**Global Learning Initiatives Program Course Syllabus**

**Course Information**

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| Course Name | Intro.to Nanoscale Science & Engineering (MECH403) |
| Lecturer(s) | Prof. Junsuk Rho |
| Course Description | Nanoscience and Nanotechnology are the refinement of functional properties of materials, devices, or systems that are approximately 1-100 nm in at least one dimension. In recent years, nanoscience and nanotechnology have revolutionized how we think of science and its impact on society. In this course, the student will explore a wide range of new science and technologies based on and influenced by the breakthroughs in the field of “nano”. Such examples include, but are not limited to, nanoelectronics, nanooptics, nanophotonics, nanomagnetics, nanomechanical systems and nanosensors. A general goal is to understand the fundamental concepts in the theory, design, manufacturing, characterization and application of various nanomaterials and nanostructures. Through the classroom lecture, review of scientific literature, and student projects, the student is afforded an opportunity to become well-versed in this important burgeoning field of nanoscience and nanotechnology.  \* Policies:  1. Students are responsible for all material reviewed and assignments (reading and homework) made.  2. The instructor and the students will behave in a professional manner at all times.  3. Appropriate referencing is required for ALL sources including web resources. Plagiarism will NOT be tolerated. For questions regarding plagiarism, see “http://sja.ucdavis.edu/avoid.htm” or talk with the instructor.  4. The honor code will be followed and enforced. POSTECH is committed to the principles of intellectual honesty and integrity. All members of POSTECH community are expected to maintain complete honesty in all academic work presenting only what is their own work in tests and assignments. If you have questions regarding proper attribution of the work of others, contact your professors prior to submitting the work for evaluation. |
| Course Objectives | 1. Understand fundamental material science and solid state physics, and apply the obtained knowledge to the study of nanoscale science and engineering  2. To illustrate how material properties, such as electronic, optical, magnetic, mechanical properties, can be tailored at the nanoscale  3. Understand the fundamental concepts in the design, fabrication, manufacturing, characterization and application of various nanoscale materials and structures  4. Develop the skill to be conversant in the multiple disciplines involved in nanoscience and nanotechnology  5. Aware of ethical and environmental issues resulted from nanoscience and nanotechnology |
| Suggested Proficiencies | Senior standing or Graduate level in Engineering or Science  Required: MATH110 (Calculus), PHYS101/102 (General Physics I/II) or PHYS105/106  Preferred: EECE261 (Electromagnetics) or PHYS206 (Electromagnetism I) |
| Reading List | \* No required textbooks. Lecture notes and additional materials will be distributed |
| Grading Criteria | Quiz: each lecture has short quiz, which counts total 25%.  Homework: 5 handed-in homework assignments count for total 25%  Exam: midterm 25%, final term 25% |

**Course Schedule**

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| Class | Date (YYYY/MM/DD) | Course Topic | Lecturer |
| 1 | Week 1 | *Introduction & Quantum mechanics* | *Prof. Junsuk Rho* |
| 2 | Week 2 | *Quantum mechanics (Homework)* | *Prof. Junsuk Rho* |
| 3 | Week 3 | *Solid state physics & Optical microscopy* | *Prof. Junsuk Rho* |
| 4 | Week 4 | *Optical microscopy (Homework* | *Prof. Junsuk Rho* |
| 5 | Week 5 | *Fabrication* | *Prof. Junsuk Rho* |
| 6 | Week 6 | *Fabrication (Homework)* | *Prof. Junsuk Rho* |
| 7 | Week 7 | *Fabrication & Nanostructures Midterm (Exam)* | *Prof. Junsuk Rho* |
| 8 | Week 8 | *Midterm (Exam)* | *Prof. Junsuk Rho* |
| 9 | Week 9 | *Nanostructures & Nanophotonics (Homework)* | *Prof. Junsuk Rho* |
| 10 | Week 10 | *Nanophotonics & Metamaterials* | *Prof. Junsuk Rho* |
| 11 | Week 11 | *Metamaterias* | *Prof. Junsuk Rho* |
| 12 | Week 12 | *Plasmonics (Homework)* | *Prof. Junsuk Rho* |
| 13 | Week 13 | *Nanoelectronics* | *Prof. Junsuk Rho* |
| 14 | Week 14 | *Course Review* | *Prof. Junsuk Rho* |