

Topics in Geometry I
Course Outline (Updated)
Course 9114001 Section 01, Fall 2024
12:00 - 14:50 for January 6th to 24th
Room: E1-2 #306
Chungbuk National University

This document prevails whenever interpretations of the course syllabus (the version in 개선누리) and that of this document conflict. This document contains terms and conditions on how this class will be administered throughout the semester. Registering for this class means you agree on plans, policies, and details in this document. You MUST drop this course if you disagree with any item listed in this document.

Instructor: Dr. Byungdo Park

Email: byungdo@chungbuk.ac.kr

Office hours: By appointment.

Class webpage: Announcements, homework, exam schedules and other relevant information will be posted on the following webpage: https://byungdo.github.io/teaching/f2024_tig1.html which is also accessible via instructor's webpage: <https://byungdo.github.io/>

Textbook:

- Israel M. Gelfand and Tatiana Alekseyevskaya (Gelfand), *Geometry* 1st Edition (2020), Birkhäuser, ISBN-13: 9781071602973

References: None. Just read the main textbook multiple times if you don't get it.

Prerequisites: None. All are welcome.

Course description: This course offers in-service mathematics teachers a deep dive into advanced geometric concepts, focusing on Chapters 3 (Area: A Look at Symplectic Geometry) and 4 (Circles: A Look at Euclidean Geometry) of Gelfand's "Geometry" book. Participants will explore the properties of various geometries classified by transformations, including projective, affine, and Euclidean geometries.

The course will:

- Investigate area concepts and their applications in symplectic geometry
- Examine circles and their properties in Euclidean geometry
- Compare Euclidean and non-Euclidean geometries through concrete models
- Discuss how these advanced concepts relate to secondary school curricula

Through this exploration, teachers will gain a richer theoretical background in geometry, enhancing their ability to connect advanced mathematical ideas to the content they teach in their classrooms. The course will include discussions on how to adapt these concepts for secondary education, providing practical insights for curriculum development and instruction.

Course objectives: By the end of this course, participants will be able to:

- Analyze and apply concepts of area in the context of symplectic geometry, including: i) Calculate areas of various geometric figures using advanced techniques ii) Explain the significance of area in symplectic geometry and its applications
- Demonstrate a deep understanding of circle properties in Euclidean geometry by: i) Solving complex problems involving circles, angles, and polygons ii) Proving theorems related to circles and their interactions with other geometric figures
- Compare and contrast Euclidean and non-Euclidean geometries through: i) Examining models of non-Euclidean geometries ii) Analyzing how geometric properties differ in various geometric systems
- Classify and explain the properties of geometries based on transformations, including: projective geometry, affine geometry, and Euclidean geometry
- Develop strategies to integrate advanced geometric concepts into secondary school mathematics curricula by: i) Creating lesson plans that connect advanced topics to standard curriculum content ii) Designing activities that introduce students to higher-level geometric thinking
- Critically analyze the progression of geometric concepts from elementary to advanced levels, enhancing their ability to build students' long-term mathematical understanding
- Engage in and lead mathematical discussions about complex geometric ideas, improving their ability to facilitate deep mathematical discourse in their classrooms
- Apply the theoretical knowledge gained from the course to solve and create challenging geometric problems suitable for gifted students or mathematics competitions

Details on class proceeding: The instructor will give lectures on the material following the weekly lesson plan.

Grading policies: 90% from class participation, 2% final exam, and 8% from attendance. Class participation will be calculated as a %-score based on weekly scores. The grading scale will be as follows: 3 out of 3 points if the class participation is overall very active, 2 if the class participation is overall active, 1 if the class participation is overall poor, 0 if absent. Absolute evaluation [A: 100–80 points, B: 79.99–70 points, C: 69.99–60 points, D: less than 60 points] with curving. Here the curving means a horizontal shift of the bell-shaped curve of %-score distribution. For example, if your final score is 59/100 and the curving constant is +20, then it is impossible for you to expect a grade A.

Attendance policies: (1) Attendance data will be collected in every class meeting and will be used for determining your final grade. You will get a grade F if you have missed more than 25% of class meeting hours. Up to 3 hour of absence there is no penalty on your score. After that, you lose 1% of total score for an absence to each 50-minute long class meeting, with a maximum total loss 8% from your total score.

(2) If you have permissible reasons for your absence in accordance with the Regulation on Academic Management of the CBNU Article 52(1) (충북대학교 학사운영규정 제52조(공결승인) 제1항), you will need to contact your department secretary to follow the procedure for getting an approval on your absence bringing proper documentation as proof. That said, you have to fill out a form and submit it along with appropriate proofs before the absence or after seven days of the date of absence.

Weekly lesson plan:

Week 1. Introduction to area and figures

Week 2. Area of parallelograms and triangles

Week 3. Area of trapezoids and polygons

Week 4. Advanced problems on areas

Week 5. Measuring the area of a figure

Week 6. Introduction to circles: operations and segment comparison

Week 7. Angles: definition, measurement, and properties

Week 8. Triangle elements and congruent triangles

Week 9. Relations between triangle elements and special triangles

Week 10. The Pythagorean theorem and its applications

Week 11. Relations between lines and points

Week 12. Special lines and points in a triangle

Week 13. Polygons and quadrilaterals

Week 14. Similarity and circles: points, lines, and intersections

Week 15. Circles: angles, arcs, and sectors

수업운영계획: 충북대학교 교육대학원 시행세칙 제3조제2항의 규정에 따라 본 강좌는 동계 교육대학원 수업개시일 이전 시점에 전체 수업일수의 1/2이하를 진행합니다. 구체적인 강의 진행일시는 다음과 같습니다. 아래 일정은 전체 수강생들과의 일정 조율을 통해 조정될 수 있습니다. 또한, 수강 인원이 3명 이하일 경우 집중된 수업분위기와 효율적인 강의실 활용을 위해 강의의 일부 또는 전부를 담당교수 연구실에서 진행할 수 있습니다.

- 제01주차: 2024. 10. 30.(수) 18:30-21:20
제02주차: 2024. 11. 06.(수) 18:30-21:20
제03주차: 2024. 11. 13.(수) 18:30-21:20
제04주차: 2024. 11. 20.(수) 18:30-21:20
제05주차: 2024. 11. 27.(수) 18:30-21:20
제06주차: 2024. 12. 04.(수) 18:30-21:20
제07주차: 2024. 12. 11.(수) 18:30-21:20
제08주차: 2025. 01. 07.(화) 13:00-15:50 [비대면강의(담당교수 복무 사유)]
제09주차: 2025. 01. 08.(수) 13:00-15:50 [비대면강의(담당교수 복무 사유)]
제10주차: 2025. 01. 09.(목) 13:00-15:50 [비대면강의(담당교수 복무 사유)]
제11주차: 2025. 01. 14.(화) 13:00-15:50
제12주차: 2025. 01. 15.(수) 13:00-15:50
제13주차: 2025. 01. 16.(목) 13:00-15:50
제14주차: 2025. 01. 21.(화) 13:00-15:50
제15주차: 2025. 01. 23.(목) 13:00-15:30 (학기말시험 포함)

Accommodating disabilities in learning and assessment: The instructor is committed to providing access to all students. If you need accommodation in classroom or in assessment, you are encouraged to set up an appointment with the instructor at your soonest availability so that we can figure out the best way to accommodate you. Possible accommodations include, but not limited to, provision of materials from lectures, permission to hire an assistant for taking notes, audio-recording lectures, and aid/assistant devices, extension of due dates for assignments, alternative assessment for in-class presentations, extension of exam hours, and provision of an accommodating exam locations and exam sheets.

Academic integrity: It is expected that you will complete all exams without giving or receiving help from anyone. Electronic devices are not allowed in any in-class exam. If you violate any of these policies, you receive score zero to that exam at the discretion of the instructor. In addition, your case will be handled through the standard procedure of the university. Note that a use of your smartphone during an exam is simply a cheating.