College of Natural & Applied Sciences
Division of Mathematics & Computer Science

MA431-01 Topics in Advanced Mathematics:

Introduction to Topology (3 Credits)

Spring (FAÑOMNÅKAN) 2025

Instructor: Dr. Hyunju Oh

Class Meeting: TTh 2:00-3:20pm, SC121

Office: ALS Rm316

Phone: 671-735-2142

Email: ohh@triton.uog.edu

Office Hours: (MTWTh) 12:30 – 1:30pm, (MW) 3:30-4:30pm, or by appointment

Course Code Moodle: MA-431 SP25 **https://moodle.uog.edu/course/view.php?id=13762**

Enrollment Key: ma431stu2025

Please Note: The Enrollment Key is CASE SENSITIVE, and there are NO spaces before and after the enrollment key.

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Textbook/References:

- Topology, 2nd Edition, James R. Munkres
- Introduction to Topology Pure and Applied, Colin Adams and Robert Franzosa
- The Knot Book: An Elementary Introduction to the Mathematical Theory of Knots, Colin Adams

Catalog Course Description:

This course offers selected topics in advanced mathematics such as topology, mathematical induction, non-Euclidean geometries. Different subject matter may be repeated for credit.

Prerequisite:

Grades of C or above in MA205 and MA302. Or Consent of Instructor.

Course Content:

The course covers:

- Understand terms, definitions and theorems related to topology.
- Know how to read and write proofs in topology.
- Demonstrate understanding of concepts like open and closed sets, interior, closure and boundary, continuity, connectedness, compactness.
- Form topological spaces by using subspace, product and quotient topologies.

- Use continuous functions & homeomorphisms to understand structure of topological spaces.
- Demonstrate understanding of metric and other spaces.
- Construct examples and counterexamples, solve problems, and prove theorems in topology.
- Know about the fundamental group and covering spaces.
- Demonstrate understanding of the historical developments leading to topology.
- Knot Polynomials

Rational for the Course:
The basic content of the course is needed by any student who is planning to continue in mathematics. The ideas introduced here provide a foundation for all upper division mathematics courses. More generally, students are presented with an important paradigm as they are exposed to the sustained development of a significant mathematical area defined by fundamentals of point-set topology, algebraic topology, and its application. In the process, students will learn how topological ideas were discovered.

Tentative Quiz/Test Schedule:
Midterm: March 13 (Thursday)
Final Exam: 2:00-3:50pm, May 20 (Tuesday)

Evaluation:
The grade distribution and grading scheme are as follows:

Homework 20% Project/Presentations 20% Midterm 30% Final Exam 30%

Grading Scale:

98-100%: A+ 93-97%: A 90-92%: A- 87-89%: B+ 83-86%: B
80-82%: B- 77-79%: C+ 70-76%: C 60-69%: D 0-59%: F

Student's work is usually graded on a partial credit basis. **Students' written solutions must include all work needed to solve problems**. Points will be deducted (or given none) for omitting any work even if the answer is correct.

Homework:
Assignments will be assigned, collected periodically, and graded some of problems. As doing homework is important for learning the material in this course, it will count as 20% of your grade. **Use LaTeX** and upload it pdf file in Moodle.

Project/Presentation: All students will do **two short individual presentations** during the semester. This course will require your active participation in class. Students are often asked to write on the blackboard to explain the content and exercises in front of others. You are

encouraged to work together and to see me discussing the content and preparing for the presentation. This will make you learn how to present, discuss, and communicate with others. The oral presentation could be informal; it could even be sketchy if you succeed in convincing others. However, one of the SLO's of this course is to learn the process of turning informal mathematical ideas into formal narrative proofs. Whenever it is necessary, you will be asked to show the formal proof on board. **Use Beamer (LaTeX).**

Exams/Final Exam:
There will **a midterm** and **a final exam**. It is crucial to do well on Test and Final Exam. Missing any single test or final exam will result in grade F. Very special circumstances will be handled very specially by consultation with the instructor. Except for true emergencies, these special cases are arranged in advance with the instructor.

Any evidence of cheating will result in a "0" for that test/Final exam and an "F" for the entire course regardless of your total points!!!

Attendance:
Students are expected to attend every scheduled class. It is the students' responsibility to keep informed of any announcements, syllabus adjustments or policy changes made during scheduled classes. In case you must leave early, you need to inform the instructor in advance about your leaving class early. Please inform the instructor if you will be absent.

Make-up policy: There will be no make-up exams unless you contact the instructor **IMMEDIATELY** for extenuating circumstances. For example, you must go off-island, you will be hospitalized or under serious medical treatment, deployment, etc.

Withdrawal from Class: [*UOG Student Handbook, p.33-34*]
Students may withdraw from a class or classes during the first week of instruction of a regular semester and the first two days of a summer session without anything being recorded on their transcripts. From the second through the eighth week of instruction of a regular semester and from the third day of classes through the third week of a summer term, students may withdraw by using the Withdrawal feature in their Webadvisor account.

Academic Dishonesty:
All assignments and Quiz/Test/Exam must be your own work. The term plagiarism includes, but is not limited, to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. Plagiarizing in your essay or **CHEATING on Homework/Exam will result in Course Grade F regardless of your total points.** If you are not sure what plagiarism is and how to avoid it in using sources for your work, see www.indiana.edu/~wts/pamphlets/plagiarism.shtml but be careful when paraphrasing not to change the meaning of scientific information. Answers you write on Quiz/Test/Exam must come only from in your head or the information supplied in the test papers; anything else is

cheating. The term cheating includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations, e.g., looking at other students answers, using crib notes (including electronic), getting information from another person via any kind of communication; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff. If you need to use an electronic translator, you must discuss this with me in advance.

Curriculum Mapping:

Course SLOs	Program SLOs	UOG ILOs	Method of Assessment
SLO 1	MA PR 1,2,3,4,5	ILO 1,2,3,5,6	Homework, Presentation, Test
SLO 2	MA PR 1,2,3,4,5	ILO 1,2,3,5,6	Homework, Presentation, Test
SLO 3	MA PR 1,2,3,4,5	ILO 1,2,3,5,6	Homework, Presentation, Test
SLO 4	MA PR 1,2,3,4,5	ILO 1,2,3,5,6	Homework, Presentation, Test
SLO 5	MA PR 1,2,3,4,5	ILO 1,2,3,5,6	Homework, Presentation, Test

Course SLOs

SLO 1: State the definition of degree of field extension and relate field extensions to vector spaces.
SLO 2: Present and prove properties of examples of fields and field extensions involving rational, real, complex, and finite fields.
SLO 3: Give an outline of the proof of advanced group theory such as the Fundamental Theorem of finitely generated abelian groups and Sylow theorems.
SLO 4: Understand the Fundamental Theorem of Galois theory, the Galois correspondence between intermediate fields and subgroups of the Galois group.
SLO 5: Apply Galois theory to derive consequences such as unsolvability of polynomial equations by radicals.

Math PLOs

MA PR 1: Demonstrate critical thinking, problem solving skills and ability to use mathematical methods by identifying, evaluating, classifying, analyzing, synthesizing data and abstract ideas in various contexts and situations.
MA PR 2: Exhibit a sound conceptual understanding of the nature of mathematics, and demonstrate advanced mathematical skills in mathematical analysis, modern algebra, and other mathematical discipline(s).
MA PR 3: Argue and reason using mathematics, read, create and write down logically correct mathematical proofs, use exact mathematical language and communicate mathematics efficiently orally, in writing and using information technology tools.
MA PR 4: Apply abstract thinking, mathematical methods, models, and current practices in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications.
MA PR 5: Show maturity in mathematical knowledge and thinking that prepares and encourages students to pursue graduate studies in mathematics or in related fields.
MA PR 6: Demonstrate an appreciation of and enthusiasm for inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to pursue lifelong learning and up-to-date professional expertise in their careers through various areas of jobs, including governmental, business or industrial jobs in mathematics, related sciences, education, or technology.

UOG ILOs

ILO 1: Mastery of critical thinking & problem solving

ILO 2: Mastery of quantitative analysis
ILO 3: Effective oral and written communication
ILO 4: Understanding & appreciation of culturally diverse people, ideas & values in a democratic context
ILO 5: Responsible use of knowledge, natural resources, and technology
ILO 6: An appreciation of the arts & sciences
ILO 7: An interest in personal development & lifelong learning

Academic Integrity Policy:

Academic Integrity is about performing in your role as student in ways that are honest, trustworthy, respectful, responsible, and fair (see www.academicintegrity.org for more information). As a student, you will complete your academic assignments in the manner expected by the instructor. Academic dishonesty, including but not limited to cheating and plagiarism may result in suspension or expulsion from the University. Refer to the UOG Student Handbook and Code of Conduct for more information.

No Recording Policy

Recording of online class meetings is not allowed. Not only is the delivery of course content the intellectual property of the instructor, but students enrolled in the course have privacy rights. Unauthorized recording and distribution of online courses may violate federal law.

UOG Disabilities Policy

For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Disability Support Services Office to discuss your confidential request. A Faculty Notification letter from the Disability Support Services counselor will be provided to me. To register for academic accommodation, please contact or visit Sallie S. Sablan, DSS counselor in the School of Education, office 110, disabilitysupport@triton.uog.edu or telephone/TDD 671-735-2460.
Office Hours: Monday to Thursday 9:00-noon and 1:00-3:00; Friday by appointment only
To schedule an appointment at https://calendly.com/sssablan, Office: School of Education, room 110
Office Phone Number/TTY: 735-2460, Email address: sssablan@triton.uog.edu
Disability Support Services email: disabilitysupport@triton.uog.edu
Scheduled appointments preferred.

Tobacco-free/Smoke-free/Vaping-free campus:

UOG is a tobacco-free/smoke-free, vaping/e-cigarette free campus. Thank you for not using tobacco products or e-cigarettes on campus, for helping to fight cancer, and for helping make UOG a healthy learning and living environment.

Notification of Rights Under FERPA:

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights for students, parents and school officials can be viewed at http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html