TED University

Department of Mathematics

2023-2024 Fall Semester

MATH 211 – Advanced Calculus I

Syllabus

Credit Hours: (4+0+0) 4 TEDU Credits, 7 ECTS Credits

Pre-requisite: Math 114

Course Description

Open, Closed and Bounded Sets in $\mathbb{R}^n$. Interior, Exterior, Boundary, and Closure of a Set. Compactness. Sequences in $\mathbb{R}^n$. Functions of Several Variables. Limits, Continuity, and Uniform Continuity. Partial Derivatives. Differentiability. Chain Rule. Directional Derivatives. Gradient. Tangent Planes and Normal Lines. Tangent Plane Approximation. Classification of Critical Points. Extreme Values. The Method of Lagrange Multipliers. Divergence and Curl.

Instructor

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Textbook

- Lecture Notes

Supplementary Books

- Calculus, A Complete Course, by Adams and Essex (9^{th} Edition)
- An Introduction to Real Analysis, by Tosun Terzioğlu
- Advanced Calculus, by Wilfred Kaplan (5^{th} Edition)
- Advanced Calculus, by R. Creighton Buck (3^{th} Edition)

Grading

Midterm Exam 1: 25%
Midterm Exam 2: 25%
Final Exam: 30%
Homework 1 (from Webwork): 5%
Homework 2 (from Webwork): 5%
Active Learning Exercises: 2% x 5 = 10%

Learning Outcomes

Upon successful completion of this course, a student will be able to:

1. Recall principles of mathematical writing, definitions, statements of theorems, certain examples and counterexamples pertaining to topology of $\mathbb{R}^n$ and functions of several variables;

2. Identify open, closed, bounded, and compact sets in $\mathbb{R}^n$;

3. Evaluate limits, partial derivatives, and directional derivatives of functions of several variables,

4. Interpret differentiability of functions of several variables;

5. Determine equations of tangent planes and normal lines;

6. Classify critical points of functions of several variables;

7. Use the method of Lagrange multipliers;

8. Evaluate divergence and curl of vector fields.

Student Workload (175 hours)

Activities	Number	Duration (hour)	Total Work Load
Lectures	14	4	56
Course Readings	14	4	56
Active Learning Exercises (Study duration)	5	5	25
Homeworks (Study duration)	2	6	12
Midterm Exams (Study duration)	2	7	14
Final Exam (Study duration)	1	12	12

Midterm and Final Exams

Throughout the semester there will be 2 midterm exams and 1 final exam.

Homeworks

Throughout the semester there will be 2 homeworks from Webwork.

Active Learning Exercises

Throughout the semester there will be 5 active learning exercises. These exercises will help you learn the course material in an active and collaborative manner.

Calculator Policy

You may use a graphing calculator or software that does symbolic calculations during the lectures. But you will not be allowed to use a calculator during active learning exercises and exams.

Make-up Policy

Make-up for the exams and active learning exercises will be given for the students who missed an exam or active learning exercise due to medical excuses documented by medical reports that are approved by official health institutes or due to other official excuses approved by TED University's executive branches.

There will not be any make-up for a make-up exam and homeworks.

Course Outline

The course outline is given below. This outline is tentative, and it will be adapted to the pace of the class in agreement with the students. Any changes will be announced either in the classroom or via e-mail.

Week 1	Fields, Ordered fields, Supremum and infimum of sets, The least upper bound property
Week 2	Introduction to topology of $\mathbb{R}$, $\mathbb{R}^2$, and $\mathbb{R}^3$: Interior, exterior and boundary of a set
Week 3	Bounded sets, Open and closed sets
Week 4	Closure of a set, Compact sets
Week 5	Sequences, Subsequences, Sequential compactness
Week 6	Functions of several variables, Limits, Continuity
Week 7	Uniform continuity, Partial derivatives
Week 8	Higher-order derivatives, Tangent planes and normal lines
Week 9	Differentiability, Differentials, The Chain Rule
Week 10	Directional derivatives, Gradient vector, Linear approximation
Week 11	Extreme values, Classifying critical points
Week 12	Extreme values of functions defined on restricted domains, The method of Lagrange multipliers
Week 13	Divergence and curl, Jacobian matrix, Jacobian determinant
Week 14	Implicit Function Theorem, Inverse Function Theorem, Taylor's Theorem

Student Services Info

- **Student Development and Psychological Counseling Center**

The Center is a service mandated with providing crisis intervention and supportive listening services to the campus community. A major part of fulfilling that mandate is raising awareness of our service so students know they are never alone in dealing with problems. You may contact the SDPCC at: ogrencidanismamerkezi@tedu.edu.tr, 0312 585 0316, Office A122, or visit their website at http://csc.tedu.edu.tr/

- **TEDU COPeS - Psycho-Social Support**

TED University Psychosocial Support Team was initially established in order to facilitate coping with the psychological, social, familial, academic, and professional difficulties that may arise due to adverse conditions associated with COVID-19 pandemic for TEDU students and employees.
In time we have expanded our services to provide psychosocial support in diverse disasters. In this line, TEDU COPeS offers psychosocial support for TED University students and employees in the aftermath of Kahramanmaraş earthquakes.

For further information and/or questions, visit their website at https://copes.tedu.edu.tr/

- **Specialized Support and Students with Disabilities**

Students who may require specialized support due to a disability affecting mobility, vision, hearing, learning, mental or physical health should consult with Specialized Support and Disability Coordinator, Asst. Prof. Emrah Keser E-mail: emrah.keser@tedu.edu.tr, or visit the website at https://www.tedu.edu.tr/tr/main/engelsiz-tedu

Principles of Academic Integrity
(Can be found in the webpage https://student.tedu.edu.tr/en/student/principles-of-academic-integrity)

TED University upholds the open-mindedness and diversity of ideas as essential to the foundation and development of an academic community. In this regard, students are encouraged to discuss about their courses, researches and assignments with their instructors and classmates. These discussions and exchange of ideas are the core elements of academic life. Endeavored by this freedom they had, members of the academic community trust each other and work in collaboration. In order to maintain the ongoing viability of this academic environment and to safeguard the proper use of resources, ideas and knowledge, TED University has adopted the academic integrity policies as given below.

Any type of academic dishonesty (during exams or on assignments, projects, etc.) is not tolerated and strongly condemned by TED University. Academic frauds include, but are not limited to, the following

- **Cheating** (deliberately using or attempting to use course materials or auxiliary equipment not allowed during an exam, etc.)
- **Fabrication** (deliberate falsification of data, information, or citations.)
- **Aiding and abetting** (helping someone in an act or attempt of deliberate academic dishonesty)
- **Plagiarism** (using an author's words or ideas as if one's own)

Cheating

Cheating has a very broad description which can be summarized as "acting dishonestly". Some of the things that can be considered as cheating are the following: copying answers on exams, homework and lab works, using prohibited material on exams, lying to gain any type of advantage in class, providing false, modified or forged data in a report, plagiarizing, modifying graded material to be re-graded, causing harm to colleagues by distributing false information about an exam, homework or

lab. Cheating is a very serious offense and will be penalized accordingly by the university disciplinary committee.

Plagiarism

All of the following are considered plagiarism:
- Turning in someone else's work as your own
- Copying words or ideas from someone else without giving credit
- Failing to put a quotation in quotation marks
- Giving incorrect information about the source of a quotation
- Changing words but copying the sentence structure of a source without giving credit
- Copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not

Plagiarism is a very serious offense and will be penalized accordingly by the university disciplinary committee. The best way to avoid accidentally plagiarizing is to work on your own before you ask for the help of other resources.