

32002 - DOPAF - High Frequency and Optoelectronic Devices

Coordinating unit: 230 - ETSETB - Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona
 Teaching unit: 710 - EEL - Department of Electronic Engineering
 Academic year: 2011
 Degree: MASTER IN ELECTRONICS ENGINEERING (Syllabus 2006). (Teaching unit Optative)
 DEGREE IN ELECTRONICS ENGINEERING (Syllabus 1992). (Teaching unit Optative)
 TELECOMMUNICATION ENGINEERING (Syllabus 1992). (Teaching unit Optative)
 ECTS credits: 5 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: JUAN MIGUEL LOPEZ GONZALEZ
 Others: JUAN MIGUEL LOPEZ GONZALEZ

Prior skills

Basic Electronics, Theory of circuits, basic MATLAB

Requirements

Teaching methodology

Learning method has three stages:

1. Knowledge presentation and summary guide
2. Activities and student work
3. Student results presentation and discussion

Learning objectives of the subject

Electronic semiconductor devices for radio frequency and microwaves.

Content

(ENG) 0. Presentació del curs	Learning time: 1h Theory classes: 1h

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1. MATLAB High Frequency Device modelling	Learning time: 3h Practical classes: 1h Self study (distance learning): 2h
2. Extraction of parameters and modelling of devices using IC-CAP	Learning time: 4h Laboratory classes: 2h Self study (distance learning): 2h
1. Transmission lines and microwaves	Learning time: 4h 20m Theory classes: 1h Practical classes: 1h Assessment sessions: 0h 20m Self study (distance learning): 2h
2. RLC Circuits	Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h
3. Lineal two-ports	Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h
4. Power gain	Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h

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<p>5. Materials and components for hybrid circuits of High Frequency, HF, -RF and Microwaves-.</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>6. Materials and components for MMIC circuits</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>7. Models for passive structures</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>8. Models for HF diodes</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>9. Compact models for HF effect field devices of HF</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>

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<p>10. Compact models for HF bipolar devices of HF.</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>11. Matching and stability of the HF amplifiers.</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>12. Noise.</p>	<p>Learning time: 10h Theory classes: 2h Practical classes: 2h Assessment sessions: 2h Self study (distance learning): 4h</p>
<p>13. Noise in HF transistors and amplifiers.</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>
<p>14. Distortion and linearity.</p>	<p>Learning time: 8h 20m Theory classes: 2h Practical classes: 2h Assessment sessions: 0h 20m Self study (distance learning): 4h</p>

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Content planning

Week: 1	Content: 1. MATLAB High Frequency Device modelling
	Content: 2. Extraction of parameters and modelling of devices using IC-CAP
	Content: (ENG) 0. Presentació del curs
Week: 2	Content: 1. Transmission lines and microwaves
Week: 3	Content: 2. RLC Circuits
Week: 4	Content: 3. Lineal two-ports
Week: 5	Content: 4. Power gain
Week: 6	Content: 5. Materials and components for hybrid circuits of High Frequency, HF, -RF and Microwaves-.
	Content: 6. Materials and components for MMIC circuits
Week: 7	Content: 7. Models for passive structures
Week: 8	Content: 8. Models for HF diodes
Week: 9	Content: 9. Compact models for HF effect field devices of HF

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Week: 10	Content: 10. Compact models for HF bipolar devices of HF.
Week: 11	Content: 11. Matching and stability of the HF amplifiers.
Week: 12	Content: 12. Noise.
Week: 13	Content: 13. Noise in HF transistors and amplifiers.
Week: 14	Content: 14. Distortion and linearity.

Qualification system

activities results: 60 %

presentation and discussion of results: 40 %

Regulations for carrying out activities

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Bibliography

Basic:

Rohde, U.L.; Newkirk, D.P. *RF/microwave circuit design for wireless applications*. New York [etc.]: John Wiley and Sons, 2000. ISBN 0471298182.

González, G. *Microwave transistor amplifiers: analysis and design*. 2nd ed. Englewood Cliffs, NJ: Prentice Hall, 1997. ISBN 0132543354.

López-González, J.M. *El transistor bipolar de heterounión: física, electrónica y microondas* [on line]. Barcelona: Edicions UPC, 2002 [Consultation: 29/11/2011]. Available on: <<http://biblioteca.upc.es/EdUPC/locate4.asp?codi=EE050XXX>>. ISBN 8483015668.

Sischka, F. *IC-CAP characterization handbook* [on line]. 2002 [Consultation: 29/11/2011]. Available on: <<http://edocs.soco.agilent.com/display/iccapmh/Home>>.

Complementary:

Gilmore, R.; Besser, L. *Practical RF circuit design for modern wireless systems*. Boston, MA: Artech House, 2003. ISBN 1580535216 (V.1); 1580535224 (V.2).

Gilmore, R.; Besser, L. *Practical RF circuit design for modern wireless systems (Vol. 2: Active circuits and systems)*. Boston, MA: Artech House, 2003. ISBN 1580535224 (V.2).

Lee, T.H. *Planar microwave engineering: a practical guide to theory, measurement and circuits*. Cambridge; New York, NY: Cambridge University Press, 2004. ISBN 0521835267.

Maas, S.A. *Nonlinear microwave and RF circuits*. 2nd ed. Boston; London: Artech House, 2003. ISBN 1580534848.

Others resources: