

Math 1042
Mathematics of Design
Fall 2017
(4 credits)

Monday/Wednesday 3:30-5:30 [location TBD]

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Introduction to the Course

Course Description

A tour of mathematics relevant to principles of design that support the "making" of things: from objects to buildings. Project-based problem solving. Systems of equations, trigonometry, vectors, analytic geometry, conic sections, transformations, approximation of length, area, and volume.

Educational Purpose

This course serves as a requirement in the Construction Management major in CMgt. It can also be used as an elective undergraduate course for architecture students.

Prerequisites

Satisfactory score on placement test or grade of at least C- in MATH 1031 or MATH 1051

Course Materials

Required Materials

Textbook

Appropriate sections/problems selected from the [Open Textbook Library \(open.umn.edu\)](https://open.umn.edu)

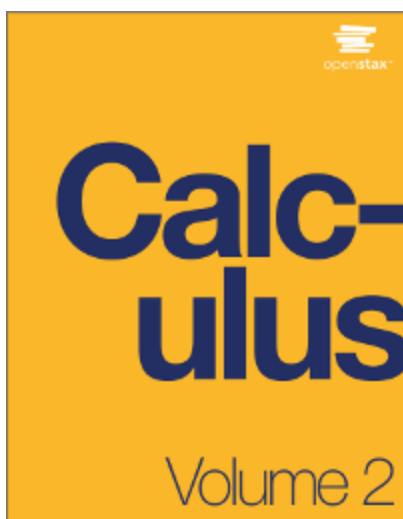
Textbooks



Algebra and Trigonometry

OpenStax CNX. Feb 27, 2017

<http://cnx.org/contents/13ac107a-f15f-49d2-97e8-60ab2e3b519c@6.35>



Calculus Volume 2

OpenStax CNX. Feb 24, 2017

<http://cnx.org/contents/1d39a348-071f-4537-85b6-c98912458c3c@2.40>

others?	others?
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Learning Outcomes

Course-level Outcomes (CO)

This course supports the following outcomes

	Course-level Outcomes (CO)	Assessment Measure	PO
1	<i>Describe design-based problems using standard mathematical notation and functions</i>		
2	<i>Solve design-based problems using Trigonometric functions and Geometric relationships.</i>		
3	<i>Solve design-based problems using linear algebra functions and methods.</i>		
4	<i>Use a mathematical approach to approximate length, area and volume of figures.</i>		
5	<i>Use multiple representations to communicate solutions and methods</i>		
6			
7	<i>Develop strategies, heuristics and a mathematical orientation toward problem-solving</i>		

Course Schedule

Module / Week	Topic	Learning Activities and Outcomes
0	Getting Started	Update Your Moodle Profile Prepare for Google Video Calls Update Your Google+ Profile Introduce Yourself
Foundations		
1	Introduction to course <i>Assess prerequisite knowledge/skills</i> <i>Review materials</i>	Homework 1 Group Problem 1 Design Problem 1

2	Building Problem-solving Skills	Homework 2 Group Problem 2 Design Problem 2 Foundations Exam
Approximation/Estimation/Bounding		
3	Approximation in one dimension	Homework 3 Group Problem 2 Design Problem 3
4	Approximation in two dimensions	Homework 4 Group Problem 4 Design Problem 4
5	Approximation in three dimensions	Homework 5 Group Problem 5 Design Problem 5 Approximation Exam
Optimization		
6	Introduction Optimization	Homework 6 Group Problem 6 Design Problem 6
7	Scheduling and Sequencing	Homework 7 Group Problem 7 Design Problem 7
8	Systems of equations	Homework 8 Group Problem 8 Design Problem 8
9	Systems of equations <i>Higher dimensions and solution spaces</i>	Homework 9 Group Problem 9 Design Problem 9 Optimization Exam

Geometry in Design		
10	Triangles in Design	Homework 10 Group Problem 10 Design Problem 10
11	Cross-section and Axis	Homework 11 Group Problem 11 Design Problem 11
12	Centers of Mass and Inertia	Homework 12 Group Problem 12 Design Problem 12
13	Levers	Homework 13 Group Problem 13 Design Problem 13
14	Computer Models	Homework 14 Group Problem 14 Design Problem 14
15	Presentations and Final Exam	Research Report Geometry in Design Exam

Grading

Grading Table

The following table summarizes the requirements and grading of the assignments in this course. The specific instructions for each activity are included in the appropriate forum, assignment, or quiz.

Learning Activity	Individual/Group	Assessment	% of Grade
Homework	Individual	~10 mathematics problems	20

<i>Weekly skill problems</i>			
Design Problems	Individual	Mathematical justification of solutions to design problems	20
Group Problems	Group	In class open ended problems	10
Research Report	Individual	Written report with calculations and figures	30
Topic Exams Foundations Approximation Optimization	Individual	Written exam	20
Total			100%

Evaluation

Process	Evidence of reflection Problem-solving approach Iterations
Method	Accurate, appropriate and complete calculations
Representation	Graphs, illustrations, visualizations
Presentation/ Communication	Explaining your thinking

Late Submissions

Late work will only be accepted with prior approval from the instructor.

Make-up Work for Legitimate Absences

You are responsible for informing your instructor as soon as possible of missed classes for [legitimate reasons](#) and provide documentation of the reason for absence. Reasonable and timely accommodations will be arranged.

Withdrawals

Week 10 is the last week to withdraw without your college's approval. For details check the [Cancel/add & refund deadlines](#) page.

Incompletes

An "Incomplete" requires prior approval from the instructor for extraordinary circumstances. Contact your instructor if you need to arrange an incomplete.

Grade Distribution

Percentage Achieved	Grade	Definition of Grades and Workload Expectations
93-100	A	Achievement that is outstanding relative to the level necessary to meet course requirements.
90-92	A-	
87-89	B+	
83-86	B	Achievement that is significantly above the level necessary to meet course requirements.
80-82	B-	
77-79	C+	
73-76	C	Achievement that meets the course requirements in every respect.
70-72	C-	
67-69	D+	
60-66	D	Achievement that is worthy of credit even though it fails to meet fully the course requirements.
0-59	F	Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an 'I' (see also I). Academic dishonesty: academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.
	S	Achievement that is satisfactory, which is equivalent to a C- or better (achievement required for an S)
	I	Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student. http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html

For more information on UMN Grade Distribution, please see [Grades and Grade Basis](#).

Expected Student Academic Work per Credit

UMN defines one undergraduate credit as equivalent to 42-45 hours of learning effort distributed across a semester (including all classroom and outside activities).

UMN defines one graduate credit as exceeding 45 hours of learning effort distributed across a semester (including all classroom and outside activities).

Please review the [UMN Policy on Expected Student Academic Work per Credit](#).

Academic Policies and Accommodations

[Academic Policies](#)

[Academic Accommodations](#)

Syllabus subject to change

This syllabus may change as needed to support the student learning outcomes for this course.
