Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. This request is submitted by the Department of Electrical & Computer Engineering

2. Course prefix, number and complete title of course: ECEN 770 Organic Semiconductors

3. Course description (not to exceed 50 words): Organic Semiconductors (3-0) Credit 3 Organic semiconductors are new semiconducting materials with huge application potentials; designed to help students understand the material properties of organic semiconductors and the operation principles of organic electronic devices; gain broad knowledge in organic semiconductors, from the structure-property relationship to the design and optimization of organic devices and systems.

4. Prerequisite(s): Approval of instructor

5. Is this a variable credit course? □ Yes ☒ No   If yes, from _____ to _____

6. Is this a repeatable course? □ Yes ☒ No   If yes, this course may be taken _____ times.
Will this course be repeated within the same semester? □ Yes ☒ No

7. Has this course been taught as a 489/689? ☒ Yes □ No   If yes, how many times? 3
Indicate the number of students enrolled for each academic period it was taught. 07a: 9/08c: 8/09a: 10

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in History)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in Geography)

      M.S., MEN, Ph.D. in Electrical & Computer Engineering

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments.
   Attach approval letters.

10. Prefix
    Course #
    Title (excluding punctuation)

<table>
<thead>
<tr>
<th>ECEN</th>
<th>770</th>
<th>ORGANIC SEMICONDUCTORS</th>
</tr>
</thead>
</table>

   Lect.
   Lab
   SCH
   CIP and Fund Code
   Admin. Unit
   Acad. Year
   HCF Code

   03000031410010006094010110003632

   Approval recommended by:

<table>
<thead>
<tr>
<th>Head of Department</th>
<th>Date</th>
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<tbody>
<tr>
<td>Head of Department (if cross-listed course)</td>
<td>Date</td>
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</tbody>
</table>

   Submitted to Coordinating Board by:

| Associate Director, Curricular Services | Date |

   Chair, College Review Committee | Date |

   Dean of College | Date |

   Dean of College | Date |

   Date | Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201.
Curricular Services – 11/07

1 of 8 B8
Texas A&M University
Departmental Request for a New Course
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• Submit original form and attach a course syllabus.

1. Type of Request submitted by the Department of ___________________________

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Approval recommended by: [Signature] 7/1/2009

Head of Department Date

Dean of College Date

Associate Director, Curricular Services Submitted to Coordinating Board by:

Questions regarding this form should be directed to Sandra Williams at 845.8201.
Curricular Services – 11/07
Syllabus: Organic Semiconductors

Instructor: Dr. Xing Cheng
Office: 312B ZEC
Office #: 845-5130
Email: chengx@ece.tamu.edu

Lectures: TBD

Office Hours: Monday 3 - 5 pm
Wednesday 10 - 11 am
Other time by appointment.

Course prerequisites: Permission by the instructor. Basic knowledge in semiconductors is preferred.

Course Description:

In the past two decades, organic semiconductors have attracted widespread attention in both academic research and industrial development due to their huge potential in applications such as flat-panel displays, solid-state lighting, ubiquitous RFID and sensors, and low-cost solar panels. Significant progress has been made in developing new materials with better performance, optimizing device structures and exploring novel applications for organic semiconductors. Flat panel displays based on organic semiconductors are now commercially available and are expected to gradually replace liquid crystal displays as technology matures. Being mechanically flexible, organic semiconductors also enable low-temperature and low-cost fabrication of flexible electronics and optoelectronics for novel deployment. Because of these unique advantages, a huge market in the next decade has been envisioned for organic semiconductors.

The research in organic semiconductors usually involves multidisciplinary fields such as chemistry, chemical engineering, material science and engineering, applied physics and electrical engineering. This course is geared at providing students who are interested in organic semiconductor technologies with multidisciplinary background to understand material properties and device principles. The origin of the electro-active properties in organics will be explained. Molecular structure, thin film morphology, and their effect on the electrical and photophysical properties of organic semiconductors such as carrier mobility, band gap and light-carrier interaction will be discussed. Organic semiconductor processing and device fabrication will also be explored. Typical applications of organic semiconductors such as organic light-emitting devices, organic thin-film transistors, organic photovoltaic cells and integration of organic semiconductor devices will be studied in detail. Students who take this course will gain broad knowledge in organic semiconductors, from structure-property relationship to designing and optimizing various types of organic semiconductor devices and systems.
Learning outcomes:

Upon completion of the course, students will be able to:
1. Understand properties of organic semiconductors;
2. Understand structure-property relations in organic semiconductors;
3. Understand operating principles of organic electronic devices: OLED, OTFT, OPV, organic memories, and organic sensors;
4. Model, design and optimize device structures of organic electronics;
5. Understand remaining issues in organic electronics.

Textbook


Reading Materials

Lecture notes and selected journal papers will be handed out in class.


Grading

Homework (20%)
Midterm exam (25%)
Final exam (25%)
Term paper and presentation (30%)

Grade distribution:

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Course Topics:

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<tr>
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Midterm exam

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<tr>
<td>5. Organic light-emitting devices</td>
<td>4</td>
</tr>
<tr>
<td>6. Organic thin-film transistors</td>
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</tr>
<tr>
<td>7. Organic photovoltaic cells</td>
<td>3</td>
</tr>
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<td>8. Other organic devices (organic lasers, organic memories, bio- and chemical sensors)</td>
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<td>9. Integration of organic devices (flat-panel display based on organic light emitting devices, integrated circuits based on organic thin-film transistors, hybrid integration)</td>
<td>3</td>
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<tr>
<td>10. Processing of organic semiconductors and fabrication techniques for organic semiconductor devices (thin-film formation, various lithography techniques, flexible substrates, packaging, roll-to-roll manufacturing techniques)</td>
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</tr>
<tr>
<td>11. Future outlook of organic semiconductors</td>
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Final exam (Last lecture)

Term paper (Due on university scheduled final exam date)

Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

Academic Integrity Statements

"An Aggie does not lie, cheat, or steal or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

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**Midterm exam**

5. Organic light-emitting devices  
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7. Organic photovoltaic cells  
8. Other organic devices (organic lasers, organic memories, bio- and chemical sensors)  
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