



**CAMOSUN COLLEGE**  
**School of Trades & Technology**  
**Dept of Mechanical Engineering Technology**

**MENG 284 – Robotics & Automation**  
**Winter 2018**

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## **COURSE OUTLINE**

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The calendar description is available on the <http://camosun.ca/learn/calendar/current/web/meng.html> web @ \_\_\_\_\_

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*Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

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### **1. Instructor Information**

(a) Instructor	Imtehaze Heerah
(b) Office hours	M (12.30 – 13.20), M (14.30 – 15.20), Tu (14.30 – 16.20)
(c) Location	TEC 117
(d) Phone	250 370 4510 <b>Alternative:</b> _____
(e) E-mail	<a href="mailto:heerah@camosun.ca">heerah@camosun.ca</a>
(f) Website	<a href="https://sites.camosun.ca/imtehazeheerah/meng-284-robotics-automation/">https://sites.camosun.ca/imtehazeheerah/meng-284-robotics-automation/</a>

### **2. Intended Learning Outcomes**

*(If any changes are made to this part, then the Approved Course Description must also be changed and sent through the approval process.)*

Upon successful completion of this course, a student will be able to:

- Identify robotics and automation applications.
- Classify industrial robots by kinematic structure, work envelope, control system and actuation.
- Identify common robotic and automated systems components such as actuators, power transmission systems, sensors and grippers.
- Create control programs for a 5-axis robot.
- Mathematically analyze planar & simple spatial robotic systems for position control.
- Understand and know when to use fixed, programmable and flexible automation systems including computer integrated manufacturing (CIM) and automated work cells.
- Identify automation support systems including: materials handling, storage & retrieval, inspection & testing, identification & tracking.
- Cooperate as part of a team on an automation project.

### **3. Required Materials**

- (a) Texts  
None

(b) Other  
Handouts posted online

#### 4. Course Content and Schedule

(Can include: Class hours, Lab hours, Out of Class Requirements and/or Dates for quizzes, exams, lecture, labs, seminars, practicums, etc.)

In-class workload: 3 hrs Lecture, 2 hrs Lab

Out-of-class workload: 5 hrs

##### COURSE OUTLINE:

1. Introduction to Robotics and Robotic Applications
2. Industrial Robots Classification – Kinematic Structure, Work envelope, Control System & Actuation
3. Robot Kinematic Design
4. Electric Actuators & Control Techniques - DC Motors, Stepper Motors
  - a. Speed Control (PWM, Dynamic Braking & Plugging)
  - b. Direction control using H-bridges
5. Robot Transmission Components - Conventional components, Ballscrew assemblies, Harmonic Drives
6. Sensors
  - a. Sensor Characteristics & Construction
  - b. Position Sensors (Resistive, Capacitive, Inductive & Optical)
    - Potentiometers, LVDT, Eddy Currents sensors, Hall effect sensors, Ultrasonic sensors, Infrared sensors, Encoders (Absolute & Incremental)
  - c. Velocity & Acceleration Sensors
  - d. Force & Tactile Sensors
  - e. Vision systems
7. Robot controllers & programming
8. Kinematic analysis of Planar & SCARA Robots
  - a. Position analysis
  - b. Robot resolution
  - c. Velocity analysis
9. Introduction to Automation – Fixed & Flexible Automation; Automated Workcells - Materials Handling, Storage, Assembly, Inspection & Testing and Identification & Tracking
10. Overview of Automation Systems – Flexible Manufacturing Systems & Computer Integrated Manufacturing Systems

#### 5. Basis of Student Assessment (Weighting)

*(Should be directly linked to learning outcomes.)*

1. Lab Work & Assignments:	20%
2. Project I:	20%
3. Project II:	15%
4. Midterm:	20%
5. Final Exam:	25%

#### 6. Grading System

*(If any changes are made to this part, then the Approved Course description must also be changed and sent through the approval process.)*

*(Mark with "X" in box below to show appropriate approved grading system – see last page of this template.)*

Standard Grading System (GPA)

Competency Based Grading System

## 7. Recommended Materials to Assist Students to Succeed Throughout the Course

## 8. College Supports, Services and Policies



### Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

### College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

### College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

## A. GRADING SYSTEMS <http://www.camosun.bc.ca/policies/policies.php>

The following two grading systems are used at Camosun College:

### 1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

### 2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

## B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://www.camosun.bc.ca/policies/E-1.5.pdf> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.