**PURDUE UNIVERSITY**

REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE

(10000-40000 LEVEL)

**DEPARTMENT:** School of Electrical and Computer Engineering (EFD 1-14)  **EFFECTIVE SESSION:** Fall 2013  **2014-30**

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- [ ] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in Instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

**PROPOSED:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>Subject Abbreviation</th>
<th>Course Number</th>
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<tbody>
<tr>
<td>ECE</td>
<td>ECE</td>
<td>45300</td>
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<table>
<thead>
<tr>
<th>Long Title</th>
<th>Fundamentals of Nanoelectronics</th>
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<tbody>
<tr>
<td>Short Title</td>
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**Abbreviated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)**

**CREDIT TYPE**

1. Fixed Credit: Ctr., Hrs.  
2. Variable Credit Range:  
   | Minimum Ctr., Hrs. (Check One) | To | Or |
   | Maximum Ctr., Hrs. |
3. Equivalent Credit: Yes | No |

**COURSE ATTRIBUTES:** Check All That Apply

1. Pass/Not Pass Only  
2. Satisfactory/Unsatisfactory Only  
3. Repeatable  
4. Credit by Examination  
5. Fee: Coop | Lab | Rate Request |
   | Include comment to explain fee |
6. Registration Approval Type  
   | Department | Instructor |
   | Variable Title |
7. Honors  
8. Full Time Privilege  
9. Off Campus Experience

**RECEIVED**

**FEB 21 2014**

**OFFICE OF THE REGISTRAR**

**COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):**

SEE ATTACHED.

**COURSE LEARNING OUTCOMES:**

- [ ] 1.  
- [ ] 2.  
- [ ] 3.  
- [ ] 4.  
- [ ] 5.  
- [ ] 6.  
- [ ] 7.  
- [ ] 8.  
- [ ] 9.  
- [ ] 10.  

**Curriculum Department Head**  **Date**

**Curriculum School Dean**  **Date**

**Fort Wayne Department Head**  **Date**

**Fort Wayne School Dean**  **Date**

**Indianapolis Department Head**  **Date**

**Indianapolis School Dean**  **Date**

**North Central Faculty Senate Chair**  **Date**

**Vice Chancellor for Academic Affairs**  **Date**

**West Lafayette Department Head**  **Date**

**AVP, West Lafayette College School Dean**  **Date**

**OFFICE OF THE REGISTRAR**
TO: The Faculty of the College of Engineering

FROM: The Faculty of the School of Electrical and Computer Engineering

RE: Change to Existing Undergraduate Course: ECE 45300, Fundamentals of Nanoelectronics, change in prerequisite and course description.

The faculty of the School of Electrical and Computer Engineering has approved the following changes to an existing course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: ECE 45300 Fundamentals of Nanoelectronics
Sem. Fall; Cr. 3; Lecture 3.
Prerequisites: ECE 30500 and MA 26600 or MA 26200
Restrictions: Must be enrolled in one of the following: School of Electrical & Computer Engineering
Description: The development of nanotechnology has made it possible to engineer materials and devices on a length scale as small as several nanometers. The properties of such nanostructures cannot be described in terms of macroscopic parameters like mobility or diffusion coefficient and a microscopic, or atomistic, viewpoint is called for. The purpose of this course is to convey the conceptual framework that underlies this microscopic viewpoint using examples related to the emerging field of nanoelectronics.

To: ECE 45300 Fundamentals of Nanoelectronics
Sem. Fall; Cr. 3; Lecture 3.
Prerequisites: MA 26600 and MA 26500 or MA 26200
Restrictions: None
Description: Nanoelectronic devices are an integral part of our life, including the billion-plus transistors in every smartphone, each of which has an active region that is only a few hundred atoms long. This course is designed to convey the key concepts developed in the last 25 years which constitute the fundamentals of nanoelectronics and mesoscopic physics, assuming a minimal set of prerequisites. Topics covered include the new Ohm’s law, conductance quantization, the nanotransistor, spin valves, thermoelectricity, quantum systems and the non-equilibrium Green’s function (NEGF) method.
Reason: The faculty in ECE has determined that knowledge of semiconductor devices is not essential for the course. In addition the course description has been updated to reflect the evolution of the field over the last few years.

On behalf of V. Balakrishnan, Head
School of Electrical and Computer Engineering
School of Electrical and Computer Engineering (EFD 1-14)

**Course Description:** Nanoelectronic devices are an integral part of our life, including the billion-plus transistors in every smartphone, each of which has an active region that is only a few hundred atoms long. This course is designed to convey the key concepts developed in the last 25 years which constitute the fundamentals of nanoelectronics and mesoscopic physics, assuming a minimal set of prerequisites. Topics covered include the new Ohm’s law, conductance quantization, the nanotransistor, spin valves, thermoelectricity, quantum systems and the non-equilibrium Green’s function (NEGF) method.

**Prerequisite:** MA 26600 and MA 26500 or MA 26200

**Restrictions:** None
Course Learning Outcomes:

i) Ability to perform semiclassical analysis of charge flow in nanoelectronic devices.

ii) Ability to perform semiclassical analysis of spin flow and heat flow in nanoelectronic devices.

iii) Ability to perform quantum analysis of nanoelectronic devices.