EEL 3110 – Circuit Analysis –

Department of Electrical & Computer Engineering

Florida International University SPRING 2020

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| **Classroom** | **:** | EC 1104 |
| **Class Time** | **:** | T & R 12.30 PM – 13.45 PM |
| **Faculty** | **:** | Dr. Gus Roig Ph.D; [Course Coordinator]  Dr. Subbarao Wunnava, Ph.D.,P.E.,[Course Instructor] |
| **Office Hours** |  | 8.30 AM to 10.30 AM T & R; Other times by appointment |
| **Office** | **:** | ECE 3113 [Tentative] |
| **Phone** | **:** | Dept 305 348 2807   end\_of\_the\_skype\_highlighting |
| **Email** | **:** | subbarao@fiu.edu |
| **Prerequisite** | **:** | MAC 2312, PHY 2049 |
| **Corequisite** | **:** | EEL 3111L |
| **Textbooks** | **:** | Electric Circuits (10e) Circuit Analysis And Design  By Nilsson \* Riedel Fawwaz T Ulaby, Michael Maharbiz Cynthia Furse  Publisher: Prentice Hall University of Michigan [pdf version available]  Copyright: 2017/20 |

**Course Description [Courtesy: Dr. Gus Roig Ph.D, Professor; Course Coordinator]**

The pervasive presence of electronic devices and instrumentation in all aspects of engineering design and analysis is one of the manifestations of the electronic revolution that has characterized the second half of the 20th century. Computers are perhaps the most obvious manifestations of this presence. However, many other areas of electrical engineering are also important to the practicing engineer, from mechanical and industrial engineering, to chemical, nuclear, and materials engineering, to civil and the emerging field of biomedical engineering. Engineers today must be able to communicate effectively within the interdisciplinary teams in which they work.

This course is about presenting the basic principles of electrical and electronics engineering (DC and AC circuit analysis, electronic devices and amplifiers, digital circuits, and power systems) to an audience composed of different engineering majors.

**Course Objectives**

1. Learn the concepts and applications of electric circuits
2. Learn the concepts and applications of DC circuit analysis
3. Solve problems using nodal and mesh methods
4. Be able to analyze sinusoidal steady state circuits
5. Solve problems using impedance concepts
6. Have a basic understanding of transients in electric circuits

**Topics Covered**

1. Fundamentals of Electrical Circuits
2. DC and AC Network Analysis
3. AC Power
4. Frequency Response and Transient Analysis (time and s-domain)
5. Operational Amplifiers
6. Semiconductor Diodes and Rectifiers

**Relationship of course to program objectives**

In this course, the student will have to show:

1. an ability to apply knowledge of mathematics, science and engineering
2. an ability to design a system, component, or process to meet desired needs
3. an ability to function in multi-disciplinary teams (practice homework and teaching others in study groups)
4. an ability to identify, formulate, and solve engineering problems (homework)
5. an ability to communicate effectively (through teamwork)
6. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (SPICE Simulations)
7. an ability to apply knowledge of advanced math (D.E., Linear Algebra, Complex Variables)

**Grading Scheme [Tentative]: Home work will be assigned and is expected to be performed by the students to help them with Projects, Quizzes, and Tests.**

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| **3 Quizzes(unannounced)** | **30 %** |
| **3Tests** | **55 %** |
| **Projects and assignments** | **15%** |
| **Total** | **100%** |

**Tentative Grading Scale: Following ABET [Accreditation Board for Engineering and Technology] and**

**ASEE [American Society of Engineering Education] guidelines:**

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| **A** | **> 95** | **B+** | **>87** | **C+** | **>77** | **D+** | **>67** | **F** | **< 60** |
| **A-** | **> 90** | **B** | **>84** | **C** | **>74** | **D** | **>64** |  |  |
|  |  | **B-** | **>80** | **C-** | **>70** | **D-** | **>60** |  |  |

Completing the homework and follow class discussions would help performance in Quizzes, Pr0jects, and Tests

**Tentative Dates:**

**Tests, Quizzes, and Projects:**

1. There will be a total of three announced Tests including final; There will be 3 un-announced quizzes.
2. The location and timing of test will be announced later.
3. Format of the test will be discussed in class

**Homework/Class work**

1. The instructor will assign the end-of-chapter homework and in-class assigned homework.
2. You must maintain a notebook for all of your homework and class work.
3. The homework must be done neatly and all the assigned questions must be done in their entirety,
4. All the chapters must be clearly identified in the notebook, using some sort of labels or separators.

**Exam policy [As per the requirements of the Accreditation Board and FIU College of Engineering]**

1. Make sure to complete the assigned homework in order to do well in the exam.
2. Use of any electronic device with keyboard is prohibited. This also applies to cellphones with messaging system.
3. No discussion is permitted during the exams.
4. Instructors not compelled to give credit for something they cannot read or follow logically.
5. Cheating is considered as a serious offense. Students who are caught will receive the appropriate consequences.

**Course Policies**

1. To get assistance try to see the instructor during listed office hours.
2. Students are encouraged to ask questions and to discuss course topics with the instructor and with each other.
3. Any work submitted should display Panther ID number and should be signed, as the students’ own work, and that no unauthorized help was obtained.
4. According to University policies, cheating is considered as a serious offense. Students who are caught will receive the appropriate consequences. Baseball or other brimmed caps/hats are not allowed to be worn during an exam.
5. Cell phones, communicators, MP3 players, head sets are not allowed to be used in the class.
6. Late arrival to the classroom disturbs everyone. Please do not be late, but if you are unavoidably delayed, join the class quietly and with minimal disturbance.
7. Students who were absent from a class are responsible for material covered in that class.
8. Any student who is absent during a test will obtain a zero mark unless he/she is able to present a documented excuse **prior to the due date**. If students are not able to attend test they should call instructor or department secretary (**348-2807**) to notify of problem **prior** to the test. Only in this case will it be possible to arrange a make-up test during 10 days after missed test.
9. It will be possible for a student to request a grade of INCOMPLETE[\*](http://www.ece.fiu.edu/syllabi/eel3003.htm" \l "_ftn1" \o ") only when the standard conditions used within EE department are met:
   1. Must contact the instructor or the secretary immediately **before** or during the part missed, so the instructor will be aware of  the circumstances causing the incomplete
   2. Must be passing the course prior to that part of the course that is not completed
   3. Must be unable to complete the course through **documented** circumstances beyond his/her control
   4. Must make up the incomplete work through the instructor of the course and should not sit through another entire course to make up the incomplete
   5. Must make up all missed work **before** the last two weeks of the following term

**EEL 3010: Course Content: SPRING 2020: [Ulaby and Nilsson Books]**

**Instructor: Dr. Subbarao V Wunnava: [Courtesy: Dr. Gus Roig; Course Coordinator]**

**Number Content and Description Reading & Problems**

1. **Fundamentals of Electric Circuits** **Chps 1 & 2 & Notes**

Resistance, Capacitance, Inductance

Voltages and Currents, and Power

Concepts of DC and AC systems

1. **Resistive Network Analysis** **Chps 3 & 4 & Notes**

Series and Parallel Circuits, Nodal and Loop (Mesh) Analysis

Thevenin & Norton Equivalent Circuits; Transformations

1. **Inductive and Capacitive Circuits Chps 6 & 7 & Notes**

Inductive and capacitive properties

Storage concepts; Mutual inductance & Transformers

Transient RC and RL circuit responses

1. **Alternating Current (AC) Network Analysis Chp 8 & 9 & Notes**

Sinusoidal steady state concepts

Phasors, House hold electrical networks

Transformers and voltage conversions

1. **AC power systems and distributions Chp 8 & 9 & Notes**

Ideal circuits and practical circuits and systems

Protecting circuits against overloads & surges

Practical case studies of power distributions

1. **Operational Amplifiers (Op.Amp) Chp 5 & Notes**

Op.Amp as a circuit element & properties

Inverting, Non-inverting, and Differential Amplifiers

Differentiating and integrating circuits

1. **Transient Analysis of RC, RL, RLC circuits Chp 11 & Notes**

Time domain analysis and interpretation

Frequency domain analysis

Laplace transformations

1. **Transfer Functions Laplace Transformations Chp 12 & Notes**

Introductory concepts leading to multitude of circuit applications

1. **Introduction to Frequency Selective Circuits (Filters) and applications Chp 13 & Notes**

Concept of Low, High and All pass filters

Band pass and band reject filters

1. **Diodes, and Rectifiers**  **Notes**

Properties of these devices in electronic circuits

Introduction to electronic circuits

**Tentative Class Schedule: EEL 3110 Circuits: SPRING 2020:**

**Instructor: Dr. Subbarao Wunnava [courtesy Dr. Gus Roig: Coordinator]**

**Schedule as of 08 20 2020:**

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| **Wk** | **Date** | **3110 Weekly Topics** | **Homework/Activity** |
| 1 | 01/07/20 T  R | **Fundamentals Electric Circuits:** Resistance, Capacitance, Inductance  Resistive Series and Parallel Circuits; Nodal & Loop Analysis | Study Chp 1 & 2  Obtain Text/materials  HW 1 Assign |
| 2 | 01/14/20 T  R | Thevinin & Norton Eq. Ckts and Transformations  Practical circuit analysis examples & case studies:  **Inductive and Capacitive Circuits:** Properties; RC & RL responses | Study Chp3&4; HW 2  Study Chp 6&7; Notes |
| 3 | 01/21/20 T  R | **Op.Amps:** properties & types of amplifier configurations; Inverting, non-inverting & differential amps; Integrators and differentiators; | Study Chp 5; Notes  Assn:HW 3 **& Proj1** |
| 4 | 01/28/20 T  R | **Op.Amps:** Practical Op.Amp based systems and case studies; D/A converters  Stability considerations; | **Study** Chaps 5 Notes  Assign HW 4 |
| 5 | 02/04/20 T  **R** | **Review of the Material**  **TEST 1 [T1]** | **Chps 1 – 5 ; Notes** |
| 6 | 02/11/20 T  R | **AC Network** Analysis: Sinusoidal Steady State and Phasor Concepts  Transformers and Voltage conversions; Case Studies | Study Chp 8&9; Notes |
| 7 | 02/18/20 T  R | **AC Power Systems :** Distributions, ideal and practical systems; | Study Chp 8&9;Notes  H.W 5; **Proj1 Due** |
| 8 | 02/25/20 T  R | **Transient RC, RL, RLC circuits:** Time & frequency domain analysis;  Laplace Transformations and Transfer functions; poles and zeros | Study Chp 11 & Notes;  Assn HW 6; **Proj 1Due** |
| 9 | 03/03/20 T  R | **Laplace Transformations:** Circuit and system applications;  Practical case studies; | Study Chp11&12;Notes  Assn: **Proj 2** |
| 10 | 03/10/20 T  R | **Review of the material**  **TEST 2 [T2]\*\*** | Chps 5, 8, 9,11 &12; T1 |
| 11 | 03/17/20 T  R | **Frequency Selective Filters:**  Case studies and design examples: | Study Chp 13 & Notes;  Assign HW 7 |
| 12 | 03/24/20 T  R | **Electronic Systems:** Diodes and rectifiers;  Half Wave, Full Wave, and Bridge Rectifiers; | Notes |
| 13 | 03/31/20 T  R | **House Hold Power Distribution Systems:** Case Studies | Notes: Assign HW 8  **Proj 2 Due** |
| 14 | 04/07/20 T  R | **House Hold and Electronic Systems: Course Review**  **Thanks Giving Holiday** | Notes and Review |
| 15 | 04/14/20 T  R | **TEST 3 [T3] Comprehensive**  **Course Conclusion** | T1,T2,All HW/Quizzes  Course Discussion |
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EIC Course website: <http://web.eng.fiu.edu/subbarao>  **FALL20\_CKTSWEB\_SUBBARAO\_WUNNAVA**