**Global Learning Initiatives Program Course Syllabus**

**Course Information**

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| Course Name  \*provide the **English** course name of the course. | Introduction to Nanoscale Science and Engineering |
| Lecturer(s)  \*provide the lecturers’ **English** name. If there are more than one lecturer, please indicate all lecturers in the column. | Junsuk Rho |
| Course Description  \*briefly describe the contents covered in the courses. | 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. |
| Course Objectives  \*list out knowledge or skills students should acquire upon completion of course. | 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  (if any)  \*list preferred knowledge or skills students should have before taking the course. | Senior standing or Graduate level in Engineering or Science  Required: Calculus, General Physics I/II  Preferred: Electromagnetics or Electromagnetism I |
| Reading List  (if any)  \*list out the textbooks, references, or other reading materials. | \* References  1. Introduction to Nanoscience and Nanotechnology, by Chris Binns, John Wiley & Sons, 2010  2. Nanotechnology: An Introduction, by Jeremy Ramsden, William Andrew, 2011  3. Introduction to Nanoscience, by Stuart Lindsay, Oxford University Press, 2009  4. Introduction to Nanoscience and Nanotechnology, by Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta and John J. Moore, CRC Press, 2008 |
| Grading Criteria  \*how would the students be assessed during the course. | Quiz: each lecture has short quiz, which counts total 50%.  Homework: 5 handed-in homework assignments count for total 25%  Exam: midterm 25% |

**Course Schedule**

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| Class | Weeks | Course Topic | Lecturer |
| 1 | 1 | Introduction & Quantum mechanics | Junsuk Rho |
| 2 | 2 | Quantum mechanics (Homework) | Junsuk Rho |
| 3 | 3 | Solid state physics & Optical microscopy | Junsuk Rho |
| 4 | 4 | Optical microscopy (Homework) | Junsuk Rho |
| 5 | 5 | Nanofabrication | Junsuk Rho |
| 6 | 6 | Nanofabrication (Homework) | Junsuk Rho |
| 7 | 7 | Midterm (Exam) | Junsuk Rho |
| 8 | 8 | Nanofabrication & Nanostructures | Junsuk Rho |
| 9 | 9 | Nanostructures & Nanophotonics (Homework) | Junsuk Rho |
| 10 | 10 | Nanophotonics & Metamaterials | Junsuk Rho |
| 11 | 11 | Metamaterials | Junsuk Rho |
| 12 | 12 | Plasmonics (Homework) | Junsuk Rho |
| 13 | 13 | Nanoelectronics | Junsuk Rho |
| 14 | 14 | Course Review | Junsuk Rho |
| 15 | 15 |  | Junsuk Rho |

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**Course Information**

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| --- | --- |
| Course Name  \*provide the **English** course name of the course. | Interaction Design Studio |
| Lecturer(s)  \*provide the lecturers’ **English** name. If there are more than one lecturer, please indicate all lecturers in the column. | Eunjeong Ma |
| Course Description  \*briefly describe the contents covered in the courses. | In the era of artificial intelligence, climate change, and pandemic, technical issues are wrapped up with complicated and complex social, political, and ecological issues, and technoscience has emerged as ever more crucial resources to provide solutions to social problems. Though engineering skills and knowledge are right resources to tackle contemporary social problems, it is also true that the possession and distribution of such technical resources can create or resolve inequalities or injustice within or across society. This course critically reviews the interrelationship between technology and society and redefines the role of technology with respect to humans and society. The course also addresses the ways to combine social scientific research methods and humanistic insights with the design and implementation of technology. Building on such understanding, the course expects students to design a socially just technology. |
| Course Objectives  \*list out knowledge or skills students should acquire upon completion of course. | - Learn about complex societal, legal, ethical, political issues with respect to technological innovations  - Develop and improve project-based collaboration and interactive technology design skills  - Cultivate global competence and apply the insights learned from social sciences and humanities to engineering research and design processes.  - Learn that technology design is a process that gives a rise both to artifacts and to their accompanying social networks, and design processes are collective processes in which humans and nonhumans interact. |
| Suggested Proficiencies  (if any)  \*list preferred knowledge or skills students should have before taking the course. |  |
| Reading List  (if any)  \*list out the textbooks, references, or other reading materials. | Readings will be uploaded to PLMS |
| Grading Criteria  \*how would the students be assessed during the course. | 10% Attendance  20% Participation  30% Mid-term ‘Speculative City Project’  40% Final-term Team project |

**Course Schedule**

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| Class | Weeks | Course Topic | Lecturer |
| 1 | 1 | Orientations: Innovations, Values, and (Social)Justice | Eunjeong Ma |
| 2 | 2 | 1. Politics of (Technology)Design I: Does human-made artifact have politics? 2. Speculative City Project: Step 1(Ideation) |  |
| 3 | 3 | 1. Politics of Technology Design II: Designing justice, comfort, disasters, or risks? 2. Speculative City Project: Step 2 |  |
| 4 | 4 | 1. Politics of Design III: Anthropocence and Sustainable Technology Design 2. Speculative City Project: Step 3 |  |
| 5 | 5 | 1. Engineering and (Social)Justice I: Political (in)Difference and (Social) Mobility 2. Speculative City Project: Step 4 |  |
| 6 | 6 | 1. Engineering and (Social)Justice II: Diversity, Materialism, Globalization 2. Speculative City Project: Step 5(Conceptualization) |  |
| 7 | 7 | 1. Engineering and (Social)Justice III: Military, Enabling/Sustainable Innovations 2. Speculative City Project: Step 6(Visual Story) |  |
| 8 | 8 | Mid-term period(No classes) |  |
| 9 | 9 | 1. Research Methods: Design Thinking 2. Speculative City Project: Presentation, ideas for final project, team-building |  |
| 10 | 10 | 1. Research Methods: Design Thinking 2. Final Project: Idea Presentation |  |
| 11 | 11 | 1. Research Methods: Design Thinking & Customized Readings for Final project 2. Final Project: Background research and proposition of technical solutions |  |
| 12 | 12 | Final project: Alternative solutions, expert consultation, user research |  |
| 13 | 13 | Final project: Prototyping |  |
| 14 | 14 | Final project: User experience |  |
| 15 | 15 | Project presentation and Demo |  |