DePAUL UNIVERSITY
COLLEGE OF COMPUTING AND DIGITAL MEDIA

CSC 412 – 801/810
TOOLS AND TECHNIQUES FOR COMPUTATIONAL ANALYSIS

SYLLABUS

Quarter: Winter 2023 -2024
Class time: W 5:45 – 9:00
Location: Lewis 1105/OL
Instructor: Vladimir Lepetic
Office: LC; **Phone:**
e-mail: vlepetic@depaul.edu
Office Hours: W 4:30 – 5:30, 1105 Lewis; by appointment;
M 11:30 -12-30; Zoom by appointment.

TEXT: **Shore, Thomas S,** *Applied Linear Algebra and Matrix Analysis*, Springer 2019;
    Mendelson, C, *Schaum's Outline of Calculus, Seventh Edition* McGraw Hill,
    2021

In case you have not been previously exposed to any (advanced) Linear Algebra and
Calculus, I strongly suggest you consult some of the following:

Lipschutz, S., Lipson, M., *Schaum's Outline of Linear Algebra, 5th Edition*;
Axler, S., *Linear Algebra Done Right*, Springer, 2014;
Lepetic, V., *Principles of Mathematics – A Primer*, Wiley, 2016;
Streng, G., *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 2023.
Fridberg, S., Insel, A., *Linear Algebra*, Pearson, 2002.
Larson, R., Edwards, B., *Calculus*, Cengage Learning, 2013.
Steward, J., *Calculus, Early Transcedentals*, Cengage Learning, 2015.

In addition, (more advanced) lecture notes may be available on D2L

If you need additional online help/support you may want to consult the following:

For Matlab:

• University of Edinburgh interactive Matlab Tutorial

• University of British Columbia Guide to Matlab

• DePaul (Dr. Raicu's) Matlab Tutorials

• Matlab dictionary (Matlab for class)

• Virtual lab access to Matlab (and other statistics software)

For Calculus:

• Mendelson, Beginning Calculus, 3rd edition, 2008 (a more leisurely introduction

  than our textbook).

• Wrede, Spiegel, Advanced Calculus, 3rd edition,2010

PREREQUISITES:

None, however the assumption is that students have knowledge of basic college level

algebra and trigonometry.

SUMMARY:

CSC412 is intended to provide a solid foundation of mathematics needed for computer science. In particular the basic concepts, foundations and techniques of linear algebra and calculus will be explored.

LEARNING OUTCOMES

After successfully completing this course students will be able to understand fundamental concepts, techniques and applications of Linear Algebra and Calculus to sciences, in particular mathematical and computational technologies underlining different disciplines of computer science.

CONTENTS

O   INTRODUCTION

 0.1 Motivation and General Idea.
 0.2 Prerequisites.

I   LINEAR ALGEBRA (Shores: Ch. 2 – 6; Lipschutz: Ch. 1 – 13)

1.1 Introduction
1.2. Matrix Algebra (Shores: Ch. 2.1 – 2.6; Lipschutz: Ch.2)
(*) Discussion/Exercises
1.3. Vector Spaces (Shores: 3.1 – 3.6; Lipschutz Ch.4)
1.4. Geometrical Aspects of Standard Spaces (Shores: 4.1 – 4.3; Lipschutz Ch.6)[1]

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[1] Optional and/or time permitting

(*) Discussion/Exercises

1.5. The Eigenvalue Problem (Shores: 5.1 – 5.2; Lipschutz Ch.9)
1.6. Geometrical Aspects of Abstract Spaces (Shores: 6.1 – 6.4; Lipschutz Ch.9, Ch.13)[2]
(*) Discussion/Exercises

II CALCULUS (Ayres, Mendelson: Ch. 6 – 36)

2.1 Introduction
2.2. Functions (Ayres, Mendelson: Ch. 6)
(*) Discussion/Exercises
2.3 Limits (Ayres, Mendelson: Ch. 7)
2.4. Continuity (Ayres, Mendelson: Ch. 8)
(*) Discussion/Exercises
2.5 The Derivative (Ayres, Mendelson: Ch. 9; Ch. 10 - 15; Ch. 25 - 27)
2.6. Infinite Sequences; Infinite Series (Ayres, Mendelson: Ch. 42 –43; 46 - 47)[3]
2.7 Integration (Ayres, Mendelson: (Ch. 29 – 36)
(*) Discussion/ Exercises

In addition to exercises with solutions listed in the textbooks four sets of "Self-Tests" will be given and will be discussed in class a week after assignment during regular problem sessions. However, **students are strongly urged to attempt problems by themselves and ask about or discuss (in class or in private) those they couldn't do.** Performance on self-test problems should be a reliable indication of your command of the subject.
This is a fast-paced course that requires you to set aside adequate time for practice. **It is highly recommended** that you practice three or more times per week. Doing well in this course usually requires at least **6-10** hours per week of practice, depending on your current skill level. If you start to fall behind, for whatever reason, you should contact me as soon as possible to determine what can be done to rectify matters. Usually, something can be done to help you if you give me enough advance notice.

EXAMS

There will be three exams – a mid-term, take-home and the final. The grade will be calculated as follows: mid-term: 35%, "take-home": 15%, and final 50%. Because of the

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[2] Optional and/or time permitting
[3] Optional and/or time permitting

unique nature of the subject, in order to get full credit for exam problems, students have to show **ALL WORK IN DETAIL!** Make-up exams **will not be given.**

Schedule of Exams:

MIDTERM:

Midterm exam will be accessible on D2L on February14, at 5:30 pm CST and solutions have to be uploaded to D2L **Submission folder** on February 14, by 9:00 pm CST. **NO LATE SUBMISSIONS WILL BE ACCEPTED.**

TAKE-HOME:

Take-home exam will be accessible on D2L on March 13 at 9:00 pm CST and solutions have to be uploaded to D2L **Submissions folder** by March 20, at 5:00 pm, CST. **NO LATE SUBMISSIONS WILL BE ACCEPTED.**

FINAL:

Final exam will be accessible on D2L on March 20, at 5:30 pm, CST and solutions have to be uploaded to D2L **Submission folder** on March 20, by 9:00 pm, CST. **NO LATE SUBMISSIONS WILL BE ACCEPTED.**

NOTE: Since CSC412 is a graduate class, I assume that all students will adhere to the University's Academic Integrity Policy. Thus, no exam will be proctored, i.e., all exams will be of the **"take-home type"**. The only thing I require is that all exams are submitted in the allotted time

Grade scale: 90-100% (A), 90-80% (B), 70-80% (C), 60-70% (D), below 60% (F)

Changes to Syllabus
This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L and sent via email.

Online Course Evaluations
Evaluations are a way for students to provide valuable feedback regarding their instructor and the course. Detailed feedback will enable the instructor to continuously tailor teaching methods and course content to meet the learning goals of the course and the academic needs of the students. They are a requirement of the course and are key to continue to provide you with the highest quality of teaching. The evaluations are anonymous; the instructor and administration do not track who entered what responses. A

program is used to check if the student completed the evaluations, but the evaluation is completely separate from the student's identity. Since 100% participation is our goal, students are sent periodic reminders over three weeks. Students do not receive reminders once they complete the evaluation. Please see https://resources.depaul.edu/teaching-commons/teaching/Pages/online-teaching-evaluations.aspx for additional information.

Academic Integrity and Plagiarism
This course will be subject to the university's academic integrity policy.

All students are expected to abide by the University's Academic Integrity Policy, which prohibits cheating and other misconduct in student coursework. Publicly sharing or posting online any prior or current materials from this course (including exam questions or answers) is considered to be providing unauthorized assistance prohibited by the policy. Both students who share/post and students who access or use such materials are considered to be cheating under the Policy and will be subject to sanctions for violations of Academic Integrity.
In addition, violations of academic integrity include but are not limited to the following categories: cheating; plagiarism; fabrication; falsification or sabotage of research data; destruction or misuse of the university's academic resources; alteration or falsification of academic records; and academic misconduct. Conduct that is punishable under the Academic Integrity Policy could result in additional disciplinary actions by other university officials and possible civil or criminal prosecution. More information can be found at https://offices.depaul.edu/oaa/faculty-resources/teaching/academic-integrity/Pages/default.aspx.

Academic Policies
All students are required to manage their class schedules each term in accordance with the deadlines for enrolling and withdrawing as indicated in the University Academic Calendar. Information on enrollment, withdrawal, grading and incompletes can be found at: http://www.cdm.depaul.edu/Current%20Students/Pages/PoliciesandProcedures.aspx

Incomplete Grades
An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptions cases will receive such approval. Information about the Incomplete Grades policy can be found at http://www.cdm.depaul.edu/Current%20Students/Pages/Grading-Policies.aspx

Students with Disabilities
DePaul University is committed to ensuring equal access to its educational and extracurricular opportunities for students with disabilities. The Center for Students with Disabilities (CSD) offers reasonable academic accommodations and services to support our students. We also serve as a resource to the many university departments that have a responsibility to accommodate students.

Please see https://offices.depaul.edu/student-affairs/about/departments/Pages/csd.aspx for Services and Contact Information.