

Course Outline (W2026)**ELE882: Intro to Digital Image Processing**

Instructor(s)	Dr. Javad Alirezaie [Coordinator] Office: ENG452 Phone: (416) 979-5000 x 556092 Email: javad@torontomu.ca Office Hours: Thu. 11:00AM-12:00 PM
Calendar Description	The course will cover basic theory and principles of digital image processing. The topics covered include: Image Capture and Display, Digital Image Storage and formats, 2-D Sampling and Quantization of Images, Grey-level image processing, 2-D image filtering operations (spatial and frequency domain), colour and trichromacy, planar colour image processing, image compression, and the extension of concepts to video.
Prerequisites	ELE 632
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. R.C. Gonzalez & R.E. Woods, Digital Image Processing, 4th Edition, Pearson, 2018.
Reference Text(s):	1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing using MATLAB 3rd Edition. Gatesmark Publishing, 2020. 2. W.K. Pratt, Digital Image Processing, 4th Edition, Wiley, 2007

<p>Learning Objectives (Indicators)</p>	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> 1. Use technical knowledge and the appropriate design tools (C and MATLAB) to analyze a design, simulate and then implement and test. Furthermore, demonstrate ability to describe differences between designs and explain different specific solutions and why they worked and/or were not effective. (4a) 2. Use technical knowledge and the appropriate design tools (C and MATLAB) to analyze a design, simulate and then implement and test. Furthermore, demonstrate their ability to describe differences between designs and explain different specific solutions and why they worked and/or were not effective. (4b) 3. Learn efficient use of MATLAB/OpenCV programming environments to design and develop software tools. (5a) 4. Demonstrate the ability to formulate and express ideas in clear grammar, correct format in a technical style. (7a) 5. Investigate and communicate recent developments in a selected topics in the design of image processing systems. Critically evaluate the procured information for authority, currency and objectivity and make accurate and appropriate use of technical literature. (12b) <p>NOTE:Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).</p>														
<p>Course Organization</p>	<p>3.0 hours of lecture per week for 13 weeks 1.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks</p>														
<p>Teaching Assistants</p>	<p>TBA</p>														
<p>Course Evaluation</p>	<table border="1" data-bbox="425 1081 1351 1491"> <thead> <tr> <th colspan="2" style="text-align: left;">Theory</th> </tr> </thead> <tbody> <tr> <td>Midterm Exam</td> <td style="text-align: right;">20 %</td> </tr> <tr> <td>Course Project</td> <td style="text-align: right;">10 %</td> </tr> <tr> <td>Final Exam</td> <td style="text-align: right;">45 %</td> </tr> <tr> <th colspan="2" style="text-align: left;">Laboratory</th> </tr> <tr> <td>Laboratory and Lab Project: Assignments (5 x 5%)</td> <td style="text-align: right;">25 %</td> </tr> <tr> <td>TOTAL:</td> <td style="text-align: right;">100 %</td> </tr> </tbody> </table> <p>Note: In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both "Theory and Laboratory" components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section above for details on the Theory and Laboratory components (if applicable).</p>	Theory		Midterm Exam	20 %	Course Project	10 %	Final Exam	45 %	Laboratory		Laboratory and Lab Project: Assignments (5 x 5%)	25 %	TOTAL:	100 %
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<p>Examinations</p>	<p>The midterm exam is scheduled on D2L calendar during the regular lecture period. Final exam, during the examination period, between 2.5 to 3 hours, closed-book (covers all course materials).</p>														

Other Evaluation Information	<p>Laboratories</p> <p>There will be 5 individual practical assignments (4 lab assignments and a final lab project) in this course. These assignments are more like mini-projects and are NOT meant to be done/completed in the assigned lab hours. They are to be done primarily outside lab and lecture hours. The assigned lab hours are available for you to make use of as you see fit and will also be the best time to get direct help from the TA on these assignments. The assignments will consist of theoretical and practical parts and will require the use of Python.</p>
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction to Digital Image Processing (Chapter 1 All Sections)
2	3		Digital Image Fundamentals (Chapter 2 All Sections)
3-4	4		Intensity Transforms (Chapter 3 Sections 3.1-3.3)
4-5	5		Spatial Filtering (Chapter 3 Sections 3.4-3.7) ===MIDTERM=== Date and Time on D2L calendar
6-7	6		2-D Fourier Transform & Sampling (Chapter 4 Sections 4.1-4.6)
8	3		Frequency Domain Filtering (Chapter 4 Sections 4.7-4.9)
9	3		Image Restoration (Chapter 5 Sections 5.1-5.3 5.11)

10-11	6		Colour Image Processing (Chapter 6 Sections 6.1-6.7)
12	3		Extra and Advanced Topics (Time permitted)

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2-3	Assignment 1	DIGITAL IMAGES
4-5	Assignment 2	POINT OPERATIONS
6-7	Assignment 3	IMAGE ENHANCEMENT AND NOISE REMOVAL
8-9	Assignment 4	COLOUR
10-11	Assignment 5	Final Lab Project

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on [the Senate website](#)

Refer to the [Departmental FAQ page](#) for further information on common questions.

Important Resources Available at Toronto Metropolitan University

- [The University Libraries](#) provide research [workshops](#) and individual consultation appointments. There is a drop-in Research Help desk on the second floor of the library, and students can use the [Library's virtual research help service](#) to speak with a librarian, or [book an appointment](#) to meet in person or online.

- [Student Life and Learning Support](#) offers group-based and individual help with writing, math, study skills, and transition support, as well as [resources and checklists to support students as online learners](#).
- You can submit an [Academic Consideration Request](#) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the [Senate website](#) and select the blue radio button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request.

For Extenuating Circumstances, [Policy 167: Academic Consideration](#) allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, always require documentation. Students must notify their faculty/contract lecturer once a request for academic consideration is submitted. See Senate [Policy 167: Academic Consideration](#).

Longer absences are not addressed through Policy 167 and should be discussed with your Chair/Director/Program to be advised on next steps.

- [FAQs Academic Considerations and Appeals](#)
- Information on Copyright for [Faculty/Contract Lecturers](#) and [students](#).

Lab Safety (if applicable)

Students are to strictly adhere and follow:

- a. The Lab Safety information/guidelines posted in the respective labs,
- b. provided in their respective lab handouts, and
- c. instructions provided by the Teaching Assistants/Course instructors/Technical Staff.

During the lab sessions, to avoid tripping hazards, the area around the lab stations should not be surrounded by bags, backpacks etc, students should place their bags, backpacks etc against the walls of the labs and/or away from their lab stations in such a way that it avoids tripping hazards.

Accessibility

- Similar to an [accessibility statement](#), use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about [Academic Accommodation Support](#).
- Learn [how to register with AAS](#).
- Learn about [Policy 159: Academic Accommodation of Students with Disabilities](#)

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about [Academic Accommodations versus Academic Consideration and how to access each](#).

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:** 24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via [My SSP app](#) or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the [Toronto Metropolitan University Mental Health and Wellbeing](#) website.