Course Unit Descriptor

Study Programme: Biomedical engineering
Course Unit Title: Biomedical signals processing and analysis
Course Unit Code: BMI123
Name of Lecturer(s): Bajić Dragana, Petrović Milovan
Type and Level of Studies: Bachelor
Course Status (compulsory/elective): compulsory
Semester (winter/ summer): winter
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:. Introduction of advanced biomedical signal processing methods adapted to high demands in practice, considering the limitations of signal processing methods and ways of overcoming them, learning about time-frequency analysis methods and multiresolution analysis with applications to one-dimensional signals
Learning Outcomes: Analysis of correlated processes and specific processing methods; power spectral density estimation; adjustment of processing methods for the analysis of non-stationary signals, types of time-frequency analysis, wavelets transformation, feature selection principles and relevant classification methods in diagnostic decision making
Syllabus. Analysis of coupled and correlated physiological processes, examples of coupled processes and interactions between systems - Signal characterization in the frequency domain: estimation of power spectral density (PSD) (parametric and non-parametric methods, the use of window functions, resolution and spectral leakage), measures that can be derived from the spectral density: relation of power, moments. Illustrative examples of application of the methods in the frequency domain - Specific analysis of non-stationary signal illustration of the examples of non-stationary biomedical signals, the use of time-frekvecnisjkih methods and specific, signal segmentation for further analysis, adaptive filters - Time-frequency methods, Multiresolution analysis, wavelets transform and discrete filter banks, the application of one-dimensional biomedical signals - The application of pattern recognition in the diagnostic decision-making, application examples and unsupervised classification methods, selecting relevant features with respect to the physiological background, the measures of diagnostics accuracy and reliability of the classifier
Required Reading:

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

Teaching Methods: Lectures, laboratory analysis using the signals from patients and laboratory animals, obtained by courtesy of various research institutions from Belgrade; visit to hospital and cardiovascular laboratory to observe 1D signal acquisition, and to Imaging center to observe CT, PET, NMR.
Knowledge Assessment (maximum of 100 points):

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