MATH 1320: ENGINEERING CALCULUS II
Spring 2016
SYLLABUS

Instructor: Nicola Tarasca, PhD
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TA: Andrew Basinski (a.basinski@utah.edu) and Marin Petkovic (petkovic@math.utah.edu)

Lectures when and where: MTWF 09:40 – 10:30 AM, in HEB 2004, from January 11 to April 26, 2016

Labs:
- Th 08:35 – 09:25 AM, in LCB 225 (M. Petkovic)
- Th 09:40 – 10:30 AM, in LCB 225 (M. Petkovic)
- Th 09:40 – 10:30 AM, in JFB B-1 (A. Basinski)
- Th 10:45 – 11:35 AM, in LCB 215 (A. Basinski)

Course website: See the Canvas course page in your CIS

Office hours: T & Th, 1:30 – 3:00 PM, in JWB 315, or by appointment

TA office hours: TBA

Midterm exams: Friday, February 19, 2016, 09:40 – 10:30 AM, in HEB 2004,
Friday, April 1, 2016, 09:40 – 10:30 AM, in HEB 2004

Final exam: Monday, May 2, 08:00 AM – 10:00 AM, in HEB 2004


Course Information
Math 1320–001, Engineering Calculus 2 is a 4-credit semester course.

Prerequisite
“C” or better in MATH 1310 OR AP Calc BC score of 3 or better OR Department Consent.

Course description
Differential and Integral Calculus II, with a focus on applications and projects for engineers: integral expressions for moments, centers of mass, and work; modeling with first order differential equations; infinite series and sequences; power series and Taylor series; vectors, dot and cross
products, and the geometry of space; the calculus of vector functions and particle motion in space; differential calculus for functions of several variables, including linear approximation, partial and directional derivatives, chain rule, and multi-variable optimization.

**Expected learning outcomes for 1320**

**The topics**

- Students will be able to utilize methods of integration to compute volumes of objects with circular-shaped aspects, and compute lengths of curves. These applications introduce a higher-level concept of integration, involving the summation of small volume segments $dV$ or small length segments $ds$, which are computed by performing an appropriate parameterization to a real-number-line integral in terms of $dx$.
- Students will be skilled in using integration to compute problems important in physics and engineering. Students will know how to compute an average value of a function using the mean value theorem for integrals, the center of mass for objects, and the computation of energy as a force integrated over a distance. Students will also be able to utilize physical laws to formulate differential equations that solve for the motion of masses by forces of gravitation, friction, electrostatics, to name a few. Students will also become familiar with the phenomenon of exponential growth and decay in science and engineering contexts.
- Students will become skilled in computations and applications of infinite sequences and sums. Students will become familiar with the properties of infinite sums to either converge to a finite value or diverge to an infinite value, and will learn about methods to determine convergence. Students will be able to represent functions as a Taylor series, and use Taylor’s theorem to approximate functions and estimate error from using finitely many terms of the Taylor series.
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- and 3-dimensional coordinate systems, vectors and vector operations including the dot and cross product, and equations of lines, planes, and other surfaces. Students will also learn how to represent motion of objects in 3D using vector functions, how to represent velocity and acceleration using vector projections into tangential and centripetal coordinates of acceleration, and how to characterize curves in space by computing arc length and curvature. For functions of 3D surfaces, students will be able to characterize aspects of surfaces and volumes using partial derivatives and the gradient vector. Partial derivatives will also be used to describe approximating tangent planes to points on surfaces, and how to compute derivatives of multi-dimensional function compositions can be performed using a multi-dimensional version of the chain rule.

**Problem solving fluency**

- Students will be able to read and understand problem descriptions, then be able to formulate equations modeling the problem usually by applying geometric or physical principles. Solving a problem often requires a series of transformations that include utilizing the methods of calculus. Students will be able to select the appropriate calculus operations to apply to a given problem, execute them accurately, and interpret the results using numerical and graphical computational aids.
- Students will gain experience with problem solving in groups, be able to communicate effectively about problem objectives and the use of solving methods with peers, and solve problems in a team fashion. Students will also learn how to and articulate questions effectively with both the instructor and TA, and be able to effectively communicate problem solutions by articulate how it meets problem objectives.
Tentative Schedule

Week 1  §§6.3-6.6 Volumes by Shells, Arc Length, Average Values, Applications of Integration to Engineering.
Week 3  §§7.4, 8.1-8.2 Exponential Growth and Decay, Sequences, Series.
Week 4  §§8.3-8.4 Convergence Tests for Series, Estimating Sums.
Week 5  §§8.5-8.6 Power Series, Representing Functions with Power Series.
Week 6  §§8.7-8.8 Taylor and Maclaurin Series, Applications of Taylor Polynomials.
Week 7  §§9.1-9.3 Three Dimensional Coordinates, Vectors, Dot Product.
Week 8  §§9.4-9.5 Cross Product, Equations of Lines and Planes.
Week 9  §§9.6-10.1 Functions and Surfaces, Vector Functions, Space Curves.
Week 11 §§10.2-10.3 Derivatives and Integrals of Vector Functions, Arc Length, Curvature.
Week 12 §§10.4-10.5 Velocity, Acceleration, Parametric Surfaces.
Week 13 §§11.1-11.3 Functions of Several Variables, Limits, Partial Derivatives.
Week 14 §§11.4-11.5 Tangent Planes, Linear Approximation, Chain Rule.
Week 15 §§11.6-11.7 Directional Derivative, Gradient Vector, Maximum and Minimum Values.
Week 16 §§11.8 Lagrange Multipliers, Review

Assignments

The work you will complete in this course consists of weekly homework and quizzes, two super quizzes, two midterm exams, a comprehensive final exam, lab attendance, lab worksheets, and lab presentations. Homework assignments will not be graded. On Fridays there will usually be a quiz, a super quiz, or a midterm. The complete calendar of assignments is available on Canvas.

The two lowest quiz scores will be dropped. Super quizzes and all exams grades will not be dropped.

Calculators are not permitted during quizzes or exams.

The Lab

Every Thursday a Teaching Assistant–directed lab section will be held. Credit will be given for lab attendance, completion of the lab worksheets, and student presentations. The due date for the lab worksheets is the following Thursday. The two lowest scores will be dropped. Presentation credit is earned by presenting problem solutions at the board. Two or more presentations will be required in the semester to earn presentation credit depending on class size. The TA will work with all the students to find appropriate presentation times over the semester.

Course Evaluation Methods

Grades are computed as a weighted average consisting of 10% quiz scores, 10% super quiz scores, 5% lab attendance, 10% lab worksheets, 5% lab presentations, 40% midterm exam scores, and 20% the final exam score.

Letter grades are determined as follows: If X is your percentage grade, then $X \geq 93\% \Rightarrow A$, $90\% \leq X < 93\% \Rightarrow A-$, $87\% \leq X < 90\% \Rightarrow B+$, $83\% \leq X < 87\% \Rightarrow B$, $80\% \leq X < 83\% \Rightarrow B-$, $77\% \leq X < 80\% \Rightarrow C+$, $73\% \leq X < 77\% \Rightarrow C$, $70\% \leq X < 73\% \Rightarrow C-$, $67\% \leq X < 70\% \Rightarrow D+$, $63\% \leq X < 67\% \Rightarrow D$, $60\% \leq X < 63\% \Rightarrow D-$, $X < 60\% \Rightarrow F$. Letter grade assignments can be changed at the discretion of the instructor.
Strategies for Success

- Attend class.
- Plan to do homework daily.
- Read the relevant textbook sections daily.
- Form study groups with other students.
- Know how grades are computed at the start of the semester and plan your effort accordingly.

Tutoring Lab

T. Benny Rushing Mathematics Student Center (adjacent to JWB and LCB), Room 155, M - Th: 8 AM – 8 PM, F: 8 AM – 6 PM (closed Saturdays, Sundays, and holidays). They are also offering group tutoring sessions. If you are interested, inquire at the Tutoring Lab. [http://www.math.utah.edu/ugrad/tutoring.html](http://www.math.utah.edu/ugrad/tutoring.html)

Computer Lab

Also in the T. Benny Rushing Mathematics Student Center, Room 155C, M - Th: 8 AM - 8 PM, F: 8 AM - 6 PM (closed Saturdays, Sundays, and holidays). Link to computer lab is [http://www.math.utah.edu/ugrad/lab.html](http://www.math.utah.edu/ugrad/lab.html)

Class Policies

- There will be no retakes of quizzes or exams, for any reason.

- You may take an alternate exam if you talk to me about it first and explain the emergent circumstances that make it necessary. It is your responsibility to communicate with me as soon as possible. I reserve the right to make alternate exams more difficult than the scheduled exam.

- If you have crisis-level extenuating circumstances which require flexibility, it is your responsibility to communicate with me as soon as possible so I can help you in some manner. The longer you wait to communicate with me, the less I can do to help.

- If you have questions about any exam/quiz grade, or you want to appeal the grading of the exam/quiz, you must bring it to me within one week of the exam. I am happy to look over your questions and give my feedback.

- Faculty and Student Responsibilities
  All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty’s responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. [http://regulations.utah.edu/academics/6-400.php](http://regulations.utah.edu/academics/6-400.php)

- I will demand respectful behavior in my classroom. Examples of disrespect include, but are not limited to, reading a newspaper or magazine in class, chatting with your friends in class, text-messaging during class. If you choose to be disrespectful with distracting behavior during my class,
I will take action to terminate disruptive behaviors, and that action may not be desirable to you.

- If you cheat on any homework, project, quiz or exam, I will give you a zero for that grade. Depending on the severity of the cheating, I may decide to fail you from the class. Please note that the use (or even just pulling it out of your pocket) of a cell phone or any other electronic internet device is considered cheating and cause for receiving an automatic zero on any quiz or exam. Also, if you exhibit any other behaviors that are unethical, like offering me a bribe to give you a better grade (even if you later claim you were joking), I will report your behavior to the Dean of Students.

- I do NOT allow the use of laptop computers in my classroom. It is totally fine if you are using a tablet or some similar device to take notes, and the screen lies parallel to your desk.

- ADA - Nondiscrimination and Disability Access Statement
  The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the CDS.

- Center for Student Wellness
  Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness: [http://www.wellness.utah.edu](http://www.wellness.utah.edu)

**NOTE:** The syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification.