TExAS STaTE UnIvERSITY
COuRSEx ADDITION FORM

1. Effective Semster: Fall 2016

2. College: Science & Engineering

3. Department/School/Program: Ingram School of Engineering

4. Prefix/Subject Number
   EE 5398 B

5. Course Title:
   Proposed Long: Electronic Materials and Beyond for Sustainable Energy
   Abbreviated: (18 characters only including spaces)
   ELEC MATER SUSTAIN

6. Course Description (complete sentences in 50 words or less): This course covers the basic science and technology for sustainable energy from the view of materials, where electronic materials are highly emphasized. The topics include solar cells, thermoelectrics, batteries, supercapacitors, artificial photosynthesis, fuel cells, biomass and nuclear energy.

7. Prerequisites (Including Minimum Grade Required): EE 3355 with a grade of B or higher or Instructor approval.

8. Co-Requisites (Including Concurrent Enrollment Allowed): None

9. Restrictions: Restricted to students enrolled in MS Engineering, MS Physics, MS Mathematics, MS Computer Science, or MS Technology Management.

10. Course Data
   CIP Code (10 digits - no spaces or periods)
   14100100006
### Course Addition Form:
Prefix/Subject and Number: EE 5398B

<table>
<thead>
<tr>
<th>Instruction Type</th>
<th>Lecture Contact Hours</th>
<th>Lab Contact Hours</th>
<th>Credit Hours</th>
<th>Repeatable for Credit?</th>
<th>Maximum Credit Hours Allowed</th>
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</thead>
<tbody>
<tr>
<td>1-Lecture</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>Yes</td>
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<td>2-Lab</td>
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<td>3-Practicum/Internship/Student Teaching</td>
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<td>4-Seminar</td>
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<td>5-Independent Study</td>
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<td>6-Private Lesson</td>
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<td>8-Thesis</td>
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<td>9-Dissertation</td>
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<td>0-Individualized</td>
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<td>C-Clinical</td>
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**Writing Intensive?**

<table>
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<th>Yes</th>
<th>No</th>
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<td>Yes</td>
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</table>

**Topics Course?**

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<tr>
<th>Yes</th>
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<tbody>
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<td>Yes</td>
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**Valid Grade Mode**
(choose only one)
(See PPS 4.07 for definitions.)

- Standard Letter: X
- Credit/No Credit: □
- Leveling/Assistantships/ESL: □
- Developmental: □

**Course Equivalency(s)**
(Prefix and Number)

- None

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### 11. Justification for the course action:

**Degree:** Master of Science  
**Major:** Engineering  

**Minor:**  
**Certificate:**

Explain why the new course is needed in the curriculum and how this course may or may not affect the above degree/major/minor/certificate program. If necessary please submit the appropriate Program Addition or Change Form along with this Course Addition Form.

Sustainable/clean/green energy has attracted vast attention from academy and industry. It also represents one of the most critical issues globally today. The job opportunities in this area are expected to increase continually in the coming decade. However, in our graduate program, we do not have a course to respond to this demand. This course will give students an understanding of future energy technologies.
12. Course Goals and Objectives:
   - Must be specific and unique to each course.
   - Must be stated in measurable terms.
   - Must have distinct differences between a graduate level course and an undergraduate course (in case of stacked courses).
   - Please refer to Bloom's Taxonomy of Measurable Verbs.

   - Review the photon-electron conversion theory and the principles of different types of solar cells.
   - Review the principle of PN junction and thermoelectrics .
   - Review the principle of catalysis, electrochemical reactions.
   - Understand electrical energy storage.
   - Design and analyze experiments for understanding the frontier of energy technologies.

13. Description of Instructional Methodologies:
   - Examples include lecture, discussions, group projects, role playing, simulations, modeling, field-based activities, writing, cooperative learning, inquiry, experimentation, product design, creative activities, case studies, seminars, internship activities, coaching, etc.
   - Lecture: Two sessions of 80 min weekly.
   - Two literature reviews with personal opinions (as projects)
   - Homework, tests and project.

14. Assessment of Student Learning:
   - Examples include tests, projects, presentations, performances, creative works, papers, etc.
   - Above examples of assessment must include percentages of total grade assigned.
   - Must have distinct differences between a graduate level course and an undergraduate course (in case of stacked courses).

Assessment will be performed by the course instructor. The course grade will depend upon performance in the tests (30%), homework (30%), and project (40%). The final letter grade will be determined by the student's raw score as well as by the performance of the class (class average and standard deviation) as a whole. Additionally, attendance policies may have an impact on the letter grade.
15. Course Outline:
- Provide a weekly outline as appropriate for an example semester in which the course will be taught.
- Must distinguish the course clearly from similar offerings in the same or other programs.
- Must indicate specific topics.

<table>
<thead>
<tr>
<th>Week 1: Solar cells: Photon</th>
<th>Week 9: Catalysis</th>
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<tbody>
<tr>
<td>Week 2: Solar cells: Photon and Semiconductor</td>
<td>Week 10: Photosynthesis and water splitting</td>
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<tr>
<td>Week 3: Solar cells: Semiconductor</td>
<td>Week 11: Fuel cells</td>
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<tr>
<td>Week 4: Solar cells: Photon-electron conversion</td>
<td>Week 12: Batteries</td>
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<td>Week 5: Solar cells: Basic structures</td>
<td>Week 13: Supercapacitors</td>
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<tr>
<td>Week 6: Solar cells: Problems and efficiency</td>
<td>Week 14: Biomass</td>
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<td>Week 7: Thermoelectrics: PN junction</td>
<td>Week 15: Nuclear Energy</td>
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<td>Week 8: Thermoelectrics: principle and application</td>
<td>Week 16: Final</td>
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</tbody>
</table>

16. Suggested Textbook(s) and Other Learning Resources:
- Must list the required and recommended (if any) resources (e.g., relevant textbooks, course packets, websites), with complete bibliographical data (author, title, date and other publication data) in a standard academic format (e.g., CBE, APA, MLA, Chicago, etc.).

17. Bibliography:
- Must include literature other than required textbooks and other learning resources.
- Must demonstrate familiarity with current research. Ordinarily, the bibliography should include scholarship published during the last five years.
- Must conform to a standard academic format (e.g., CBE, APA, MLA, Chicago, etc.) Each bibliography will use only one format.
18. Approvals:

Department Chair/Program Director/School Director

Chair of College Curriculum Committee

Dean of College

Dean of The Graduate College (if applicable)

Chair of University Curriculum Committee (if applicable)

Date

Date

Date

Date