Course Subject, Number and Title
MATH 521 – Analysis I
Section 001

Credits
3

Canvas Course URL https://canvas.wisc.edu/courses/183852

Course Designations and Attributes
Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Honors - Honors Optional

Meeting Time and Location
Social Sciences 6102, MWF 9:55am-10:45am.

Instructional Mode
Face-to-face

Specify how Credit Hours are met by the Course

This class meets for three 50-minute class period each week over the fall/spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 2 hours out of classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

Honors Optional
If you are taking this course for Honors, you will be assigned extra homework problems in some homework sets.
INSTRUCTORS AND TEACHING ASSISTANTS

Instructor Title and Name
David Beltran

Instructor Availability
Tentative office hours: 625 Van Vleck Hall, Mondays 11am-11.50am, Tuesdays 3pm-3.50pm. Office hours may change during the semester, this will be notified in Canvas.

Instructor Email/Preferred Contact
dbeltran@math.wisc.edu

OFFICIAL COURSE DESCRIPTION

The real numbers, elements of set theory, metric spaces and basic topology, sequences and series, limits, continuity, differentiation, integration, sequences and series of functions, uniform convergence.

Requisites
MATH 322, 341, 376, or 421 or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program

LEARNING OUTCOMES

Course Learning Outcomes
At the end of this course, students are expected to:

- explain the Least Upper Bound axiom, the real number field and the Euclidean space
- state and prove the Schwarz inequality in $\mathbb{R}^n$
- state and use the definitions of finite, countable and uncountable sets
- define a metric space and check the definition for simple examples
- state and prove properties of open and closed sets and of compact sets in a metric space
- state and use the definition of sequence, subsequence, convergent sequence and Cauchy sequence
- define a monotone sequence and work out the lim sup and lim inf of a sequence
- define convergent, absolutely convergent and conditionally convergent series
- use the geometric series, root test and ratio test for convergence of series
- state and use the $\varepsilon$–$\delta$ definitions of continuity and limits for functions and verify them in simple examples
- state and prove theorems relating to continuous functions on compact and connected sets
- define the derivative of a real valued function and apply L'Hôpital’s rule
- state and prove the Mean Value Theorem
- define the Riemann-Stieltjes integral and prove its basic properties
- explain the criteria for integrability and the integral of step functions
• state and prove the fundamental theorem of calculus and explain why the hypotheses are necessary
• compute change of variables in an integral and explain the relationship between differentiation and integration
• explain pointwise and uniform convergence of functions
• show properties of integrability and differentiability of the uniform limit of a sequence of functions
• explain uniform convergence of series and the Weierstrass M-test

GRADING

The grading in this class is based on exams and homework. The course grade will be determined according to students' performance on:

• homework assignments (20%)
• two midterm exams (20% each)
• final exam (40%)

DISCUSSION SESSIONS

Add information specific to discussion sections as appropriate or have a separate document.

REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

Textbook: Principles of Mathematical Analysis, Walter Rudin, 3rd Ed.

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

There will be two midterm exams and a final exam. The midterm exams will be in class (in Weeks 6 and 10).

• Midterm Exam 1: Wednesday February 26, 9.55am-10:45am in Social Sciences 6102
• Midterm Exam 2: Wednesday April 1, 9.55am-10:45pm in Social Sciences 6102
• Final Exam: Wednesday May 6, 10.05am-12:05pm in TBA

Exams are closed book and notes, and access to electronic devices is not allowed.

HOMEWORK & OTHER ASSIGNMENTS

There will be tentatively 10 homework assignments; usually on a weekly basis except for the mid-term exam weeks. Homework assignments will be posted in Canvas and are to be turned in on the due date (typically on Wednesdays) in class at the beginning of the lecture.
There will be no make-up assignments. Late homework or e-mail submissions is not accepted.

Students may discuss the material with others and consult other sources but must specify their collaborators and all sources on each homework, including other textbooks and information found on websites. Failure of doing so is considered academic misconduct.

RULES, RIGHTS & RESPONSIBILITIES

- To see the Guide’s Rules, Rights and Responsibilities information, refer to http://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilities.

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison’s community of scholars in which everyone’s academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: “The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.” http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.”
The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” [https://diversity.wisc.edu/](https://diversity.wisc.edu/)