



Course Number	ARCH 680.24 L07	Classroom	CBDL workshop
Course Name	Integrative Design Intro Robotics		
Pre/Co-Requisites			
Instructor	Guy Gardner	Office Hours/Location	by appointment
	Email: gegardne@ucalgary.ca	Phone: 403 471 0183	
Class Dates	In Person, Friday 9AM -12PM		
Instructor Email Policy	Please note that all course communications must occur through your @ucalgary email, and I will respond to emails sent via student's @ucalgary emails within 48 hours.		
Name and Email of Teaching Assistant(s)			

Course Description

Industrial Robotics are transforming the way buildings are designed and made. The Introduction to Robotic Fabrication course is intended for students and practitioners who are interested in applied digital craft and exploring the implications of industrial robotic manufacturing for architectural design research and construction. Lectures and tutorials will provide participants with the basic vocabulary and safe working practices necessary to work in proximity with industrial robotic systems. Collaborative design and making activities leveraging computation and digital fabrication will allow participants to learn about robot programming in a hands-on manner. The course will explore the development of tools and techniques for the production of architectural prototypes. Software including Rhino, Grasshopper, and Robotstudio will be used to control Universal UR10-E and ABB IRB2600 Industrial Robots. Students will work iteratively to develop end-of-arm tooling, toolpaths, digital outputs and other processes necessary for the production of projects. Deliverables will include exhibition-ready 1:1 prototypes, documentation of the tools, techniques and processes developed, and speculation about the future uses for these techniques.

Course Hours: 3 units

Online Delivery (If applicable)

NA

Course Learning Outcomes

Upon completion of this course, students will know and be able to:

1. Basic robot programming, and how to program a collaborative robot using a teach pendant
2. Basic industrial collaborative robot simulation and path planning.
3. Design a component or assembly and produce necessary drawings /fabrication instructions for robotic construction
4. Produce high quality documentation and analysis of mock-ups and prototypes
5. Present the findings of their research in the form of a report and presentation.

Learning Resources

Required readings, textbooks and learning materials:

- Rhino 6/Grasshopper 3d modelling software.
- ACADIA conference publications: <http://papers.cumincad.org>

Technology requirements (D2L etc.):

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Broadband internet connection

Workshop Safety Training Requirement

If a course requires the use of the SAPL workshop, students must complete all online University of Calgary safety courses, the online Trajectory safety training course, as well as in-person workshop training and a grade of pass on the final evaluation project, to be granted access to the SAPL workshop. This training is offered once a year, around the start of the Fall term and has a completion deadline.

Additional Classroom Conduct and Related Information

Guidelines for Zoom Sessions in Online Classes

Students are expected to participate actively in all Zoom sessions and to turn on their webcam. Please join our class in a quiet space that will allow you to be fully present and engaged in the Zoom sessions. Students must behave in a professional manner during the session. Students, employees, and academic staff are also expected to demonstrate behaviour in class that promotes and maintains a positive and productive learning environment.

Assessment Components

Assessment Method	Description	Weight	Learning Outcome	Due Date
1. Technique	Develop robotic techniques and execute drawings.	30%	2,3,4,6	September 30
2. Material Effects	PDF/Presentation/Animation: Robotic path simulations. Physical prototypes.	30%	1,2,3,4,5	October 28
3. Integration	PDF/Presentations: Team Designing using pseudocode. Path planning. Robotic simulations. Project documentation.	40%	1,2,3,4,5	December 2

Assessment and Evaluation Information

Attendance and Participation Expectations:

Students are required to participate in the asynchronous learning tasks using the D2L learning environment and synchronous Zoom sessions. If unable to participate live due to unforeseen circumstances, inform the instructor in advance to work out an alternative participation activity (e.g., watch the recordings, submit a brief reflection, and actively contribute to the follow-up online discussion).

Guidelines for Submitting Assignments:

Students will be evaluated individually for all assignments. In the case of group assignments, participants will be asked to describe their contribution to the assignment. Projects will be evaluated for completeness, quality and originality.

Assignments should be submitted to D2L Dropbox on or before the due date. Assignments submitted after the deadline will be penalized with the loss of a grade (e.g.: A- to B+). For late submission after one week but not more than 2 weeks late, the loss will be two grades, e.g.: A- to B. Assignments will not be accepted after 3 weeks.

Final Examinations:

N/A

Expectations for Writing (<https://www.ucalgary.ca/pubs/calendar/current/e-2.html>):

Criteria that must be met to pass: Note: Students must submit and pass Assignment 3 in order to receive credit for the course. Final grades will be reported as letter grades, with the final grade calculated according to the 4-point range. Assignment(s) will be evaluated by percentage grades, with their letter grade equivalents as shown.

Grading Scale				
Grade	Grade Point Value	4-Point Range	Percent	Description
A+	4.00	4.00	95-100	Outstanding - evaluated by instructor
A	4.00	3.85-4.00	90-94.99	Excellent - superior performance showing comprehensive understanding of the subject matter
A-	3.70	3.50-3.84	85-89.99	Very good performance
B+	3.30	3.15-3.49	80-84.99	Good performance
B	3.00	2.85-3.14	75-79.99	Satisfactory performance
B-	2.70	2.50-2.84	70-74.99	Minimum pass for students in the Faculty of Graduate Studies
C+	2.30	2.15-2.49	65-69.99	All final grades below B- are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements.
C	2.00	1.85-2.14	60-64.99	
C-	1.70	1.50-1.84	55-59.99	
D+	1.30	1.15-1.49	50-54.99	
D	1.00	0.50-1.14	45-49.99	
F	0.00	0-0.49	0-44.99	

A student who receives a "C+" or lower in any one course will be required to withdraw regardless of their grade point average (GPA) unless the program recommends otherwise. If the program permits the student to retake a failed course, the second grade will replace the initial grade in the calculation of the GPA, and both grades will appear on the transcript.

CACB Student Performance Criteria

The following CACB Student Performance Criteria will be covered in this course:

A1 Design Theories, Precedents and Methods, A2 Design Skills; A3 Design Tools, A5 Site Context and Design. A7 Detail Design, A8 Design Documentation; B1 Critical Thinking and Communication; C2 Materials; C5 Environmental Systems.

Topic Areas & Detailed Class Schedule		
Course Schedule Date	Topic	Assignments/Due Dates
Phase 1: Technique		
September 9	Course Intro. Lecture 1: Introduce Assignment 1.	Grasshopper modules
Sept 16	Lecture/ Tutorial: Robot Programming	Universal University Modules
Sept 23	Lecture/ Tutorial: Simple Offline Simulation Introduce assignment 2	
Sept 30	Parkstock Event	Assignment 1 due.
October 3 - 7	No classes – Mid-term Break	
Phase 2: Material Effects		
Oct 14	Lecture/Tutorial Offline Simulation 2 Develop proposal for instructor review + approval (pseudocode).	
Oct 21	Lecture/Tutorial: I/O Production of prototypes + mockups documentation, testing, lit review.	
Oct 28	Student presentations Assignment 2 Introduce assignment 3	Assignment 2 Due
Phase 3: Assemblies		
Nov 4	Production (Desk reviews of proposals)	
Nov 6-12	No classes – Block Week	
Nov 18	Production (desk reviews)	
Nov 25	Production (desk reviews)	
Dec 2	Student presentations Assg. 3	Assignment 3 Due

Guidelines for Zoom Sessions

Zoom is a video conferencing program that will allow us to meet at specific times for a “live” video conference, so that we can have the opportunity to meet each other virtually and discuss relevant course topics as a learning community.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor’s permission.

The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as per the [Code of Conduct](#)). When entering Zoom or other video conferencing sessions (such as MS Teams), you play a role in helping create an effective, safe and respectful learning environment. Please be mindful of how your behaviour in these sessions may affect others. Participants are required to use names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities.

Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under relevant University of Calgary conduct policies (e.g. [Student Non-Academic Misconduct Policy](#)). If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception, and on what terms. For more information on how to get the most out of your zoom sessions visit: <https://elearn.ucalgary.ca/guidelines-for-zoom/>

If you are unable to attend a Zoom session, please contact your instructor in advance to arrange an alternative activity for the missed session (e.g., to review the recorded session). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in Zoom sessions. Students will be advised by their instructor when they are expected to turn on their webcam (for group work, presentations, etc.).

The instructor may record online Zoom class sessions for the purposes of supporting student learning in this class – such as making the recording available for review of the session or for students who miss a session. Students will be advised before the instructor initiates a recording of a Zoom session. These recordings will be used to support student learning only and will not be shared or used for any other purpose.

Special Budgetary Requirements

nil

University of Calgary Policies and Supports

COVID-19 PROCEDURE FOR SICK STUDENTS: <https://ucalgary.ca/risk/sites/default/files/Covid-19%20Folder/COVID-19-Procedure-for-Sick-Students.pdf>

ACADEMIC ACCOMMODATION

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/university-policies-procedures/student-accommodation-policy>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/university-policies-procedures/accommodation-students-disabilities-procedure>

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to their instructor (contact information on first page above).

SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/ .

ACADEMIC MISCONDUCT

Academic Misconduct refers to student behavior which compromises proper assessment of a student's academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

For information on the Student Academic Misconduct Policy and Procedure please visit:

<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-policy.pdf>

<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-procedure.pdf>

Additional information is available on the Academic Integrity Website

at <https://ucalgary.ca/student-services/student-success/learning/academic-integrity>.

COPYRIGHT LEGISLATION:

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorized sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy (<https://www.ucalgary.ca/pubs/calendar/current/k.html>).

INSTRUCTOR INTELLECTUAL PROPERTY

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

Student information will be collected in accordance with typical (or usual) classroom practice. Students' assignments will be accessible only by the authorized course faculty. Private information related to the individual student is treated with the utmost regard by the faculty at the University of Calgary.

SEXUAL VIOLENCE POLICY

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. The University of Calgary's sexual violence policy guides us in how we respond to incidents of sexual violence, including supports available to those who

have experienced or witnessed sexual violence, or those who are alleged to have committed sexual violence. It provides clear response procedures and timelines, defines complex concepts, and addresses incidents that occur off-campus in certain circumstances. Please see the policy available at <https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>

UNIVERSITY STUDENT APPEALS OFFICE: If a student has a concern about the course, academic matter, or a grade that they have been assigned, they must first communicate this concern with the instructor. If the concern cannot be resolved with the instructor, the student can proceed with an academic appeal, which normally begins with the Faculty. <https://www.ucalgary.ca/secretariat/student-appeals>

OTHER IMPORTANT INFORMATION

Please visit the Registrar's website at:

<https://www.ucalgary.ca/registrar/registration/course-outlines> for additional important information on the following:

- Wellness and Mental Health Resources
- Student Success
- Student Ombuds Office
- Student Union (SU) Information
- Graduate Students' Association (GSA) Information
- Emergency Evacuation/Assembly Points
- Safewalk