AEEE238 - Electronics I

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<tr><td>Course Title</td><td colspan="5">Electronics I</td></tr>
<tr><td>Course Code</td><td colspan="5">AEEE238</td></tr>
<tr><td>Course Type</td><td colspan="5">Compulsory</td></tr>
<tr><td>Level</td><td colspan="5">BSc (Level 1)</td></tr>
<tr><td>Year / Semester</td><td colspan="5">2 /1</td></tr>
<tr><td>Teacher's Name</td><td colspan="5">Dr. Photos Vryonides</td></tr>
<tr><td>ECTS</td><td>5</td><td>Lectures / week</td><td>3</td><td>Laboratories/week</td><td>1</td></tr>
<tr><td>Course Purpose</td><td colspan="5">The aim of the course is to familiarize the students with the concepts and the principles of operation semiconductors devices such as diodes and transistors), in order to identify and implement their basic concepts for the design of rectifiers, regulators and amplifiers.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">By the end of the course, students must be able to:
1. Review the general characteristics of three important semiconductor materials: Si, Ge, GaAs and identify the conduction using electron and hole theory. Appraise the effect in difference between n- and p- type materials.
2. Identify a clear understanding of the basic operation and characteristics of a diode in the no-bias, forward-bias, and reverse-bias regions and calculate the dc, ac, and average ac resistance of a diode from the characteristics.
3. Describe the impact of an equivalent circuit whether it is ideal or practical and examine the operation and characteristics of a Zener diode and light- emitting diode. Become familiar with the analysis of and the range of applications for Zener diodes.
4. Identify the concept of load-line analysis and how it is applied to diode networks and examine the use of equivalent circuits to analyze series, parallel, and series-parallel diode networks. Describe the process of rectification to establish a dc level from a sinusoidal ac input and predict the output response of a clipper and clamper diode configuration.
5. Describe the basic construction and operation of the Bipolar Junction Transistor/ Apply the proper biasing to insure operation in the active region. Recognize and explain the characteristics of an npn or pnp transistor and identify the important parameters that define the response of a transistor. Estimate the dc levels for the variety of important BJT configurations and deduce the important voltage levels of a BJT transistor configuration and use them to determine whether the network is operating properly. Perform a load-line analysis of the most common BJT configurations and explain the design process for BJT amplifiers. Describe the basic operation of transistor switching networks.</td></tr>
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	6. Identify the equivalent model to find the important ac parameters for an amplifier and deduce the effects of a source resistance and load resistor on the overall gain and characteristics of an amplifier. Begin to understand the advantages associated with the two-port systems approach to single- and multistage amplifiers.		
Prerequisites	AEEE222	Corequisites	None
Course Content	**Basic Semiconductor:** Introduction to semiconductors materials, N-type and P-type semiconductors, diode model and voltage current characteristics, diode biasing. **Diode Applications:** Half-wave and full-wave rectification, power supply filter, Zener diodes and regulators, clippers and clampers, voltage multipliers, diode datasheets. **Special Purposes Diodes:** varactor diodes, optical diodes, other types of diodes. **Bipolar Junction Transistors:** Transistor structure and operation, transistor characteristics and parameters, transistor as an amplifier, transistor as a switch, transistor packages and terminal identification. Large signal analysis and transistor switching circuits. **Transistor Bias Circuit:** Q-point, voltage divider bias, other bias methods. **Field Effect Transistors**: Transistor structure and operation, transistor characteristics and parameters, biasing circuits. **Amplifiers:** Amplifier operation, ac equivalent circuit, common-emitter Amplifier, common-base Amplifier, common-collector amplifier. Coupling and multistage amplifiers. Amplifiers using FETs. Power amplifiers. **Laboratory work:** Individual and small group experiments performed with the use of Electronic boards, components, measuring instruments and simulation packages. Experiments include the design, construction on Electronic boards and analysis of the circuits and devices taught in theory. Testing is performed using signal measuring equipment such as digital multimeters and oscilloscopes. The performance of the designed circuits is also simulated and the results are evaluated and compared with the experimental analysis.		
Teaching Methodology	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the e-learning platform or the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Furthermore, design projects may be assigned to the students, where literature search is encouraged to identify a specific problem related to some issue, gather relevant scientific information about how others have		

	addressed the problem, implement to implement the design and report the results in written or orally. Laboratory experiments are carried out in small groups and lab reports are required two weeks after the laboratory class resulting in a cumulative mark.
Bibliography	**(g) <u>Textbooks:</u>** • **Thomas L. Floyd, "Electronic Devices",** 10th Ed. Prentice Hall,2017 **(h) <u>References:</u>** • R. Boylestad and L. Nashelsky, ***Electronic Devices and Circuit Theory***, 11th Ed. Prentice Hall, 2013
Assessment	The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final written exam. The coursework and the final exam grades are weighted **50%** and **50%**, respectively, and compose the final grade of the course. Various approaches are used for the continuous assessment of the students, such as mid-term written exam, oral exam, quizzes, design assignments, design projects and laboratory experiments. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below: • Assignments 10% • Homework 10% • Mid-Term written exams 30% • Laboratory Work 40% • Quizzes 10% Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constrains and revision timetable. The criteria considered for the assessment of each type of the continuous assessment and the final exam of the course are: (i) the comprehension of the fundamental concepts and theory of each topic, (ii) the application of the theory in solving related problems and (iii) the ability to apply the above knowledge in more complex design problems. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Language	**English**