Last update: 05-07-2019

230658 - IMT - Introduction to Microelectronic Technologies

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 710 - EEL - Department of Electronic Engineering

Academic year: 2019

Degree: MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: I. MARTIN

Degree competences to which the subject contributes

Transversal:

1. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
2. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology

- Lectures
- Application classes
- Problem deliveries
- Exams with short questions and problems
- Short oral presentations

Learning objectives of the subject

Learning objectives of the subject:

The aim of this course is to teach students at an introductory level about the physical principles of semiconductor devices and offer them an overview about the reasons why semiconductor devices are the basis of the electronics industry.
In particular we go in depth in the physical foundations, then we will present in detail diodes and bipolar transistors. Additionally, a brief description and analysis of fundamental properties of basic electron devices will be done.

Learning results of the subject:

- Ability to analyse and predict the general behaviour of semiconductor devices.
- Ability to quantify the electrical properties.
- Ability to obtain the different electrical models to be applied in circuit analysis and design.

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Study load

Total learning time: 125h	Hours large group:	39h	31.20%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	86h	68.80%

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Content

1. Fundamentals

Learning time: 42h

Theory classes: 17h 30m
Self study : 24h 30m

Description:
- Crystal structure
- Atomic structure and wave properties
- Energy bands
- Carrier concentrations
- Currents in semiconductors
- The continuity equation

2. P/N juntions

Learning time: 22h

Theory classes: 7h 30m
Self study : 14h 30m

Description:
- Band diagram in thermal equilibrium
- Electrostatics
- Steady state I-V characteristics
- Small signal model
- Junction breakdown

3. Bipolar junction transistor.

Learning time: 23h

Theory classes: 8h
Self study : 15h

Description:
- The transistor effect
- Band diagram
- Common-base I-V characteristics
- Ebers-Moll model
- Small signal model
- Non idealities

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4. Other electron devices	Learning time: 6h Theory classes: 2h Self study : 4h

Description:
- Description and analysis of basic optoelectronic devices like photoconductors, photodiodes, solar cells, LED's, lasers, TFT, etc.

Planning of activities

SHORT ANSWER TEST (CONTROL)

Description:
Mid term control.

EXTENDED ANSWER TEST (FINAL EXAMINATION)

Description:
Final examination.

Qualification system

Final examination: 45%
Partial examinations and controls: 45%
Oral presentation: 10%

Bibliography

Basic:

Sze, S.M.; Lee, M.K. Semiconductor devices: physics and technology. 3rd ed.; int. stud. version. Singapore: John Wiley & Sons Singapore, 2013. ISBN 9780470873670.

Prat Viñas, L.; Calderer Cardona, J. Dispositivos electrónicos y fotónicos : fundamentos [on line]. 2a ed. Barcelona: Edicions UPC, 2006 [Consultation: 20/06/2016]. Available on: <http://hdl.handle.net/2099.3/36596>. ISBN 8483018543.