

1. General Information

1a. Submitted by the College of: ARTS & SCIENCES

Date Submitted: 5/6/2013

1b. Department/Division: Chemistry

1c. Contact Person

Name: D. Allan Butterfield

Email: dabncs@uky.edu

Phone: 257-3184

Responsible Faculty ID (if different from Contact)

Name: Arthur Cammers

Email: a.cammers@uky.edu

Phone: 8593238977

1d. Requested Effective Date: Semester following approval

1e. Should this course be a UK Core Course? No

2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: No

2b. Prefix and Number: CHE 556

2c. Full Title: ELEMENTS OF NEUROCHEMISTRY

2d. Transcript Title:

2e. Cross-listing:

2f. Meeting Patterns

LECTURE: 3

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 3

2i. Is this course repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester?

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2j. Course Description for Bulletin: A course in the neurochemistry of the brain. Among topics to be covered: brain cell cytoarchitecture; chemical bases for: neuronal membrane transport, electrical excitability, and ion channels; axonal transport; energy metabolism; synaptic transmission; cellular signaling; Ca²⁺ homeostasis; neurotransmitters; oxidative stress; apoptosis and necrosis; application of neurochemical principles to the molecular bases of neurodegenerative disorders.

2k. Prerequisites, if any: CHE 232 and a biological chemistry course, or consent of instructor.

2l. Supplementary Teaching Component:

3. Will this course be taught off campus? No

If YES, enter the off campus address:

4. Frequency of Course Offering: Spring,

Will the course be offered every year?: No

If No, explain: Due to Chemistry Department teaching needs, this course would be offered every other year.

5. Are facilities and personnel necessary for the proposed new course available?: Yes

If No, explain:

6. What enrollment (per section per semester) may reasonably be expected?: 15

7. Anticipated Student Demand

Will this course serve students primarily within the degree program?: Yes

Will it be of interest to a significant number of students outside the degree program?: Yes

If Yes, explain: [var7InterestExplain]

8. Check the category most applicable to this course: Not Yet Found in Many (or Any) Other Universities ,

If No, explain:

9. Course Relationship to Program(s).

a. Is this course part of a proposed new program?: No

If YES, name the proposed new program:

b. Will this course be a new requirement for ANY program?: No

If YES, list affected programs:

10. Information to be Placed on Syllabus.

a. Is the course 400G or 500?: Yes

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: Yes

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1.How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2.How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3.How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4.Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5.How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6.How do course requirements ensure that students make appropriate use of learning resources?

7.Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8.How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)?

9.Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10.Does the syllabus contain all the required components? NO

11.I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|MEIER|Mark S Meier|Dept approval for ZCOURSE_NEW CHE 556|20121221

SIGNATURE|RHANSON|Roxanna D Hanson|College approval for ZCOURSE_NEW CHE 556|20121221

SIGNATURE|JMETT2|Joanie Ett-Mims|Undergrad Council approval for ZCOURSE_NEW CHE 556|20130301

SIGNATURE|ZNNIKOO|Roshan N Nikou|Graduate Council approval for ZCOURSE_NEW CHE 556|20130411

Courses	Request Tracking
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New Course Form

<https://myuk.uky.edu/sap/bc/soap/rfc?services=>

[Open in full window to print or save](#)

Generate F

Attachments:

Upload File

ID	Attachment
Delete: 1530	NEW CLASS DESCRIPTION-Elements of Neurochemistry.d
Delete: 1678	ELEMENTS OF NEUROCHEMISTRY SYLLABUS for New Course

First 1 Last

Select saved project to retrieve...

(*denotes required fields)

1. General Information

- a. * Submitted by the College of: Today's Date:
- b. * Department/Division:
- c.
- * Contact Person Name: Email: Phone:
- * Responsible Faculty ID (if different from Contact): Email: Phone:
- d. * Requested Effective Date: Semester following approval OR Specific Term/Year ¹
- e.
- Should this course be a UK Core Course? Yes No
- If YES, check the areas that apply:
- Inquiry - Arts & Creativity Composition & Communications - II
- Inquiry - Humanities Quantitative Foundations
- Inquiry - Nat/Math/Phys Sci 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:
- c. * Full Title:
- 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 hours³ for each meeting pattern type.
- | | | | |
|---|--|-------------------------------------|-------------------------------------|
| <input checked="" type="checkbox"/> 3 Lecture | <input type="checkbox"/> Laboratory ¹ | <input type="checkbox"/> Recitation | <input type="checkbox"/> Discussion |
| <input type="checkbox"/> Indep. Study | <input type="checkbox"/> Clinical | <input type="checkbox"/> Colloquium | <input type="checkbox"/> Practicum |
| <input type="checkbox"/> Research | <input type="checkbox"/> Residency | <input type="checkbox"/> Seminar | <input type="checkbox"/> Studio |
| <input type="checkbox"/> Other | If Other, Please explain: <input type="text"/> | | |
- g. * Identify a grading system: Letter (A, B, C, etc.) Pass/Fall
- h. * Number of credits:
- 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 neurochemistry of the brain. Among topics to be covered: brain cell cytoarchitecture; chemical bases for: neuronal membrane transport, electrical excitability, and ion channels; axonal transport; energy metabolism; synaptic transmission; cellular signaling; Ca²⁺ homeostasis; neurotransmitters; oxidative stress; apoptosis and necrosis; application of neurochemical principles to the molecular bases of neurodegenerative disorders.

k. Prerequisites, if any:

CHE 232 and a biological chemistry course, or consent of instructor.

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:

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: Due to Chemistry Department teaching needs, this course would be offered every other

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

If No, explain:

6. * What enrollment (per section per semester) may reasonably be expected? 15

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:

A new minor in Neuroscience will draw students to neurochemistry. Also, at UK there is a research strength in neuroscience; hence, students from these laboratories likely will be interested

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 requirement² for ANY program? Yes No

If YES², 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) ident additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See SR

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

- ^[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.
- ^[2] The chair of the cross-listing department must sign off on the Signature Routing Log.
- ^[3] 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, require two hours per week for a semester for one credit hour. (from SR 5.2.1)
- ^[4] You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.
- ^[5] In order to change a program, a program change form must also be submitted.

Rev 8/09

[Submit as New Proposal](#) [Save Current Changes](#) [Delete Form Data and Attachments](#)

Elements of Neurochemistry

CHE 556

Have you ever wondered how the brain actually works? What are the chemical principles that underlie brain neurochemistry? What happens when this brain chemistry goes awry? If these questions are of interest to you, this course is for you.

The brain typically weighs approximately 1.3 Kg, yet consumes up to 30 percent of inspired oxygen and about 20 percent of ingested glucose. Hence, the brain is highly metabolically active. Moreover, the brain regulates the function of essentially everything that defines a human, and yet, after decades of intensive research, much remains to be learned about brain neurochemistry. This course delves into the neurochemistry of the brain, and applying these principles to a topic of increasing importance in the USA, i.e., the nearly 80 million Americans in the Baby Boomer cohort require scientists to know more of how the brain functions, understanding that will be critical to age-related neurodegenerative disorders.

This course is a major field option for undergraduates and an advanced course for graduate students.

Topics to be covered:

Neurocellular Anatomy

Neurocellular Membrane Structure and Functions

Neurolipids

Membrane Transport

Electrical Excitability and Ion Channels

Intracellular Trafficking

**Synaptic Transmission and Cellular Signaling: Acetylcholine;
Glutamate**

**Intracellular Signaling: G-proteins; Phosphoinositides; Cyclic Nucleotides;
Ca²⁺; Phosphorylation of Ser, Thr, Tyr**

Energy Metabolism in the Brain

Apoptosis and Necrosis: Role of Mitochondria

Neurochemistry of Inherited and Neurodegenerative Diseases

Class time: 9:30 am – 10:45 am on Tu, Th

Room: CP 103

Instructor: Professor D. Allan Butterfield

Office: 249 Chem-Phys Bldg.

Office hours: Tuesday, 11:00-12:00; Wednesday, 11:30-12:30 or by appointment

Text Book: *Neurochemistry: Principles of Molecular, Cellular, and Medical Neurobiology*, 8th Edition. Brady, Siegel, Albers, and Price, Eds., Elsevier Press, San Diego. Details and concepts covered in the course will be supplemented by using current literature.

Learning Outcomes. At the completion of this course, students will be able to:

- Discuss in depth the structure and function of neurons, including organelles.
- Discuss in depth the composition of neuronal membranes.
- Discuss in depth the steps involved in neurotransmission, neuronal signaling, axonal transport, and Ca²⁺ homeostasis, and what happens when these processes go awry.
- Discuss in depth chemical principles associated with oxidative stress such as labile allylic H-atoms on acyl chains of phospholipids, and Michael addition to proteins of reactive alkenals formed from lipid peroxidation.
- Discuss in depth processes associated with apoptosis and necrosis.
- Discuss in depth the neurochemical basis of the clinical presentation, pathology, and biochemistry of major neurodegenerative disorders.
- Apply neurochemical principles to explain the clinical presentation, pathology, and biochemistry of an assigned disorder of the central nervous system.

Grades.

Undergraduates: Three examinations @ 16 % each.....	48 %
Graduate Students: Three examinations @ 14 % each.....	42 %
Unannounced Quizzes.....	10 %
Report of Selected CNS Disorder.....	10 %
Powerpoint of Selected CNS Disorder.....	10 %
Graduate Student Lecture Presentation of Assigned Topic....	6 %
Class Participation.....	5 %
Final Examination.....	17 %
TOTAL.....	100%

Total Course Score	Letter Grade for Course
100-87	A
86-75	B
74-62	C
61-50	D (Undergraduates Only)
< 62	E (Graduate Students Only)
<50	E (Undergraduates Only)

1. **Make-up exams and make-up quizzes:** Make-up exams and make-up quizzes as a general rule, will **not** be given. If after mutual agreement between student and Professor Butterfield, a make-up examination or quiz is to be given, the format for the examination or quiz will be at the discretion of Professor Butterfield.

2. **Attendance:** One of the best ways to learn neurochemistry is to attend each class. Attendance is mandatory. Therefore, for each two unexcused absences, your final

course letter grade **will be reduced by one letter grade**. Courtesy to Professor Butterfield and to your student colleagues dictates that you should not be tardy nor leave prior to the end of class. Failure to abide by this courtesy will reduce your course percentage by 5 percentage points (Class Participation).

3. **The CNS disorder that is the subject of your report and powerpoint presentation** must be approved by Professor Butterfield. Generally, these will be assigned by Professor Butterfield from a list, but if the student has a particular disorder she/he wishes to choose, this will be permissible if approved by Professor Butterfield. The report is to be 5-10 pages long, **typed single spaced in Arial Font size 11, with one-inch margins**. The key item on which your grade will be based includes your ability to express the neurochemistry associated with each disorder. Thus, the report can be lengthened beyond the 10-page limit with the use of diagrams, figures, charts, tables, chemical equations, etc. You must make it clear what the underlying neurochemical alterations are, how they relate to pathology and clinical presentation of the disorder, and you should include a modest discussion, based on neurochemical principles that you should outline, of your best idea for therapeutic intervention in the chosen disorder. For the powerpoint presentation, you will have about 3-5 slides that tell the story of your assigned neurodegenerative disorder.
4. **Cheating and Plagiarism.** All assignments, projects, and exercises completed by students for this class should be the product of the personal efforts of the individual whose name appears 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_retulations/index.htm. The ombud site also has information on plagiarism found at <http://www.uky.edu/Ombud>.
5. **Cell Phones:** As a matter of courtesy to Professor Butterfield and to your classmates, please ensure that your cell phone is silenced during class. Repeated violations of this request will result in class-wide prohibition of cell phones in the classroom.
6. **Major Religious Holidays.** Notice of intended absence due to a major religious holiday must be presented, in writing, to Professor Butterfield by January 19th.
7. **Disability.** If you have a documented disability that requires academic accommodations, please see Professor Butterfield as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide to Professor Butterfield a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, Email: jkarnes@email.uky.edu) for coordination of campus disability services available to students with documented disabilities.
8. **Neurochemistry is both challenging and important.** Hence, to be successful in this class you will need to be dedicated and focused. Since didactic interaction between students and Professor Butterfield, as well as unannounced quizzes will be two means

of assessing how material is being grasped, it is incumbent upon you to always be prepared for each lecture. Anything less almost certainly will reduce your course grade.