

## Clackamas Community College

### Online Course/Outline Submission System

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#### Section #1 General Course Information

**Department:** Mathematics

**Submitter**

First Name: Scot  
Last Name: Pruyn  
Phone: 6611  
Email: scot.pruyn

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**Course Prefix and Number:** MTH - 261

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**# Credits:** 4

**Contact hours**

Lecture (# of hours): 44  
Lec/lab (# of hours):  
Lab (# of hours):  
Total course hours: 44

For each credit, the student will be expected to spend, on average, 3 hours per week in combination of in-class and out-of-class activity.

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**Course Title:** Linear Algebra

**Course Description:**

This course is an introduction to linear analysis of n-space: systems of linear equations, vectors, matrices, matrix operations, linear transformations, linear independence, span, bases, subspaces, determinants, eigenvalues, eigenvectors, inner products, diagonalization, and applications of these topics.

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**Type of Course:** Lower Division Collegiate

Is this class challengeable?

**Yes**

Can this course be repeated for credit in a degree?

**No**

Is general education certification being sought at this time?

**Yes**

**Check which General Education requirement:**

✓ **Mathematics**

Is this course part of an AAS or related certificate of completion?

**No**

Are there prerequisites to this course?

**Yes**

**Pre-reqs:** MTH-252 with a C or better.

**Have you consulted with the appropriate chair if the pre-req is in another program?**

**No**

Are there corequisites to this course?

**No**

Are there any requirements or recommendations for students taken this course?

**Yes**

**Recommendations:** WRD-098 or placement in WR-121

**Requirements:**

Are there similar courses existing in other programs or disciplines at CCC?

**No**

Will this class use library resources?

**No**

Is there any other potential impact on another department?

**No**

Does this course belong on the Related Instruction list?

**Yes**

**Area:** Computation

**GRADING METHOD:**

A-F or Pass/No Pass

**Audit: Yes**

When do you plan to offer this course?

✓ **Summer**

✓ **Spring**

Is this course equivalent to another?

If yes, they must have the same description and outcomes.

**No**

Will this course appear in the college catalog?

**Yes**

Will this course appear in the schedule?

**Yes**

Student Learning Outcomes:

Upon successful completion of this course, students should be able to:

1. Use the row-echelon form of a matrix to draw conclusions about a given system of equations or set of vectors.
  2. Interpret properties of vectors geometrically, including dimensions of surfaces, orthogonality, and norms.
  3. Demonstrate understanding of subspaces of  $R^n$  as well as general vector spaces.
  4. Perform matrix operations, including inverses, determinants, and finding eigenspaces.
  5. Apply principles of matrix algebra to linear transformations, including finding nullspaces and ranges.
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Clackamas Community College Online Course/Outline Submission System  
**AAOT/ASOT GENERAL EDUCATION OUTCOMES**  
**COURSE OUTLINE MAPPING CHART**

**Mark outcomes addressed by the course:**

- Mark "C" if this course completely addresses the outcome. Students who successfully complete this course are likely to have attained this learning outcome.
- Mark "S" if this course substantially addresses the outcome. More than one course is required for the outcome to be completely addressed. Students who successfully complete all of the required courses are likely to have attained this learning outcome.
- Mark "P" if this course partially addresses the outcome. Students will have been exposed to the outcome as part of the class, but the class is not a primary means for attaining the outcome and assessment for general education purposes may not be necessary.

***As a result of completing the AAOT/ASOT general education requirements, students will be able to:***

**WR: Writing Outcomes**

1. Read actively, think critically, and write purposefully and capably for academic and, in some cases, professional audiences.
2. Locate, evaluate, and ethically utilize information to communicate effectively.
3. Demonstrate appropriate reasoning in response to complex issues.

**SP: Speech/Oral Communication Outcomes**

1. Engage in ethical communication processes that accomplish goals.
2. Respond to the needs of diverse audiences and contexts.
3. Build and manage relationships.

**MA: Mathematics Outcomes:**

- C** 1. Use appropriate mathematics to solve problems.
- C** 2. Recognize which mathematical concepts are applicable to a scenario, apply appropriate mathematics and technology in its analysis, and then accurately interpret, validate, and communicate the results.

**AL: Arts and Letters Outcomes**

1. Interpret and engage in the Arts & Letters, making use of the creative process to enrich the quality of life.
2. Critically analyze values and ethics within range of human experience and expression to engage more fully in local and global issues.

**SS: Social Science Outcomes**

1. Apply analytical skills to social phenomena in order to understand human behavior.
2. Apply knowledge and experience to foster personal growth and better appreciate the diverse social world in which we live.

**SC: Science or Computer Science Outcomes**

1. Gather, comprehend, and communicate scientific and technical information in order to explore ideas, models, and solutions and generate further questions.
2. Apply scientific and technical modes of inquiry, individually, and collaboratively, to critically examine the influence of scientific and technical knowledge on human society and the environment.
3. Assess the strengths and weaknesses of scientific studies and critically examine the influence of scientific and technical knowledge on human society and the environment.

**Outcomes Assessment Strategies:****✓ General Examination**

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**Major Topic Outline:**

1. Linear equations in linear algebra.
  - a. Systems of linear equations.
  - b. Row reduction and echelon forms.
  - c. Vector equations.
  - d. The matrix equation .
  - e. Solution sets of linear systems.
  - f. Applications of linear systems.
  - g. Linear independence.
  - h. Introduction to linear transformations.
  - i. The matrix of a linear transformation.
2. Matrix algebra.
  - a. Matrix operations.
  - b. The inverse of a matrix.
  - c. Characterizations of invertible matrices.
  - d. Applications to computer graphics.
  - e. Subspaces of .
  - f. Dimension and rank.
3. Determinants.
  - a. Introduction to determinants.
  - b. Properties of determinants.
  - c. Cramer's rule, volume, and linear transformations..
4. Eigenvalues and eigenvectors.
  - a. Eigenvectors and eigenvalues.
  - b. The characteristic equation.
  - c. Diagonalization.
  - d. Markov chains.
5. Orthogonality.
  - a. Inner product, length, and orthogonality.
  - b. Orthogonal sets.
6. Introduction to general vector spaces.
  - a. Vector spaces in settings other than  $R^n$  (particularly function spaces).

Does the content of this class relate to job skills in any of the following areas:

- |                                      |           |
|--------------------------------------|-----------|
| 1. Increased energy efficiency       | <b>No</b> |
| 2. Produce renewable energy          | <b>No</b> |
| 3. Prevent environmental degradation | <b>No</b> |
| 4. Clean up natural environment      | <b>No</b> |
| 5. Supports green services           | <b>No</b> |

Percent of course: 0%

**Section #2 Course Transferability**

Concern over students taking many courses that do not have a high transfer value has led to increasing attention to the transferability of LDC courses. The state currently requires us to certify that at least one OUS school will accept a new LDC course in transfer. Faculty should communicate with colleagues at one or more OUS schools to ascertain how the course will transfer by answering these questions.

1. Is there an equivalent lower division course at the University?
2. Will a department accept the course for its major or minor requirements?
3. Will the course be accepted as part of the University's distribution requirements?

If a course transfers as an elective only, it may still be accepted or approved as an LDC course, depending on the nature of the course, though it will likely not be eligible for Gen Ed status.

Which OUS schools will the course transfer to? (Check all that apply)

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> <b>EOU (Eastern Oregon University)</b>      | <input checked="" type="checkbox"/> <b>PSU (Portland State University)</b>  |
| <input checked="" type="checkbox"/> <b>OIT (Oregon Institute of Technology)</b> | <input checked="" type="checkbox"/> <b>SOU (Southern Oregon University)</b> |
| <input checked="" type="checkbox"/> <b>OSU (Oregon State University)</b>        | <input checked="" type="checkbox"/> <b>UO (University of Oregon)</b>        |
| <input checked="" type="checkbox"/> <b>OSU-Cascade</b>                          | <input checked="" type="checkbox"/> <b>WOU (Western Oregon University)</b>  |

Identify comparable course(s) at OUS school(s)

EOU: MATH LDT (lower division transfer credit)  
 PSU: MATH 261  
 OIT: MATH 341 (but not towards upper division)  
 SOU: MATH 261  
 OSU: MATH LDT (lower division transfer credit)  
 UO: MATH 227T (lower division transfer credit)  
 WOU: MATH 2XX (lower division transfer credit)

How does it transfer? (Check all that apply)

**other (provide details):** Depends on the school - see above.

Provide evidence of transferability: (minimum one, more preferred)

- Correspondence with receiving institution (mail, fax, email, etc.)**
- Other. Please explain.**

Corresponded with each school and checked the "transfer equivalency tools" available on most Oregon university websites.

First term to be offered:

**Next available term after approval**

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