

**Faculty of Science Course Syllabus**  
**Department of Mathematics & Statistics**  
*Math2040, Matrix Theory and Linear Algebra II*  
*Summer 2020*

**Instructor(s):** Daniele Turchetti, [Daniele.Turchetti@Dal.ca](mailto:Daniele.Turchetti@Dal.ca)

**Lectures:** Asynchronous, updated to Brightspace weekly

**Office Hours:** Tuesdays 10-11am and Thursdays 4-5pm (Atlantic Daylight Time)

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**Course Description**

*This course is a continuation of MATH 1030.03. Topics include: vector spaces and linear transformations, eigenvalues and eigenvectors, similarity and diagonalization, inner product spaces and orthogonal transformations, diagonalization of symmetric matrices and quadratic forms.*

**Course Prerequisites**

MATH 1030.03 or 2030.03 **and** MATH 1000.03 or MATH 1215.03

**Course Objectives/Learning Outcomes**

*Students will learn advanced concepts of linear algebra, including real and complex vector spaces, inner product spaces, linear transformations, and orthogonality. We will discuss the use of vectors in representing and manipulating data and several applications, including compression, coding theory, and cryptographic applications.*

**Course Materials**

Textbook: "Matrix Theory and Linear Algebra", an open text by Peter Selinger, available on Brightspace and online at <https://www.mathstat.dal.ca/~selinger/linear-algebra/>.

**Course Delivery**

*This course will be delivered asynchronously: It is divided into 7 modules, one for every week, and you will be able to access the material and perform coursework at the time you prefer in a given week. Lecture videos and notes will be posted before the start of every week. Proficiency in the content of a module will be assessed individually through **WebWork assignments**, **bridging assignments** (containing problems that help introduce the topic of the following module), and a **module test** to be posted at the end of the respective week. For a full calendar of the assessment, please refer to the table on the next page.*

**Course Assessment**

Webwork assignments	10%	Online, accessed via Brightspace.
Bridging assignments	30%	Accessed via Brightspace, to be uploaded on Brightspace upon completion.
Module Tests	60%	Timed, online, accessed via Brightspace.
<i>The first module test is a practice test and does not count toward the final grade.</i>		

## Course Policies

1. Rather than emailing your content- or problem-related questions to the instructor or TAs, you are asked to post your questions on Piazza. The system is highly catered to getting you help fast and efficiently from other classmates, TAs, and the instructor. Before accessing Piazza, you will need to enroll in our course space at <https://piazza.com/dal.ca/summer2020/math2040>. You can find our class page at <https://piazza.com/dal.ca/summer2020/math2040/home> (both of these are also linked on Brightspace).
2. Late assignments will not be accepted except with the instructor's prior permission. Please contact me by email if you anticipate a problem with a deadline and have a reasonable reason to ask for an extension. Extensions will **not** be granted after the due date has passed.
3. Module tests and assignments will be open-book, meaning that you may use your notes, textbook, or online encyclopedias such as Wikipedia. Keep in mind that such encyclopedias are not always accurate and you are responsible for any mistakes. You are **not** permitted to consult any internet forum where people ask and answer questions, or internet sites that post answers to specific math questions.
4. You are permitted to use a general-purpose scientific calculator. The use of any other resource (online or offline) that can perform mathematical computations (including linear algebra operations) is **not** allowed. You will be given adequate time for module tests to complete the content as well as to account for any technical difficulties.
5. Communicating with others is strictly prohibited while taking module tests and homework, but you can collaborate with other students to complete the bridging assignments. The rules of attribution apply to assignments and tests: All sources must be cited. In particular, you must explicitly acknowledge any online resource that you consulted.
6. In addition to Piazza, you will be able to get support from TA office hours and the online Math Learning Centre, which is available for assistance from 3-5pm Atlantic time every weekday for the duration of the course.

## Course Content and assessment schedule

(the numbers in parentheses refer to the sections in the textbook)

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### Week 1 - From July 6 to July 12

Content	<b>Abstract Vector spaces</b> (9.1, 9.2, 9.3) <b>Complex numbers</b> (A.1,A.2,A.3)
Assessment	Homework due: <b>July 10</b> Test: <b>Opens July 9. Closes July 13</b> Assignment: <b>Opens July 9. Due July 15</b>

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### Week 2 - From July 13 to July 19

Content	<b>Error correcting codes and linear transformations</b> (9.4, 9.5, 10.1, 10.2)
Assessment	Homework due: <b>July 17</b> Test: <b>Opens July 16. Closes July 20</b> Assignment: <b>Opens July 16. Due July 22</b>

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*Week 3 - From July 20 to July 26*

<b>Content</b>	<b><i>Matrices of linear transformations (10.3, 10.4, 6.5)</i></b>
<b>Assessment</b>	Homework due: <i>July 24</i> Test: <i>Opens July 23. Closes July 27</i> Assignment: <i>Opens July 23. Due July 29</i>

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*Week 4 - From July 27 to August 2*

<b>Content</b>	<b><i>Inner product spaces (11.1, 11.2, 11.3)</i></b>
<b>Assessment</b>	Homework due: <i>July 31</i> Test: <i>Opens July 30. Closes August 3</i> Assignment: <i>Opens July 30. Due August 5</i>

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*Week 5 - From August 3 to August 9*

<b>Content</b>	<b><i>Orthogonality and Fourier series (11.4, 11.5, 11.6)</i></b>
<b>Assessment</b>	Homework due: <i>August 7</i> Test: <i>Opens August 6. Closes August 10</i> Assignment: <i>Opens August 6. Due August 12</i>

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*Week 6 - From August 10 to August 16*

<b>Content</b>	<b><i>Symmetric matrices and quadratic forms (11.7, 11.8, 11.9)</i></b>
<b>Assessment</b>	Homework due: <i>August 14</i> Test: <i>Opens August 13. Closes August 17</i> Assignment: <i>Opens August 13. Due August 19</i>

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*Week 7 - From August 17 to August 23*

<b>Content</b>	<b><i>Complex vector spaces with inner product (11.10, 11.11, 11.12)</i></b>
<b>Assessment</b>	Homework due: <i>August 21</i> Test: <i>Opens August 20. Closes August 24</i> No Assignment for this module.

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**Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale**

<b>A+</b> (90-100)	<b>B+</b> (77-79)	<b>C+</b> (65-69)	<b>D</b> (50-54)
<b>A</b> (85-89)	<b>B</b> (73-76)	<b>C</b> (60-64)	<b>F</b> (<50)
<b>A-</b> (80-84)	<b>B-</b> (70-72)	<b>C-</b> (55-59)	