University of Waterloo
Department of Systems Design Engineering

SYDE 674
3D Computer Vision and Imaging

Course Outline - Spring 2022

Instructor: Dr. J. Kofman, Ph.D., P.Eng.

Office: E7-6318
E-mail: jkofman@uwaterloo.ca
Tel: 519-888-4567 ext 45185

Office Hours: By appointment

Classroom: E5-6004

Class Period: Fri 12:00 PM - 2:50 PM

Teaching and Learning methods:
The teaching and learning will use blended learning (https://uwaterloo.ca/centre-for-teaching-excellence/support/blended-learning), thus with a combination of online and in-person components, for lectures, student presentations, discussions, peer evaluation, and assessments.

Special conditions under COVID-19 conditions.
Given the unusual and challenging situation, the instructor reserves the right to modify course methods, including assessment (evaluation) methods. If necessary, the instructor will work with the Department to determine reasonable and fair solutions for assessments.

Notice: Students do not have the right to share the course materials with others under intellectual property law.

Important Dates (Spring 2022):

Fri May 6	First class
Tues July 26	Last class (Make-up day for July 1) Project written report due

Course Description

This course focuses on 3D computer-vision and camera/optical–based 3D shape-measurement techniques. Topics include stereo-camera 3D measurement, structured-light techniques, laser-camera range-sensing, fringe-projection phase shifting methods, curve and surface representation, surface fitting, and range-image registration. The measurement methods will include setup of measurement systems and calibration of instrumentation.

Course topics

Geometric modeling – curve and surface representation

Surface fitting

Image processing fundamentals
[may include short review if needed, or omitted entirely]

Stereo-vision measurement
- calibration, measurement, accuracy
- (human motion modeling & measurement application)

Surface geometry measurement
- Structured light methods, laser-scanning
- Fringe-projection phase-shifting full-field techniques

Range-image registration

Evaluation:

- Students will complete an individual tutorial on a chosen topic, and an individual course project (short experiment), both with written and oral components.

Tutorial:

Proposal	5%
Oral presentation	20%
Written notes	20%
(Total	**45 %)**

Project (Short Experiment):

Proposal	5%
Oral presentation	20%
Written report	20%
(Total	**45 %)**

Peer discussion (questions/comments) on Tutorials: 5%
Peer discussion (questions/comments) on Projects: 5%

Course material and references:

- Reference books may be available at the library.
- Supplementary material will be made available to students.

University of Waterloo – Faculty of Engineering
Academic Regulations:

FACULTY OF ENGINEERING

Faculty of Engineering website: *[Link* Academic Support and Policies *].*

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect, and responsibility. [Check Academic Integrity website for more information. Link Office of Academic Integrity].

Discipline: A student is expected to know what constitutes academic integrity (see link above) to avoid committing an academic offence, and to take responsibility for their actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (for example: plagiarism, cheating) or about expectations for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. Relevant documents include:

- University of Waterloo Policy 71 [Link https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71].
- Academic Penalty Guidelines [Link https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties].
- Assessment of Unauthorized Collaboration: [Link Assessment of Unauthorized Collaboration].

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt please be certain to contact the **Associate Chair Graduate** who will provide further assistance.
[Link https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70.]

Appeals: A decision made, or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72 (Student Appeals) [Link https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72].

Students Needing Special Help are Accommodated
http://uwaterloo.ca/accessability-services/
AccessAbility Services collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.