George Mason University
Graduate Course Approval/Inventory Form

Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete the Coordinator Form on page 2, if changes in this course will affect other units.

Please indicate:  ____ NEW  ____ MODIFY  ____ DELETE

Local Unit:  PSYCHOLOGY  Graduate Council Approval Date:

Course Abbreviation:  PSYC  Course Number: 556

Full Course Title: CHEMISTRY AND THE BRAIN

Abbreviated Course Title (24 characters max.): CHEMISTRY AND THE BRAIN

Credit hours: 3  Program of Record: MA/PHD PSYC

Repeatable for Credit?  ____ D=Yes, not within same term  Up to hours
                         ____ T=Yes, within the same term  Up to hours
                         ____ N=Cannot be repeated for credit

Activity Code (please indicate):  ____ Lecture (LEC)  ____ Lab (LAB)  ____ Recitation (RCT)
                                 ____ Studio (STU)  ____ Internship (INT)  ____ Independent Study (IND)  ____ Seminar (SEM)

Catalog Credit Format 3:3:0  Course Level: GF(500-600)  ____ GA(700+)

Maximum Enrollment: 20  For NEW courses, first term to be offered: F04

Prerequisites or corequisites: PSYC 372 or permission of instructor.

Catalog Description (35 words or less) Please use catalog format and attach a copy of the syllabus for new courses.: Fundamentals of general chemistry, atoms, molecules, and reactions, with emphasis on water solutions. Organic compounds and functional groups, their (bio)synthesis, and properties, and examples from the nervous system. Biopolymers and their roles in cellular and neuronal organization. Ionic channels, neurotransmitter receptors, and psychoactive substances.

For MODIFIED or DELETED courses as appropriate:

Last term offered:  Previous Course Abbreviation:  Previous number:

Description of modification:

APPROVAL SIGNATURES:

Submitted by:  ________________________________ email: ________________

Department/Program:  ________________________________ Date: ________________

College Committee:  ________________________________ Date: ________________

Graduate Council Representative:  ________________________________ Date: ________________
GEORGE MASON UNIVERSITY  
Course Coordination Form

Approval from other units: NONE

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

<table>
<thead>
<tr>
<th>Unit:</th>
<th>Head of Unit’s Signature:</th>
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Graduate Council approval: _______________________________ Date: ____________

Graduate Council representative: ___________________________ Date: __________

Provost Office representative: _____________________________ Date: __________
CHEMISTRY AND THE BRAIN: Syllabus

**Prerequisite:** PSYC372 or permission of instructor.

**Course Goals and Contents.** This is an intense overview of chemistry and biochemistry, recommended for any graduate or advanced undergraduate psychology student with less than five credits of chemistry. The goal is to provide the students with sufficient knowledge to understand and appreciate the molecular bases of much neuroscience, including the physiological action of nerve conductance and synaptic transmission, and the functional mechanisms of common psychoactive drugs and neuropathologies. We will start from the foundations of general chemistry and cover all major classes of organic compounds. We will then go into the properties and functions of the most important biopolymers, with particular emphasis on proteins. Finally, we will integrate this knowledge in the context of cellular and neuronal organization, with examples relevant to neuroscience.

**Method of instruction and evaluation:** Weekly lectures will be divided in two portions of approximately 1hr15min, with a 10min break in the middle. Student attendance and participation is required (with questions and discussions during class). Mandatory readings and homework questions will be assigned every week. Each lecture will be preceded by a brief homework discussion by the students (this will be an opportunity to review and expand the material as well). This means that each student will be called several times during the semester to explain and discuss how (s)he answered the assigned question(s) to the rest of the class. The final exam will be take-home, open-book, and in the style of the homework questions assigned throughout the semester. Final grades will be based on 50% class participation and homework discussion and 50% final exam.

**Instructor:** Dr. Giorgio Ascoli - Ph. x3-4383, E-mail: ascoli@gmu.edu
Office location: Krasnow Institute, Rm. 217
Office hours: Monday 3-4p, Thursday 11a-12p, or by appointment.

**Text:** Blei & Odian, Organic and Biochemistry (NY: Freeman)

**Content**

<table>
<thead>
<tr>
<th>Wk</th>
<th>Topic (reading reference)</th>
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<tbody>
<tr>
<td>1)</td>
<td>Introduction – Atoms, molecules, reactions. Periodic table. (Chapter 1)</td>
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<tr>
<td>2)</td>
<td>Electronegativity, metals, and redox. Acid, bases, salts. Bonds. Water. (Chapter 2)</td>
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<td>3)</td>
<td>Organic compounds and the Carbon atom. Alkanes, alkenes, alkynes, and aromatic compounds. (Chapters 3, 4)</td>
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<td>4)</td>
<td>Alcohols, ethers, aldheydes, and ketones. Polar and apolar compounds. (Chapters 5, 6). REVIEW of classes 1-4.</td>
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<td>5)</td>
<td>Carboxyl acids and esters. (Chapter 7)</td>
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<td>6)</td>
<td>Amines and amides. (Chapter 8).</td>
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<td>7)</td>
<td>Stereoisomers. Aminoacids. (Chapter 9).</td>
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</table>

9) Other macromolecules: Carbohydrates and nucleic acids. Information flow and genomics. (Chapters 10, 13).

10) Metabolism, homeostasis, and regulation. (Chapters 15, 16).

11) Lipids, cell membranes, and cell structure. Ionic gradients and channels. (Chapter 11 and Handouts).

12) Neurotransmitters, ligand- and voltage-gated ionotropic receptors, metabotropic receptors and second messengers. (Chapter 17 and Handouts). REVIEW of classes 9-12.

13) Drugs and the nervous system. Structure, transport, interaction, and mechanisms. Benzodiazepines, cocaine, and other psychoactive substances. (Chapter 18 and Handouts).

14) Biochemistry: from theory to practice. Grand Review (classes 1-13) and Take Home Exam assignment.