ECE 345 Syllabus, Electronics  
Fall 2014

**Instructor:** James W. Phegley, Ph.D.  
**Office:** ENGR. E-210  
**Email:** phegley@engr.siu.edu  
**Office Phone:** 453-7044

**Office Hours:** Monday, Wednesday, and Friday from 1:00 to 3:00 and by appointment.

**Lecture:** M, W, F – 9:00 to 9:50, ENGR. A-310

**Labs:**  
Section 001 Tuesday – 11:00 to 1:50 ENGR. E-237  
Section 002 Thursday – 2:00 to 4:50 ENGR. E-237


**References:**  

**Course Topics:**  
Chapters 1 – 3: Introduction to microelectronics, basic physics of semiconductors, diode models and circuits (Test 1).  
Chapters 4 and 5: Physics of bipolar junction transistors and Bipolar amplifiers (Test 2).  
Chapters 6 and 7: Physics of MOSFETs and MOSFET amplifiers (Test 3)  
Chapter 8: Operational amplifiers, op-amp circuits, and non-ideal characteristics of the op-amp (Covered on the comprehensive Final Exam).

**Evaluation:**  
Test 1, Chaps. 1 – 3, Friday, Sept. 12  
Test 2, Chaps. 4 – 5, Friday, Oct. 10  
Test 3, Chaps. 6 – 7, Friday, Nov. 7  
Final Exam, Chaps. 1 – 8, Friday, Dec 12th, 8:00 - 9:45 A.M.  
Homework  
Lab  
20%  
20%  
20%  
20%  
10%  
10%

**Notes:**  
1.) Students are responsible for all announcements made in class.  
2.) If a test (other than the final exam) is missed for a legitimate reason a grade may be given based on the remaining work.  
3.) Late homework is not accepted.  
4.) Students are expected to conduct themselves in a professional and ethical manner. Failure to do so could count against the final grade.  
5.) Attendance will be taken at random throughout the semester; excessive absences could count against the final grade.
1. **Course number and name**: ECE 345 Electronics
2. **Credits and contact hours**: 4 credits, Three 50-minute sessions per week, Ten 110-minute laboratory experiments
3. **Course Committee**: S. Ahmed, M. Sayeh, H. Wang
4. **Text book**:

**Reference and supplemental materials**:

5. **Specific course information**
   b. prerequisites or co-requisites: PHYS 205b, ECE 235
   c. Required for EE and CpE majors
   d. Professional Component {4 Credit Hours}

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

A. **By the time of Exam #1 (after about 15 lectures), the students should be able to do the following**:
   1. Solve circuit problems with ideal diodes. (a, e, k)
   2. Apply the constant voltage drop model and the piece-wise linear diode model to diode problems. (a, e, k)
   3. Apply the small signal diode model to calculate the changes in the diode voltage for changes in the diode current. (a, e, k)
   4. Calculate the carrier concentration in p and n type materials. Calculate the resistivity of doped semiconductors. Calculate the built-in voltage, reverse saturation current, and the junction capacitance of p-n junctions. (a, e, k)
   5. Use diodes to design half wave, full wave and bridge rectifiers. (a, e, k)
   6. In the laboratory obtain diode characteristics and measure and verify currents and voltages in diode circuits. (a, b, e, j, k)

B. **By the time of Exam #2 (after about 26 lectures), the students should be able to do the following**:
   1. Identify the different modes of operation of BJT. (a, e, k)
   2. Identify the differences between large-signal and small-signal models of a BJT and the limits of these models. (a, e, k)
   3. Calculate the gain and input/output resistance of a BJT circuit by replacing the BJT with a proper small signal model. (a, e, k)
   4. Identify the configuration of single BJT circuit (i.e., common emitter, common collector or common base) and the advantages and disadvantages of the configuration with respect to gain and input/output resistance. (a, e, k)
   5. Design, build, and verify BJT biasing circuits. (a, b, e, j, k)
   6. Measure and verify the characteristics of BJT amplifiers. (a, b, e, j, k)
C. By the time of Exam #3 (after about 37 lectures), the students should be able to do the following:
   1. Identify the different modes of operation of MOSFET. (a, e, k)
   2. Identify the differences between large-signal and small-signal models of a MOS and the limits of these models. (a, e, k)
   3. Calculate the gain and input/output resistance of a MOS circuit by replacing the MOS with a proper small signal model. (a, e, k)
   4. Identify the configuration of single MOS circuit (i.e., common source, common drain or common gate) and the advantages and disadvantages of the configuration with respect to gain and input/output resistance. (a, e, k)
   5. Design basic building blocks such as current mirror circuits and inverters. (a, e, k)
   6. Design, build, and verify MOS FET biasing circuits. (a, b, e, j, k)
   7. Measure and verify the characteristics of MOS amplifiers. (b, j, k)

D. By the time of Final Exam (after about 41 lectures), the students should be able to do the following:
   1. Solve circuit problems with ideal operational amplifiers. (a, e, k)
   2. Understand the effect of non-ideal characteristics of operational amplifiers on circuit performance. (a, e, k)
   3. Calculate the voltage and frequency limits set by slew rate and bandwidth. (3, 6, 11)
   4. Design inverting, non-inverting, Miller integrators. (a, e, k)
   5. Measure the offset voltage and current of operational amplifiers. (b, k)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
IMPORTANT DATES *
Semester Class Revers: ............................................... 08/18/2014
Last day to add a class (without instructor permission): ........... 08/24/2014
Last day to withdraw completely and receive a 100% refund: ... 08/11/2014
Last day to drop a course using SakaiNet: .......................... 10/26/2014
Last day to file diploma application (for name to appear in Commencement program): .......................... 10/31/2014
Final examinations: .................................................. 12/8-12/12/2014

Note: For outreach, internet, and short course drop/dial dates, visit Registrar’s Academic website: http:// registrar.siu.edu/

FALL SEMESTER HOLIDAYS
Labor Day 08/01/2014
Fall Break 10/11-10/14/2014
Veteran Day 11/11/2014
Thanksgiving Vacation 11/26-11/30/2014

WITHDRAWAL POLICY—Undergraduate only
Students who officially register for a session may not withdraw merely by the
stopping of attendance. An official withdrawal form needs to be initialed by the
student and processed by the University. For the proper procedures to follow
when dropping courses and when withdrawing from the University, please visit

INCOMPLETE POLICY—Undergraduate only
An INC is assigned when, for reasons beyond their control, students engaged
in passing work are unable to complete all class assignments. An INC must be
changed to a completed grade within one semester following the term in which
the course was taken, or graduation, whichever occurs first. Should the student
fail to complete the course within the time period designated, that is, by no
later than the end of the semester following the term in which the course was
taken, or graduation, whichever occurs first, the incomplete will be converted
to a grade of F and the grade will be computed in the student’s grade point
average. For more information, please visit:
http:// registrar.siu.edu/grades/inc/complete.html

REPEAT POLICY
An undergraduate student may, for the purpose of raising a grade, enroll in a
course for credit no more than two times (two total enrollments) unless
otherwise noted in the course description. For students receiving a letter grade
of A, B, C, D, or F, the course repetition must occur at Southern Illinois
University Carbondale. Only the most recent (last) grade will be calculated in
the overall GPA and count toward hours earned. See full policy at

GRADUATE POLICIES
Graduate policies often vary from Undergraduate policies. To view the
applicable policies for graduate students, please visit
http://gradschool.siu.edu/about-si/grad-catalog/index.html

DISABILITY POLICY
Disability Support Services provides the required academic and programmatic
support services to students with permanent and temporary disabilities. DSS
provides centralized coordination and referral services. To utilize DSS
services, students must come to the DSS to open cases. The process involves
interviews, reviews of student-supplied documentation, and completion of
Disability Accommodation Agreements.
http://disabilityservices.siu.edu/

SALUKI CARES
The purpose of Saluki Cares is to develop, facilitate and coordinate a
university-wide program of care and support for students in any type of
distress—physical, emotional, financial, or personal. By working
closely with faculty, staff, students and their families, SIU will continue
to display a culture of care and demonstrate to our students and their
families that they are an important part of the community. For
information on Saluki Cares: (618) 453-5714, or salukicares@siu.edu,
http://saluki.cares.siu.edu/index.html

EMERGENCY PROCEDURES
Southern Illinois University Carbondale is committed to providing a
safe and healthy environment for study and work. We ask that you
become familiar with the SIU Emergency Response Plan and
Building Emergency Response Team (BERT) programs. Emergency
response information is available on posters in buildings on campus,
available on BERT’s website at www.bert.siu.edu, Department of
Safety’s website at www.dps.siu.edu (disaster drop down) and the Emergency
Response Guideline pamphlet. Instructors will provide guidance and
information to students in the classroom in the event of an emergency
affecting your location. It is important that you follow these instructions
and work with your instructor during an evacuation or sheltering
emergency.

INCLUSIVE EXCELLENCE
SIU contains people from all walks of life, from many different
cultures and sub-cultures, and representing all strata of society,
nationalities, ethnicities, lifestyles, and affiliations. Learning from and
working with people who differ is an important part of education as well
an essential preparation for any career. For more information please visit:
http://www.inclusiveexcellence.siu.edu/

MORRIS LIBRARY HOURS
http://www.lib.siu.edu/about

LEARNING AND SUPPORT SERVICES
Help is within reach. Learning support services offer free tutoring on
campus and on-line. To find more information please visit the Center
for Learning and Support Services website:
Tutoring: http://tutoring.siu.edu/
Math Labs http://tutoring.siu.edu/math_tutoring/index.html

WRITING CENTER
The Writing Center offers free tutoring services to all SIU students
and faculty. To find a Center or Schedule an appointment please visit
http://write.siu.edu/

AFFIRMATIVE ACTION & EQUAL OPPORTUNITY
Our office’s main focus is to ensure that the university complies with
federal and state equity policies and handles reporting and investigating
discrimination cases. For more information visit:
http://diversity.siu.edu/

Additional Resources Available:
SALUKINET: https://salukinet.siu.edu/cp/home/displaylogin
ADVISEMENT: http://advisement.siu.edu/

Fall 2014 R.O. Roouke

* Southern Illinois University Carbondale. SIU Pathways to Excellence: A Strategic Plan. Revised: http://strategicplan.siu.edu/