

MATH 317 Advanced Calculus of one variable

Fall 2017

- Instructor:** Dr. Manuela Girotti; office: Weber 223C
email: manuela.girotti@colostate.edu
- Time:** Mon-Wed-Fri 9:00am-9:50am
- Location:** Engineering E105
- Office hours:** Monday 4:00pm – 5:30pm and Thursday 11:00am – noon
Weber 008 (basement)
- Textbook:** *Basic Analysis: Introduction to Real Analysis*, Volume I, by Jiří Lebl
Paperback: 260 pages; 4th edition (March 1, 2016)
Publisher: CreateSpace Independent Publishing Platform;
ISBN-10: 1530256747; ISBN-13: 978-1530256747
downloadable online for free at: <http://www.jirka.org/ra/>
- Catalog description:** convergence of sequences, series: limits, continuity, differentiation, integration of one-variable functions; development of skills for proving theorems.
- Overview:** This is a proofs-based course, mostly aimed at Mathematics-major students. Prerequisite for this course are the two Calculus courses MATH 160 and 161 which provide already the basic concepts and results of Real Analysis. However, the purpose of the present course is to give a deeper and more theoretical understanding of the theorems already showed in the previous courses and develop them further.



- Homework:** you will be required to hand in **5 assignments** along the semester. The assignments will be posted on the Canvas website (with due dates – please, check the Canvas calendar often) and they reflect the content of the course. No late assignments will be accepted.
- Please, submit your assignment with all the papers stapled together and with your name and CSU ID written on the first page. Use a pen and write clearly.
- If you are unable to submit a hard copy assignment, you can also scan it and send it to the instructor by email, no later than the due date and due time.
- Discussions and work group are encouraged, however the final submission has to be personal and show understanding of the material. Grades will be posted on Canvas.
- Midterm exams:** there will be **2 midterm tests on Friday September 29th, 2017 and Friday November 10th, 2017**. The first one will cover chapters 0-1-2 from the book and the second one will cover the subsequent chapters 3 and 4. They will be held in class and they will last 50 minutes.
- Final exam:** the final examination will cover material from the entire course, but emphasis will be given on recent material on integration and open/closed sets as foundations for topology (chapters 5, 6 and 7). It will be a closed-book exam, no notes are allowed.
- The final exam is scheduled for **Monday December 11th, 2017 between 7:30am and 9:30am**. It will be held in class (room E105).
- If you have time conflicts with other examinations, please notify the instructor as soon as possible.



Grading scheme: your final grade will be built up from the grades coming from assignments, midterm and final exams in the following percentage:

- 20% assignments,
- 20% + 20% midterm exams,
- 40% final exam.

Please, note that the grading algorithm on Canvas is set automatically and does not respect the above scheme.

Calculators: unless otherwise stated, basic 4-function calculators and scientific calculators (like Sharp EL 531 and Casio FX 300MS, for example) are permitted in class tests and final examination.

Academic Integrity: as in any other course you will attend, you are required to study and act according to the University Policy on Academic Integrity and the Student Conduct Code (see <http://tilt.colostate.edu/integrity>).

Moreover, bear in mind that the consequences for such misconduct (cheating, plagiarism, etc.) will ultimately fall upon you: this course is a precious opportunity for you to learn something new and valuable. It's an investment on your future. Failing to acquire it will sadly be your loss.

IMPORTANT: note that there is no “100% final exam” option in this course. The term work will substantially contribute to the final grade. Therefore, active participation in classes and continuous work on the course material during the semester is essential for success in this course.

Tentative (and ambitious) outline of the course

A diary of the lectures will be regularly kept on the Canvas calendar with the sections covered in each class.

Week	Chapter	Topic	Suggested exercises
1 08/21– 08/25	Ch. 0, 1	Basic Set Theory Basic properties; the set of real numbers	Ch. 0: 3.7, 3.9, 3.10, 3.11, 3.15, 3.20 Ch. 1: 1.2, 1.6, 1.8, 1.9, 1.10; 2.5, 2.6, 2.7, 2.8, 2.11, 2.13
2 08/28– 09/01	Ch. 1	The set of real numbers; absolute value; intervals and the size of \mathbb{R} ; decimal representation of the real	Ch. 1: 3.2, 3.5, 3.7; 4.4, 4.6, 4.9
3 09/06– 09/08	Ch. 2	Sequences and limits	Ch. 2: 1.7, 1.8, 1.9, 1.13, 1.15, 1.17, 1.20
4 09/11– 09/15	Ch. 2	Facts about limits of sequences; limit superior, limit inferior and Bolzano-Weierstrass; Cauchy sequences	Ch. 2: 2.3, 2.4, 2.7, 2.9, 2.10, 2.11; 3.5, 3.9, 3.10, 3.11, 3.12; 4.3, 4.4
5 09/18– 09/22	Ch. 2	Series; more on series	Ch. 2: 5.1, 5.2, 5.5, 5.6, 5.11, 5.12, 5.13; 6.6, 6.7, 6.10, 6.11
6 09/25– 09/29	Ch. 3	Limits of functions	Ch. 3: 1.7, 1.9, 1.10, 1.13
7 10/02– 10/06	Ch. 3	Continuous functions	Ch. 3: 2.3, 2.10, 2.11, 2.14, 2.15, 2.16

8 10/09– 10/13	Ch. 3	Min-max and intermediate value theorem; uniform continuity; limits at infinity; monotone functions and continuity Midterm exam # 1	Ch. 3: 3.3, 3.4, 3.6, 3.8, 3.10, 3.11; 4.3, 4.5, 4.6, 4.9, 4.10, 4.14; 5.7; 6.7, 6.8, 6.11
9 10/16– 10/20	Ch. 4	The derivative; mean value theorem; Taylor's theorem; inverse function theorem	Ch. 4: 1.1, 1.3, 1.5, 1.8, 1.9, 1.10, 1.12; 2.4, 2.5, 2.7, 2.9, 2.10, 2.11; 3.3, 3.4, 3.6; 4.7, 4.8
10 10/23– 10/27	Ch. 5	The Riemann integral; properties of the integral	Ch. 5: 1.3, 1.7, 1.9, 1.10, 1.11; 2.4, 2.5, 2.6, 2.7, 2.10, 2.11, 2.12, 2.13
11 10/30– 11/03	Ch. 5	Properties of the integral; Fundamental theorem of Calculus	Ch. 5: 3.4, 3.5, 3.7, 3.9, 3.11
12 11/06– 11/10	Ch. 5	The logarithm and exponential; improper integrals	Ch. 5: 4.3, 4.4, 4.5, 4.6; 5.6, 5.7, 5.8, 5.12, 5.13, 5.14
13 11/13– 11/17	Ch. 6	Pointwise and uniform convergence; interchange of limits Midterm exam # 2	Ch. 6: 1.2, 1.7, 1.9, 1.10; 2.1, 2.2, 2.7, 2.10, 2.11
11/20– 11/24		*** fall break ***	



14 11/27– 12/01	Ch. 7	Metric spaces; open and closed sets; sequences and convergence; completeness and compactness; continuous functions	Ch. 7: 1.4, 1.7, 1.8; 2.4, 2.5, 2.7, 2.9, 2.10, 2.11; 3.5, 3.6, 3.9, 3.11; 4.2, 4.3, 4.7, 4.8; 5.3, 5.8, 5.9
15 12/04– 12/08		Review & conclusions	

Disclaimer: the instructor reserves the right to make changes to the course outline and course content should this be necessary for academic or other reasons. Changes will also be posted on Canvas and promptly communicated. Every effort will be made to minimize such changes.