Syllabus for EEL 3008–Physics of EE

1. Catalog Description

An introduction to the fundamental physics underlying components and devices, and, their application to electronics, power and wireless. Credits: 3

2. Pre-requisites and Co-requisites

EEL 3111 Circuits I, MAC 2313 Calculus III, MAP 2302 Elementary differential equations, CHM 2045 General Chemistry I

3. Course Objectives

The objective of this course is to provide an understanding of the physics behind electrical components, systems and applications.

4. Contribution of course to meeting ABET professional component

For undergraduate courses only

5. Relationship of course to ABET program outcomes

For undergraduate courses only

6. Instructors: Dr. A. Turner and Dr. T. Nishida

Contact information for Dr. A. Turner
  a) Office location: NEB 227
  b) Office hours: Tuesday and Thursday (10:40am –11:30am) or by appointment
  c) Telephone: (352) 392-2652
  d) E-mail address: turneral@ufl.edu
  e) Web site: http://lss.at.ufl.edu/ (Click on “Sakai system entry” button)

Contact information for Dr. T. Nishida
  a) Office location: Larsen 219
  b) Office hours: Thursday and Friday (12:50pm – 1:40pm) or by appointment
  c) Telephone: (352) 392-6774
  d) E-mail address: nishida@ufl.edu
  e) Web site: http://lss.at.ufl.edu/ (Click on “Sakai system entry” button)

7. Teaching Assistants: Trent Fields

Contact information for Trent Fields
  a) Office location: TBA
  b) Office hours: TBA

8. Meeting Times

T 3:00-4:55, R 4:05-4:55

9. Meeting Location

FLG 270

10. Laboratory Schedule

None

11. Material and Supply Fees

None

12. Textbooks and Software Required

Textbook:
  a) Title: * Note 1: No textbook exists currently
  b) Author: ** Note 2: One option is to combine separate texts into one composite text
  c) Publication date and edition:
  d) ISBN number:

Other: Digilent Analog Discovery board
14. Course Outline (provide topics covered by week or by class (approximate))

I. How do components work at a fundamental level? (3 Weeks)
   i. How a resistor works
   ii. How a capacitor works
   iii. How an inductor works
   iv. How a transformer works

II. Application to power (2 Weeks)
   i. How motors/generators work
   ii. Why ac 3-phase power
   iii. How is power distributed

III. How do solid-state devices work? (2.5 Weeks)
   i. How diode works
      1. Example rectifier
      2. Example solar cell, photodiode
      3. Example LED
   ii. How a MOSFET works
      1. Example switch

IV. Application to electronics (1.5 weeks)
   i. How does an amplifier work
   ii. How does digital logic work

V. Application to computing (1 week)
   i. Why does computation take time
   ii. Why does computation consume power (and drain the battery)

VI. How do radios and cellphones transmit and receive (4.5 Weeks)
   i. Propagating E&M waves
   ii. Transmission of waves using an antenna (radiation from a small dipole antenna)

15. Attendance and Expectations

It is understood that all attendees will be focused on the lecture and will take every possible measure to minimize distractions for everyone (i.e. no newspapers, no cell phones, no PDAs, no iPODs, no laptops, etc. unless instructed to use them for class, no newspapers, yes on-time attendance, and no early departures (unless noted and approved in advance)).

16. Grading–methods of evaluation

The score, S, for the course will be determined by combining the average scores, out of 100, on Daily Quizzes, Q, Homework, H, In Class/Take Home Projects, I, and Tests, T, with $S = qQ + hH + iI + tT$ where q, h, i and t are determined as follows.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Formula</th>
<th>Maximum</th>
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<tbody>
<tr>
<td>$Q &gt; T$</td>
<td>$q = 0.10$</td>
<td>$q = 0.2$</td>
</tr>
<tr>
<td>$H &gt; T$</td>
<td>$h = 0.15 + (T-H) \times 0.003$</td>
<td>$h = 0.3$</td>
</tr>
<tr>
<td>$I &gt; T$</td>
<td>$i = 0.15 + (T-I) \times 0.003$</td>
<td>$i = 0.3$</td>
</tr>
<tr>
<td>$t = 1-q-h-i$</td>
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a) Daily Quizzes: (3 Free)

b) Homework: Weekly

c) In class/ take home projects: Labs and projects

   i. Students will be assigned activities that complement and reinforce the theory taught in lecture.
   ii. These activities will include measurements on electrical components using a portable USB-based electrical engineering laboratory kit (Digilent Analog Discovery board).
   iii. Students will turn in screen capture demonstrating results.

d) Three tests (September 29th, November 3rd, December 8th)

Pop quizzes can occur at any time, however, they will occur whenever the instructor deems that the class is not prepared to start on time, if any student is using a computer, cell phone, ipod, ipad, etc., reading a newspaper, socializing or otherwise being rude, disrespectful or disruptive during class.

Any student causing a pop quiz will receive a zero on the pop quiz and any student responsible for multiple pop quizzes will, at the instructor's discretion, receive a zero for their overall pop quiz score.

Each pop quiz will count 2% of the overall score, the remaining portion of the overall score will be weighted as shown in the table below.

An overall score, OA, will be tabulated for each student based on the pop quiz score, P, the number of pop quizzes, N, along with the score, S, according to the formula below

\[ OA = S(1 - 0.02N) + P(0.02N) \]

17. Grading Scale:

Grading Scale: ≥90 A, ≥89 A-, ≥86 B+, ≥80 B, ≥79 B-≥76 C+, ≥70 C, ≥69 C-, ≥66 D+, ≥60 D, ≥59 D-, <59 E Examinations may be curved to an average of 5 with no score > 100.

18. Make-up Exam Policy

Makeup exam is contingent on appropriate justifications and legal documents (UF Dean of Students, certified physician, military active duty, judge for jury duty, etc.) Late assignments will receive a 10% deduction per day late.

19. Honesty Policy

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

20. Accommodation for Students with Disabilities

Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

21. UF Counseling Services

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

22. Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator.
Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.