
Term Information

Effective Term Autumn 2012

General Information

Course Bulletin Listing/Subject Area Biochemistry
Fiscal Unit/Academic Org Biochemistry - D0310
College/Academic Group Arts and Sciences
Level/Career Graduate, Undergraduate
Course Number/Catalog 5694
Course Title Frontiers in Life Sciences Research: Genomics, Proteomics and Bioethics
Transcript Abbreviation Frontiers-Life Sci
Course Description As genomes are being sequenced at a rapid pace, students in life sciences need to stay abreast of the tools required to exploit genomic information. The course, which includes videoconferencing with peers in India, covers the theoretical underpinnings of modern tools used in proteomics, genetics, and genomics. Ethical issues associated the remarkable advances in modern biology will be discussed.
Semester Credit Hours/Units Fixed: 1

Offering Information

Length Of Course 7 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Satisfactory/Unsatisfactory
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course Yes
Admission Condition Natural Science
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites Biochem 4511 (511) or Biochem 5615 (615) or MolGen 4500 (500)
Exclusions Not open to students with credit for Biochem 694 or MolGen 694 (5694)

Cross-Listings

Cross-Listings Cross-listed in MolGen

Subject/CIP Code

Subject/CIP Code 26.0202
Subsidy Level Baccalaureate Course
Intended Rank Senior, Masters, Doctoral

Quarters to Semesters

Quarters to Semesters

Semester equivalent of a quarter course (e.g., a 5 credit hour course under quarters which becomes a 3 credit hour course under semesters)

List the number and title of current course being converted

Biochem 694

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 the principles, theories and methods pertaining to functional genomics and proteomics
- Appreciate the inter-dependence of fundamental scientific discoveries and technological advances
- Explore ethical dilemmas confronted by scientists

Content Topic List

- Genetics and genomics; model systems, genome sequencing and gene expression
- Proteomics; mapping proteomes and protein-protein interactions (structural and functional aspects)
- Bioethics; responsible conduct, societal and scientific considerations

Attachments

- Biochem 5694 Syllabus Rev042512.pdf: Revised Syllabus

(Syllabus. Owner: Swenson, Richard Paul)

Comments

- Responses to Hadad's comments:

(1) Corrected typo.

(2) This course was initially offered as a "Group Studies" course and, thus, listed under the 694 number. But, the course has been offered repeatedly so we think it should now have its own course number. Thus, we propose to leave it as the proposed 5694 course number which under the semester system would be a unique regular course number.

(3) Corrected.

(4) Course syllabus now attached.

In addition,

A revised syllabus has been submitted per ASCCAO request

Exclusions have been added. *(by Swenson, Richard Paul on 04/25/2012 02:46 PM)*

- Shouldn't previous offerings of this Biochemistry 694 be stated in the exclusions box, as well as the MolGen course under semesters? *(by Vankeerbergen, Bernadette Chantal on 04/24/2012 02:50 PM)*

- (1) In the course title, the word "Gemocis" is used -- do you mean "Genomics"?

(2) This course is a semester-based course of a quarter course, 694. The old 694 number would be for an experimental group studies course that could be varied from offering to offering as a "group studies request". The 5694 number is OK as a regular course, but 5194 would be more appropriate if you truly mean that this course is the conversion of 694. In general, the x194 course is meant as "group studies".

(3) In the "Prereq/Coreq" category above, you did not use the necessary Registrar's format. Please click on the "?" and it will provide the correct syntax for submitting the semester and quarter based course numbers. That will ensure that the Registrar's office gets the information correctly.

(4) A syllabus is needed for all new course submissions. Ensure that the syllabus describes how the satisfactory grade would be assigned to a student on the basis of performance. *(by Hadad, Christopher Martin on 04/20/2012 12:43 PM)*

COURSE REQUEST
5694 - Status: PENDING

Last Updated: Vankeerbergen, Bernadette
Chantal
04/26/2012

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Swenson, Richard Paul	04/20/2012 10:58 AM	Submitted for Approval
Approved	Swenson, Richard Paul	04/20/2012 10:59 AM	Unit Approval
Revision Requested	Hadad, Christopher Martin	04/20/2012 12:43 PM	College Approval
Submitted	Swenson, Richard Paul	04/23/2012 10:05 AM	Submitted for Approval
Approved	Swenson, Richard Paul	04/23/2012 10:07 AM	Unit Approval
Approved	Hadad, Christopher Martin	04/23/2012 10:24 AM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	04/24/2012 02:51 PM	ASCCAO Approval
Submitted	Swenson, Richard Paul	04/25/2012 02:49 PM	Submitted for Approval
Approved	Swenson, Richard Paul	04/25/2012 02:50 PM	Unit Approval
Approved	Hadad, Christopher Martin	04/26/2012 10:48 AM	College Approval
Pending Approval	Nolen, Dawn Jenkins, Mary Ellen Bigler Meyers, Catherine Anne Vankeerbergen, Bernadette Chantal Hogle, Danielle Nicole Hanlin, Deborah Kay	04/26/2012 10:48 AM	ASCCAO Approval

Syllabus
Biochemistry/Molecular Genetics 5694

1. *Instructors' names and contact details*

Venkat Gopalan (Course coordinator and Co-Instructor)
Professor, Department of Biochemistry
774 Biological Sciences Building, 484 W 12th Ave
Tel: 292-1332; Email: gopalan.5@osu.edu
Office hours: One hour/week; time to be decided after discussion with students

Amanda Simcox (Co-instructor)
Professor, Department of Molecular Genetics
972 Biological Sciences Building, 484 W 12th Ave
Tel: 292-8857; Email: simcox.1@osu.edu
Office hours: One hour/week; time to be decided after discussion with students

Dan Farrell (Guest lecturer)
Professor, Department of Philosophy
322 University Hall, 230 North Oval Mall
Tel: 292-1534; Email: farrell.4@osu.edu

2. *Expected learning outcomes*

- i. Students understand the basic facts, principles, theories and select methods pertaining to functional genomics and proteomics.
- ii. Students appreciate (through discussions of specific examples) the interdependence of fundamental scientific discoveries and technological developments.
- iii. Students explore at least some instances of (i) specific ethical dilemmas that individual scientists face in their research, and (ii) general ethical issues that both scientists and the public face in connection with scientific research and the possibilities it opens up to us.

3. *A description of the course*

As genomes are being sequenced at a rapid pace, it is vital for students in life sciences to stay abreast of the tools required to exploit genomic information. Drs. Amanda Simcox and Venkat Gopalan will describe the theoretical underpinnings of state of the art tools used in proteomics, genetics and genomics (8 hrs). At least 4 hrs of the course will involve discussions with Dr. Daniel Farrell, Professor of Philosophy, on the ethical issues that accompany remarkable advances in modern biology. Dr. Farrell will encourage students to explore (i) specific ethical dilemmas that individual scientists face in their research, and (ii) general ethical issues that both scientists and the public face in connection with scientific research and the possibilities it opens up to us. The course will involve computational database mining projects (motif searches, gene ontology mapping) where groups of students from the three or four sites will work together remotely and present their findings to the entire class during the final session (2 hrs). The course will cover the following topics:

Genetics and genomics (Simcox)
- Gene expression (Microarray analysis)

- Functional tests (RNAi, knockouts, etc.)
- Use of model systems to study biology and disease (flies, worms, etc.)

Proteomics (Gopalan)

- Mass spectrometry (ESI, MALDI-TOF, SILAC, ICAT, etc.)
- Proteome and protein-protein interaction network maps (yeast two-hybrid, affinity tagging, FRET, etc.)
- Structural and functional proteomics

Ethics (Farrell)

- Scientific integrity
- Specific case studies (stem cells, biofuels, etc.)

Tentative weekly schedule

Week 1

Genomics and genetics - Use of model systems to study biology and disease (flies, worms, etc.)
 Proteomics – Definition of the problem

Week 2

Genomics and genetics - Functional tests (RNAi, knockouts, etc.), gene expression (Microarray analysis)
 Informatics and use of databases
 Proteomics - Key methods and instrumentation; mass spectrometry (ESI, MALDI-TOF, SILAC, ICAT, etc.)

Week 3

Genomics and genetics - Next generation DNA sequencing
 Proteomics - Proteome and protein-protein interaction network maps (yeast two-hybrid, affinity tagging, FRET, etc.)

Week 4

Synthetic Biology – Building organisms Biobrick by Bioobrick
 Proteomics - Structural and functional proteomics; tomography and in situ mapping methods

Weeks 5 and 6

Ethics (Farrell)

Scientific integrity
 Genetic alteration of plants and animals (including stem cells)
 Social issues related to adoption of modern technologies (case studies, e.g., biofuels)

Week 7

Student presentations

4. *A list of required texts and other course materials, and information on where they are available*

There is no prescribed textbook for this course. All the relevant information will be from the recent scientific literature. The instructors will post the handout materials for each session on Carmen. Here is a representative list of articles that students will be required to read.

- i. Patterson SD, Aebersold RH. (2003) Proteomics: the first decade and beyond. *Nat Genet.* **33** Suppl: 311-23.
- ii. Cox J, Mann M. (2007) Is proteomics the new genomics? *Cell* **130**: 395-398.
- iii. Fournier ML, Gilmore JM, Martin-Brown SA, Washburn MP. (2007) Multidimensional separations-based shotgun proteomics. *Chem. Rev.* **107**: 3654-3686.
- iv. Mallick P, Kuster B. (2010) Proteomics: a pragmatic perspective. *Nat Biotechnol.* **28**: 695-709.
- v. Siuzdak, G. (2003) The expanding role of mass spectrometry in biotechnology. MCC Press, San Diego, CA
- vi. Collins, M. O. and Choudhary, J. S. (2008) Mapping multiprotein complexes by affinity purification and mass spectrometry. *Curr. Op. Biotech.* **19**: 324-330.
- vii. Blow, N. (2008) Structural genomics: inside a protein structure initiative center. *Nat. Methods* **5**: 203-207.
- viii. Lee H, Tang H (2012) Next-generation sequencing technologies and fragment assembly algorithms. *Meth. Mol. Biol.* **855**: 155-174.
- ix. Shendure J, Ji H. (2008) Next-generation DNA sequencing. *Nat. Biotech.* **26**: 1135-1145.
- x. Teusink B, Westerhoff HV, Bruggeman FJ. (2010) Comparative systems biology: from bacteria to man. *Wiley Interdiscip Rev Syst Biol Med.* **2**: 518-32.
- xi. Feinberg AP. (2010) Epigenomics reveals a functional genome anatomy and a new approach to common disease. *Nat Biotechnol.* **28**:1049-52.
- xii. Case studies and reports from <http://www.nuffieldbioethics.org/>

5. *Grading information, indicating the percentages assigned to various requirements*

A satisfactory (S) grade will be based on three criteria: (i) attendance, (ii) classroom participation, and (iii) a final project presentation. Poor performance in any two of these categories will be cause for an unsatisfactory (U) grade. For example, missing more than one session and failing to actively participate in classroom discussions will be cause for an unsatisfactory grade.

6. *A grading scale*

S/U

7. *A class attendance policy*

Since there are only seven sessions and all of them involve video-conferencing, no make-up sessions are possible. Absences will be allowed only for medical emergencies (written notice) or if the instructors have provided prior approval.

8. *Statement on academic misconduct:*

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

9. *Statement about disability services:*

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Ave; Tel: 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu>.