ELEC 412/ELEC547 – Electronic Devices: II

Term - SPRING 2015 (201501)

Instructor
Dr. Dr. H.L. Kwok
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E-mail: hlkwok@ece.uvic.ca

Office Hours
Days: T and F
Time: 14:30-15:00
Location: EOW425

Lectures
A-Section(s): A01/A02 CRN 21094/5 ; 21129
Days: TWF
Time: 1330-1420
Location: DSBC128

Required Text
Title: Electronic materials
Author: H.L. Kwok
Publisher: Trans tech Publ.
Year: 2010

Optional Text
Title: Physics of Semiconductor Devices
Author: M. Shur
Publisher: Prentice-Hall
Year: 1990

Labs
B-Section(s):

Assessment:
Assignments: 10%
Mid-term 2 x 25% Date: Feb.4 (Wed.) and March 4 (Wed.)
Final 40%

Reference:
Title: Semiconductor devices, Physics and Technology
Author: S.M. Sze
Publisher: J.Wiley
Year: 1985

Due Dates for Assignments:
To be decided (normally 1 week after the assignments are given)
The final grade obtained from the above marking scheme will be based on the following percentage-to-grade point conversion:

<table>
<thead>
<tr>
<th>Passing Grades</th>
<th>Grade Point Value</th>
<th>Percentage for Instructor Use Only</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>9</td>
<td>90 – 100</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>85 – 89</td>
<td></td>
</tr>
<tr>
<td>A-</td>
<td>7</td>
<td>80 – 84</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td>6</td>
<td>77 – 79</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>73 – 76</td>
<td></td>
</tr>
<tr>
<td>B-</td>
<td>4</td>
<td>70 – 72</td>
<td></td>
</tr>
<tr>
<td>C+</td>
<td>3</td>
<td>65 – 69</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>60 – 64</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>50 – 59</td>
<td></td>
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<table>
<thead>
<tr>
<th>Failing Grades</th>
<th>Grade Point Value</th>
<th>Percentage for Instructor Use Only</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>0</td>
<td>0 – 49</td>
<td>Fail, *Conditional supplemental exam. (For undergraduate courses only)</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0 – 49</td>
<td>Fail, no supplemental.</td>
</tr>
<tr>
<td>N</td>
<td>0</td>
<td>0 – 49</td>
<td>Did not write examination, Lab or otherwise complete course requirements by the end of term or session; no supplemental exam.</td>
</tr>
</tbody>
</table>

*Assignment of E grade will be at the discretion of the Course Instructor.

The rules for supplemental examinations are found on page 80 of the current 2014/15 Undergraduate Calendar.

<table>
<thead>
<tr>
<th>Term in which E Grade Was Obtained</th>
<th>Application Deadline for Supplemental Exam</th>
<th>Supplemental Exam Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>First term of Winter Session (Sept – Dec)</td>
<td>February 28 in the following term</td>
<td>First week of following May</td>
</tr>
<tr>
<td>Second term of Winter Session (Jan – Apr)</td>
<td>June 30 in the following term</td>
<td>First week of following September</td>
</tr>
<tr>
<td>Summer Session (May – Aug)</td>
<td>October 31 in the following term</td>
<td>First week of following January</td>
</tr>
</tbody>
</table>

Deferred exams will normally be written at the start of the student's next academic term; i.e., approximately 4 months following the deferral of the exam.
Course Description

1. Course Objectives

This course deals with the principle of operation and design issues related to modern electronic devices. The advancement of electronics has been primarily due to the invention of new devices and it is desirable for practicing engineers to have an updated perspective and understanding on state-of-the-art electronic devices and the future trends.

2. Learning Outcomes

LO-1: Study the operation of advanced bipolar and field-effect transistors
   SLO-1.1: Examine the state-of-the-art transistors, their performance and operation in the context of Very-Large Scale Integration Circuits
   SLO-1.2: Analyze the physical limitations and processing issues
   SLO-1.3: Describe methodologies to improve potentially transistor operation and factors to lower manufacturing cost
LO-2: Study the operation of photonic and opto-electronic devices
   SLO-2.1: Examine the relationship between light properties and material properties with emphases on device applications
   SLO-2.2: Analyze the design and operation of the state-of-the-art opto-electronic devices
   SLO-2.3: Describe novel opto-electronic devices and methodologies to improve performance and to lower cost
LO-3: Study the operation of organic semiconductor devices and their future trends
   SLO-3.1: Describe the properties of organic semiconductors and their processing techniques
   SLO-3.2: Analyze the design and operation of organic semiconductor devices
   SLO-3.3: Examine the merits of organic semiconductor devices and the potential of developing novel devices
LO-4: Study the principles, construction and design of lasers and related applications
   SLO-4.1: Understand the basic operation of solid-state lasers
   SLO-4.2: Examine different laser applications
LO-5: Study the operation of display devices; thin-film devices; imaging devices; energy conversion devices; transducers; and micro-machines and interfacing
   SLO-5.1: Understand the operation of different display and imaging devices including liquid crystal displays; charge-coupled imaging devices and medical imagers
   SLO-5.2: Describe energy conversion devices including solar cells, thermoelectric devices
   SLO-5.3: Examine the design and operation of transducers, micro-machines and their interfacing
   SLO-5.4: Study the operation and construction of sensor arrays and related system design

3. Syllabus

Topics:

Operation of bipolar and field-effect devices in VLSI design
Photonic and optoelectronic devices
Organic semiconductor devices and their upcoming trends
Principles, construction and design of lasers and related light sources
Display devices, thin-film devices, imaging devices, transducers and micro-machines
Interfacing, sensor arrays and related system-level design

Note to Students:
Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the ECE Chair by email or the ECE Chair's Secretary eceasst@uvic.ca to set up an appointment.

Accommodation of Religious Observance
See http://web.uvic.ca/calendar2014/GI/GUPo.html

Policy on Inclusivity and Diversity
See http://web.uvic.ca/calendar2014/GI/GUPo.html

Standards of Professional Behaviour
You are advised to read the Faculty of Engineering document Standards for Professional Behaviour at http://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult http://web.uvic.ca/calendar2014/FACS/UnIn/UARe/PoAcI.html for the UVic policy on academic integrity.