IMA5003	**e-Health and bio-imaging**	
Period: S9 / P3	**ECTS:** 4	**Language:** English

Organization:

- Teaching Load / Total Load: 45/90
- Lectures/Exercices/Labs/Final Exam 1: 36/0/9/0

Objectives:

- To know the e-health challenges and their impact on public health policies in France and Europe.
- To be able to develop IST solutions for addressing such issues as digital patient record, computer-aided diagnosis, therapeutic simulation and genomics.
- To master the physical and mathematical basis underlying the major medical imaging modalities and the companion modeling, representation and analysis functionalities.

Reference to CDIO Syllabus:

1.3 Advanced engineering fundamental knowledge, methods and tools
2.1.5 Solution and Recommendation

2.4.3 Creative Thinking

4.2.6 New Technology Development and Assessment

4.7.1 Thinking Creatively and Imagining Possibilites (which builds on and expands Creative Thinking 2.4.3)

Keywords:

Imaging modalities, CT, MRI, PET, ultrasound, image segmentation, image registration, 3D rendering, anatomical modeling, micro-arrays, genomic analysis.

Course outlines:

- Medical & technological challenges for healthcare
- Medical image acquisition technologies: computerized tomography, magnetic resonance imaging, positron emission tomography, ultrasound imaging
- Spatial and frequency domains approaches for biomedical image enhancement and filtering
- Segmentation of anatomical structures from 2D/3D medical images: contour- and region-based approaches, mathematical morphology
- Image registration and multimodal data fusion
- Discovering clinical practice: visit of the Central Radiology Service at the Pitié-Salpétrière Hospital, Paris
- Static & dynamical modeling of anatomical territories
- 3D representation and visualization of medical data
- Biotechnologies: micro-arrays and genomic analysis

Assessment:

Continuous evaluation based on lab assignments (BE) and personal supervised project (P)

Final mark = Average (BE, P)

Learning materials and literature:

Literature :

- A.K. Jain, *Fundamentals of Digital Image Processing,* Prentice Hall, 1989.

- I. Bankman, *Handbook of Medical Imaging. Processing and Analysis,* Academic Press, 2000.

- W. Schroeder, K. Martin, B. Lorensen, *Visualization Toolkit. An Object-Oriented Approach to 3D Graphics*, 2nd edition, Prentice Hall 1998.

Person in charge:

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Lecturers:

From Télécom SudParis :
- Dr. Catalin FETITA
- Dr. Nicolas ROUGON
- Dr. Jérôme BOUDY

Guest lecturers:
- Prof. Philippe GRENIER (Paris VI University, Pitié Salpêtrière Hospital)
- Dr. Laurence Vancamberg (GE Healthcare)
- Dr. Alfonso Jaramillo (Genopole/UEVE)
- Dr. Daniel Stockholm (Genethon)