

<b>Program</b>	<b>09AQ-Master in Telecommunication Engineering</b>
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<b>Course number and name</b>	
<b>Number</b>	93000795
<b>Name</b>	User Equipment and Terminals Equipos y Terminales de Usuario
<b>Semester</b>	Y1-S1

<b>Credits and contact hours</b>	
<b>ECTS Credits</b>	6
<b>Contact hours</b>	60

<b>Coordinator's name</b>	Octavio Nieto-Taladriz García
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<b>Specific course information</b>
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**Description of course content**

Main goal of the course is to give the student an overview of the roadmap to develop electronic systems with special emphasis in cutting edge consumer portable terminals. The course is organized in four blocks:

- Overview of system level design methodologies to give the student the knowledge for making key decisions, including the selection and integration of elements.
- Detailed description and comparison of key elements as interfaces, processing, software, communications and packaging where comparison among the different alternatives is discussed, mainly focusing the scope in design decision making.
- Case of study on three real world products, a cellular phone, a portable PC and a camcorder to show, apply and discuss the knowledge obtained in parts one and two. Special emphasis is done in comparing the selected terminals with the state of the art (or announced) ancillary in a critical way to allow discern where the smoke is.
- As an application case of commercial technologies, two practical exercises of decision making on a reference design using design tools as thermal simulators, mechanical design tools for verification and testing methodologies is performed by the students and discussed with the teachers and students.

**List of topics to be covered**

- Design process:
  - Product development process: Product planning, design and engineering, procurement, manufacturing, marketing and distribution, service and support.
  - Design factors: Functionality, performance, user interface, form factor, battery life, cost, time-to-market, reliability.
  - System design: Product concept, innovation, creation, validation, communication, product requirements, system architecture development, trade-off analysis, cost modeling, circuit design, physical and mechanical design.
- Digital and analog processing – Microprocessor, logic devices, microcontroller, DSP,

<p>analog devices, sensors, wireless communications, system memory, mass storage.</p> <ul style="list-style-type: none"> <li>• Electronic packaging – IC packaging, discrete components, board-to-board connectors, substrates, escape routing, PCA/ module design metrics, electronic package metrics, I/O hardware.</li> <li>• Displays – Display technology overview, LCD, other display technologies, micro displays, pen input, definition of key terms.</li> <li>• Power sources – Battery technologies, implementation, high-level power analysis.</li> <li>• Mechanical design – Housing, EMI shielding, thermal management, mechanical integration, DFMA analysis.</li> <li>• Software and communications – Software hierarchy, OSI network communications model, communications and system I/O, wireless standards.</li> </ul>		
<b>Prerequisites or co-requisites</b>		
None		
<b>Course category in the program</b>		
<input checked="" type="checkbox"/> R (required)	<input type="checkbox"/> E (elective)	<input type="checkbox"/> SE (selective elective)

<b>Specific goals for the course</b>	
<b>Specific outcomes of instruction</b>	
<p>RA100: Electronic equipment design capability. RA101: User terminals design capability. RA126: Capability of understanding and selecting different approaches and methodologies for electronic equipment and user terminals design.</p> <p>RA127: Capability of understanding and selecting different approaches to implement analog and digital processing.</p> <p>RA128: Capability of understanding and selecting different electronic and equipment packages.</p> <p>RA129: Capability of understanding and selecting user interface subsystems.</p> <p>RA130: Capabilities of understanding and selecting power supply subsystems.</p> <p>RA131: Capability of understanding and selecting different mechanical design solutions.</p> <p>RA132: Capability of understanding and selecting different software alternatives.</p> <p>RA133: Capability of understanding and selecting different communication alternatives.</p>	
<b>Student outcomes addressed by the course</b>	
CT3, CT5, CE10, CE11, CE12, CE15	

<b>Bibliography and supplemental materials</b>	
<ul style="list-style-type: none"> <li>• Portable Electronics Product Design &amp; Development. Bert Haskell. McGraw-Hill.</li> <li>• Essentials of Mobile Handset Design. Abhi Naha and Meter Whale. Cambridge Wireless Essentials Series.</li> <li>• Software for the practical part, simulators and design tools</li> </ul>	

<b>Teaching methodology</b>			
<input checked="" type="checkbox"/> lectures	<input type="checkbox"/> problem solving sessions	<input type="checkbox"/> collaborative actions	<input checked="" type="checkbox"/> laboratory sessions
<b>Other:</b>			