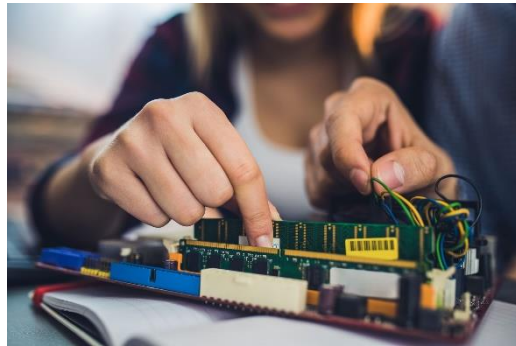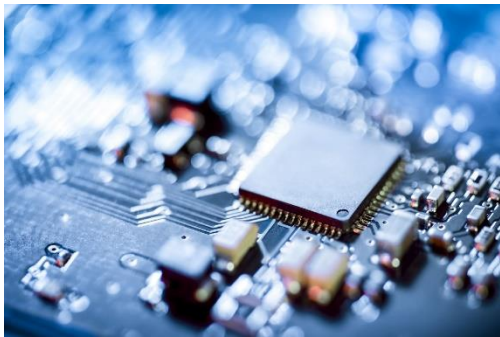
In this course, the focus will be on the process of science as it is motivated through measurements and inquiry. Cooperative learning groups, computer-assisted activities, worksheets, etc, will facilitate the conceptual understanding. The emphasis here is on understanding, and not memorizing. Physics is essentially an experimental science, not a collection of tenets to be handed down. To that end, it is important to keep up with the material, complete the assignments, and attend and participate in

every class. The course culminates with an individual final project, integrating as many of the topics as possible. Each student documents work on each biweekly topic in a personal website/e-portfolio, thereby finishing the course with an online portfolio that not only illustrates their new skill sets, but also contributes to a collective repository of knowledge.

For Fall 2020, this course will be taught remotely. Students will work on experiments, circuit building and testing remotely, using Arduino kits. Live video conferencing will be conducted via zoom during the scheduled times.

Learning Objectives:

To achieve proficiency in experimental skills and scientific reasoning, upon completion of this course, successful students will be able to
- Design and build simple circuits using Arduino kits.
- Perform measurements using their cell phones
- Understand how a scientific theory of sensors and circuits can be developed from systematic observations and experiments
- Observe, classify, and describe physical processes using different representations including words, pictures, graphs and mathematical equations
  Develop quantitative skills through data analysis, graphical representations and interpretation
- Describe the challenges in experimental methodologies to collect unbiased data, graphing techniques
- Communicate their scientific findings through lab reports, project reports, reflection letters, oral presentations and class discussions

Prerequisites: Basic computer literacy (word processing, online search skills) is expected.

Required Text: Adventures in Arduino, by Becky Stewart, Wiley Publishers, May 2015. ISBN: 978-1-118-94847-7

Other Course Materials: Arduino component kit purchase it from https://www.sunfounder.com/product-mega-2560-r3-project-kit-for-arduino.html; one three ring binder for all your notes and homework solutions; one lab notebook: as well as a scientific calculator.

Electronic Lab Notebook: In lieu of a lab notebook, each student is to maintain an electronic copy of lab measurements and observations, including graphs, tables, calculations, and analyses using standard spreadsheets and word processing software (Microsoft-Office, Google docs, Mac word processor). Students will also video themselves, and upload it to Youtube (with restricted link options), when fully functioning circuits are completed. A log of videos and the electronics notes are to be maintained on student's e-portfolio.

Grading: Grades for this course will be based on homework assignments, final exam, project, lab-work and student participation. Explanation of the grading scale: The final grades will be determined at the end of the semester, on absolute point scale of 100 points. The weighted % point for each assessment type is listed in the table above. For example, a student must have total points of 95 or above to receive an A grade.

Type	Weight
Assignments	20%
Lab e-Portfolio	25%
Final Project	30%
Attendance and Participation	10%
Exam	15%

Points	Grade	Points	Grade
<60	F	76-79	C+
60-62	D-	80-82	B-
63-65	D	83-85	B
66-69	D+	86-89	B+
70-72	C-	90-94	A-
73-75	C	≥95	A

Assignments: There will be weekly assignments, consisting of questions and problems from readings, class discussions, simulations, and circuit design principles. You must work on these assignments on your own. Assignments will be submitted on Inquire via Turnitin. Copying homework solutions from others or other resource materials is not allowed. Copying solutions is a violation of the Academic Integrity policy.

Exam: There will be one final exam scheduled on Mon, Nov 23rd from 8 am – 12 pm. Please consult the registrar's webpage for any updates to the exam schedule.

Project: Students are asked to present an idea for a final project at the start of the semester, which is expected to evolve over the duration of the course. Students will have weekly opportunities for advising on final project ideation. Final projects should integrate most of the skills covered over the semester, including at a minimum:
- Design atleast one sensor
- Electronics (input and output)
- Microcontroller programming

MCSP Colloquium Series: You are required to attend at least 2 of the several talks as a part of the MCSP colloquia this semester. You should submit a 1 page reflection paper, using turn it in link before the end of last day of classes. Simply regurgitating the talk will get you only ½ the credit. MCSP credits, a maximum of 2 extra points, will be added to your project score at the end. This can swing the needle between a + /-. Do not wait till the end of the semester to attend one of these talks, as you may run out of options. A schedule of this semester's talk can be found on MCSP webpage.

Attendance: Since the class is taught remotely, students are required to attend all class meetings. Each class meeting will be on Zoom , and during the live web-conferencing session we will go over the theory, discussions on assignments, work on in class problems and review relevant content from. After the short

lecture/discussions, you will work on lab experiments (which includes simulations, cell phone physics, circuit design. Lab sessions provide an opportunity for students to engage one-on-one and in small groups with course instructor and TA, in order to get feedback on their project ideas as well as any relevant technical support. Students are required to check in at the beginning of their lab section in order to earn participation credit. Attendance at lab time will also count towards your participation grade. **Conflicts:** There will be no make-up lab-times.

Absences will also include the following:
If a student logs in 10 mins late /log out in the middle of the class/turns off the camera during the class discussion time (typically between 9-10 am on Tue and Thurs) will be marked absent. Students who do not participate in lab work or engage in activities not related to this course will be marked absent.

Excused Absence: Any unexpected absence due to health reasons/emergency situation/participation in events representing the College should be supported by proper documentation such as doctor's note, court order, and schedule of conference/sports events. You will need to inform me prior to the absence or within 48 hours of such an absence to be considered as excused. It is your responsibility to make up for the work that you missed. I will not extend the deadline for turning in homework or other work assigned in the class unless you have my prior approval.

Inquire: Log-in to Inquire program via MyRC web portal on the College website. This will give you access to the syllabus, office hours schedules, lecture notes, any class announcements and a bunch of other stuff. Regular updates will be available posted here. Make sure to check the Inquire website regularly!!! No excuses can be made and no extensions can be granted if you miss a deadline that was posted on Inquire.

Class Disruption: All students are entitled to a professional learning environment. Students should not act in a manner which will distract and disrupt the class learning experience. Such practices will not be tolerated. Appropriate clothing and behavior is expected.

Academic Integrity: Policies of Academic Integrity of Roanoke College are enforced in all aspects of this course. It is the responsibility of the student to strictly adhere to the policies of Academic Integrity of Roanoke College. If you are unsure of AI policies, please come and see me.

Course Schedule:

Date	Topic
Aug 20– Sep 17	Introduction to Phyphox
Sep 22- Oct 13	Introduction to Arduino
Oct 15 – Nov 12	Project Work
Nov 17	Project Demo
Nov 23	Final Exam

Disclaimer: While the course schedule, listed above, is a general outline of topics , it is by no means complete. Since we are starting the semester in a usual way and with a phased in arrival of students on campus, the course topics may have to be altered as the situation demands. A detailed list of sub-topics, assignments, readings, and requirements will be updated on Inquire on a weekly basis. Please be sure to check Inquire frequently for updates to get an accurate list of topics, readings, assignments, and due dates.

Additional Learning and Academic Resources:

The Office of Disability Support Services, located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library, provides reasonable accommodations to students with identified disabilities. Reasonable accommodations are provided based on the diagnosed disability and the recommendations of the professional evaluator. In order to be considered for disability services, students must identify themselves to the Office of Disability Support Services. Students are required to provide specific current documentation of their disabilities. Please contact the Coordinator of Disability Support Services, at 540-375-2247

Subject Tutoring is a CRLA Nationally Certified Program located on the lower-level of Fintel library in room 005. Subject Tutoring offers individual appointments in 30-minute intervals for Lab Sciences, Modern Languages, Math & CPSC, Social Sciences, Business & Economics. Hours are Sunday - Thursday 4 p.m. - 9 p.m. For a list of tutorials or to make an appointment, go to www.roanoke.edu/tutoring.

 The Writing Center @ Roanoke College, located in Room 15 on the Lower Level of Fintel Library, offers writing tutorials for students working on writing assignments/projects in any field. Writers at all levels of competence may visit the Writing Center at any point in their process, from brainstorming to drafting to editing, and talk with trained peer writing tutors in informal, one-on-one

sessions. Simply stop in, or schedule an appointment by going to www.roanoke.edu/writingcenter, where our schedule of writing workshops and creative writing playshops is also posted. Questions? Email writingcenter@roanoke.edu or call 375-4949. You can also Like our page on Facebook!