Electrical and Computer Engineering 791
Sensory and Neuromuscular Engineering

Objective:

To give the student a more detailed knowledge of engineering applications to sensory and neuromuscular physiology and medicine. The student will be introduced to sensory and neuromuscular physiology from an engineering perspective including equivalent circuits and models. A second objective is to gain an understanding of the origin, acquisition and processing of EEG signals. The student will also gain experience in collecting electrophysiological or other physiological signals and in analyzing electroneurographic and electroencephalographic (EEG) signals.

Instructor:

Dr. Hubert de Bruin
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Text:

No course text. A selection of current journal papers will be used for some of the topics

References:

J.G. Webster , *Medical Instrumentation, Application and Design*, Third Edition, Houghton Mifflin, 1998.

A.C. Guyton, *Basic Human Physiology, Normal Function and Mechanisms of Disease*, (a number of different editions and variations)

B. Katz, *Nerve, Muscle and Synapse*,

S. Deutsch and A. Deutsch, *Understanding the Nervous System: An Engineering Perspective*, IEEE Press, 1993. ISBN 0-87942-296-3
Copies will be ordered as required

J. Malmivuo and R. Plonsey, *Bioelectromagnetism: Principles and Applications of Bioelectric and Biomagnetic Fields,* Oxford University Press, 1995

P. L. Nunez and R. Srinivasan, *Electric fields of the brain: the neurophysics of EEG*, 2nd Edition, Oxford University Press, 2005.

Course Outline: (Subject to Change)

- Sensory and neuromuscular anatomy and physiology.
- Acquisition and analysis of Electromyographic and Electroneurographic signals to determine normal and pathological neuromuscular function
- Models of the myelinated and unmyelinated nerves including applied stimulating electrical fields
- Surface and subcutaneous electrical fields in tissue resulting from single or populations of active nerve or muscle fibres
- Origin and acquisition of EEG signals
- Processing of EEG signals
- Functional Electrical Stimulation (FES) and Magnetic Stimulation (FMS) in rehabilitation
- Neuroprostheses and sensory system interfaces.

Assessment:

Term Project (100%)

Term II