



Programme of Module "Reti di calcolatori Evolute: Architetture"

- Code: DT0041
- Type of course unit: Elective (Master Degree in Computer Science curriculum General)
- Level of course unit: Postgraduate Degrees
- Semester: 1

Number of ects credits: (Master Degree in Computer Science) 6 (workload 150 hours)

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1	<b>Course objectives</b>	The module presents the architectures, protocols and services of the current and future telecommunication networks. After introducing the requirements (bandwidth, real time, etc.) of voice, data and video and a brief description of the legacy PSTN (TDM) infrastructures (originally designed only for phone services), the main features of an integrated multiservice IP-based backbone are described. Such IP based architecture is an essential element for the growing digital services and applications (i.e. web 2.0, cloud computing, big data, etc.) Among the various access networks the fixed access (i.e. ADSL, NGAN-fiber based, etc.) and mobile and wireless access are covered. Regarding the mobile technologies, the course presents the evolution from GSM/GPRS/EDGE to 3G systems (UMTS/HSPA) up to 4G-LTE architectures, services and applications. For the local environments wired (LAN) and wireless (WiFi) standards are described including the upcoming wifi-mobile integration. Finally Voice over IP and audio/video streaming architectures and protocols are described.
2	<b>Course content and learning outcomes (dublin descriptors)</b>	<p>Topics of the module include:</p> <ul style="list-style-type: none"> <li>• Services requirements and Network architectures (access technologies, switching nodes, etc.)</li> <li>• Basics on transmission and information theory</li> <li>• Circuit and packet switching</li> <li>• Legacy PSTN/ISDN infrastructures</li> <li>• The fixed access (Fiber to the X architectures) towards the UltraBroadband Services</li> <li>• Signaling protocols (SS7) and call scenarios (PSTN services, IN services)</li> <li>• Intro to mobile networks and GSM architecture and services</li> <li>• Mobile procedures (authentication, location update, handover, call scenario, roaming)</li> <li>• TCP/IP architecture fundamentals</li> <li>• Local Area Networks (LANs) standards and protocols</li> <li>• Wi-Fi networks and security issues</li> <li>• Mobile data networks evolution: from GPRS/EDGE to UMTS/HSPA and 4G-LTE systems; Voice over IP (VoIP) architectures and protocols (H.323, SIP) and audio/video streaming</li> </ul> <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> <li>• Understand the main features of current and future IP multimedia network architectures and Protocols</li> <li>• Analyze and evaluate the performance of fixed, mobile and wireless access networks</li> </ul>
3	<b>Course prerequisites</b>	Basics on mathematics and physics
4	<b>Teaching methods and language</b>	<p>The course consists of a main part and a series of seminars on topics such as Fiber optics and next generation access networks</p> <p><b>Language:</b> Italian</p> <p><b>Reference textbooks</b></p> <ul style="list-style-type: none"> <li>• A.R. Prasad, N.R. Prasad, <i>802.11 WLANs and IP Networking: Security, QoS, and Mobility</i>. Artech House.</li> <li>• C. Cox, <i>An Introduction to LTE: LTE, LTE-Advanced, SAE, VoLTE and 4G Mobile</i></li> </ul>

		<p><b>Communications.</b> WILEY.</p> <ul style="list-style-type: none"><li>• D. Collins, <b><i>Carrier Grade Voice Over IP.</i></b> McGraw-Hill.</li><li>• D. E. Comer, <b><i>TCP/IP principles, protocols, and architectures.</i></b> Prentice Hall.</li><li>• E. Brynjolfsson, A. McAfee, <b><i>The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies.</i></b></li></ul>
<b>5</b>	<b>Assessment methods</b>	The exam consists of a single oral test (questions and exercises)