Course Unit Descriptor

Study Programme: Biomedical engineering

Course Unit Title: Medical Image Processing

Course Unit Code: BMI121

Name of Lecturer(s): Petrović Vladimir, Kozić Duško

Type and Level of Studies: Bachelor

Course Status (compulsory/elective): compulsory

Semester (winter/ summer): summer

Language of instruction: english

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 5

Prerequisites: none

Course Aims:.

Application of contemporary image analysis and computer vision methods to medical imaging. Introduction into basic tools in medical computer vision and image processing and solving of actual medical imaging problems through computer vision and processing systems.

Learning Outcomes:
Knowledge of medical image properties. Knowledge of useful tools for digital medical image processing for diagnostic display. Awareness of modern machine vision algorithms in medicine. Practical experience in digital processing of diagnostic medical images from different imaging modalities.

Syllabus.

- Basic terminology – digital medical imagery 2D and 3D, modalities, resolution, isotropy, dynamic images, temporal resolution, interpolation
- Multiscale image analysis – analysis and synthesis processes, pyramidal image representation, wavelets and Discrete Wavelet Transform
- Image processing for presentation and analysis – digital x-ray images, properties of raw image data, dynamic range and MTF corrections, image structure enhancement, normalisation, sources and removal of noise, tone scaling
- Multimodal diagnostic image fusion – visualisation of different modalities in a single image, structure fusion methods, monochromatic multi-scale fusion, colour spaces and colour fusion
- Optimisation – advanced local and global optimisation methods, objective functions and distance measurement, hypothesis testing
- Registration – image normalisatin, (perspecte) image transformarions, deformations, deformable registration, deformation fields, objective measures (MI, absolute differences, sum of squares)
- Segmentation – iluminatin segmentation, snakes, level sets, mean shift, graf cuts, Markov fields
- Shape and appearance modeling – statistical shape and texture models, appearance models, active appearance models (AAM)

Required Reading:

Weekly Contact Hours: 2	**Lectures: 3**	**Practical work: 0**

Teaching Methods:
Oral lectures; computer lab exercises in adequate software packages

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Attendance			
Computer exercises			
Tests (4x)			