



THE UNIVERSITY OF BRITISH COLUMBIA

Department of Computer Science, Mathematics, Physics and Statistics
Okanagan Campus

PHYS 420 – 101
Data and Image Processing
W2020 – T-2

Instructor: Dr. Andrew Jirasek

E-mail: andrew.jirasek@ubc.ca

Classroom Schedule: Tue/Fri 8 – 9:30AM

Location: Online, Zoom, ID: 7707717701

Office Hours: 1hr after class

Course Website: Canvas

Teaching Assistant: None

Calendar Course Description

PHYS 420 (3) Data and Image Processing

Introduction to digital signal and image processing. Correlation, convolution, Fourier transforms, digital filtering, model of image formation and degradation, image filtering in the spatial and Fourier domain, deconvolution, multivariate analysis. [3-0-0]

Prerequisite: All of MATH 225, MATH 317 and 3 credits in 200-level Physics.

Textbook

Lyons, Understanding Digital Signal Processing, 3rd Ed, (Optional)

Grading Scheme

Assignments	30%
Review Lectures	10%
Midterm exam #1	15%
Midterm exam #2	15%
Final exam take home	30%
	100%

Final grades will be based on the evaluations listed above and the final grade will be assigned according to the standardized grading system outlined in the UBC Okanagan Calendar.



Phys 420, STAT 449, STAT 547
Schedule, Spring Term, 2021

Lec	Date	S/A S	Topic	Content	Assgn	Book Sections
1	21/01/12	Sync	Intro	Averaging and error reduction		
2	21/01/15	Async	Matlab	Matlab tutorial		
3	21/01/19	Async	Systems and sampling	LTI, stability, causality, sampling, aliasing		Ch 1, Ch 2.1,2.2
4	21/01/22	Async	Correlation	Correlation, lag		
5	21/01/26	Sync	Student lec #1	Student lecture #1 - L1 - 4		
6	21/01/29	Async	Time Series	Convolution		Lyons 5.9 +
7	21/02/02	Async	Fourier Theory I	DFT, properties of the DFT	A1	Lyons 3.1,3.2+
8	21/02/05	Async	Fourier Theory II	DFT leakage, windowing, zero padding		Lyons 3.3-8
9	21/02/09	Sync	Student lec #2	Student lecture #2 - L6 - 8		
10	21/02/12	Sync	Midterm #1			
11	21/02/23	Async	Fourier Theory III	DFT cont, aliasing		Lyons 3.8,9,14,15
12	21/02/26	Async	Filtering I	FIR, averaging, convolution in FIR, Impulse response		Lyons 5.1,2
13	21/03/02	Async	Filtering II	FIR design	A2	Lyons 5.6-end,6.1
14	21/03/05	Sync	Student lec #3	Student lecture #3 - L10 - 13		
15	21/03/09	Async	Filtering III	IIR, Laplace transform		Lyons 6.2
16	21/03/12	Async	Filtering IV	IIR, z-transform		Lyons 6.3
17	21/03/16	Async	Image processing I	Image degradation model, spatial & frequency domain filtering		G&Woods Ch 5
18	21/03/19		No Class			
19	21/03/23	Sync	Midterm #2		A3	
20	21/03/26	Sync	Student lec #4	Student lecture #4 - L16 - 18		
21	21/03/30	Async	Image processing II	Deconvolution		G&Woods Ch 5
22	21/04/02	Async	Multivariate analysis I	PCA		Schlens
23	21/04/06	Async	Multivariate analysis II	Clustering		
24	21/04/09	Sync	Student lec #5	Student lecture #5 - L21 - 23	A4	
25	21/04/13		Spare			



Grading Practices

Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student's academic record.

<http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014>

Final Examinations

The examination period for **W2020 T-2 is April 16 - 29, 2021**. Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 24-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.

Further information on **Academic Concession** can be found under **Policies and Regulation in the Okanagan Academic Calendar** <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0>

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.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at: <http://okanagan.students.ubc.ca/calendar/index.cfm?tree=3,54,111,0>.



Cooperation vs. Cheating

Working with others on assignments is a good way to learn the material and we encourage it. However, there are limits to the degree of cooperation that we will permit. Any level of cooperation beyond what is permitted is considered cheating.

When working on programming assignments, you must work only with others whose understanding of the material is approximately equal to yours. In this situation, working together to find a good approach for solving a programming problem is cooperation; listening while someone dictates a solution is cheating. You must limit collaboration to a high-level discussion of solution strategies, and stop short of actually writing down a group answer. Anything that you hand in, whether it is a written problem or a computer program, must be written by you, from scratch, in your own words. If you base your solution on any other written solution, you are cheating. If you provide your solution for others to use, you are also cheating.

Copyright Disclaimer

Diagrams and figures included in lecture presentations adhere to Copyright Guidelines for UBC Faculty, Staff and Students <http://copyright.ubc.ca/requirements/copyright-guidelines/> and UBC Fair Dealing Requirements for Faculty and Staff <http://copyright.ubc.ca/requirements/fair-dealing/>. Some of these figures and images are subject to copyright and will not be posted to **Canvas**. All material uploaded to **Canvas** that contain diagrams and figures are used with permission of the publisher; are in the public domain; are licensed by Creative Commons; meet the permitted terms of use of UBC's library license agreements for electronic items; and/or adhere to the UBC Fair Dealing Requirements for Faculty and Staff. Access to the **Canvas** course site is limited to students currently registered in this course. Under no circumstance are students permitted to provide any other person with means to access this material. Anyone violating these restrictions may be subject to legal action. Permission to electronically record any course materials must be granted by the instructor. Distribution of this material to a third party is forbidden.

Grievances and Complaints Procedures

A student who has a complaint related to this course should follow the procedures summarized below:

- The student should attempt to resolve the matter with the instructor first. Students may talk first to someone other than the instructor if they do not feel, for whatever reason, that they can directly approach the instructor.
- If the complaint is not resolved to the student's satisfaction, the student should e-mail the Associate Head, Dr. Jake Bobowski jake.bobowski@ubc.ca or the Department Head, Dr. John Braun at john.braun@ubc.ca

Student Service Resources

Disability Assistance

The Disability Resource Centre ensures educational equity for students with disabilities, injuries or illness. If you are disabled, have an injury or illness and require academic accommodations to meet the course objectives, e-mail us or visit our website for more information.

Web: <http://students.ok.ubc.ca/drc/welcome.html>

E-mail DRC at: drc.questions@ubc.ca



Equity, Human Rights, Discrimination and Harassment

UBC Okanagan is a place where every student, staff and faculty member should be able to study and work in an environment that is free from human rights-based discrimination and harassment. If you require assistance related to an issue of equity, discrimination or harassment, please contact the Equity Office, your administrative head of unit, and/or your unit's equity representative. **UBC Okanagan Equity Advisor: ph. 250-807-9291**

Web: <https://equity.ok.ubc.ca/>

E-mail: equity.ubco@ubc.ca

Health & Wellness - UNC 337

At UBC Okanagan health services to students are provided by Health and Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Health and Wellness for more information or to book an appointment.

Web: www.students.ok.ubc.ca/health-wellness

Email: healthwellness.okanagan@ubc.ca

Sexual Violence Prevention and Response Office (SVPRO)

A safe and confidential place for UBC students, staff and faculty who have experienced sexual violence regardless of when or where it took place. Just want to talk? We are here to listen and help you explore your options. We can help you find a safe place to stay, explain your reporting options (UBC or police), accompany you to the hospital, or support you with academic accommodations. You have the right to choose what happens next. We support your decision, whatever you decide. Visit svpro.ok.ubc.ca or call us at 250-807-9640

Independent Investigations Office (IIO)

If you or someone you know has experienced sexual assault or some other form of sexual misconduct by a UBC community member and you want the Independent Investigations Office (IIO) at UBC to investigate, please contact the IIO. Investigations are conducted in a trauma informed, confidential and respectful manner in accordance with the principles of procedural fairness. You can report your experience directly to the IIO by calling 604-827-2060.

Web: <https://investigationoffice.ubc.ca/>

E-mail: director.of.investigations@ubc.ca

The Hub

The Student Learning Hub (LIB 237) is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with study skills and learning strategies.** **Web:** (<https://students.ok.ubc.ca/student-learning-hub/>) **Ph:** 250-807-9185.

SAFEWALK - Download the UBC SAFE – Okanagan app.

Don't want to walk alone at night? Not too sure how to get somewhere on campus?

Call Safewalk at 250-807-8076 For more information: <https://security.ok.ubc.ca/safewalk/>