Concordia University
Faulty of Engineering and Computer Science

Course Outline
MECH 370 – Modelling, Simulation and Control Systems
(Formerly: Modelling and Analysis of Physical Systems)
Winter 2012

Instructor:

Prof. Youmin Zhang
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Concordia University
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Textbook:

C. M. Close, D. K. Frederick and J. C. Mewell, *Modeling and Analysis of Dynamic Systems*, 3rd edition, John Wiley and Sons Inc., 2002, ISBN: 0-471-39442-4.

Lectures:

Time: Wednesdays and Fridays, 11:45 - 13:00; **Location**: H-531

Tutorials:

TA (Hadi Amoozgar, EVs2.109, x7064):	Fridays, 13:15 - 14:05;	Location: H-427
TB (Carlos Agudelo, EV13.235, x7098):	Fridays, 13:15 - 14:05;	Location: H-564
TC (Hadi Amoozgar, EVs2.109, x7064):	Wednesdays, 14:45 - 15:35;	Location: H-427

Laboratory:

Labs will be started from Jan. 9, 2011 (Week 1). Lab locations are H-843 (for Lab #1) and H-822 for remaining labs. Please see the detailed lab schedule in the documents available at the course website.

A passing mark in laboratory is mandatory. You are required to perform all the experiments. If you miss more than one experiment, you will receive a grade R.

Lab Demonstrators:

TI, TJ, TM: Iman Sadeghzadeh (iman_59ir@yahoo.com, EV S2-109, x7064)
TK,TL,TN: Farid Sharifi (fsharifi@gmail.com, EV S2-415, x7058)

Lab Specialists:

Belal Ibrahim, belal@encs.concordia.ca, H0011-1, x2513
N. Suresh, suresh@ece.concordia.ca, H851.02, x3157

Marker:

Eva Abdulmalak (eva.abdulmalak@gmail.com)

Design Soft Skill:

The following design soft skill will be included in this course:

Engineering Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modelling, to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.

TEACHING – This course focuses on introduction to the methodologies and tools for modelling, simulation and analysis of different types of physical systems, from simple to complex, ranging from mechanical system to electrical systems, with an understanding of the dynamics of systems for the purposes of modelling and analysis.

PRACTICE – Problems given in the assignments will involve significantly the activities and tools as mentioned in the above.

EVALUATION – This aspect will be covered by assignment and examination problems.

Lecture Topics:

1. Definition and classification of dynamic systems (chapter 1)
2. Translational mechanical systems (chapter 2)
3. Standard forms for system models (chapter 3)
4. Block diagrams, signal flow graphs and computer simulation using Matlab/Simulink (chapter 4)
5. Rotational mechanical systems (chapter 5)
6. Electrical systems (chapter 6)
7. Time domain analysis and solution techniques for linear systems (chapter 7)
8. Transfer function models analysis (chapter 8)
9. Nonlinear systems and linear representation of nonlinear components (chapter 9)
10. Electromechanical (and electrohydraulic) systems (chapter 10)
11. Characteristics and performance of linear feedback control systems; System stability (chapter 13)

Grading Scheme:

Two Quizzes	5 % of each
Laboratory	10% (need 70 % to pass)
Midterm Exam	30 %
Final Exam	50 %
Total	100 %

A test can be missed only for valid reasons. You must have a letter from a doctor or a university official to verify your excuse.

Course Webpage:

Assignment solutions, lecture notes, review material, and other types of important information will be regularly posted on the course webpage at:

http://moodle.concordia.ca/moodle/

Students are recommended to check the webpage frequently or at least once a week.

<u>Important Notes</u>:

- The assignment problems and solutions can be downloaded from the course website.
- You do not have to submit the assignments.
- Only "Faculty Approved Calculators" are allowed in the exams which are SHARP EL-531 or CASIO FX-300MS.
- All cell phones <u>must</u> be turned off before entering the class.
- Electronic communication devices including cell phones are <u>not</u> allowed in the exams.
- Follow the Code of Conduct set by the Concordia University. Details can be obtained from the following website.
  http://relish.concordia.ca/Legal_Counsel/policies/english/AC/Code.html, OR
  See Section 16.3.13 (page 64) of the undergraduate calendar.

ADDENDUM TO THE COURSE OUTLINE

ACADEMIC CONDUCT ISSUES
The basic ten rules that make you a good engineer

The B. Eng. program is set to satisfy most of the requirements for your education and prepares you for a professional engineering career that requires dedication and knowledge. What you learn, and how you learn, will be used extensively in your engineering profession for the next 30 to 40 years. Therefore, the four years spent in the engineering program are crucial towards your professional formation. The first step is for you to learn to "think like an engineer" which means:

- accept responsibility for your own learning
- follow up on lecture material and homework
- learn *problem-solving skills*, not just how to solve each specific homework problem
- build a body of knowledge integrated throughout your program
- behave responsibly, ethically and professionally

One of the mainstays of being a professional engineer is a professional code of conduct and as an engineering student this starts with the Academic Code of Conduct (Article 16.3.14 of the undergraduate calendar). However, you may encounter situations that fall outside the norm and in such cases, you use your common sense.

Further, the following issues should be given serious consideration:

1) Attendance at lectures and tutorials are major learning opportunities and should not be missed. The labs represent a unique opportunity for you to acquire practical knowledge that you will need in your career. Class and tutorial attendance is important for you to comprehend the discipline and make the connections between engineering skills. You are strongly encouraged to participate in the class, ask questions and answer the instructor's questions. Tutorials are just extensions of the classes in which application of the concepts presented during the lectures are presented and problems are practically solved.

2) The decision to write tests that are not mandatory is entirely yours. For example, midterm test are often stated in many courses as optional. However, one the objectives of midterms is to check on your comprehension of the material and allow time for whatever action is necessary (from more study time to discontinuing a course). Plan to attend the class tests even if they are not mandatory. If you pay attention in the lectures, it will take you significantly shorter time to comprehend the material. **Note also** that if you are in the unfortunate position of being unable to write a final exam due to medical reasons and seek a deferral, this may not be possible if the instructor has no information indicating that you have been attending the course and assimilating the material (ie through midterms, quizzes, assignments etc).

3) Homework is usually mandatory and it has some weight in the final grade (such information is given in the course outline). Homework may also be conceived as training material for the class tests. Under all circumstances, it is highly recommended to carry out the home work on time and submit it on the prescribed date. Late submissions are not granted to individual cases regardless of the reason. This is part of the training for being in the workforce where deadlines have to be met. Please, plan your work such that you submit all the assignments and lab reports on time and in the correct place (not in the corridor or on the street!).

4) Office hours with tutors, lab instructors or class instructors are listed in the course outline/website/office doors. Please respect these office hours and in case you have a serious conflict, contact the instructor

asking for a special time arrangement.

5) Class tests (midterms, quizzes) are returned to the student. The final exams are not. If you wish to see your exam paper, be aware that most instructors allow only a narrow window of time for that purpose. For the fall term, exams may usually be reviewed in January and May for the spring term.

6) When you see your marked work (assignments, midterms, final exam etc), be aware that you are supposed to review your material and see the type of errors you made and if marks have been added incorrectly. This is not an opportunity to try and "negotiate" a higher grade with the instructor. If you believe that your grade is not right, you may apply for a formal Course Reevaluation through the Birks Student Centre.

7) Writing tests and exams represents a major component of your course work. These tests and exams have rigorous requirements such as:
   - **No cell phone or other communication enabling tool is allowed on the student** during the examination period.
   - Only **specified faculty calculators** are allowed during tests and exams unless otherwise indicated by the instructor.
   - Usually, **no materials** are allowed in the exam unless otherwise announced.

   Get used to signing in and out of your exam. Make sure that you leave your exam papers with the invigilator. There are rules concerning general exam issues in the UG Calendar. These requirements are there to eliminate any possible misunderstanding and you are asked to **respect the rules**. Disciplinary measures are taken when the rules are not followed.

8) Respect your colleagues and those that you meet during the class: tutors, instructors, lab instructors, technical personnel, assistants, etc. Use appropriate communication means and language. Be considerate for all human beings. This includes small things such as turning off cell-phones before a class begins. Concordia University is a very diverse group of people and a very large multicultural community.

9) Communication is part of your future profession. Learn how to communicate effectively and efficiently in the shortest time possible. Write short but meaningful e-mails, make effective phone calls, etc. If your instructor accepts emails make sure that your request is clear with the course number and your name in the *Subject* line. Do not ask for special treatment as instructors have to treat all students equitably.

10) Respect all the above and you will get closer to your future profession.