General Information

Course Bulletin Listing/Subject Area	Physics
Fiscal Unit/Academic Org	Physics - D0684
College/Academic Group	Arts And Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5740
Course Title	Quantitative Cell Biology for Engineers and Scientists
Transcript Abbreviation	Quant Cell Biology
Course Description	Introduction to the biophysical and biochemical principles underlying the behavior of cellular processes with an emphasis on surveying engineering models and quantitative measurements.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Permission of instructor
Exclusions	

Cross-Listings

Cross-Listings	CHBE 5740

Subject/CIP Code

Subject/CIP Code	14.0701
Subsidy Level	Baccalaureate Course
Intended Rank	Senior, Masters, Doctoral

Quarters to Semesters

Quarters to Semesters	New course
Give a rationale statement explaining the purpose of the new course	To introduce students to the biophysical and biochemical principles underlying the behavior of cellular processes in an interdisciplinary manner.
Sought concurrence from the following Fiscal Units or College	CHBE

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Understand of the hierarchy of characteristic time scales, length scales, and forces involved in cellular processes.
- Identify quantitative models, analytical tools, and experimental techniques appropriate to describing cellular processes that occur on and/or across different characteristic time scales, length scales, and forces.
- Apply the principles of thermodynamics and reaction kinetics to analyze and model specific cellular processes.
- Apply the principles of momentum and mass transport to analyze and model specific cellular processes.

Content Topic List

- Characteristic time and length scales of cells and cellular processes.
- Life cycle- cell death, differentiation, population dynamics.
- Cell-cell communication.
- Endocytosis and exocytosis.
- Cell structure- cytoskeleton, membrane structure, biomechanical properties of cells
- Specialized cells: immune cells.
- Specialized cells: neurons.
- Specialized cell functions: biomechanics.
- Specialized cell functions: transporters, pumps, and ion channels.
- Cancer.

Attachments

- CBE_5740.pdf: Syllabus is from CHBE
  (Syllabus. Owner: Hughes,Richard E)
- ChBE 694_ (Quant_Cell_Biology)_Concurrence_Approvals.pdf: Concurrence from Life Sciences, Biology, Mol Gen
  (Concurrence. Owner: Hughes,Richard E)

Comments

- CHBE will be submitting CHBE 5740 at the same time. *(by Hughes,Richard E on 02/16/2012 12:29 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Hughes,Richard E	02/16/2012 12:30 PM	Submitted for Approval
Approved	Hughes,Richard E	02/16/2012 12:31 PM	Unit Approval
Approved	Hadad,Christopher Martin	02/16/2012 03:07 PM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Meyers,Catherine Anne Vankeerbergen,Bernadette Chantal Hogle,Danielle Nicole Hanlin,Deborah Kay	02/16/2012 03:07 PM	ASCCAO Approval

CHBE 5740 (Proposed): Quantitative Cell Biology for Engineers and Scientists

Course Description

Introduction to the biophysical and biochemical principles underlying the behavior of cellular processes with an emphasis on surveying engineering models and quantitative measurements.

Transcript Abbreviation: Quant Cell Biology
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Senior, Masters, Doctoral
Course Offerings:
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Permission of instructor
Exclusions:
Cross-Listings: Physics 5740

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0701
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
CHBE	Chemical and Biomolecular Eng

Course Goals

After taking this course, a student should be able to: Understand of the hierarchy of characteristic time scales, length scales, and forces involved in cellular processes.
identify quantitative models, analytical tools, and experimental techniques appropriate to describing cellular processes that occur on and/or across different characteristic time scales, length scales, and forces.
Apply the principles of thermodynamics and reaction kinetics to analyze and model specific cellular processes.
Apply the principles of momentum and mass transport to analyze and model specific cellular processes.

Apply system biology approaches in combination with the science and engineering principles cited above to analyze and model complex biological processes.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Characteristic time and length scales of cells and cellular processes.	6.0							
Life cycle- cell death, differentiation, population dynamics	5.0							
Cell-cell communication	3.0							
Endocytosis and exocytosis	4.0							
Cell structure- cytoskeleton, membrane structure, biomechanical properties of cells	6.0							
Specialized cells: immune cells	4.0							
Specialized cells: neurons	2.0							
Specialized cell functions: biomechanics	4.0							
Specialized cell functions: transporters, pumps, and ion channels	4.0							
Cancer	4.0							

Grades

Aspect	Percent
Class participation	10%
Course project	25%
Midterm exam	30%
Final exam	35%

Representative Textbooks and Other Course Materials

Title	Author
Physical Biology of the Cell	R. Phillips et al.
Essential Cell Biology, 2nd Ed.	M. B. Alberts et al.

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
	c	An ability to design a system, component, or process to meet desired needs.
**	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.

Course Contribution		College Outcome
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

This course was first approved as a 694 group studies in autumn 2011 but was later cancelled at the request of the instructors. Concurrence requests were approved by Molecular Genetics, Biology, and EEOB.

Prepared by: James Rathman

DEPARTMENTAL COURSE REVIEW CONCURRENCE FORM

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should response to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: ChBE Date: 3-4-2011

Registrar's Listing: ChBE 694 (co-taught w/ Physics)

Course Number: 694 Level: U ☒ P ☐ G ☒ Credit Hours: 4

Course Title: Quantitative Cell Biology for Engineers and Scientists

Type of Request: ☐ New Course ☒ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Units with related interests asked to review the request: Biology, EEOB, Molecular Genetics

Date responses are needed:
One week if possible

B. Information from academic units *reviewing* the request: EEOB

☑ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☐ The academic unit suggests:

Signature of Department Chair Signature of Graduate Studies Chair (if applicable)

DEPARTMENTAL COURSE REVIEW CONCURRENCE FORM

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should response to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: ChBE Date: 2-24-2011

Registrar's Listing: CHBE 694 (co taught w/ Physics)

Course Number: 694 Level: U ☒ P ☐ G ☒ Credit Hours: 4

Course Title: Quantitative Cell Biology for Engineers and Scientists

Type of Request: ☐ New Course ☒ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Units with related interests asked to review the request: Biology, EEOB, Molecular Genetics

Date responses are needed: March 3rd

B. Information from academic units *reviewing* the request: BIOLOGY

☒ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

This course does not overlap with any of our courses. We do plan to offer a Quantitative Biology course, but it would be at the introductory level, not as advanced as the one proposed above.

☐ The academic unit suggests:

Caroline Breitenberger

Signature of Department Chair
Center for Life Sciences Education

Signature of Graduate Studies Chair (if applicable)

DEPARTMENTAL COURSE REVIEW CONCURRENCE FORM

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should response to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: ChBE Date: 3-4-2011

Registrar's Listing: ChBE 694 (co-taught w/ Physics)

Course Number: 694 Level: U ☒ P ☐ G ☒ Credit Hours: 4

Course Title: Quantitative Cell Biology for Engineers and Scientists

Type of Request: ☐ New Course ☒ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Units with related interests asked to review the request: Biology

Date responses are needed:
One week if possible

B. Information from academic units *reviewing* the request:

☑ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☐ The academic unit suggests:

Signature of Department Chair Signature of Graduate Studies Chair (if applicable)

DEPARTMENTAL COURSE REVIEW CONCURRENCE FORM

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should response to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: ChBE Date: 3-4-2011

Registrar's Listing: ChBE 694 (co-taught w/ Physics)

Course Number: 694 Level: U ☒ P ☐ G ☒ Credit Hours: 4

Course Title: Quantitative Cell Biology for Engineers and Scientists

Type of Request: ☐ New Course ☒ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Units with related interests asked to review the request: Molecular Genetics, Biology, EEOB

Date responses are needed: March 28th

B. Information from academic units *reviewing* the request:

☒ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☒ The academic unit suggests: The number of credit hours needs to be clarified. Four are indicated on this form yet three credit hours is listed on the course syllabus. No prerequisites are listed other than permission of instructor. I would imagine that a course in Intro Biology would be required, like Bio 133 or 115H.

Mark A. Seeger

Mark A. Seeger, PhD, Associate Chair Molecular Genetics

Signature of Department Chair Signature of Graduate Studies Chair (if applicable)