Phys 490 **Senior Seminar: Physics Capstone** **Spring 2018**

Dr. Rama Balasubramanian (a.k.a) Dr. Bala
Room No: 243, Massengill; Phone: 540-375-2057
E-mail: bala@roanoke.edu
Office Hours: MWF 10-11am; MW 2.15-3.15 pm; Th: 1-2 pm; Other Hours: By Appointment

---

Lectures: Block 5 MWF: 1.10-2.10 pm

Required Textbook: Physics for Scientists and Engineers (8th Edition)

Overview: This is a capstone course that captures the essence of what a Physics major is expected to know. The following is taken from the Roanoke College mission statement for students majoring in physics:

"Students majoring in physics are provided with a curriculum that emphasizes a balance of breadth and depth of knowledge of the field. Physics students learn to address real-world problems through a curriculum that provides a balance between sound theoretical frameworks and practical expertise. Graduates are well prepared for traditional and non-traditional career paths and are capable of contributing broadly to the global scientific community"

Some of the objectives of this course are

1) To be conversant of the fundamental laws of Physics and be able to apply them in solving problems
2) To be able to design and demonstrate the understanding of the laws of Physics through innovative experimentation
3) To be able to see the relevance of physics to technology and its applications and apply the knowledge in future career.

The course is divided into three sections, namely

1) Review of fundamental Physics
2) Design and build demo experiments that elucidate fundamental laws of Physics
3) Understand and analyze the significance of laws of physics in modern day applications.

Grading:

- Review Material (Team work and Individual)
  - Presentation and Discussion (Team) 10%
  - Quiz (Individual) 15%
  - Oral Exam (Individual) 15%
- Demonstration Project (Team Work))
  - Abstract and Documentation 5%
  - Demo and Presentation 20%
  - Peer Evaluation 5%
- Capstone Application (Individual)
  - Quiz 5%
  - Topic Paper 10%
  - Project Presentation 15%

Team Roles: The class will be divided into three teams, viz., **Team Feynman, Team Heisenberg** and **Team Curie.** On each team activity, your team should designate a ***coordinator*** to organize work sessions, make sure everyone knows where and when to meet and understand who is supposed to be doing what, a ***recorder*** to prepare and turn in papers/presentations, and a ***checker*** to check the research and the strategies used to prepare the discussion document. The team roles must rotate on every activity – once a team member has carried a role, he/she may not do it again until everyone else on the team has done it. If a team is unhappy with the performance of a non participative member, he/she can be fired from the team. Individuals who are fired must find a team (either a new team or form their own team with atleast one more member) unanimously willing to accept them; otherwise they will lose 40% of the points for the following team activities. Please be aware that I will not get involved in team member conflicts. You will need to work out the differences on your own.

Individual effort and assessments for team work: All students will periodically be asked to submit evaluations of how well they and their teammates performed as a team. These evaluations will be incorporated into the activity grade.

MCSP Colloquium Series: You are required to attend at least 3 of the several talks as a part of the MCSP colloquia this semester. You have to write up a paper on your reflections of the talk to get full credit. The papers will be graded on a scale of 1-3. A well written and reflective paper will be awarded 3 points. Points from MCSP reflection will be added to the total at the end. This will help swing your grade between a +/-

Quiz: The quizzes will be based on the review material from PSE textbook as well as assigned reading material from nuclear physics.

Exams: There will be one departmental oral exam indicated in your syllabus. Final paper is due on April 25th.

Presentation: You will be required to give several presentations as a part of the course. More information will be provided in class at appropriate times during the semester

Topic Paper: You will be turning in a 5-7 page long paper on a specific topic you will research on. Details of this will be made available to you before spring break.

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.

Attendance: Students are required to attend every class. Your attendance will be recorded each lecture period. If you show up 10 minutes late, you will be marked absent. Any student who has four consecutive absences will be dropped from the course. A warning e-mail/letter will be sent when the third consecutive absence occurs. Also, any student who misses a total of five classes will be dropped from the class. This includes both excused and unexcused absences. A warning letter/email will be sent when the fourth absence occurs.
Excused Absence: Any unexpected absence due to health reasons/emergency situation/participation in a conference or sporting 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 best to inform me about your absence in person. Emails and phone voice messages are not very reliable. It is your responsibility to make up for the work that you missed. I will not extend the deadline for turning in the work assigned in the class unless you have my prior approval.

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. **Cell-phones, pagers, beepers or any other electronic communication/entertainment devices must be turned off** at all times during the lecture period.

Academic Integrity: Policies of Academic integrity 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.

Disclaimer: Everything above is subject to change with notice and, where appropriate, with your approval.

Course **Schedule:**

Week	Date	Topic	Deadlines
1	15-Jan	Introduction	
	17-Jan	Review POP-SE Ch 1-3	
	19-Jan	Review POP-SE Ch 4-6	
2	22-Jan	Review POP-SE Ch 7-9	
	24-Jan	Review POP-SE Ch 10-12	
	26-Jan	Review POP-SE Ch 13-15	List of demo project ideas
3	29-Jan	Review POP-SE Ch 16-18	
	31-Jan	Review POP-SE Ch 23-25	
	2-Feb	Review POP-SE Ch 26-28	List of final paper topic
4	5-Feb	Review POP-SE Ch 29-31	
	7-Feb	Review POP-SE Ch 32-34	
	9-Feb	Review POP-SE Ch 39	List of careers for physics majors
5	12-Feb	Review Modern Physics – Wave Particle Duality, HUP	
	14-Feb	Review Modern Physics – Atomic Models	
	16-Feb	Review Modern Physics – TISE, Potential Box	Resume/CV draft
6	19-Feb	Resume building + Career discussions	
	21-Feb	Oral Exam / Project Work	Demo project abstract
	23-Feb	Oral Exam / Project Work	
7	26-Feb	Oral Exam / Project Work	
	28-Feb	Oral Exam / Project Work	
	2-Mar	Oral Exam / Project Work	
8	5-Mar	Spring Break NO classes	
	7-Mar		
	9-Mar		
9	12-Mar	Discovery of the nucleus	Final paper abstract
	14-Mar	Nuclear forces	
	16-Mar	Stability	
10	19-Mar	Nuclear radioactivity	
	21-Mar	Nuclear Radiations	
	23-Mar	Radioactive Nuclides	
11	26-Mar	Nuclear Reactions	
	28-Mar	Fission, Fusion	
	30-Mar	Good Friday No classes	
12	2-Apr	Fission - Atomic Bomb	
	4-Apr	Fusion - Hydrogen Bomb	
	6-Apr	Nuclear Policy (Discussions)	
13	9-Apr	Topic Presentation - Nuclear medicine	Preliminary draft of final paper
	11-Apr	Topic Presentation - Archeology	
	13-Apr	Topic Presentation - Art	
14	16-Apr	Topic Presentation - Crime Detection	
	18-Apr	Topic Presentation - Mining and Oil	
	20-Apr	Topic Presentation - Materials and small power system	
15	23-Apr	Demo Project Presentation	Demo project documentation
16	25-Apr	Final Paper Due	