Fall Semester 2017 Electives

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<table>
<tr><th>Class number</th><th>Credit Hours</th><th>Days / Time</th><th>Session</th><th>Room</th><th>Instructors</th></tr>
<tr><td colspan="6">ANAT 7710 - Neuroanatomy</td></tr>
<tr><td>5198</td><td>1.5</td><td>THF / 10:45AM-11:35AM</td><td>First Half Semester</td><td>SMBB 4100</td><td>BRENNAN, K. C.
WACHOWIAK, D. M.</td></tr>
<tr><td colspan="6">Anatomy of the human nervous system (designed for graduate students). Meets With NEUSC 6060</td></tr>
<tr><td colspan="6">ANAT 7750 - Developmental Neurobiology</td></tr>
<tr><td>16841</td><td>1.5</td><td>THF / 10:45AM-11:35AM</td><td>Second Half Semester</td><td>SMBB 4100</td><td>WILLIAMS, M. E.</td></tr>
<tr><td colspan="6">Cellular and molecular biology of nervous system development.</td></tr>
<tr><td colspan="6">BIOEN 5110 Regulatory Affairs I</td></tr>
<tr><td></td><td>3.0</td><td>TH / 12:25PM-1:45PM + Lab</td><td>Full Semester</td><td>WEB L122
MEB 2405</td><td>PETELENZ, T. J.
SKOUSEN, J. L.</td></tr>
<tr><td colspan="6">This is a non-technical, hands-on regulatory affairs course. The course will give students a solid foundation and understanding of the regulation of medical devices, drugs, biologics, and combination products. Students will work in teams on practical projects developing regulatory strategies, clinical trial designs, and selected US regulatory submission for medical products. This course is suited for majors and non-majors across disciplines.
At the end of this course students will be able to:
1. Understand US regulations for devices, drugs, biologics, and combination products
2. Develop regulatory strategies to get your medical products to market
3. Prepare selected US regulatory submissions
4. Compare international & US regulations
5. Utilize web-based regulatory resources
6. Interact with regulator agencies & industry professionals
Lecture TH / 12:25PM-1:45PM + either Lab secton (choose 1):
Either Class 16786 with Laboratory W / 11:50AM-01:45PM
Or Class 18045 with Laboratory F / 08:35AM-10:35AM</td></tr>
<tr><td colspan="6">BIOEN 6002 - Molecular Biophysics</td></tr>
<tr><td>14318</td><td>3.0</td><td>TH / 12:25PM-01:45PM</td><td>Full Semester</td><td>HSEB 5100B</td><td>HLADY, V.</td></tr>
<tr><td colspan="6">This intermediate-level 3 credit-hour course is focused on the application of physical principles to: 1) develop quantitative understanding of biophysical processes in natural and engineered macromolecules, membranes, and tissues, 2) learn about modern biophysical methods capturing single molecule properties, and to 3) apply biophysical principles to the solution of biomedical engineering problems.</td></tr>
<tr><td colspan="6">BIOEN 6304 - Introduction to Polymers and Biopolymers</td></tr>
<tr><td>14319</td><td>3.0</td><td>TH / 10:45AM-12:05PM</td><td>Full Semester</td><td>SMBB 5100</td><td>YU, M. S.</td></tr>
<tr><td colspan="6">This class is designed to provide comprehensive review of synthetic tools for making natural and artificial bioploymers, and, at the same time, give students creative perspective in biopolymer design. This is achieved by reviewing the similarity and difference in chemistry, molecular structures, and high-order structures between synthetic polymers and naturally derived bioploymers.</td></tr>
</table>

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BIOEN 6100 - Biomedical Technology for Applied Research					
14315	**2.0**	**T / 02:00PM-03:20PM**	**Full Semester**	**HSEB 2962**	**PHILLIPS, J. D.**
The class alternates lectures with demonstration labs at the SOM Core Facilities. Research projects now often involve expertise and resources beyond individual laboratories. To introduce students to the wide variety of cutting-edge technologies and equipment available on campus for biomedical research, the survey course includes presentations by selected University Health Science Core Facility directors on the services their facilities offer, followed by hands-on interactive demonstrations of how the techniques are applied to achieve research goals. Students will have the opportunity to interact with the Core directors whom are experts in their respective fields and visit the respective core facilities. Students will be required to demonstrate an understanding of the technologies described in written and oral formats.					
BIOEN 6760 - Modeling and Analysis of Biological Networks					
16787	**3.0**	**TH / 02:00PM-03:20PM**	**Full Semester**	**MEB 2325**	**MYERS, C. J.**
Introduction to methods for modeling, analysis, and design of genetic circuits. A particular emphasis will be given to methods inspired by those used by engineers for circuit analysis. Other topics include: learning methods such as Bayesian analysis, differential equation models, stochastic analysis using Monte Carlo methods, reaction-based and logical abstraction, and synthetic genetic circuit design. Meets With CS 6760 001 and ECE 6760 001					
BLCHM 6400 - Genetic Engineering					
11301	**2.0**	**MWF / 08:35AM-09:25AM**	**First Half Semester**	**AEB 310**	**CARROLL, D.**
This course covers essential techniques used in genetic engineering. Assuming modest background in biology, the course introduces fundamental aspects of molecular biology including mechanisms for storage of information in DNA and transfer of this information to RNA and protein molecules. Manipulations of DNA molecules to rearrange or remodel genetic information ("cloning") are described from both theoretical and practical viewpoints. Topics covered include the use of restriction endonucleases, amplification of DNA sequences using the polymerase chain reaction (PCR), detection of DNA and RNA using hybridization (Southern and Northern blotting), properties of cloning vectors and their use in constructing genomic and cDNA libraries, DNA sequencing and sequence analysis, creating and detecting mutations in DNA and introducing these mutations into a genome, and expression and characterization of proteins. Meets With BLCHM 6400 001					
BLCHM 6410 - Protein and Nucleic Acid Biochemistry					
11297	**2.0**	**MWF / 10:45AM-11:35AM**	**First Half Semester**	**ASB 210**	**SIGALA, P. A.**
The Biochemistry course covers the structure and function of nucleic acids and proteins, as well as the thermodynamics and kinetics of their interactions with each other and with other biologically important molecules. It is expected that all students have taken an undergraduate course in Biochemistry, and you may find it useful to review chapters discussing the above-mentioned subjects in an undergraduate Biochemistry textbook. You will also need to have a basic working knowledge of kinetics and thermodynamics. (So, if you are not comfortable working with equilibrium constants, free energies, and rate constants, please review these topics in an undergraduate chemistry text.) Meets With BLCHM 6410 001 and MBIOL 6410 001 and MBIOL 6410 002					

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BLCHM 6450 - Biophysical Chemistry					
2110	**2.0**	**MWF / 09:35AM-10:40AM**	**Second Half Semester**	**HEB 2006**	**KOEHNTOP, B. A.**
Meets with CHEM 5450. Topics covered include: Basics of thermodynamics and statistical mechanics, with applications in biochemistry; transport phenomena; enzyme kinetics and inhibition; kinetic isotope effects; principles and applications of absorbance, fluorescence, and CD spectroscopies. Meets With BLCHM 6450 002 and CHEM 5450 001 and CHEM 7450 001					
BLCHM 6460 - Protein Chemistry					
9197	**2.0**	**MWF / 08:20AM-09:10AM**	**First Half Semester**	**JTB 130**	**BANDARIAN, V.**
Meets with CHEM 5460. This is a one half semester course which focuses on the mechanisms of chemical reactions involving peptides and proteins and methods for their study. Subject matter includes enzyme mechanisms, chemical modification of proteins and cofactor chemistry. Prerequisite: organic chemistry. Meets With BLCHM 6460 001 and CHEM 5460 001 and CHEM 7460 001					
CHEM 6740 - Bioanalytical Chemistry					
11541	**2.0**	**MWF / 11:00AM-12:05PM**	**Second Half Semester**	**HEB 2010**	**CONBOY, J. C.**
This course is intended to provide an overview of the methods of chemical analysis used to characterize biological samples. Topics will include a discussion of separations techniques, the spectroscopy of biological molecules, immunological and enzymatic assays, and surface analytical methods.					
CHEM 7000 - Introduction to Quantum Mechanics I					
2159	**2.0**	**MWF / 08:20AM-09:25AM**	**First Half Semester**	**HEB 2002**	**NORIEGA, R.**
An introduction to time-independent quantum mechanics, including fundamental theorems and postulates, exact solutions to model problems, relations between wave functions and potentials, the hydrogen atom, approximation methods, multielectron atoms, including angular momentum coupling and term symbols. This course covers topics useful for chemists, physicists, and engineers, and provide essential background for subsequent courses in molecular electronic structure, time-dependent quantum mechanics, and spectroscopy.					
CHEM 7010 - Introduction to Quantum Mechanics II					
2163	**2.0**	**MWF / 09:35AM-10:40AM**	**Second Half Semester**	**HEB 2002**	**TRUONG, T.**
An introduction to the electronic structure and symmetry of molecules, including point group theory, approximation methods and their limitations (the Born-Oppenheimer approximation, the Hartree-Fock SCF method, and several post-SCF methods). Use of quantum chemistry programs to calculate ground state molecular geometries, electronic wave functions, molecular orbitals, vibrational modes, and other molecular properties, including transition states for reaction. This course covers topics useful for chemists, physicists, and engineers, who have the necessary fundamental background in time-independent quantum mechanics.					

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CHEM 7040 - Statistical Thermodynamics					
2160	**2.0**	**MWF / 11:00AM-12:05PM**	**First Half Semester**	**HEB 2010**	**GRUENWALD, M.**
This course introduces the statistical machinery used to connect molecular behavior with thermodynamic principles. Covered topics are useful for chemists, physicists, biologists, and engineers.					
CHEM 7050 - Classical Thermodynamics					
12432	**2.0**	**TH / 09:10AM-10:30AM**	**Second Half Semester**	**LS 111**	**MOLINERO, V.**
This course covers classic topics of thermodynamics, including phase and chemical equilibria, solutions, and electrochemistry. Students will learn to derive and understand fundamental thermodynamic relations, equations, and formulae and explore their importance in modern applications. The material covered in this course is useful for scientists and engineers with a thorough understanding of undergraduate thermodynamics.					
CHEM 7100 - Principles of Inorganic Chemistry					
2161	**2.0**	**MWF / 08:20AM-09:25AM**	**First Half Semester**	**HEB 2010**	**ERNST, R. D.**
This course is intended for graduate students in Chemistry, Biology, Physics, and Engineering, and covers a broad overview of properties and trends of all of the element with emphasis on coordination compounds. Structure and bonding using symmetry, crystal field theory, valence bond and molecular orbital concepts are focused upon. The structure and bonding of boron hydrides are described.					
CHEM 7130 - Solid-State Chemistry					
11542	**2.0**	**MWF / 08:20AM-09:25AM**	**Second Half Semester**	**HEB 2010**	**WHITTAKER-BROOKS, L.**
This course is intended for graduate students in Chemistry, Physics, and Material Science & Engineering with a need to understand the fundamental aspects of solid-state materials and their properties. A broad overview covering the unique aspect of the synthesis, characterization, structure and properties with respect to solids are provided. Meets With CHEM 3130 001					
CHEM 7160 - Organometallic Chemistry I					
18161	**2.0**	**TH / 09:10AM-10:30AM**	**Second Half Semester**	**HEB 2010**	**LOUIE, J.**
This course is intended for graduate students in Chemistry with interests in the intersection of organic and inorganic chemistry. Organometallic chemistry is defined by metal complexes performing chemical reactions might involve intermediates containing transition metal-carbon bonds. The course will introduce fundamental concepts of both inorganic and organic chemistry and the application of these concepts to designing and applying catalytic chemical reactions to target directed organic synthesis, chemical biology, and material science.					

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CHEM 7200 - Contemporary Organic Synthesis I					
2164	**2.0**	**MWF / 09:35AM-10:40AM**	**Second Half Semester**	**HEB 2010**	**ROBERTS, A. G.**
This course surveys various modern methods for bond construction. Chemical factors that influence reactivity and selectivity are introduced. Examples of application in historical and modern-day syntheses are given.					
CHEM 7240 - Physical Organic Chemistry I					
2162	**2.0**	**TH / 09:10AM-10:30AM**	**First Half Semester**	**HEB 2010**	**ZHAROV, I.**
Physical organic chemistry studies the approaches to deciphering the mechanisms of organic reactions and the principles that govern host-guest binding. The topics include stereochemistry, conformational analysis, thermochemistry, acidity, tools to decipher reaction mechanisms, rate laws, kinetic isotope effects, linear free energy relationships.					
CHEM 7250 - Physical Organic Chemistry II					
2165	**2.0**	**MWF / 09:35AM-10:40AM**	**Second Half Semester**	**LS 101**	**RAINIER, J. D.**
Course examines organic reaction mechanisms involving all fundamental reaction types. Included will be complex mechanisms as combinations of fundamental steps, orbital symmetry controlled reactions (with Woodward-Hoffman, Fukul, and Zimmerman treatments), trajectory analysis and radical reactions.					
EAS 6060 - Advanced EAS Communication Skills for Graduate Students					
8958	**3.0**	**MW / 01:25PM-02:45PM**	**Full Semester**	**BU C 207**	
An advanced integrated-skills course designed to improve reading, writing, and listening skills through note-taking, writing short essays, and giving oral lectures and presentations in class. Meets With EAS 306 001 and EAS 3060 001					
EAS 6150 - Introduction to Graduate Writing 1					
	3.0	*Various*	**Full Semester**		
Focus on the development of the writing process for specific fields of study and research skills. This course has a heavy emphasis on writing in a U.S. University and the practices and assumptions made about research, citation, style and form.					

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FILM 3945-002 – Animating Biology					
17738	**4.0**	**MW / 02:00PM-03:55PM**	**Full Semester**	**FMAB 109**	**IWASA, J. SHEN, L. F.**
Prerequisite: Film 2600 Introduction to Animation and basic knowledge in Maya interface and animation. *If you are interested in this course but do not meet rhe prerequisites, please conracr the course directors. **If you are interested in working with film students on a scientific animation project. please contact Janet Iwasa.** Lien Fan Shen: lienfan.shen@utah.edu & Janet Iwasa: jiwasa@biochem.utah.edu ***$150.00 Fee NOT covered by Tuition Benefit Program*** 3D computer animation is a powerful tool for scientific communication and artistic explorations. In biology, animation can be used to visualize complex events that are too small to see. This course will focus on creating animations of biological processes, particularly at the molecular and cellular scale. Students will use Maya, Aftereffects, and scientific software, utilizing Maya dynamic animation/FX, MEL scripts, basic rigging, Arnold shading, and realistic lighting and rendering. Projects will involve working with biological researchers at the U to develop scientific narratives through animated images.					
H GEN 7380 - Biochemical Genetics					
11840	**3.0**	**M / 03:30PM-05:30PM W / 04:30PM-05:30PM**	**Full Semester**	**HSEB 3430**	**LONGO, N. PASQUALI, M.**
Prerequisite: College level biochemistry. This course will educate physicians and graduate students on the fundamentals of biochemical genetics. Includes inborn errors of metabolism and several common disorders, such as diabetes and hypertension, which have biochemical bases correctable by diet or other medical intervention. Provides overview of biochemical pathways, practical experience on how the biochemical pathways can be studied in vivo and in vitro, the molecular bases of common metabolic problems, the mechanism of inheritance including recurrence risk, and how to rationally treat metabolic blocks.					
MBIOL 6410 - Protein & Nucleic Acid Biochemistry					
11296	**2.0**	**MWF / 10:45AM-11:35AM**	**First Half Semester**	**ASB 210**	**SIGALA, P. A**
The Biochemistry course covers the structure and function of nucleic acids and proteins, as well as the thermodynamics and kinetics of their interactions with each other and with other biologically important molecules. It is expected that all students have taken an undergraduate course in Biochemistry, and you may find it useful to review chapters discussing the above-mentioned subjects in an undergraduate Biochemistry textbook. You will also need to have a basic working knowledge of kinetics and thermodynamics. (So, if you are not comfortable working with equilibrium constants, free energies, and rate constants, please review these topics in an undergraduate chemistry text.) Meets With BLCHM 6410 001 and BLCHM 6410 002 and MBIOL 6410 001					

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<tr><td colspan="6">MBIOL 6420 - G3: Genetics, Genomes, and Gene Expression</td></tr>
<tr><td>11299</td><td>3.0</td><td>MWF / 08:35AM-09:25AM</td><td>Full Semester</td><td>ASB 210</td><td>LETSOU, A.</td></tr>
<tr><td colspan="6">This course covers transmission genetics, methods of genetic and genome analysis in model systems and humans, as well as transcriptional and post-transcriptional mechanisms of gene regulation. Lectures cover both classical achievements and recent advances in these fields, with readings based chiefly in the primary literature. Grades are based on exams and problem sets. A passing grade on an entrance exam covering basic concepts in Genetics serves as a prerequisite for registration in this class. You should review the CD-Rom/Booklet entitled interactive Genetics, which is on reserve at the campus libraries. Alternatively you may borrow the booklet from the Program Office or purchase it (ISBN 0-7380-1546-6) for $16.00 from Hayden-McNeil Publishing.</td></tr>
<tr><td colspan="6">MBIOL 6480 - Cell Biology</td></tr>
<tr><td>15243</td><td>1.5</td><td>MWF / 10:45AM-11:35AM</td><td>Second Half Semester</td><td>ASB 210</td><td>HUGHES, A. L.</td></tr>
<tr><td colspan="6">This course covers basic and advanced topics related to cell structure and function including cytoskeleton, membrane trafficking, protein targeting/modification and degradation, cell cycle regulation, and signal transduction.</td></tr>
<tr><td colspan="6">MDCRC 6000 - Introduction to Biostatistics</td></tr>
<tr><td>12420</td><td>2.0</td><td>T / 11:00AM-12:50PM</td><td>Full Semester</td><td>HSEB 2912</td><td>STODDARD, G. J.</td></tr>
<tr><td colspan="6">Department Consent Required. Please e-mail msci_admin@lists.utah.edu to obtain a permission code. Basic statistics with emphasis on medical and epidemiologic research problems, including description of data, theoretical distributions, hypothesis testing, multiple comparisons, correlation, confidence intervals, basic regression models, and sample size estimation. Meets With MDCRC 600 001</td></tr>
<tr><td colspan="6">MDCRC 6050 - Biostatistics for Basic Science</td></tr>
<tr><td>11960</td><td>1.0 - 2.0</td><td>W / 11:00AM-12:50PM</td><td>Full Semester</td><td>HSEB 4100C</td><td>STODDARD, G. J.</td></tr>
<tr><td colspan="6">Applied statistical methods in basic science. Problems will be solved using the Stata statistical software. Topics include: descriptive statistics, significance testing, multiple comparison adjustment, data management using Stata, computer graphics, sample size determination, and analysis of clustered data (multiple observations in same animal). Animal and bench experiment datasets will be used in lectures and homework. Meets with MDCRC 605 001</td></tr>
<tr><td colspan="6">NEUSC 6040 - Cellular and Molecular Neuroscience</td></tr>
<tr><td>1895</td><td>4.0</td><td>TH / 09:10AM-10:30AM
F / 09:40AM-10:30AM</td><td>Full Semester</td><td>SMBB 4100</td><td>SHEPHERD, J. D.</td></tr>
<tr><td colspan="6">The bulk of this course will focus on the cellular mechanisms of signaling. The topics to be covered include basic neuronal/glial morphology and cell biology; neurostructural mapping and identification; basic neural development; cytoskeleton-structure and biochemistry; basic membrane biophysics; cable properties; ion channel biophysics and molecular biology; synaptic transmission; neurotransmitter gated ionotropic systems; and neurotransmitter gated metabotropic systems.</td></tr>
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NEUSC 7750 - Developmental Neurobiology					
16846	**1.5**	**THF / 10:45AM-11:35AM**	**Second Half Semester**	**SMBB 4100**	**WILLIAMS, M. E.**
Cellular and molecular biology of nervous system development. Meets with ANAT 750 001					
NEUSC 7950 - Professional Skills/Grant Writing					
13537	**2.0**	**M / 12:55PM-2:45PM**	**Full Semester**	**HSEB 3430**	**DORSKY, R.**
This course will provide a brief overview of professional skills for graduate students and postdoctoral fellows, and will focus on how to write grant proposals in the biomedical sciences. Meets with PH TX 7690 001					
ONCSC 6700-001 - Cancer Genomics					
17720	**2.0**	**TH / 03:00PM-04:30PM**	**Second Half Semester**	**HCI 3 South Conference Room**	**GERTZ, J.**
This course is designed for graduate students that have completed their first year. Genomic assays have revolutionized our understanding of the molecular defects that occur in cancer genomes. This knowledge has shaped our understanding of how tumors arise, revealed extensive heterogeneity within and between patients' tumors, influenced our treatment strategies, and led to new insights about the basic biology of transcription regulation. This course will introduce students to genomic assays that can be used to study cancer. Emphasis will be placed on understanding the capabilities and limitations of different genomic methods and exploring how the techniques can be applied to address new questions. This is an advanced seminar course with a focus on primary literature, student presentations, and project-based learning.					
PATH 6900 - Techniques of Biochemical Analysis in Laboratory Medicine					
2231	**4.0**		**Full Semester**		**ROCKWOOD, A. L.**
Current and future technologies used in research and diagnostic medicine are covered, including basic principles, instrumentation, and clinical applications. Topics include electrophoresis, flow cytometry, DNA technologies, chromatography, immunologic techniques.					
PATH 7330 - Basic Immunology					
6299	**3.0**	**TH / 02:00PM-03:30PM**	**Full Semester**	**HSEB 1730**	**ROUND, J. L.**
Meets with PATH 5030. Basic Immunology, PATH 7330, is designed to survey major topics in immunology, and is appropriate for Ph.D. students needing a survey course in immunology.					
PH TX 7114 - Principles of Toxicology					
14094	**2.0**	**T / 01:00PM-03:00PM**	**Full Semester**	**HSEB 2600**	**CROUCH, B. I.**
Prerequisite: Instructor's permission required. General principles, testing procedures, toxic responses, and target organ toxicities.					

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PHCEU 7021 - Formulations and Dosage Forms					
16468	**2.0**	**TH / 11:00AM-12:50PM**	**Second Half Semester**		**CHEN, M.**
Meets with PHCEU 5125. Design principles and compositions involved in pharmaceutical formulations for traditional dosage forms including tablets, capsules, suspensions, emulsions, creams, ointments, and also for more advanced delivery systems.					
PHCEU 7030 - Macromolecular Therapeutics and Drug Delivery					
10920	**4.0**	**TH / 08:50AM-10:50AM**	**Full Semester**		**BAE, Y. H. & GHANDEHARI, H. S.**
Introduction to polymer in Pharmaceutics and drug delivery. Transport phenomena in drug delivery systems. Macromolecular and vesicular carriers. Biorecognition and drug targeting. Protein, oligonucleotide, and gene delivery systems.					
PHCEU 7230 - Nanomedicine					
17495	**3.0**	**TH / 02:00PM-03:20PM**	**Full Semester**	**WEB L114**	**GHANDEHARI, H. S.**
Meets with BIOEN 6405. The convergence of recent advances in nanotechnology with modern biology and medicine has created the new research domain of nanobiotechnology. The use in medicine is termed nanomedicine. Nanomedicine research includes the development of diagnostics for rapid monitoring, targeted cancer therapies, localized drug delivery, improved cell material interactions, scaffolds for tissue engineering, and gene delivery systems among others. Successful research and development in nanomedicine where ultimately patients and the general public can benefit from these new technologies require the interaction of a multitude of disciplines including chemistry, materials science and engineering, cellular biology, pharmaceutical sciences and clinical translational research. This course will span the spectrum of how such materials are fabricated, characterized, interact with the biological environment, used in specific biomedical applications and translated from concept to the clinic and commercialization. Topics are taught by experts in the respective areas and will include fundamentals of nanomedicine, bottom up and top down approaches to nanofabrication, conjugation strategies, physiochemical characterization, cellular uptake and toxicity, biodistribution, clinical and preclinical nanomedicine as well as special topics in nanobiosensors, nanofluidics, polymer therapeutics and commercialization of nanomedicine products. This course will count as an elective for the Nanotechnology Graduate Programs and potentially other departmental graduate programs at the University of Utah.					