SUBJECT DESCRIPTION FORM

SUBJECT CODE: HTI3111

SUBJECT TITLE: Electrophysiological Instrumentation and Measurements

CREDITS: 3

PRE-REQUISITES: Nil

RESPONSIBLE DEPARTMENT: Department of Health Technology & Informatics

RESPONSIBLE MEMBER OF THE ACADEMIC STAFF:

Dr. Raymond K.Y. TONG

CONTACT HOURS & ESTIMATED STUDENT EFFORTS:

Lecture	36 hours
Tutorial	6 hours
Total Contact	42 hours

RATIONALE:

Electrophysiological Measurements covers principles, instrumentation and measurements of electrical signals arisen from active nerves and muscles, and the design of amplifier for measuring bioelectrical signals from skin surface. Understanding the measurements of Electromyogram (EMG), Electrocardiogram (ECG), Electroencephalogram (EEG), Somatosensory Evoked Potentials (SEP), Visual Evoked Potentials (VEP), Auditory Evoked Potentials (AEP), Transcranial magnetic stimulation (TMS) and Nerve Conduction Studies (NCS) are important for clinical diagnosis and monitoring.

Learning Outcomes:

On successfully completing this subject, students will be able to:

- Describe and outline the relationship between bioelectric signals in human body and measurement devices
- Describe the routine clinical electrodiagnosis and monitoring procedures
- Describe and design the instrumentation for amplifying the bioelectrical signals
- Interpret and analyze bioelectrical signals using signal processing techniques for enhancement of quality and extraction.
- Handle the measurements of Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG)

- Handle the measurements of Nerve Conduction Studies (NCS) and Compound Muscle Action Potentials (CMAP)
- Understand the principles of Somatosensory Evoked Potentials (SEP), Visual Evoked Potentials (VEP), Auditory Evoked Potentials (AEP) and Transcranial magnetic stimulation (TMS)
- Identify and solve any noise interference during measurements
- Describe the electrical safety during electrophysiological measurements

SYLLABUS:
Signals and Noises, Action Potentials, Design of Amplifier for Bioelectrical signals, Electromyogram (EMG), Electrocardiogram (ECG), Electroencephalogram (EEG), Somatosensory Evoked Potentials (SEP), Visual Evoked Potentials (VEP), Auditory Evoked Potentials (AEP), and Nerve Conduction Studies (NCS) and Compound Muscle Action Potentials (CMAP).

TEACHING-LEARNING METHODS:
There will be 36 hours lecture; and 6 hours tutorial and laboratory demonstrations. Students will learn additional example problems in tutorial sessions.

ASSESSMENT:

Continuous Assessment	60%
Final Examination	40%

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

REFERENCE MATERIALS:

1. Webster JG (Editor). Medical Instrumentation: Application and Design, 3rd ed., John Wiley & Sons, New York, 1998.
2. Carr JJ, Introduction to Biomedical Equipment Technology, (4th ed.), Prentice Hall, 2001
3. Akay M (Editor), Wiley Encyclopedia of Biomedical Engineering, Wiley, 2006
4. Gulrajani, RM, Bioelectricity and Biomagnetism. New York : Wiley, 1998.
5. Lenman JAR and Ritchie AE, Clinical Electromyography, (4th ed.), Churchill Livingstone, Edinburgh, 1987.
6. Malmivuo J, Bioelectromagnetism : Principles and Applications of Bioelectric and Biomagnetic fields, New York : Oxford University Press, 1994
7. Picton TW (ed), Handbook of Electroencephalography and Clinical Neurophysiology, Volume 3: Human Event-related Potentials, Elservier, Amsterdam, 1988.
8. Regan D, Human Brain Electrophysiology: Evoked Potentials and Evoked Magnetic Fields in Science and Medicine, Elsevier, New York, 1989.
9. Ward DE and Camm AJ, Clinical Electrophysiology of the Heart, Edward Arnold, Maryland, 1987.