Dr. Rama Balasubramanian (a.k.a) Dr. Bala
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Office Hours: MWF 10-11am; MW 2.15-3.15 pm; Th: 1-2 pm; Other Hours: By Appointment

Course Overview: This course is a calculus based, rigorous introduction to modern physics. The students will be able to understand the fundamentals of scientific ideas and principles of physics, through lectures, homework, quizzes, class discussions and exams. The students will also engage in discussions and apply the underlying concepts to solve problems and understand the way things work. The students will also develop a scientific approach to solving physics problems using calculus and through a thorough grasp of the fundamental physics principles.

Learning Outcomes: Upon completion of this course, successful students will be able to
- Understand the wave-particle duality of matter and uncertainty principle
- Make connections to wave phenomena and fundamental nature of matter
- Apply mathematical approach in understanding the behavior of a quantum particle in different potentials
- Describe atomic structure and in atomic processes based on fundamental quantum rules
- Describe principles of relativity

Prerequisites: Phys 202, Math 121

Course Materials:
- Required Book: Modern Physics For Scientists and Engineers: 3nd Edition, Stephen Thornton and Andrew Rex. (You can also use the more expensive 4th Edition, but homework problems will be from 3rd edition. It is your responsibility to make sure that the problems you work on from 4th edition correlates to the problems assigned from 3rd edition).
- Recommended Book : Modern Physics: 3rd Edition, Raymond A. Serway, Clement J. Moses and Curt A. Moyer., Thomson/Brookscole (2005)
- Principles of Physics, 4th Edition with Modern Physics, Raymond A. Serway and John W. Jewett, Jr. Thomson/Brookscole (2006)

Grading: Grades for this course will be based on homework assignments, tests, quizzes, in-class assignments and student participation.

			Points	Grade	Points	Grade
Homework	10%		<60	F	76-79	C+
Exam 1	10%		60-62	D-	80-82	B-
Exam 2	10%		63-65	D	83-85	B
Exam 3	10%		66-69	D+	86-89	B+
Quizzes	10%		70-72	C-	90-94	A-
In-class work , Participation	5%		73-75	C	≥95	A
Final Exam	20%					
Lab	25%					

Expectation: Students are expected to put in a minimum of 12 hours/ week work outside the class in order to successfully complete this course.

Homework: There will be atleast one homework set each week, consisting of problems from the lectures given during the week. The homework sets will be posted on Inquire. Occasionally I will assign homework problems inclass. Regardless of how the homework problems are assigned, all homework sets must be submitted before the indicated due date/ deadline. Late homework will not be accepted. A quick check on the homework will be done for completion, with detailed grading on one problem.

Quizzes: These will be about 10 minutes long and will be held during the lecture time. The quiz date will be announced during one lecture period prior to the quiz date. They will consist of 5-10 questions from your homework, class discussions and lecture material. There will be no make-up quizzes – if you are absent, you get zero. This includes both excused and unexcused absences.

In-Class Problems and Participation: You will also be required to complete problems assigned in class. Participation in class discussions is also an important aspect of learning the material.

MCSP Colloquium Series: You are required to attend at least 2 of the several talks as a part of the MCSP colloquia this fall. You should submit a 1 page reflection paper, using turn it in link, within 48 hours of the talk to get credit. Simply regurgitating the talk will get you only ½ the credit. For example if you attend a talk on statistics theme, you should make connections to the statistical concepts you have learnt. MCSP credits, a maximum of 2 extra points, will be added to your course total 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. You should make connections to courses in the MCSP curriculum, as much as possible. A schedule of this semester's talk can be found on MCSP webpage.

Midterm Tests: There will be three tests during the semester as listed. Each test will cover the material listed on the syllabus or as informed by me in class, prior to the tests.

Final Exam: Yes, there will be a final exam at the end, and it is cumulative! April 25, from 8:30-11:30 am.

Labs: Labs are worth 25% of the grade and will be instructed by Dr. Fleenor. Students cannot pass this course without successfully completing all the requirements of Phys 203L

Attendance: Students are required to attend all class meetings. Attendance will be recorded during every class meeting. Any student who misses a total of four classes will be dropped from the course with a grade of DF. This includes both excused and unexcused absences. A warning email will be sent after the third absence occurs. This will be cc-ed to your academic advisor and registrar.

Absences will also include the following:
If a student shows up for class 10 minutes late/walk out in the middle of the class/caught napping/texting/ checking emails, he/she will be marked absent. In addition, I will consider texting/checking emails/browsing internet all as a form of violation of professional academic code. A physical presence alone does not construe as being present in the class.

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 24 hours of such an absence to be considered as excused. Students can make up missed homework/inclass worksheets only if their absences are **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.

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.

Philosophy: My teaching philosophy is not to make you memorize equations but rather help you understand the basics Physics. I am willing to work with you, if you need extra help. Please talk to me if you have any problems understanding the material. ASK QUESTIONS; GET YOUR DOUBTS CLEARED WITHOUT PROCRASTINATION. Feel free to stop by my office. I believe that questions and clarifications are best addressed in person rather than via emails and phone. I would urge you to take full advantage of my office hours to get your questions answered.

The Writing Center @ Roanoke College, located on the Lower Level of Fintel Library, offers tutorials focused on writing projects and oral presentations for students working in any field. Writers and presenters at all levels of competence may visit the Writing Center at any point in their process—including brainstorming, drafting, organizing, editing, or polishing presentation skills—to talk with trained peer tutors in informal, one-on-one sessions. The Writing Center is open Sunday through Thursday from 4 to 9 pm. Simply stop in, or schedule an appointment by going to www.roanoke.edu/writingcenter, where our staff members and workshops are also posted. Questions? Email writingcenter@roanoke.edu or call 375-4949. Like our Facebook page for hours and event updates!

Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 p.m. – 9 p.m., Sunday – Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are highly trained Roanoke College students who offer one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250 & Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in 15, 30, or 45-minute appointments. Feel free to drop by for a quick question or make an appointment at www.roanoke.edu/tutoring for a longer one-on-one appointment. For questions or concerns, please call 540-375-2590 or subject_tutoring@roanoke.edu.

Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in **Fintel Library**. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Dr. Sue Brown, Director of Academic Services and Acting Coordinator of Accessible Education Services, at 540-375-2247 or by e-mail at sbrown@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Dr. Brown at your earliest convenience to schedule an appointment.

Week	Date	Chapter	Topic	Reading Sections
1	15-Jan		Introduction	
	17-Jan	Ch 1	Classical Physics, Waves Particles	1.1, 1.3
	19-Jan		Forces, Atoms, Questions	1.4-1.6
2	22-Jan	Ch 2	Early Relativity, Einstein"s view	2.1-2.3
	24-Jan		Lorentz Transformation	2.4
	26-Jan		Time Dilation , Length Contraction	2.5
3	29-Jan		Relativity, Twin Paradox	2.7 -2.9
	31-Jan		Mass Energy Equivalence	2.11-2.12
	2-Feb		Applications	
4	5-Feb	Ch 3	X-rays, Electrons, Spectra	3.1-3.4
	7-Feb		Black Body Radiation	3.5
	9-Feb		Photo Electric Effect	3.6
5	12-Feb		Compton Effect	3.8
	14-Feb		Applications	
	16-Feb		Exam1 (Ch 1 ,2, 3)	
6	19-Feb	Ch 4	Atom Models	4.1-4.3
	21-Feb		Applications	4.4
	23-Feb		Applications	
7	26-Feb	Ch 5	DeBroglie Hypothesis	5.1-5.3
	28-Feb		Uncertainty Relation	5.4-5.6
	2-Mar		Wave Function, Probaility Waves	5.7-5.8
8	5-Mar		Spring Break	
	7-Mar			
	9-Mar			
9	12-Mar		Exam 2 (Ch 4, 5)	
	14-Mar	Ch 6	TISE, Infinte Potential Box	6.1
	16-Mar		Expectation Values	6.2
10	19-Mar		Applications	6.3
	21-Mar		Finite Potential Box	6.4
	23-Mar		Barriers and Tunneling	6.7
11	26-Mar		Applications	
	28-Mar	Ch 7	Hydrogen Atom Wave functions	7.1-7.2
	30-Mar		Good Friday No class	
12	2-Apr		Quantum Numbers , Spin	7.3, 7.5-7.6
	4-Apr	Ch 8	Periodic Table	8.1
	6-Apr		Angular Momentum	8.2
13	9-Apr		Coupling Schemes	8.2
	11-Apr		Applications	
	13-Apr		Exam 3 (Ch 6, 7, 8)	
14	16-Apr	Ch 10	LASERS	10.2
	18-Apr		Magnetism	10.4
	20-Apr		Superconductivity	10.5
15	23-Apr		Review	
16	25-Apr		Final Exam (8.30-11.30 am)	