

MECH 420: Sensors and Actuators – Fall 2015

Instructor: Boris Stoeber
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Office Hours: Tu 5-6pm, Th 11-noon
no office hour on Sep 24, Oct 13, Nov 17, Nov 19

Prerequisites: MECH360, MECH364, MECH366

Course Overview:

- Engineering principles of sensor and actuator systems
- Sensing principles for the measurement of position, velocity, acceleration, angular velocity, strain, torque, force, pressure, flow rate
- Actuator principles and applications
- Practical experience with sensor and actuator systems

MECH 420 Laboratory

TAs: Shaun Laidlow
9spl2@queensu.ca

Amir Farzad Forughi
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Lab Schedule

Lab	Week of	Title
# 1	Sept 28 2015 Oct 05 2015	Data Acquisition and Proximity Sensors for Object Detection
# 2	Oct 12 2015 Oct 19 2015	Optical Encoder and Torque Sensor
# 3	Oct 26 2015 Nov 02 2015	Dynamic Transducer Transfer Characteristics – Time Domain
# 4	Nov 09 2015 Nov 16 2015	Dynamic Transducer Characteristics – Frequency Domain
# 5	Nov 23 2015 Nov 30 2015	Hydraulic System with Servo Valves and Sensors

time: W 10am-12pm, 12-2pm, F 10am-12pm, 4-6pm, location: 1210 Fred Kaiser Building

Each lab report needs to be turned in with the TA or with the instructor no later than 1 week after carrying out your MECH420 laboratory session.

MECH 420 Course Outline

Date	Subject
W 09/09/2015	Introduction
F 09/11/2015	Sensors: definitions, transfer characteristics
W 09/16/2015	Static transfer characteristics
F 09/18/2015	Dynamic Systems
W 09/23/2015	Dynamic transfer characteristics
F 09/25/2015	Potentiometers, strain gauges
W 09/30/2015	Wheatstone bridge, compensation, resistive pressure sensor
F 10/02/2015	Load cell, piezoresistive accelerometer, 4-pt probe measurement
W 10/07/2015	Resistive temperature sensors
F 10/09/2015	Capacitive sensors: position, pressure, acceleration, microphone
W 10/14/2015	Inductive sensors
F 10/16/2015	Magnetic sensors
W 10/21/2015	Electrostatic actuators
F 10/23/2015	Midterm 1 (material: until including “Magnetic sensors”)
W 10/28/2015	Electrostatic resonators and gyroscopes
F 10/30/2015	Piezoelectric transducers
W 11/04/2015	Piezoelectric transducers
F 11/06/2015	Electrodynamics systems
W 11/11/2015	Remembrance Day
F 11/13/2015	Thermoelectric devices
W 11/18/2015	Midterm 2 (material: “Electrostatic actuators” – “Thermoelectric devices”)
F 11/20/2015	Electromagnetic transducers
W 11/25/2015	Magnetostrictive actuators
F 11/27/2015	Flow sensors
W 12/02/2015	Flow sensors
F 12/04/2015	Resonators and acoustic wave devices

time: 3-4 pm, location: CEME 1215

Assignments are posted on Connect along with solutions.

Example midterms will also be posted on Connect.

Marking Scheme:

Pre-labs:	2%
Laboratory:	16%
Midterm 1:	16%
Midterm 2:	16%
Assignments:	0%
Final:	50%

According to UBC Mechanical Engineering policies, **the combined written exams need to be passed to pass the course.**

Optional Textbook:

Sensors and Actuators: Control System Instrumentation, C. W. de Silva, CRC Press, ISBN: 1420044834, 2007.

This book does not cover all the topics in this course.

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

link to the relevant Calendar section:

<http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0>

v. 15/08/30