**MATH 303/COSC 303 – 101 (3)**

**Numerical Analysis**

**2019-2020, Winter Term 2**

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**Course Information**

**Course Times:** Wed 15:00-16:30; Thur 14:30-16:00

**Link (Zoom): will be provided on canvas**

**Textbook:**

Numerical Analysis, 10e. Burden, Faires, and Burden. ISBN 978-1-305-25366-7

Assignment questions will be taken from this book. A copy is on 2-hour reserve in the library.

**Instructor:** Warren Hare [warren.hare@ubc.ca](mailto:warren.hare@ubc.ca) 250-807-9378

**Office Hours:** Wed 14:30-15:00; Thur 16:00-16:30, or by request.

**Teaching Assistant: TBA will be updated on canvas**

**Course Description**

**COSC 303/MATH 303 (3) Numerical Analysis**

Numerical techniques for basic mathematical processes and their analysis. Taylor polynomials, root-finding, linear systems, eigenvalues, approximating derivatives, locating minimizers, approximating integrals, solving differential equations. Credit will be granted for only one of MATH 303 or COSC 303. [3-1-0]

**Prerequisite:** All of MATH 200, MATH 221 and either (a) COSC 111 or (b) DATA 301.

Equivalency: COSC 303.

**Topics**

We will cover the following:

1. Error, Rates of Convergence (Chapter 1)
2. Solving 1-Variable Non-linear Equations (Chapter 2)

2.5. \* Optimization of 1-Variable Problems

1. Polynomial Interpolation (Chapter 3)
2. Numerical Differentiation and Integration (Chapter 4)
   1. \* Monte Carlo Methods for Integration
3. Solving Ordinary Differential Equations (Chapter 5)
4. Solving Linear Systems - Direct Methods (Chapter 6)
5. Solving Linear Systems - Iterative Methods (Chapter 7)

If time permits, then other topics will also be explored.

* Course material will be provided in video format. These are to be watched during the lab time slot.

**Evaluation**

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| --- | --- |
| Assignments (7 base+2 bonus) | 28% |
| Team Challenges | 30% |
| Tests\* | 22% |
| Final Exam † | 20% |

\* Students must pass at least ½ of the tests to pass the course. Failure to achieve this will result in your maximum course grade being capped at 40%.

† Students must pass the final exam to pass the course. Failure to achieve this will result in your maximum course grade being capped at 40%.

- 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.

**Assignments**

There will be 7 *base* assignments and 2 *bonus* assignments. The assignment grade is as follows

* Unsubmitted or late assignments are given a grade of 0.
* Your top 5 base assignments will be worth 4% each.
* Your 6th best base assignment will be worth 4%, or worth 2% with your best bonus assignment worth 2%.
* Your 7th best base assignment will be worth 2%, or worth 1% with your worst bonus assignment worth 1%.

Each assignment will have a mix of hand written and computer assisted questions. The answers for both parts should be put into a single .zip file and submitted through canvas.

*Hand written* questions are to be written by hand, then scanned as pdf. MATLAB may be used as a `scientific calculator’ for hand written assignments, but all steps must be clearly explained.

E.g., if the question is: Let , find . The answer would read

*Computer assisted* questions are to be implemented in MATLAB.

UBC students can acquire MATLAB for free here: [https://it.ubc.ca/services/desktop-print-services/software-licensing/matlab#getMATLABLinks to an external site.](https://it.ubc.ca/services/desktop-print-services/software-licensing/matlab#getMATLAB)

In order to receive marks, all implementations must be in MATLAB and must be your own code. Downloading code from the internet, or using another person's code, is considered cheating. Showing your code to a fellow student is considered cheating (for both you and the student you show it to). Cheating will result in a course assignment grade of 0.

1. You must submit the m files.  Pictures of m files is not sufficient.   Zip all into one file and upload it in the online submissions.
2. Your m files must include a file called EXERCISE1\_1.m (or something equally obvious).  The TA (or myself) will open that file and click run.  It should output the answer in a tidy form.
3. Paper may be used for rough work, but cannot be submitted, so ensure that your implementation and output is clear and well-documented.

If evidence of cheating on an assignment is present, you will be required to take an oral exam to justify the final grade. If cheating is confirmed, then you will receive a 0 across all assignments and your maximum course grade will be capped at 40%.

**Team Challenges**

During the first two weeks of term you will be assigned to a team of 4-5 people (approximately ½ MATH and ½ COSC students), this will be your team for the remainder of the course. Teams may be readjusted during the year if one group experiences a significant number of students withdraw from the course.

Some Wed lectures will include a team challenge problem. You will work with your team to complete the problem during the allotted time.

* Team challenge problems will begin at 15:30 on Weds and have a 45 minute time limit.
* A schedule of which Weds will have team challenge problems will be posted on canvas.
* Team challenges are open book.
* You may **not** communicate with any human outside of your team or the course instructor/TA during the team challenge. This includes, but is not limited to, phone, email, text, posts on reddit, comments on facebook, etc. Ignorance of whether you are communicating with a human is not an excuse.
* Challenges will be run through canvas and each student will submit an individual copy of their team answer.
* Accompanying each problem will be a survey on which team member did which part. Grades will be distributed accordingly.

If evidence of cheating on a team challenge is present, your team will be required to take an oral exam to justify the final grade. If cheating is confirmed, then you and your entire team will receive a 0 across all team challenges and your maximum course grade will be capped at 40%.

**Tests**

Some Thurs lectures will include a test.

* Tests will begin at 15:30 on Thurs and have a 15 minutes time limit.
* A schedule of which Thurs will have tests will be posted on canvas.
* Tests are open book.
* You may **not** communicate with any human outside of the course instructor/TA during the test. This includes, but is not limited to, phone, email, text, posts on reddit, comments on facebook, etc. Ignorance of whether you are communicating with a human is not an excuse.
* Tests will be run through canvas.

If evidence of cheating on a test is present, you will be required to take an oral exam to justify the final grade. If cheating is confirmed, then you will receive a 0 across all tests and your maximum course grade will be capped at 40%.

**Final Exam**

The final exam format will be determined as information unfolds.

If evidence of cheating on the final exam is present, you will be required to take an oral exam to justify the final grade. If cheating is confirmed, then you will receive a 0 on the final exam and your maximum course grade will be capped at 40%.

**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 Term 2 of W 2020 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**

**Cheating is not tolerated. Don't do it.**

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. Heinz Bauschke at [heinz.bauschke@ubc.ca](mailto:heinz.bauschke@ubc.ca) or the Department head, Dr. John Braun at [john.braun@ubc.ca](mailto: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](mailto: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](mailto:equity.ubco@ubc.ca)

**Health & Wellness**

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. **UNC 337**

**Web:** [www.students.ok.ubc.ca/health-wellness](http://www.students.ok.ubc.ca/health-wellness) **Email:** [healthwellness.okanagan@ubc.ca](mailto: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](https://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://investigationsoffice.ubc.ca/> **E-mail:** [director.of.investigations@ubc.ca](mailto: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**

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/>

or download the UBC SAFE – Okanagan app.