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OFFICE OF THE  
SENATE COUNCIL**1. General Information**

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

Date Submitted: 10/20/2015

1b. Department/Division: Chemistry

1c. Contact Person

Name: Arthur Cammers

Email: a.cammers@uky.edu

Phone: 8593238977

Responsible Faculty ID (if different from Contact)

Name: Mark Meier

Email: mark.meier@uky.edu

Phone: 8592573837

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 536

2c. Full Title: Organic Materials: Electronic and Photonic Properties

2d. Transcript Title: Org. Mat.: Electronic and Photonic Properties

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?

2j. **Course Description for Bulletin:** A description of relationships between molecular structure and optical and electronic properties, focusing on changes in properties moving from single molecules to aggregates to bulk solid states. Electronic structure and photonic properties of organic molecules, solid-state polymers and interfaces will be considered. Material characteristics will be studied in the types of devices where organic materials show promising performance: displays, lighting, transistors, energy conversion/ storage applications, and non-linear optics technologies.

2k. **Prerequisites, if any:** CHE 232 and PHY 213 or PHY 232, or permission of the 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:** Fall,

**Will the course be offered every year?:** Yes

If No, explain:

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?:** 30

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?:** No

If Yes, explain:

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?:** Yes

If YES, list affected programs: BACHELOR of SCIENCE in CHEMISTRY- Materials Chemistry Option

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|YATES|S W Yates|CHE 536 NEW Dept Review|20150702

SIGNATURE|ACSI222|Anna C Harmon|CHE 536 NEW College Review|20151110

SIGNATURE|JMETT2|Joanie Ett-Mims|CHE 536 NEW Undergrad Council Review|20160310

SIGNATURE|ZNNIKO0|Roshan N Nikou|CHE 536 NEW Graduate Council Review|20160331

### New Course Form

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

Generate R

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

**Attachments:**

Upload File

ID	Attachment
Delete 6426	CHE 536 OrganicMaterials-ElectronicsPhotonics_Syll

(\*denotes required fields)

**1. General Information**

- a. \* Submitted by the College of:  Submission 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<sup>1</sup>
- 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<sup>4</sup>  No
- b. \* Prefix and Number:
- c. \* Full Title:
- d. Transcript Title (if full title is more than 40 characters):
- e. To be Cross-Listed<sup>2</sup> with (Prefix and Number):
- f. \* Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours<sup>3</sup> for each meeting pattern type.
 

<input type="text" value="3"/> Lecture	<input type="text"/> Laboratory <sup>1</sup>	<input type="text"/> Recitation	<input type="text"/> Discussion
<input type="text"/> Indep. Study	<input type="text"/> Clinical	<input type="text"/> Colloquium	<input type="text"/> Practicum
<input type="text"/> Research	<input type="text"/> Residency	<input type="text"/> Seminar	<input type="text"/> Studio
<input type="text"/> Other			

If Other, Please explain:
- g. \* Identify a grading system:
  - Letter (A, B, C, etc.)
  - Pass/Fail
  - Medicine Numeric Grade (Non-medical students will receive a letter grade)
  - Graduate School Grade Scale
- 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 description of relationships between molecular structure and optical and electronic properties, focusing on changes in properties moving from single molecules to aggregates to bulk solid states. Electronic structure and photonic properties of organic molecules, solid-state polymers and interfaces will be considered. Material characteristics will be studied in the types of devices where organic materials show promising performance: displays, lighting, transistors, energy conversion/ storage applications, and non-linear optics technologies.

## k. Prerequisites, if any:

CHE 232 and PHY 213 or PHY 232, or permission of the instructor.

l. Supplementary teaching component, if any:  Community-Based Experience  Service Learning  Both3. \* 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:

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? 30

## 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>a</sup> for ANY program?  Yes  No

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

BACHELOR OF SCIENCE in CHEMISTRY- Materials Chemistry Option

## 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.

<sup>a</sup> Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.  
<sup>b</sup> The chair of the cross-listing department must sign off on the Signature Routing Log.

- 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)
- You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.
- In order to change a program, a program change form must also be submitted.

Rev 8/09

**UK Department of Chemistry, CHE 536**  
**Organic Materials: Electronic and Photonic Properties**  
**Fall 2017 Course Description and Syllabus**

**Instructor:** Chad Risko

**Office Address:** 217 Chemistry-Physics Building

**Office Hours:** TR 8:00-9:30 a.m.

**Meeting Times:** TR 9:30-10:45 a.m.

**Classroom:** 111 Chemistry-Physics Building

**CHE 536 home page:** <http://www.chem.uky.edu/courses/CHE536>

**Course Description:**

A course on the emerging field of organic electronics. The course will cover the electronic and optical properties of organic molecules and polymers, and describe the evolution of these properties in the solid state and at interfaces. Material characteristics will be related to devices where organic materials show promising performance, including display, lighting, transistor, energy conversion and storage, and non-linear optics technologies. Prerequisites: CHE 232 and PHY 213 or 232, or permission of the instructor.

**Student Learning Outcomes:**

After completing this course, the student will be able to:

1. Describe the electronic structure of  $\pi$ -conjugated organic molecules and polymers and the relationship to the electronic and optical properties
2. Describe basic concepts of the conducting and semiconducting properties of organic materials
3. Understand the photonic properties of organic materials, including absorption, emission, and non-linear optical processes
4. Make connections between the electronic and optical properties of organic materials and the basic operation of organic electronic, photonic, and energy storage devices

**Course Goals/Objectives:**

Active materials derived in part from  $\pi$ -conjugated molecules and polymers are set to usher in a revolution in consumer electronics and energy conversion and storage technologies. This course will provide students with the fundamental insight necessary to make connections between chemical structure, molecular electronic structure and redox and optical properties, and the transformation of these properties in the solid-state, including interactions at materials interfaces, to understand how molecular and materials design dictates device efficiency. Concurrently, students will be introduced to cutting-edge research progress in the area of organic and hybrid electronics, with strong focus on critical reading of the current materials literature.

**Required Materials:**

Notes, developed from the current materials literature, will be provided. Access to the chemical literature (Advanced Materials, Materials Horizon, Chemistry of Materials, to name but a few) is required.

**Examinations:**

There will be two in-class Midterm Exams and one Final Exam. The exams will consist of short-answer, essay, multiple choice, numeric, and/or calculation questions. Midterm Exam 1 will cover content discussed during the first one-third of the course, Midterm Exam 2 will cover content discussed during the second one-third of the course, and the Final Exam will be comprehensive. Any student with a legitimate conflict with an exam time must inform me in writing, according to University regulations posted online by the Office of the Registrar (<http://www.uky.edu/Registrar/bulletinCurrent/toc2.htm>).

Midterm Exam 1:       October 3  
Midterm Exam 2:       November 7  
Final Exam:           TBA

**Research Paper & Presentation (Graduate Students):**

For graduate students, a literature survey of at least 8 pages in length is required. The topic in organic electronics must be approved by the instructor no later than October 11. A 10 minute presentation, given the final week of class, will be scored by the instructor. The paper will count towards 15% of the final grade, and the presentation will be 5% of the grade.

**Grading:**

Grades will be assigned according to the following tentative scheme. Ranges may be lowered but will not be raised.

**Undergraduate Students**

A: 85-100%; B: 75-84%; C: 60-74%; D: 50-59%; E < 50%.  
Midterm Exam 1: 25%  
Midterm Exam 2: 25%  
Final Exam (cumulative): 50%

**Graduate Students**

A: 85-100%; B: 75-84%; C: 60-74%; E: 0-59%.  
Midterm Exam 1: 20%  
Midterm Exam 2: 20%  
Paper (15%) and Presentation (5%): 20%  
Final Exam (cumulative): 40%

**Important Dates:**

Midterm Examination 1: October 3  
Midterm Examination 2: November 7  
Thanksgiving Holiday: November 23  
Paper Due (Graduate Students): November 30  
In-Class Presentations (Graduate Students): December 5 – 7  
Final Examination: (TBA)

**Mid-term Grades (for undergraduates):**

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar: <http://www.uky.edu/Registrar/AcademicCalendar.htm>

**Course Policies:**



### **Make-up Exams**

***It is extremely important to take all exams when scheduled.*** Formal written excuses consistent with University regulations will be required for each exam absence before a makeup exam can be scheduled. Makeup exams for students with excused absences will be scheduled in accordance with the student's schedule. Failure to take an exam or provide a formal written excuse consistent with University regulations will result in 0 credit for that examination. Notice of intended absence due to a religious holiday must be presented in writing two weeks before the first exam.

### **Dropping the Course**

The last day to drop this course without it appearing on your transcript is September (TBA). The last day to withdraw from this course is November (TBA), except for urgent non-academic reasons related to extended illness or equivalent distress.

### **Attendance Policy**

Attendance is required, but is not checked. Important information and announcements may be presented in class only, and you are responsible for knowing the information that is presented in class.

### **Excused Absences**

Students need to notify the professor of absences prior to class when possible. *Senate Rules 5.2.4.2* defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Two weeks prior to the absence is reasonable, but should not be given any later. Information regarding major religious holidays may be obtained through the Ombud (859-257-3737, [http://www.uky.edu/Ombud/ForStudents\\_ExcusedAbsences.php](http://www.uky.edu/Ombud/ForStudents_ExcusedAbsences.php)).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy.

Per *Senate Rule 5.2.4.2*, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

### **Verification of Absences**

Students may be asked to verify their absences in order for them to be considered excused. *Senate Rule 5.2.4.2* states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness, or death in the family. Appropriate notification of absences due to University-related trips is required prior to the absence when feasible and in no case more than one week after the absence.

**Academic Integrity**

Per University policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the University may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

*Senate Rules 6.3.1* (see <http://www.uky.edu/Faculty/Senate/> for the current set of *Senate Rules*) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording, or content from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work (including, but not limited to a published article, a book, a website, computer code, or a paper from a friend) without clear attribution. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work, which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content, and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so generally and freely circulated as to be a part of the public domain.

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

**Accommodations Due to Disability**

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 (DRC). The DRC coordinates campus disability services available to students with

disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at [drc@uky.edu](mailto:drc@uky.edu). Their web address is <http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>.

***Tentative Course Schedule:***

**August 24:** Course Introduction and Presentation of Course Expectations

**August 29:** Introduction to Device Architectures & Materials Processes

**August 31 – September 7:** Electronic Structure: Molecular Orbitals to Band Theory

**September 12 – September 19:** Conducting Polymers: A Beginning

**September 21 – 28:** Linear Optical Processes: Light Absorption and Luminescence

**October 3:** Midterm Exam 1

**October 5:** Impact of Intermolecular Interactions on Absorption and Emission

**October 10 – 17:** Introduction to Non-Linear Optics

**October 19 – November 2:** Electron-Transfer and Charge-Carrier Transport Theories

**November 7:** Midterm Exam 2

**November 9 – 16:** Interactions at Metal/Inorganic-Organic Interfaces

**November 23:** Thanksgiving Holiday

**November 21 – 30:** Energy Storage: A New Playground for Organic Materials

**November 30:** Paper Due

**December 5 – 7:** In-Class Presentations

**Final Examination:** (TBA)