



Programme of Course "Digital Signal Processing and Multimedia"

- Code: DT0189
- Type of course unit: Elective (Laurea Magistrale in Ingegneria delle Telecomunicazioni curriculum Comune)
- Level of course unit: Postgraduate Degrees
- Semester: 2

Number of ects credits: (Laurea Magistrale in Ingegneria delle Telecomunicazioni) 6 (workload 150 hours)

Teachers: Claudia Rinaldi

1	<b>Course objectives</b>	The goal of this module is to provide the fundamental set of concepts, algorithms and solutions related to multimedia signals and content. On successful completion of this module, the student should understand i) the fundamental operations behind digital signal processing with particular focus on frequency transforms and filtering, ii) relevant modern standards for representing audio, image and video signals depending on the specific application and related requirements. The students are asked to deal with both analysis of problems and design and developing of proper solutions from an algorithmic point of view (compression, watermarking and so on.). The module is tightly connected with the modules of Digital Communications, Embedded Systems, Radiopropagation, Telecommunication Networks II.
2	<b>Course content and learning outcomes (dublin descriptors)</b>	<p>Topics of the module include:</p> <ul style="list-style-type: none"> <li>• 1st Part: Signals and Signal Processing: Discrete Time Signals in the Time Domain</li> <li>• Discrete Time Signals in the Frequency Domain</li> <li>• Discrete-time Systems</li> <li>• Finite-Length Discrete Transforms</li> <li>• Z-Transform</li> <li>• LTI Discrete Time Systems in the Transform Domain</li> <li>• Digital Filter Structures</li> <li>• IIR Digital Filter Design, FIR Digital Filter Design</li> <li>• 2nd Part: multimedia algorithms: Audio, image and video signals representation standards and solutions</li> <li>• Compression algorithms</li> <li>• Speech coding</li> <li>• Musical audio effects implementation</li> </ul> <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> <li>• have solid knowledge of digital signal processing techniques</li> <li>• have knowledge and understanding of algorithms for multimedia signal processing</li> <li>• understand and explain the complete procedure for multimedia signal processing and transmission</li> <li>• demonstrate skill in analyzing problems, elaborate appropriate written documentation and oral presentations of problems, solutions, and validation methods</li> <li>• demonstrate capacity for reading and understanding any textbooks and scientific papers on specific matters, with particular emphasis on research oriented literature and documents that describes standard systems</li> </ul>
3	<b>Course prerequisites</b>	The student should be aware of fundamentals of analog signal processing and telecommunication networks.
4	<b>Teaching methods and language</b>	<p>Lectures, exercises, practical sessions in simulation and real test-beds, invited talks by industry speakers.</p> <p><b>Language:</b> English</p> <p><b>Reference textbooks</b></p> <ul style="list-style-type: none"> <li>• Sanjit K. Mitra, <i>Digital Signal Processing, A computer Based Approach</i>. McGraw-Hill International Edition.</li> <li>• Alan V. Oppenheim, Ronald W. Schaffer, <i>Discrete-time Signal Processing</i>. Prentice Hall Signal Processing Series.</li> </ul>
5	<b>Assessment</b>	Oral exam and presentation/discussion of a project work. Students are encouraged to

**methods**

carry out the project work in team.