

Program	09TT- Engineering in Telecommunication Technologies and Services
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Course number and name	
Number	95000090
Name	Nanotechnology for Information and Communications Nanotecnología para la Información y las Comunicaciones
Semester	Y3-S5

Credits and contact hours	
ECTS Credits	4.5
Contact hours	45

Coordinator's name	Fernando Calle Gómez
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Specific course information
<p>Description of course content</p> <p>The main objective of this module is to provide the students with the basic knowledge of nanoscience and nanotechnology, the nature and properties of different nanostructures and techniques for their fabrication and characterization, towards to advanced nanodevices for nanoelectronics, nanophotonics and nanobiotechnology. Main applications in several fields like ICT, space, security, environment domotics and health will be addressed.</p>
<p>List of topics to be covered</p> <p>1. Introduction to Nanotechnology: What's Nanoscience and Nanotechnology. Emerging technologies. NS & NT markets and scientific policy. Precursors and historical revision. Size and NT approaches. Scaling laws and Quantum Mechanics for NT</p> <p>2. Nanomaterials and Nanostructures Bondings and crystals. Inorganic semiconductors. Carbon nanostructures. Nanoparticles and composites. Organic and bio-materials</p> <p>3. Nanotechniques for Fabrication and Characterization Fabrication technologies: deposition, lithography, self-assembling, molecular fabrication, nanomanipulation. Characterization techniques: electrical and optical assessment, structural characterization (SEM and TEM, STM and AFM, SOM, nanoindentation). Image treatment in nanotechnologies</p> <p>4. Nanodevices Nanoelectronics : Electronic properties of nanostructures. Applications: SETs, molecular electronics. Nanophotonics: Photonic properties of nanostructures. Applications: QW laser, near-field microscopy, optical tweezers, photonic crystals. Nanobiotechnology: Nanoideas from Nature. Applications: biomedical devices, bioelectronics. Safety in NT</p> <p>5. Applications of nanostructures and nanosystems, and future perspectives. Automotive and space. Homeland security and defense. Energy and environment. Domotics and textiles. Bioengineering and nanomedicine</p>

Prerequisites or co-requisites		
None		
Course category in the program		
<input type="checkbox"/> R (required)	<input checked="" type="checkbox"/> E (elective)	<input type="checkbox"/> SE (selective elective)

Specific goals for the course	
Specific outcomes of instruction	
<p>RA45: Knowledge and skills on scientific-technological topics related to the modules</p> <p>RA99: To know and understand scientific basis of nanotechnology, as well as working principles of systems based in electronic and optoelectronic devices and nanosystems used in information transmission, processing and storage, sensors and displays, NEMS and energy generation and storage</p> <p>RA100: To develop the skills to team-work in search of information sources</p> <p>RA101: To develop the skills to present technical information in oral sessions</p>	
Student outcomes addressed by the course	
CE-SE4, CEB4, CECT3, CG4, CG7, CG8	

Bibliography and supplemental materials	
<p>Textbook :</p> <ul style="list-style-type: none"> • B. Rogers, S. Pennathur, J. Adams, Nanotechnology. Understanding small systems. CRC Press 2nd ed. (2011) <p>Advanced books:</p> <ul style="list-style-type: none"> • V.V. Mitin, V.A. Kochelap, M.A. Strocio, Introduction to nanoelectronics. Cambridge University Press (2008). • Rainer Waser (editor), Nanoelectronics and Information Technology. 2nd ed. John Wiley & Sons (2005). • Daniel Minoli, Nanotechnology Applications to Telecommunications and Networking, Wiley (2005). • Bharat Bhushan (editor), Springer Handbook of Nanotechnology, 3rd ed. Springer. (2010). <p>Slides in Moodle, Web sources</p>	

Teaching methodology			
<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> problem solving sessions	<input checked="" type="checkbox"/> collaborative actions	<input type="checkbox"/> laboratory sessions
Other:	Visit to clean room facilities		