Class Schedule - Spring 2018

Bioengineering

Bioengineering
Head of Department: Rashid Bashir
Department Office: 1270 Digital Computer Lab, 1304 West Springfield Avenue
Phone: 217-333-1867
www.bioen.illinois.edu

BIOE 120  **Introduction to Bioengineering**  credit: 1 hours.
Lectures and discussions of recent trends in bioengineering; topics typically include biological interaction with ultrasound and microwave radiation, modeling, instrumentation, biomaterials, biomechanics, biological heat and mass transfer, and medical imaging techniques.

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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31790</td>
<td>Lecture</td>
<td>1</td>
<td>09:00 AM - 09:50 AM</td>
<td>W</td>
<td>114 - Transportation Building</td>
<td>Marjanovic, M Pool, M</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).

BIOE 198  **Special Topics**  credit: 1 TO 3 hours.
Subject offerings related to Bioengineering intended to augment the Bioengineering curriculum. Offerings will be at the freshman level. See class schedule or course information websites for topics and prerequisites. May be repeated if topics vary. Prerequisite: Majors only.

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<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>67742</td>
<td>Laboratory</td>
<td>MI</td>
<td>03:00 PM - 04:50 PM</td>
<td>MW</td>
<td>-</td>
<td>Insana, M</td>
</tr>
</tbody>
</table>

Credit Hours: 2 hours
Biomedical Data Analysis
Restricted to BS:Bioengineering - UIUC.
This computational laboratory experience introduces students to formatting, analysis, and visualization of biomedical data. Based in Matlab, students learn to read data from instruments and to simulate data using numerical models in one or several dimensions. Statistical methods are introduced for managing stochastic data at various scales. The objective is to gain experience solving fundamental engineering problems that focus on medical and biological applications.

BIOE 202  **Cell & Tissue Engineering Lab**  credit: 2 hours.
Principles of cell biology inherent in tissue engineering design. Lab experience in safely and skillfully manipulating cells of the four tissue types and performing various quantitative analyses on products produced by cells that have differentiated. Prerequisite: MCB 150, and credit or concurrent enrollment in BIOE 206.

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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>46395</td>
<td>Laboratory</td>
<td>AB3</td>
<td>01:00 PM - 02:50 PM</td>
<td>F</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Jensen, K</td>
</tr>
</tbody>
</table>
Laboratory | AB3 | 03:00 PM - 06:50 PM | T | ARR - Digital Computer Laboratory | Jensen, K
---|---|---|---|---|---
Restricted to Bioengineering major(s).
This class is restricted to Bioengineering sophomores only.

Laboratory | AB4 | 11:00 AM - 02:50 PM | M | ARR - Digital Computer Laboratory | Jensen, K
Laboratory | AB4 | 03:00 PM - 04:50 PM | R | ARR - Digital Computer Laboratory | Jensen, K

Restricted to Bioengineering major(s).
Restricted to students in the Bioengineering department.
This class is restricted to Bioengineering sophomores only.

Laboratory | AB5 | 01:00 PM - 02:50 PM | R | ARR - Digital Computer Laboratory | Jensen, K
Laboratory | AB5 | 03:00 PM - 06:50 PM | M | ARR - Digital Computer Laboratory | Jensen, K

Restricted to Bioengineering major(s).
Restricted to students in the Bioengineering department.

Lecture | AL1 | 02:00 PM - 02:50 PM | W | 1310 - Digital Computer Laboratory | Jensen, K

Restricted to Bioengineering major(s).
This class is restricted to Bioengineering sophomores only.

**BIOE 205  Signals & Systems in Bioengrg**  credit: 3 hours.
Introduction to signals and linear systems with examples from biology and medicine. Linear systems and mathematical models of systems, including differential equations, convolution, Laplace transforms, Fourier series and transforms, and discrete representations. Class examples and coursework apply general techniques to problems in biological signal analysis, including circuits, enzyme kinetics, and physiological system analysis. Use of Matlab and Simulink software to understand more complex systems.
Prerequisite: CS 101, MATH 285, and PHYS 212.

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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>60964</td>
<td>Lecture-Discussion</td>
<td>LEC</td>
<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
<td>253 - Mechanical Engineering Bldg</td>
<td>Pool, M</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).

**BIOE 297  Individual Study**  credit: 1 TO 4 hours.
Special project or reading activity. May be repeated in the same or separate terms to a maximum of 12 hours. Prerequisite: Approved written application to department as specified by department or instructor.

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<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>45391</td>
<td>Independent Study</td>
<td>ARRANGED</td>
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</tbody>
</table>

Instructor Approval Required

**BIOE 298 Special Topics**  credit: 0 TO 4 hours.

Subject offerings of new and developing areas of knowledge in bioengineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary to a maximum of 8 hours.

<table>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>66793</td>
<td>Lecture-Discussion</td>
<td>B</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>106B8 - Engineering Hall</td>
<td>Underhill, G</td>
</tr>
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Credit Hours: 3 hours
Analytical Tools for BIOE
Restricted to BS:Bioengineering - UIUC.

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<th>CRN</th>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>63406</td>
<td>Lecture-Discussion</td>
<td>MFI</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>106B1 - Engineering Hall</td>
<td>Jensen, P</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Analytical Tools for BIOE
Restricted to BS:Bioengineering - UIUC.

**BIOE 303 Quantitative Physiology Lab**  credit: 2 hours.

Experiments involving the modeling and measurement of animal and human physiology systems. Use of computer simulations to provide mathematical descriptions of physiology behavior. Calibration and validation of models through hands-on experiments. Focus on quantitative measurement of neural, cardiovascular, respiratory, muscular, and endocrine system functions. Prerequisite: BIOE 302
Departmental approval required for non-majors.

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<th>CRN</th>
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<th>Time</th>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>59648</td>
<td>Laboratory</td>
<td>AB1</td>
<td>02:00 PM - 04:50 PM</td>
<td>T</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Marjanovic, M</td>
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</table>

This lab meets in 3107 DCL.

<table>
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<tr>
<th>CRN</th>
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<th>Instructor</th>
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<tbody>
<tr>
<td>59651</td>
<td>Laboratory</td>
<td>AB2</td>
<td>02:00 PM - 04:50 PM</td>
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<td>ARR - Digital Computer Laboratory</td>
<td>Marjanovic, M</td>
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This lab meets in room 3107 DCL.

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<th>Instructor</th>
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<td>Lecture-Discussion</td>
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<td>01:00 PM - 01:50 PM</td>
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<td>335 - Mechanical</td>
<td>Marjanovic, M</td>
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</table>

page 3 - Bioengineering, Spring 2018
BIOE 310  **Comp Tools Bio Data**  credit: 3 hours.

Fundamental and applied statistics, including probability distributions, parameter estimation, descriptive statistics, hypothesis testing, and linear regression. Statistical methods in genomics including sequence analysis, gene expression data analysis, human genomic variation, regulatory genomics, and cancer genomics. Credit is not given for both BIOE 310 and IE 300. Prerequisites: BIOE 205 and BIOE 206.

Departmental approval required for non-majors.

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<th>CRN</th>
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<th>Time</th>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>60965</td>
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<td>TR</td>
<td>32 - Psychology Building</td>
<td>Dar, R</td>
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BIOE 360  **Transport & Flow in Bioengrg**  credit: 3 hours.

Fundamentals of fluid dynamics and mass transport applied to analysis of biological systems. Quantitative understanding of microscopic to macroscopic phenomena in biological systems related to their sensing by imaging techniques. Molecular phenomena in both healthy tissue and disease using examples from cardiovascular problems and cancer using ultrasound, optical and MRI techniques. Credit is not given for both BIOE 360 and any of CHBE 421, CHBE 451, or TAM 335. Prerequisites: BIOE 201 and BIOE 301.

Departmental approval required for non-majors.

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<th>Instructor</th>
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<tbody>
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<td>60966</td>
<td>Lecture</td>
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<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Jensen, K</td>
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</table>

BIOE 397  **Individual Study**  credit: 1 TO 4 hours.

Special project or reading activity. May be repeated up to 8 hours in a term to a maximum of 12 total hours. Prerequisite: Approved written application to department as specified by department or instructor.

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<tr>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
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<tr>
<td>10412</td>
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</table>

Instructor Approval Required

BIOE 414  **Biomedical Instrumentation**  credit: 3 hours.

Engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical sensors for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds,
respiration, and temperature; therapeutic and prosthetic devices; medical imaging instrumentation. Same as ECE 414. 3 undergraduate hours. 3 graduate hours. Prerequisite: BIOE 205, ECE 205 or ECE 210.

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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>33725</td>
<td>Discussion/Recitation</td>
<td>B</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
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Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).
Sign up on the waitlist if the course is closed via: https://my.bioe.illinois.edu/undergraduate/waitlist/index.asp

**BIOE 415  Biomedical Instrumentation Lab** credit: 2 hours.
Laboratory to accompany BIOE 414. use of sensors and medical instrumentation for static and dynamic biological inputs. Measurement of biomedical signals. 2 undergraduate hours. 2 graduate hours. Same as ECE 415. Prerequisite: Credit or concurrent registration in BIOE 414.

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<tbody>
<tr>
<td>33731</td>
<td>Laboratory</td>
<td>AB1</td>
<td>02:00 PM - 04:50 PM</td>
<td>M</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Pool, M</td>
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This lab meets in 3107 DCL.

<table>
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<tr>
<th>CRN</th>
<th>Type</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>33733</td>
<td>Laboratory</td>
<td>AB2</td>
<td>12:00 PM - 02:50 PM</td>
<td>W</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Pool, M</td>
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This lab meets in 3107 DCL.

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<th>CRN</th>
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<th>Instructor</th>
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<tbody>
<tr>
<td>33734</td>
<td>Laboratory</td>
<td>AB3</td>
<td>03:00 PM - 05:50 PM</td>
<td>W</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Pool, M</td>
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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>33735</td>
<td>Laboratory</td>
<td>AB4</td>
<td>12:00 PM - 02:50 PM</td>
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<td>ARR - Digital Computer Laboratory</td>
<td>Pool, M</td>
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This lab meets in 3107 DCL.

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<tr>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>33736</td>
<td>Lecture</td>
<td>AL1</td>
<td>12:00 PM - 12:50 PM</td>
<td>M</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Pool, M</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).

**BIOE 416  Biosensors** credit: 3 hours.
Same as ECE 416. See ECE 416.
BIOE 420  **Intro Bio Control Systems**  credit: 3 hours.

Systems engineering approach to modeling physiological systems to examine natural biological control systems, homeostasis, and control through eternal medical devices. Introduces open loop and closed loop feedback control; Laplace and Fourier analysis of system behavior; impulse and steady state responses; physiological modeling and system identification; and stability. Includes biological systems for endocrine function, muscle position, neuronal circuits, and cardiovascular function. Mathematical modeling, Matlab and Simulink simulation, and physiological measurements to relate control systems to maintenance of internal environment. 3 undergraduate hours. No graduate credit. Credit is not given for BIOE 420 if credit for AE 353, ECE 486, GE 320, or ME 340 has been earned. Prerequisites: BIOE 205, BIOE 302, BIOE 303, BIOE 414, BIOE 415.

Departmental approval required for non-majors.

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<th>CRN</th>
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<tbody>
<tr>
<td>65299</td>
<td>Lecture</td>
<td>AL1</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>253 - Mechanical Engineering Bldg</td>
<td>Sutton, B</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).

BIOE 436  **Senior Design II**  credit: 2 hours.

Continuation of BIOE 435. Design teams finalize concepts, evaluate alternatives, model and analyze solutions, build and test a final product, and present the results professionally to project sponsors. 2 undergraduate hours. No graduate credit. Prerequisite: BIOE 435.

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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>65048</td>
<td>Online</td>
<td>SD</td>
<td>ARRANGED</td>
<td>-</td>
<td>-</td>
<td>Amos, J Pan, D</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
Restricted to Bioengineering major(s).

BIOE 479  **Cancer Nanotechnology**  credit: 3 hours.

Applications in Cancer and Mechanobiology will provide an introduction to basic concepts in applications of nanotechnology in mechanobiology and in cancer. This is a highly interdisciplinary field of research where knowledge from various discipline need to be presented and integrated. The course will be a team taught course by faculty from Engineering and LAS. There will be 4 main sections of the course; (i) biological concepts and cancer biology, (ii) introduction to bottom nanotechnology and nanomedicine, (iii) Microfluidics, Lab on Chip, and Top Down Nanotechnology, and (iv) applications in cellular mechanics, i.e. mechanobiology and nanotechnology. The course will be targeted for first year graduate students and senior undergraduate students. 3 undergraduate hours. 3 graduate hours. Approved for letter and S/U grading. Prerequisite: BIOE 206, CHEM 232.

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<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<tbody>
<tr>
<td>64046</td>
<td>Lecture-Discussion</td>
<td>AL1</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Nie, S</td>
</tr>
</tbody>
</table>

Restricted to students in the Bioengineering department.
BIOE 481  **Whole-Body Musculoskel Biomech**  credit: 3 OR 4 hours.
Same as ME 481. See ME 481.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
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<th>Location</th>
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<tbody>
<tr>
<td>66065</td>
<td>Lecture-Discussion</td>
<td>WMG</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>153 - Mechanical Engineering Bldg</td>
<td>Kersh, M Shanley, J</td>
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Restricted to Graduate - Urbana-Champaign.

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<th>CRN</th>
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<th>Instructor</th>
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<tr>
<td>63299</td>
<td>Lecture-Discussion</td>
<td>WMU</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>153 - Mechanical Engineering Bldg</td>
<td>Kersh, M Shanley, J</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to students with Senior class standing. Restricted to Undergrad - Urbana-Champaign.

BIOE 497  **Individual Study**  credit: 1 TO 4 hours.
Special project or reading activity. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated up to 8 hours in a term to a maximum of 12 total hours. Prerequisite: Approved written application to department as specified by department or instructor.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>45449</td>
<td>Independent Study</td>
<td>ARRANGED -</td>
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Instructor Approval Required

BIOE 498  **Special Topics**  credit: 1 TO 4 hours.
Subject offerings of new and developing areas of knowledge in bioengineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary to a maximum of 12 hours, but no more than 8 in any one term.

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<tbody>
<tr>
<td>60231</td>
<td>Lecture</td>
<td>GU</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>305 - Materials Science &amp; Eng Bld</td>
<td>Sirk, S</td>
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</table>

Credit Hours: 3 hours
Stem Cell Bioengineering
Application of engineering approaches for the quantitative analysis of stem cell biology, including stem cell genetics and stem cell microenvironments. Design principles underlying stem cell-based therapies and diagnostics. Stem cell biomanufacturing.

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<tbody>
<tr>
<td>60233</td>
<td>Lecture</td>
<td>PII</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>225A - Talbot Laboratory</td>
<td>Imoukhuede, P</td>
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</table>

Credit Hours: 3 hours
Systems Bioengineering
Systems Biology and Bioengineering are emerging fields that require new minds that are adept in integrating biology with mathematics and computation. In this course you will receive training in bimodal systems biology: (1) Translating experimental
observations to mathematical representations. (2) Deterministic network model development, mathematical solution techniques, simulation, and prediction. These approaches will be presented in the context of tumor angiogenesis. Here students will examine the angiogenic signaling pathways, and apply systems biology and bioengineering approaches to design new therapeutics targeting tumor vasculature. **Pre-reqs: MCB 150 and one of the following courses: BIOE 201, CHBE 221, or TAM 210/212.

| Credit Hours: 3 hours Experimental Genetic Eng. Restricted to students in the Bioengineering department. Restricted to Bioengineering major(s). The objective of this course is to provide the knowledge and hands-on experience required for both designing and building tools that are necessary to engineer biological systems at the molecular, cellular, and organism levels. This particular course will highlight diverse examples of applications, challenges, and controversies in synthetic biology, and will deal with such topics as artificial amino and nucleic acids, genome engineering for the treatment of human diseases, rescuing extinct genomes, recoded organisms, the rise of the third agricultural revolution, synthetic life, and post humanism. |
|---|---|---|---|---|---|---|
| 62349 | Laboratory-Discussion | PP1 | 09:00 AM - 10:50 AM | WF | ARR - Digital Computer Laboratory | Perez Pinera, P |
| Laboratory-Discussion | PP1 | 09:00 AM - 09:50 AM | M | ARR - Digital Computer Laboratory | Perez Pinera, P |

Credit Hours: 3 hours Experimental Genetic Eng. Restricted to students in the Bioengineering department. Restricted to Bioengineering major(s). The objective of this course is to provide the knowledge and hands-on experience required for both designing and building tools that are necessary to engineer biological systems at the molecular, cellular, and organism levels. This particular course will highlight diverse examples of applications, challenges, and controversies in synthetic biology, and will deal with such topics as artificial amino and nucleic acids, genome engineering for the treatment of human diseases, rescuing extinct genomes, recoded organisms, the rise of the third agricultural revolution, synthetic life, and post humanism.

| Credit Hours: 3 hours Experimental Genetic Eng. Restricted to students in the Bioengineering department. Restricted to Bioengineering major(s). The objective of this course is to provide the knowledge and hands-on experience required for both designing and building tools that are necessary to engineer biological systems at the molecular, cellular, and organism levels. This particular course will highlight diverse examples of applications, challenges, and controversies in synthetic biology, and will deal with such topics as artificial amino and nucleic acids, genome engineering for the treatment of human diseases, rescuing extinct genomes, recoded organisms, the rise of the third agricultural revolution, synthetic life, and post humanism. |
|---|---|---|---|---|---|---|
| 65076 | Laboratory-Discussion | PP2 | 09:00 AM - 09:50 AM | M | ARR - Digital Computer Laboratory | Perez Pinera, P |
| Laboratory-Discussion | PP2 | 11:00 AM - 12:50 PM | WF | - | Perez Pinera, P |

BIOE 499  **Senior Thesis**  credit: 1 TO 5 hours.

Limited in general to seniors in the curriculum in bioengineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one term or divided over two terms. A maximum registration of 10 hours in two terms is permitted. 1 to 5 undergraduate hours. No graduate credit. May be repeated, if topics vary. Prerequisite: Majors only, senior standing.

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<tr>
<td>64753</td>
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Departmental Approval Required Restricted to Undergrad - Urbana-Champaign.

BIOE 500  **Graduate Seminar**  credit: 1 hours.

Lecture surveying a broad range of Bioengineering topics. 0 or 1 graduate hours. No professional credit. Approved for S/U grading only. May be repeated to a maximum of 2 hours.
BIOE 507  **Advanced Bioinstrumentation**  credit: 4 hours.

Instrumentation and underlying theory employed in bioengineering. Concepts in the design and operation of sensors, fundamentals of optics, basic control theory and systems, digital components, and fundamental principles of medical imaging techniques. Specific knowledge of one biomedical instrument or system will be emphasized including detailed mathematical analysis. Prerequisite: BIOE 504.

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<tr>
<td>45301</td>
<td>Lecture</td>
<td>A</td>
<td>11:00 AM - 11:50 AM</td>
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<td>ARR - Digital Computer Laboratory</td>
<td>Marjanovic, M</td>
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</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

BIOE 540  **Algorithmic Genomic Biology**  credit: 4 hours.

The purpose of the course is to give each student enough background and training in the area of algorithmic genomic biology so that each will be able to do research in this area, and publish papers. The main focus of the course is phylogeny (evolutionary tree) estimation, multiple sequence alignment, and genome-scale phylogenetics, which are problems that present very interesting challenges from a computational and statistical standpoint. Time permitting, we will also discuss computational problems in microbiome analysis, protein function and structure prediction, genome assembly, and even historical linguistics. Students will learn the mathematical and computational foundations in these areas, read the current literature, and do a team research project. The course is designed for doctoral students in computer science, computer engineering, bioengineering, mathematics, and statistics, and does not depend on any prior background in biology. The technical material will depend on discrete algorithms, graph theory, simulations, and probabilistic analysis of algorithms. Same as CS 581. 4 graduate hours. No professional credit. Prerequisite: CS 374 and CS 361/STAT 361, or consent of instructor.

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<tr>
<td>49397</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>01:30 PM - 02:50 PM</td>
<td>TR</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Irudayaraj, J</td>
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</tbody>
</table>

Restricted to Bioengineering major(s). Restricted to Graduate - Urbana-Champaign.

BIOE 570  **Seminar Series**  credit: 1 hours.

Guest topics will vary, but will typically cover topics of current interest relevant to the bioengineering field. Lecture and discussion on topics relevant to the development, regulatory approval, marketing, and application of systems used in the fields of biomedical imaging, life science research, and pharmaceutical discovery. Emphasis upon case studies on topics that will include regulatory approval, intellectual property, strategy, and technology innovation. 1 graduate hour. No professional credit. Approved for S/U grading only. May be repeated up to 2 hours in separate terms. Prerequisite: For students enrolled in the M.Eng. in Bioengineering degree program.

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<th>Instructor</th>
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<tbody>
<tr>
<td>63432</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>09:00 AM - 10:50 AM</td>
<td>F</td>
<td>256 - Mechanical Engineering Bldg</td>
<td>Pan, D</td>
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</tbody>
</table>
BIOE 572 Biological Measurement II  credit: 4 hours.
With special focus on medical imaging, learn about advanced techniques relating to state-of-the-art bioinstrumentation technologies. Topics will broadly include fluorescence, genomic and proteomic diagnostics, biosensors, ultrasound imaging, microscopy and their uses relevant to physiological changes related to major human diseases. 4 graduate hours. No professional credit. Prerequisite: BIOE 571. For students enrolled in the M.Eng in Bioengineering degree program.

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<th>CRN</th>
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<tr>
<td>63435</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>02:00 PM - 03:20 PM</td>
<td>TR</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Best, C, Bhargava, R Dobrucki, W Pan, D Sutton, B</td>
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</tbody>
</table>

BIOE 574 Innovation and Introduction to Financial Decision Making  credit: 4 hours.
Tools, concepts, and analytical frameworks that enhance the ability to define and analyze strategic problems stemming from innovation and technological change, and to identify sources of competitive advantage from both an industry and firm-level perspective. Introduction to financial decision making, including topics in valuation, project analysis and risk-return relationships. 4 graduate hours. No professional credit. Prerequisite: For students enrolled in the M.Eng. in Bioengineering degree program only.

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<th>CRN</th>
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<td>A</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Bradley, J Kannan, S</td>
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</tbody>
</table>

BIOE 575 Capstone Project  credit: 6 hours.
Students in the Master of Engineering (M.Eng.) in Bioengineering program will demonstrate their proficiency through a capstone project, where students will work on a translational project to develop solutions for real world problems utilizing principles of design, engineering analysis, and functional operation of engineering systems. Depending on the student's flexibility and availability, capstone projects may include collaboration with other online M.Eng. students on a team-based project, analysis of case studies, or even a self-directed project that directly relates to a specific area of interest or on behalf of their employer. Project presentations and demonstrations may be required at the end of the program. 6 graduate hours. No professional credit. Prerequisite: Proficiency in MATLAB and completion of or concurrent enrollment in core classes required for the Master of Engineering (M.Eng.) in Bioengineering program. Class only available to students in the M.Eng. in Bioengineering degree program.

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<tr>
<td>66788</td>
<td>Practice</td>
<td>A</td>
<td>03:00 PM - 03:50 PM</td>
<td>M</td>
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<td>Best, C Pan, D</td>
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</table>
BIOE 583  **HT Genomic Data Analysis**  credit: 4 hours.

The course will provide students with important practical skills for handling genomic big data and analyzing the results of various types of high-throughput sequencing experiments. The focus will be on achieving proficiency in data management and processing based on popular file formats in genomic biology. 4 graduate hours. No professional credit. Prerequisite: STAT 100, MCB 250, CS 101, or equivalent. For students enrolled in the M.Eng in Bioengineering program or with consent of the M.Eng. program.

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<th>CRN</th>
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<tr>
<td>66787</td>
<td>Lecture</td>
<td>A</td>
<td>02:00 PM - 03:20 PM</td>
<td>TR</td>
<td>ARR - Institute for Genomic Biology</td>
<td>Clark, L Fields, C Hernaez Anazola, M Hudson, M Sinha, S</td>
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</tbody>
</table>

Restricted to MENG:Bioeng:Comp Genomics-UlUC. This course will meet in IGB 607 Computer Lab for Spring 18

BIOE 597  **Individual Study**  credit: 1 TO 8 hours.

Special project or reading activity. May be repeated. Prerequisite: Approved written application to department as specified by department or instructor.

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<td>10413</td>
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Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.

BIOE 598  **Special Topics**  credit: 1 TO 4 hours.

Subject offerings of new and developing areas of knowledge in bioengineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary to a maximum of 12 hours, but no more than 8 in any one term.

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<th>CRN</th>
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<tr>
<td>64638</td>
<td>Lecture-Discussion</td>
<td>AMS</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>ARR - Digital Computer Laboratory</td>
<td>Nie, S</td>
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Credit Hours: 4 hours
Appl in Cancer & Mechanobio
Applications in Cancer and Mechanobiology will provide an introduction to basic concepts in applications of nanotechnology in mechanobiology and in cancer. This is a highly interdisciplinary field of research where knowledge from various discipline need to be presented and integrated. The course will be a team taught course by faculty from Engineering and LAS. There will be 4 main sections of the course; (i) biological concepts and cancer biology, (ii) introduction to bottom nanotechnology and nanomedicine, (iii) Microfluidics, Lab on Chip, and Top Down Nanotechnology, and (iv) applications in cellular mechanics, i.e. mechanobiology and nanotechnology. The course will be targeted for first year graduate students and senior undergraduate students. Prerequisite: Graduate student standing.
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<th>CRN</th>
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<td>60232</td>
<td>Lecture</td>
<td>GU</td>
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<td>TR</td>
<td>305 - Materials Science &amp; Eng Bld</td>
<td>Sirk, S</td>
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<td>Stem Cell Bioengineering</td>
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<td>Restricted to Graduate - Urbana-Champaign. Restricted to MS:Bioengineering - UIUC or PHD: Bioengineering-UIUC.</td>
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<td>Application of engineering approaches for the quantitative analysis of stem cell biology, including stem cell genetics and stem cell microenvironments. Design principles underlying stem cell-based therapies and diagnostics. Stem cell biomanufacturing.</td>
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<tr>
<td>60234</td>
<td>Lecture</td>
<td>PII</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>225A - Talbot Laboratory</td>
<td>Imoukhuede, P</td>
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<td></td>
<td>Systems Bioengineering</td>
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<td>Systems Biology and Bioengineering are emerging fields that require new minds that are adept in integrating biology with mathematics and computation. In this course you will receive training in bimodal systems biology: (1) Translating experimental observations to mathematical representations. (2) Deterministic network model development, mathematical solution techniques, simulation, and prediction. These approaches will be presented in the context of tumor angiogenesis. Here students will examine the angiogenic signaling pathways, and apply systems biology and bioengineering approaches to design new therapeutics targeting tumor vasculature. **Pre-reqs: MCB 150 and one of the following courses: BIOE 201, CHBE 221, or TAM 210/212.</td>
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<tr>
<td>66022</td>
<td>Lecture</td>
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<td>09:30 AM - 10:50 AM</td>
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<td>ARR - Digital Computer Laboratory</td>
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<td>Credit Hours: 4 hours</td>
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<td></td>
<td>Quantitative Biotechnology</td>
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<td>Restricted to students in the Bioengineering department.</td>
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<td>Offers first year graduate students in Bioengineering an opportunity to be exposed to the modern biotechnologies which sparked a Renaissance in current biology and biomedicine. For each weekly topic, we will do an in-depth review of various methods including the conventional/traditional protocols and the newly developed techniques. The scientific articles to be reviewed in class emphasize high precision, high spatial/temporal resolution, high-throughput, molecular accuracy, sensitivity and real-time imaging. Two students will be paired up to present each week's article and lead the discussion. The course consists of studies on the Central Dogma of Biology (DNA, RNA, and Protein) as well as cellular organelles and cell imaging.</td>
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<td>64989</td>
<td>Lecture</td>
<td>RXB</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>104 - Talbot Laboratory</td>
<td>Bhargava, R</td>
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<td></td>
<td>The Tissue Microenvironment</td>
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<td>Advanced concepts of the complexity and heterogeneity of tissue microenvironments and their role in directing cell behavior and function in health and disease. Emphasis will be on comparing and contrasting the physio-chemical rate processes that govern the function of stem cell niches and solid tumor microenvironments. Topics will include: (i) Cell migration, mitosis, apoptosis, and differentiation; (ii) Cellular responsiveness to soluble and immobilized factors that mediate interactions between cells, with extracellular matrix, and growth factor communication; (iii) Biophysical and bioengineering aspects of mechanotransduction, the process through which living cells sense and respond to their mechanical environment. Students will conduct a semester-long team project for additional credit. Prerequisite: Prior coursework in and working knowledge of cellular and molecular biology.</td>
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**BIOE 599 Thesis Research** credit: 0 TO 16 hours.

Bioengineering graduate thesis research. Approved for S/U grading only. May be repeated.