MATH 6540 – General Topology

WINTER 2019

Instructor's Information

Instructor: Paul Skoufranis
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Offices Hours: TBA
Math Lab Hours: TBA

Administrative Information

Course Prerequisites: Basic knowledge of undergraduate real analysis.
Course Webpage: http://pskoufra.info.yorku.ca/teaching/w2019-math6540/
Lectures: Mondays, Wednesdays, and Fridays from 11:30AM to 12:30PM in HNE B11.
Textbook: *Topology*, by Munkres, 2nd edition (optional).
Midterm Examination Date: In class on Friday March 1st, 2019.
Final Examination Date: TBA. The final examination will be comprehensive and will be scheduled during the April exam period in consultation with students. The final examination will be a closed book examination.

Comprehensive Examination

An extended version of the final examination of MATH 6540 will serve as a comprehensive examination for the PhD program in the Department of Mathematics and Statistics. More information pertaining to the comprehensive examination will be distributed to the students closer to the examination date. Students who are not enrolled in MATH 6540 yet wish to take the comprehensive examination should contact the instructor regarding the time, place, and material for the examination.

Course Description and Objectives

Topology, from the Greek τόπος meaning place and λόγος meaning study, is the study of properties of spaces and their deformations. As there are many different branches of topology, such as differential topology, geometric topology, and algebraic topology, this course will study what is known as general (or point-set) topology as it is the foundation of all branches of topology.

In this course, we will study the basic set-theoretic definitions and constructions used in topology. We begin with the notion of a topological space, which is a set together with a collection of subsets that describe which points in our space are close together. Given a topological space, one can generalize the notion of continuous functions as seen in previous analysis courses thereby develop a richer function theory. From there we will study the most fundamental topics in general topology, such as compactness, connectedness, separation axioms, compactifications, Baire Category, applications to analysis, StoneWeierstrass Theorem, Tietze extension theorem, Tychonoff theorem, nets and filters, and metrization theorems

Course Schedule

The following is a rough outline of material that will be covered in the lectures of this course:

1. Topological Spaces
    a. Topologies
    b. Metric Spaces
    c. Bases
    d. Nets
    e. Closures of Sets
2. Continuous Functions
    a. Homeomorphisms
    b. Intermediate Value Theorem
3. Compactness
    a. Heine-Borel
    b. Extreme Value Theorem
    c. Local Compactness
    d. Finite Intersection Property
4. Function Spaces
    a. Compactness in Metric Spaces
    b. Ascoli's Theorem
    c. Stone-Weierstrass Therorem
5. Some Big Theorems
    a. Tychonoff's Theorem
    b. Baire Category Theorem
    c. Countability and Separability Axioms
    d. Urysohn's Lemma
    e. Tietz Extension Theorem
    f. Stone-Cech Compaticification
6. Metrizations
    a. Urysohn's Metrization Lemma
    b. Local Finiteness
    c. Nagata-Smirov Metrization Theorem
    d. Paracompactness
    e. Smirov Metrization Theorem

Marking Scheme

A student's final grade in the course will be computed as follows:

30% Homework Assignments + 25% Midterm Examination + 45% Final Examination

There will be approximately 6 homework assignments during the course due approximately every two weeks.

Homework Assignments

The purpose of the homework in this course is to aid students in the comprehension of the material presented in lecture each week and to expand students' knowledge beyond what can be covered in

lectures. Thus the instructor will endeavour to provide students with a sufficient amount of time after the material is presented in lecture for completion of the homework.

Homework will be posted on the course webpage and students will have approximately two weeks to complete assignments. Homework will be due in class on the due date and late homework will not be accepted, as solutions will be posted promptly. Students are expected to clearly indicate their names and student ID number on their homework.

Students are welcome to collaborate with each other on the homework. However, the work a student submits must be their (no copying!).

Regrading

A student that believes there has been an error in the grading of their work should bring it to the attention of the instructor within two weeks from the time at which the work was returned to the class. Objections that arise after this two-week period will not be considered.

Make-up Policy

If you know you will miss a test/assignment for a valid excuse (e.g. religious holiday, university sanctioned event, etc.), please contact the course instructor at least a week prior to the absence so alternate accommodations can be made. If you missed a test/assignment due to a valid medical emergency, please contact the course instructor directly. Late assignments will be accepted and make-up tests will be arranged only if accompanied by a note from a medical professional (http://mech.lassonde.yorku.ca/wp-content/uploads/2015/10/attend_physician_statement.pdf).

If you missed a final exam due to a valid medical emergency, please follow the instructions for Deferred Exam Procedures (http://myacademicrecord.students.yorku.ca/deferred-standing). Download the forms for Deferred Standing and the Attending Physician's Statement, and submit the completed forms to the undergraduate office no later than 5 business days from the date of the exam. Once the forms have been approved, students will be emailed the decision regarding the deferred status. Students should also notify their instructor that they did not write the exam and explain why.

If you require a religious accommodation for the final examination, please follow the procedures at https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs.

Academic Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/). The policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. Students are expected to review the materials on the Academic Integrity website (https://spark.library.yorku.ca/academic-integrity-what-is-academic-integrity/).

Learning Disability Services

York University has policies in place to ensure that all students have an equal opportunity to attain their educational goals. Accommodations related to diagnosed learning disabilities may be made through

Learning Disability Services. If you would like confidential support or academic accommodations, please visit http://lds.info.yorku.ca.

Accessibility for Persons with Disabilities

The York University Accessibility Hub (http://accessibilityhub.info.yorku.ca/) is your online stop for accessibility on campus. The Accessibility Hub provides tools, assistance and resources.

Mental Health

York University aims to promote a healthy, inclusive, and supportive environment that fosters mental health and well-being. For more information or if you are struggling with mental health, please see http://mhw.info.yorku.ca/.

Intellectual Property

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