ENEL 563 Biomedical Signal Analysis
Professor Rangaraj M. Rangayyan
Specifications for Projects and Reports

To obtain a credit for the course, you are required to work on a **Biomedical Signal Analysis Project** of your choice. The research, programming, data analysis, and report for the project must all be conducted, performed, and written on your own (in teams of two or three students each).

Projects must involve computer implementation (in MATLAB or any other language of your choice) of algorithms for digital signal processing and analysis, testing of the methods with real-life signals from any biomedical application area of your choice, and analysis of the results.

The algorithms you study and implement need not be original, but must be technically advanced and sophisticated. You may select a few previously published methods for filtering for the removal of artifacts, recognition or detection of events, and time-domain and/or frequency-domain analysis of biomedical signals, study them, implement them, test them with biomedical signals, and report on your own findings. The studies related to the project must be your own.

A full-fledged **written project report** (in one pdf file) must be submitted by email to ranga@ucalgary.ca on or before **15 April 2015: no extensions.**

The project report must include an introductory **review of your chosen subject area and problem**, complete **technical details of the methods** studied and implemented (**equations, procedures, and algorithms**), **illustrations of results**, **critical analysis and discussion of the results obtained**, and **references**. More attention should be paid to the signal processing and analysis techniques studied than to the specific type of signal used or the application area of the project. Do not include your computer code. See papers in the IEEE Transactions on Biomedical Engineering http://ieeexplore.ieee.org/xpl/tocresult.jsp?isnumber=5672100 for examples of research reports.

In a statement signed by each team member submitted with the report, please specify how the project workload was shared, in percentage, between the members of your group; for equal assignment of marks, it is expected that each member contributes equally to the project.

The recommended length of the report is **eight pages** in the IEEE Transactions on Biomedical Engineering format with two columns and single-spaced printing, including illustrations and references. For assistance on preparing and formatting your report, visit http://www.ieee.org/publications_standards/publications/authors/authors_journals.html

Please **submit your final project report in a single pdf file** to ranga@ucalgary.ca

Note: You are encouraged to meet me regularly during the term. Please email me to schedule meetings to discuss your project, present and discuss ongoing work and results, and maintain progress in the project. Do not leave large portions of the project work for later parts of the term!

Description of a generic project

If you wish to develop your own project, please ensure that the following requirements are met:

- Your project involves the **processing of real-life biomedical signals**. Several signals are available on my website
  http://people.ucalgary.ca/~ranga/enel563/SIGNAL_DATA_FILES/

  Refer to lab exercises in the textbook and from previous years available in the folders {2011 to 2014}files under /enel563 for details regarding the signals and related lab exercises.

  Signals of various types are available in http://www.physionet.org/physiobank/   made available by the National Institute of Biomedical Imaging and Bioengineering (NIBIB), an institute within the National Institutes of Health (NIH), USA.

- Your project includes **at least two methods to filter and remove noise or artifacts** (see Chapter 3 of the textbook).

- Your project includes **at least one method to detect and segment events, episodes, components, or parts of the input signal(s)** for further analysis (see Chapter 4 of the textbook).

- Your project includes **at least two methods for parametric representation and quantitative analysis of signals** or their components (see Chapters 5 and 6 of the textbook).

- Your project includes **at least one method for pattern classification and diagnostic interpretation** of signals or their components (see Chapter 9 of the textbook).

Wish you success with your project and studies!