

1. Calendar Information

ENEL 563 Biomedical Signal Analysis

Introduction to the electrocardiogram, electroencephalogram, electromyogram, and other diagnostic signals. Computer techniques for processing and analysis of biomedical signals. Pattern classification and decision techniques for computer-aided diagnosis. Case studies from current applications and research.

Course Hours: H(3-2)

Calendar Reference:

<http://www.ucalgary.ca/pubs/calendar/current/electrical-engineering.html#7634>

2. Learning Outcomes

In this course, you:

- Learn about the genesis of biomedical signals such as the action potential, EMG, ECG, EEG, and heart sound signals.
- Review basic concepts of signals, systems, and digital filters.
- Study the characteristics of biomedical signals: stationarity, periodicity, rhythm, wavelet, epoch, episode, transient.
- Learn signal processing techniques for filtering, noise removal, cancellation of interference, and characterization of signals.
- Design and implement techniques for the detection of events such as the QRS complex, heart sounds and murmurs, and the dicrotic notch.
- Explore techniques for the analysis of wave shape and waveform complexity.
- Learn about spectral analysis of biomedical signals.
- Investigate pattern classification and decision techniques for computer-aided diagnosis.

3. Timetable

Section	Days of the Week	Start Time	Duration (Minutes)	Location
L01	TR	9:30	75	ENF 334
B01	W	9:00	110	ICT 217

4. Course Instructor

Course Coordinator

Section	Name	Phone	Office	Email
L01, B01	Dr. Raj Rangayyan	(403) 220-6745	ICT 440	ranga@ucalgary.ca

5. Examinations

The following examinations will be held in this course:

- One exam during the term.
- One final exam at the end of the term.

Note: The timetable for Registrar Scheduled exams can be found at the University's Enrolment Services website, <http://www.ucalgary.ca/registrar/>.

6. Use of Calculators in Examinations

No calculators, electronic devices of any kind, books, or notes are permitted in the examinations.

7. Final Grade Determination

The final grade in this course will be based on the following components:

Component	Weight
Laboratory Project for the Duration of the Term	30 %
Midterm Examination	20 %
Final Examination	50 %

TOTAL	100 %
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Notes:

- a) It is necessary to earn a passing grade on the final exam in order to pass the course as a whole.
- b) The laboratory project must be completed satisfactorily to pass the course as a whole.
- c) Conversion from a score out of 100 to a letter grade will be done using a scale determined after the final examination has been marked. This allows the creation of a scale appropriate to the relative difficulty of the term work and the final exam.

8. Textbook

The following textbook is required for this course:

Title	Biomedical Signal Analysis
Author(s)	R. M. Rangayyan
Edition, Year	First, 2002
Publisher	IEEE and Wiley, New York, NY

9. Course Policies

All Schulich School of Engineering students and instructors have a responsibility to familiarize themselves with the policies described in the Schulich School of Engineering Advising Syllabus available at:

<http://schulich.ucalgary.ca/undergraduate/advising>

10. Additional Course Information

Background Review and Preparation: You are advised to review the textbook and notes for ENEL 327 Signals and Transforms. You are also advised to familiarize yourself with MATLAB and the associated Signal Processing Toolbox.

Regarding the Laboratory Project: The laboratory project will involve the development of MATLAB programs to process biomedical signals and analysis of the results obtained. Computer lab experiments shall be performed in groups of four students each. A few projects will be made available to select from during the first two to three weeks of the term. A detailed technical report on the laboratory project and the related exercises assigned must be submitted on or before the last day of lectures (12th of April 2012).

The laboratory project must be completed satisfactorily to pass the course as a whole.

Updates and Further Information: Lab projects, data files, previous examinations, updates to the book, solutions to selected problems, and additional material are posted on the website www2.enel.ucalgary.ca/People/Ranga/enel563

Prerequisite: ENEL 327 Signals and Transforms

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