University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Electrical and Computer Engineering
Bachellor of Science in Electrical Engineering

Course Syllabus

1. General Information:

Alpha-numeric codification: INEL 5209
Course Title: Introduction to Solid State Electronics
Number of credits: 3
Contact Period: 3 credit hours, 3 hours of lecture per week
Elective in INEL

2. Course Description:

English: Energy levels in atoms. Crystal properties, energy bands and charge carriers, semiconductors, transport properties of bulk materials. P-n junction diodes, bipolar transistors, field effect transistors

Spanish: Niveles de energia en átomos. Propiedades de cristales, bandas de energía, portadores de carga, semiconductores, propiedades de transporte de sustratos. Diodos de juntas p-n, transistores bipolares y transistores de efecto de campo.

3. Pre/Co-requisites and other requirements:

IINEL 4201

4. Course Objectives:

In this course the student will:

Determine the probability that an energy state at energy E is occupied by an electron, carrier statistics of semiconductor and Fermi-Dirac statistics .
Aqcuire the fundamental understanding of semiconductor physics that will allow them to desing semiconductor devices.
Solve the Schodinger awave equation for particular situations.
Design solid-state transistors, and diodes, given a list of materials to select.
Be introduced to the most recent advances in solid-state electronics and micro-electro-mechanical systems.
Search for scientific articles and analyze them in terms of their scientific content and potential applications of the technology described.

5. Instructional Strategies:

☒conference ☒discussion ☒computation ☐laboratory

☐seminar with formal presentation ☐seminar without formal presentation ☐workshop

☐art workshop ☐practice ☐trip ☐thesis ☐special problems ☐tutoring

☐research ☐other, please specify:

6. Minimum or Required Resources Available:

1COMSOL Multiphysics software

7. Course time frame and thematic outline

Outline	Contact Hours
Semiconductor Crystal Structures	4
Electronic Structure and Quantum Effects	4
Charge Carriers and Energy Band	7
Excess Carriers	5
The p-n Junction	7
Field Effect Transistors	5
Bipolar Junction Transistors	5
Optoelectronics	5
Tests	3
Total hours: (equivalent to contact period)	45

8. Grading System

☒ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
☐ **Exams**	**3**	**45**
☒ **Final Exam**	**1**	**25**
☐ **Short Quizzes**		
☒ **Oral Reports**	**4**	**15**
☐ **Monographies**		
☐ **Portfolio**		
☒ **Projects**	**1**	**15%**
☐ **Journals**		
☐ **Other, specify:**		
TOTAL:		**100%**

10. Bibliography:

1. Ben G. Streetman and Sanjay Banerjee,Solid State Electronic Devices, 6th ed.ISBN: 013149726X; Prentice Hall.
2. Stephen D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2000
3. Marc J. Madou, Fundamentals Of Microfabrication: Science Of Miniaturization. CRC Press, 2002.
4. Nadim Maluf, Kirt Williams, An Introduction to Microelectromechanical Systems Engineering, Artech House Publishers, June 2004

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. **Contribution of Course to meeting the requirements of Criterion 5:**

Math	Basic Science	General	Engineering Topic
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13. Course Outcomes

	Map to Program Outcomes
1. The student will be able to determine the probability that an energy state at energy E is occupied by an electron, carrier statistics of semiconductor and Fermi-Dirac statistics .The student will aqcuire the fundamental understanding of semiconductor physics that will allow them to desing semiconductor devices.The student will be able to solve the Schodinger awave equation for particular situations. 1	(a)
2. The student will be able to design solid-state transistors, and diodes, given a list of materials to select.	(e)
3. Students will be introduced to the most recent advances in solid-state electronics and micro-electro-mechanical systems. 3	(j)
4. The students will search for scientific articles and analyze them in terms of their scientific content and potential applications of the technology described..	

Person(s) who prepared this description and date of preparation: Nelson Sepúlveda, June 2008. Submitted by: Gladys O. Ducoudray, Committee Coordinator, June, 19, 2008.