

## SUBJECT DESCRIPTION FORM

**Subject Code:** HTI3113

**Subject Title:** Biosignal and Image Processing

**Credits:** 3

**Pre-requisites:** AMA2152 Applied Mathematics II  
or equivalent

**Responsible Dept:** Department of Health Technology & Informatics

**Responsible Member of the Academic Staff:**

Dr. Yongping ZHENG

**Contact Hours:**

Lecture	33 hours
<u>Lab</u>	<u>9 hours</u>
Total contact hours	42 hours

**Rationale:**

Signals and images are routinely used for medical diagnosis and treatment. However, raw signals and images have to be post-processed using digital signal processing techniques for enhancement of quality and extraction of useful information. Therefore, it is important that professionals in the health technology field to have a good foundation of digital signal processing techniques.

**Learning Outcomes:**

At the end of this subject, students should be able to

- Have a solid theoretical foundation on digital signal processing;
- Classify biomedical signals into different categories according to various features;
- Understand the relationship between systems and signals;
- Understand the basic techniques involved in biomedical image processing;
- Describe systems or filters using input-output equation, impulse response, frequency response, and transfer function.
- Use FFT for signal analysis with the understanding of sampling effects and windowing effects;
- Gain practical skills in using MatLab to implement filters for the processing of biomedical signals to improve signal quality;
- Design basic digital signal processing approaches using Matlab with the consideration of data acquisition, signal frequency analysis, and filter selection.

**Syllabus:**

Linear systems, convolution, Laplace transform, frequency response, Fourier transform, FFT, sampling and series, z-transform, transfer functions, digital filters, windowing, power spectrum estimation, correlations, biomedical imaging modalities, image visualization, image enhancement, image compression, image registration, picture archiving and communication system (PACS), MatLab.

**Teaching-Learning Methods:**

Students will learn the principles of biomedical signal and image processing in lectures. Laboratory sessions will provide the students with practical experiences for biosignal and image processing using MatLab.

**Assessments:**

Continuous assessment:	40%
Final examination:	60%

Note: To pass this subject, students must obtain grade D or above in BOTH the continuous assessment and the examination.

**Reference Materials:**

1. Bruce EN. Biomedical Signal Processing and Signal Modeling. John Wiley and Sons, New York, 2001.
2. Devasahayam SR. Signals and Systems in Biomedical Engineering: Signal Processing and Physiological Systems Modeling, Kluwer Academic/Plenum Publishers, New York, 2000.
3. Akay M. Biomedical Signal Processing, Academic Press, San Diego, 1994.
4. Balmer L. Signals and Systems: An Introduction, 2<sup>nd</sup> ed., Prentice Hall, London, 1997.
5. Robb RA. Biomedical Imaging, Visualization, and Analysis, A John Wiley & Sons, Inc, Publication, New York, 2000.
6. Castleman KR. Digital Image Processing, Prentice Hall, Englewood Cliffs, New Jersey, 1996.
7. Bronzino JD. The Biomedical Engineering Handbook, CRC Press, Boca Raton, Florida, 2000.