

# NEW COURSE FORM

(\*denotes required fields)

## 1. General Information

- a. \* Submitted by the College of:

COLLEGE OF ARTS & SCIENCES  
3/26/2012

Today's Date:

- b. \* Department/Division:

Chemistry

- c.

	Mark Meier	Email:
* Contact Person Name:	meier@uky.edu	Phone:
	257-7082	

* Responsible Faculty ID	Bert Lynn	Email:
(if different from	bclynn2@uky.edu	Phone:
Contact)	218-2489	

- d. \* Requested Effective Date:  Semester following approval OR  
 Specific Term/Year 1

- e.

Does the change make the course a UK Core course?  Yes  No

**If YES, check the areas that apply:**

- |  |  |
|--|--|
| <input type="checkbox"/> Inquiry - Arts & Creativity | <input type="checkbox"/> Composition & Communications - II |
| <input type="checkbox"/> Inquiry - Humanities        | <input type="checkbox"/> Quantitative Foundations          |
| <input type="checkbox"/> Inquiry - Nat/Math/Phys Sci | <input type="checkbox"/> Statistical Inferential Reasoning |

- Inquiry - Social Sciences
- U.S. Citizenship, Community, Diversity
- Composition & Communications - I
- Global Dynamics

## 2. Designation and Description of Proposed Course.

a. \* Will this course also be offered through Distance Learning?   
 Yes 4  No

b. \* Prefix and Number:  
 CHE 666

c. \* Full Title:  
 Proteomics and Mass Spectrometry

d. Transcript Title (if full title is more than 40 characters):

e. To be Cross-Listed 2 with (Prefix and Number):

f. \* Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours 3 for each meeting pattern type.

3	Lecture	Laboratory <sup>1</sup>	Recitation	Discussion
	Indep. Study	Clinical	Colloquium	Practicum
	Research	Residency	Seminar	Studio
	Other	If Other, Please explain:		

g. \* Identify a grading system:  Letter (A, B, C, etc.)  Pass/Fail

h. \* Number of credits: 3

i. \* Is this course repeatable for additional credit?  Yes  No  
 If YES: Maximum number of credit hours:

If YES: Will this course allow multiple registrations during the same semester?  Yes  No

j. \* Course Description for Bulletin:

A course in the identification, characterization, and quantification of the proteins in tissues and cells. Mass spectrometric methods are of central importance, and those techniques (including data analysis) are a major focus of the course.

k. Prerequisites, if any:

CHE 232, a course in physical chemistry at or above the 400-level, o

l. Supplementary teaching component, if any:  Community-Based Experience  Service Learning  Both

3. \* Will this course be taught off campus?  Yes  No

If YES, enter the off campus address:

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4. Frequency of Course Offering.

a. \* Course will be offered (check all that apply):  Fall  Spring  
 Summer  Winter

b. \* Will the course be offered every year?  Yes  No

If No, explain:

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5. \* Are facilities and personnel necessary for the proposed new course available?  Yes  No

If No, explain:

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6. \* What enrollment (per section per semester) may reasonably be expected? 12

7. Anticipated Student Demand.

a. \* Will this course serve students primarily within the degree program?  Yes  No

- b. \* Will it be of interest to a significant number of students outside the degree pgm?  Yes  No

If YES, explain:

**8. \* Check the category most applicable to this course:**

- Traditional – Offered in Corresponding Departments at Universities Elsewhere
- Relatively New – Now Being Widely Established
- Not Yet Found in Many (or Any) Other Universities

**9. Course Relationship to Program(s).**

- a. \* Is this course part of a proposed new program?  Yes  No

If YES, name the proposed new program:

- b. \* Will this course be a new requirement <sup>5</sup>for ANY program?
- Yes  No

If YES <sup>5</sup>, list affected programs::

**10. Information to be Placed on Syllabus.**

- a. \* Is the course 400G or 500?  Yes  No

If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in **10.b**. You must include: (i) identification of additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See SR 3.1.4.)

- b.  \* The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from **10.a** above) are attached.

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<sup>5</sup> Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

<sup>[2]</sup> The chair of the cross-listing department must sign off on the Signature Routing Log.

<sup>[3]</sup> In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from SR 5.2.1)

<sup>[4]</sup> You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.

<sup>[5]</sup> In order to change a program, a program change form must also be submitted.

Rev 8/09

Graduate Council

5/3/12

Brian Jackson

# Proteomics and Mass Spectrometry

## CHE 666

Proteomics can be simply described as the “protein complement expressed by a genome”<sup>1</sup>. Unfortunately, this grossly underestimates the complexity of the situation. There are many more proteins than genes. Proteins are changed after assembly, expressed at different levels and function in different ways. Thus, proteomics is better defined as the field involved with the identification, characterization and quantification of proteins in tissues and cells. A key to the success of proteomics has been recent revolutions in modern mass spectrometry, thus the title of this course.

1 - Wilkins, M.R., Sanchez, J.C., Golley, A.A., Appel, R.D., Humphrey-Smith, I., Hochstrasser, D.F., Willaims, K.L. *Genet. Eng. Rev.*, **1996**, *13*, 19-50.

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**Class time:** 11:00 am - 11:50 am on MWF

**Room:** CP 103

**Instructor:** Bert C. Lynn

**Office:** A053 ASTeCC Building

**Office hours:** 12:00 to 1:00 MWF or by appointment

**Text Book:** No textbook will be used for this course since the field is rapidly changing. Details and concepts will be provided by using current literature.

**Learning Outcomes.** Students will be able to:

- Describe protein structure and modification.
- Explain protein isolation, protein separation using gel electrophoresis, and protein preparation for mass spectral analysis.
- Diagram and explain the operation mass spectrometers used in proteomics research.
- Analyze and interpret mass spectra produced from peptides and proteins.
- Describe how mass spectral data can reveal critical changes in the proteome.
- Explain how these patterns of protein expression can shed light on the health of the organism under study.

**Grades.** Class attendance is not mandatory however; there is virtually no way to pass the course without attending the majority of the lectures. Spontaneous quizzes will be used to bolster sagging attendance.

Each of the two regular examinations will be composed of two parts; an in-class and a take-home phase. In-class portions are worth 50 points and take home portions are worth 50 points. The comprehensive final will be worth 125 points, leading to a course total of 325 points. Grades will be assigned using the scale given below:

Students earning 260 points (80% of 325) will be given an A grade.

Students earning 228 points (70% of 325) will be given a B grade.

Students earning 195 points (60% of 325) will be given a C grade.

Students earning less than 195 points will be given an E grade.

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address [jkarnes@email.uky.edu](mailto:jkarnes@email.uky.edu)) for coordination of campus disability services available to students with disabilities.

**Academic Integrity:** All assignments, projects, and exercises completed by students for this class should be the product of the personal efforts of the individual(s) whose name(s) appear on the corresponding assignment. Misrepresenting others' work as one's own in the form of cheating or plagiarism is unethical and will lead to those penalties outlined in the University Senate Rules (6.3.1 & 6.3.2) at the following website:

[http://www.uky.edu/USC/New/rules\\_regulations/index.htm](http://www.uky.edu/USC/New/rules_regulations/index.htm). The Ombud site also has information on plagiarism found at <http://www.uky.edu/Ombud>.

Tentative exam dates	September 26 (Wednesday) November 16 (Wednesday)
Final Exam	December 16 at 10:30 am

# Topics Covered in Proteomics and Mass Spectrometry 2011

Charge and energy (08/26/11)  
JJ and EI (08/29/11)  
Vacuum (08/31/11)  
Vacuum pt. 2 (09/02/11)  
CI (09/02/11)  
Hydrogen bonding (09/07/11)  
Central dogma (09/07/11)  
SDS PAGE (09/09/11)  
SDS PAGE cont (09/12/11)  
gel staining (09/14/11)  
quadrupoles 1 (09/16/11)  
quadrupoles 2 (09/19/11)  
MALDI (09/21/11)  
In-gel digestion (09/23/11)  
Review (09/26/11)

## **Exam 1** (09/28/11)

Exam review (09/30/11)  
Time of Flight (TOF)(10/03/11)  
2011 Nobel Prize in Chemistry (10/05/11)  
Introduction to Mascot (10/07/11)  
Mascot demonstration (10/07/11)  
Electrospray (10/10/11)  
Electrospray continued (10/12/11)  
Ion trap 1 (10/14/11)  
Ion Trap 2 (10/17/11)  
De novo tandem mass spectral interpretation (10/19/11)  
Database Search Algorithms (10/21/11)  
PTM - Phosphorylation (10/21/11)  
PTM - Glycosylation( 10/24/11)  
Linear ion traps (10/26/11)  
Orbitrap lecture (10/28/11)  
Orbitrap continued (10/31/11)  
Orbitrap continued (10/31/11)  
Gas phase chemistry (11/02/11)  
Top-Down (11/04/11)  
Top or Middle-Down Proteomics(11/07/11)  
Triple Quadrupoles and Qtraps (11/09/11)  
Western blots -vs -MRM (11/11/11)  
Quantitative Proteomics - Labeled 11/14/11)

## **Exam 2** (11/16/11)



Yates Rat Labeling(11/18/11)  
Hybrid QTOF instruments(11/21/11)  
Thanksgiving holiday(11/23-25/11)  
Lubman Top-Down/Bottom-Up Proteomics (11/28/11)  
Phospho-Proteomics and ERLIC (11/30/11)  
Phospho-Proteomics(12/02/11)  
Triple SILAC(12/05/11)  
Label Free Proteomics(12/07/11)  
Final Exam Prep(12/09/11)

# **Academic Calendar (Points of Interest)**

## **August**

August 26 - Wednesday - First day of classes

## **September**

September 7 – Monday - Labor Day - Academic Holiday

September 16 – Wednesday - Last day to drop a course without it appearing on the student's transcript

September 23 – Wednesday - Last day to officially withdraw from the University or reduce course load and receive a 50 percent refund.

## **October**

October 19 – Monday - Midterm of 2009 Fall Semester

## **November**

November 6 – Friday - Last day to withdraw from the University or reduce course load. Students can withdraw or reduce course load after this date only for urgent non-academic reasons.

November 25 - 28 – Wednesday through Saturday - Thanksgiving - Academic Holidays

## **December**

December 11 – Friday - Last day of classes

December 14 - 18 – Monday through Friday - Final Examinations

December 18 – Friday - End of 2009 Fall Semester