

## **Justification Page for: Engineering Measurement Techniques and Statistics ENSC 280**

Date: October 17, 2008

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To Replace: Physics Laboratory II (PHYS 231)

The proposed course will be a second year core course for MSE curriculum. The main objective is to teach students data analysis and measurement techniques. It is intended to deliver the course so that it horizontally integrates with four other courses that simultaneously run with this course. Students will learn to analyze data from different domains, determine uncertainty, and more importantly design an experimental investigation. The course is aimed at teaching students a sound understanding of data representation, random data interpretation and analysis. The emphasis will be on engineering systems, applications and integration with other MSE courses. Matlab tutorial and laboratory sessions are included in the course delivery. The objectives are described below:

- **To provide fundamentals of measurement techniques and required applied statistics:** The existing curriculum lacks a course on applied statistics. The knowledge of probability, statistics, and measurement techniques is of fundamental importance in any engineering program and engineering graduates are expected to be able to design an experiment, gather data with previous planning and analyze the results. Following CEAB recommendations, application to the identification and solution of practical engineering problems in engineering programs should be stressed. It is a first level course on *applied statistics*, its applications, and probability as a way to measure uncertainty, and not a course on the *theory of probabilities*. Moreover, the proposed course will cover the fundamentals of data analysis and measurement techniques.
- **To omit overlaps and repeated contents from the MSE curriculum:** A major portion of the existing Physics Laboratory II (PHYS 231), to be replaced by the proposed course, involves fundamentals of mechanics, heat, optics, electricity, magnetism which are fully covered in other courses in the curriculum.
- **To expose MSE undergrad to Engineering concepts and applications as early as possible in the curriculum:** The proposed course, with the laboratory sessions, prepares students for data analysis and interpretation. The focus of this course will be on problem-solving skills with a particular emphasis on interdisciplinary work, needed in Mechatronics program.
- **Practical Application Oriented:** In addition to the fundamental concepts, the emphasis will also be on engineering applications throughout the course. This includes: lectures, assignments, laboratories, and tutorials. To further prepare undergraduate students, the proposed course includes: Matlab tutorials and setting-up experiments in the laboratory.
- **Integration with Mechatronics Program:** Throughout the course, reference will be made to other Mechatronics topics such as: control systems, vibration and dynamic systems, microfluidics and

thermal MEMS applications. Experimental studies and data analysis play a key role in “integrated design” which is an essential part of MSE program.