IMA5002	**Digital content protection**	
Period : S9 / P2	**ECTS :** 4	**Language :** English

Organization:

- Teaching Load / Total Load : 45/90

- Lectures/Exercices/Labs/Final Exam 1: 36/0/9/0

Assessment:

Two-student group project (P) (45h) linked to real industrial applications or to national/European research projects with oral defense (D).

Final mark = Average (P, D)

Objectives:

- To be able to analyze, define, evaluate, and design the protection level of multimedia systems and services.

- To be able to accurately identify the requirements of the secure systems at the core of new Internet services (e-commerce, multimedia databases, video on demand, social networks, ...) and of the French/European society (user rights and liberties).

- To master the scientific paradigms underlying steganography, cryptography, watermarking and fingerprinting.

- To be able to turn into practice the intellectual property rights management, identification, authentication, confidentiality, and, more generally, traceability.

- To be able to design and implement reliable solutions for the emerging watermarking applications, as resulting from the theoretical/industrial/standardisation relationship).

Reference to CDIO Syllabus:

1.1.1 Mathematics (including statistics)
1.3 Advanced engineering fundamental knowledge, methods and tools
2.1.3 Estimation and Qualitative Analysis
4.7.1 Thinking creatively and imagining possibilities
4.8.8 Managing Intellectual Property

Keywords:

Digital content protection, watermarking, robustness, transparency, data payload, capacity, MPEG-21 standard.

Prerequisites:

None

Course outline:

- Multimedia content protection: encryption, steganography and watermarking – a triptych of related, yet very different applications

- The MPEG approach: IPMP (Intellectual Property Management and Protection)
    - Basic concepts
    - Intrinsic limitations
- Digital watermarking
    - Basic concepts and models
    - Watermarking within the Information Theory framework
- Advanced statistical models and methods for the multimedia protection
- Channel coding and source coding for watermarking
- Media type peculiarities in watermarking
    - Still images: inserting a large quantity of information in a very small host
    - Video: the challenge of defeating the most daring pirates
    - Audio: the strongest transparency constraints
    -3D graphics: from CAD objects to virtual reality avatars
    - Stereoscopic video: offering an additional view in watermarking.
- Watermarking and standards
    - Users, industry and research: three actors with different roles
    - When will the first standard emerge?
- Watermarking and patents
- Beyond watermarking: joint approaches
    - Hybrid watermarking / compression and watermarking / encryption schemes
    - Watermarking and indexing
    - Intermodal watermarking

Learning materials and literature :

- A.J. Menezes, P.C. van Oorschot, S.A. Vanstone. *Handbook of Applied Cryptography*, CRC Press, 2001.
- I.J. Cox, M.L. Miller, J.A. Bloom. *Digital Watermarking*, Morgan Kaufmann Publishers, 2002.
- S. Katzenbeisser, F. Petitcolas. *Information Hiding: Techniques for Steganography and Digital Watermarking*, Artech House, 2000.

Person in charge :

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Lecturers :

Guest lecturers :
- Jean NUNEZ (Galilean)
- Gérard PELIKS (Airbus Defense and Space)