Descriptions of Courses

NST510 Introduction to Modern Physics
The goal of this course is to help students understand the physical concepts necessary to understand physical phenomena at the nanoscale.

NST520 Introduction to Nano-chemistry
The goal of this course is to understand the general chemistry for students who don't have chemistry background.

NST530 Introduction to Physiology
Understanding toward co-ordinations and integrations of physiologic processes in the body at the level of nano-molecular-cellular-tissue-organ levels.

NST535 Introduction to Nanobiology
The goal of this course is to understand the biophysical properties and principles of biological processes.

NST540 Nanoscience and Technology Laboratory
Nanoscale physics/chemistry/biology laboratory course operated in a lab-rotation style.

NST550 Nanofabrication Laboratory
A hands-on experiment and lecture using cutting-edge nano fabrication technology, offered in collaboration with National Nanofab Center.

NST551 Computational Nanoscience: Electronic Structure theory
Computational simulation is considered as a third means in modern research sciences, in addition to traditional experiment and theory. Last 20 years, predicting power of computational nanomaterials sicence has been improved significantly owing to rapid development of supercomputing multiprocessors. In this class, we will learn modern methodologies of computational materials science and electronic structure theories, and perform a term project using VASP or PWscf on selected topics such as molecules, nanoclusters, nanotubes, and proteins to acquire basic computational skills.

NST552 Biomedical Optics
This course provides an introduction to optical principles, technologies, and instruments that are being used in a variety of scientific and engnineering fields including biomedical research. The intended audience is the undergraduate and graduate students in the Department of nanoscience and technology as well as other departments (eg. biological sciences, chemistry, bioengineering, mechanical engineering), who wish to learn multidisciplinary optics in real-world applications as well as cutting-edge research.

NST553 Electrochemistry and Nanoscience
Key topic areas of electrochemistry: 1. Electrostatics and Electrokinetics: The basics of Electrode potentials, Electrical Double Layers, Structure, Diffusion, Migration, and Reaction of the interfacial region. 2. Applications: Chemical Sensors. 3. Current hot topics related with electrochemistry in nanoscience.

NST554 In Vivo Imaging System
This course will discuss the principle of modern biophotonic technologies to implement various in vivo imaging system with its current and future application for biomedical research by integrating nanotechnology.

NST555 Theoretical biophysics
This course provides physical understanding of various biological functions, based on statistical mechanics and stochastic process. The main goal is to demonstrate how quantitative theoretical models explain current issues of cellular biology. In particular, non-equilibrium dynamics and fluctuations of biological processes will be emphasized.

NST556 Introduction to Imaging Techniques
This course will introduce various techniques in optics and engineering for the implementation of imaging system. Principles of imaging optics, electrical circuit, signal and image processing and their practical applications for imaging system will be introduced.

NST557 Introduction to Soft Nanomaterials
This is a course about the science of soft nanomaterials such as liquid crystals, biopolymers, biological membranes, polymers, block copolymers, molecular monolayers, colloids, nano-particles, and other soft nanomaterials.

NST559 Cell Signaling
This course explores advanced topics in cell signal signaling related to cell proliferation, cell death, cell cycle, and so on. Some topics covered include the following: protein kinases and their function, phosphatases and their role in regulation, growth factor receptors and G-proteins, calcium and other second messengers, cell cycle and immune system signal transduction events, etc. A basic review of overall related researches will be provided, and current findings from the scientific literature will be discussed.

NST560 Introduction to BioMEMS
BioMEMS can deliver selective, sensitive, fast, and low cost diagnostic and point-of-care methods. This course will introduce microfabrication, microfluidics, and MEMS/NEMS sensors. Students will learn principles of control of fluid and sensing at small scale, and also practice actual device fabrication.

NST621 Structural Analysis of Biological Macromolecules
In this class we will discuss theoretical background and practical applications of NMR and x-ray crystallographic techniques used for structural studies of biological macromolecules.

NST631 Bio-imaging
The course provides principles of microscopy (wide-filed and confocal microscopes, and TIRF), live cell imaging, and new imaging techniques (FRET, FRAP, FLIP, and so on). The end of course will show how to understand cell and protein functions using cell imaging techniques.

NST632 NanoBio Technology
This course deals with how the basic principles of nanotechnology can be intergrated into biotechnology and what industrial fields will be created by this consequence in the future.

NST635 Cancer Biology
This course is a broad based overview of modern molecular and cellular cancer biology, including basic and clinic aspects. The course highlights multiple areas including signaling in tumor cells, oncogenes, viruses, tumor suppressors, apoptosis, metastasis, angiogenesis, epigenetics, epidemiology, homones in cancer, immunology, prevention, molecular markers used in diagnosis and prognosis and therapeutic applications, including nanotechnology specific examples.

NST671 Advanced Animal Cell Engineering
The course will provide the students with basic knowledge on cell functions needed for cultivation of animal cells. In addition, the students will be informed about the production of therapeutic proteins from animal cells. Discussions will be also held on recent trends concerning the tissue engineering of human bone marrow, epidermal, and liver cells.

NST717 Topics in Nanoscience and Technology
This course is a survey of many different methods for depositing, and analyzing, thin films, in particular for semiconductor applications. Designed for graduate students who are starting work on thin-film related research, elementary knowledge of quantum mechanics, thermodynamics, and solid state physics is recommended

NST831 Advanced Genetics
Basic concepts of eukaryotic genetics and various genetic tools for analysis of gene function will be introduced. Use of genetic model systems for studying biological phenomena and diseases will be discussed. Lectures will focus on research articles.

PH960 M.S. Thesis

PH980 Ph.D. Thesis

PH966 M.S. Seminar

PH986 Ph.D. Seminar