Department of Mathematics

College of Science

Salahaddin University-Erbil

Subject: Geometry

Course Book: Second Year – Second Course

Lecturer's name: Imad A. Aziz

Academic Year: 2023-2024

Course Book

1. Course name	Axiomatic System
2. Lecturer in charge	Imad A. Aziz
3. Department/ College	Mathematics / Science
4. Contact	e-mail: imad.aziz@su.edu.krd Tel: +9647504639909
5. Time (in hours) per week	Theory: 3 Tutorial: 2
6. Office hours	
7. Course code	
8. Teacher's academic profile	**23/6/2020** lecturer at Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **16/6/2020** Awarded Ph.D. in Mathematics, Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **3/9/2006** Assistant lecturer at Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **31/7/2006** Awarded M.Sc. in Mathematics, Department of Mathematics, College of Science, University of Al-Mustansiriyah, Iraq. **10/1/2002** Awarded B.Sc. in Mathematics, Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **1995-1996** Awarded Baccalaureate, Hamren Secondary
9. Keywords	Axiom, Categorical, Euclidean, Triangle, Similar, Altitude, Centroid

10. Course overview:

The development of geometry from the point of view of axiom systems. The course includes axiomatic systems, axiomatic systems for Euclidean geometry, geometry of triangles and geometry of quadrilaterals.

11. Course objective:
- Introduce the concept of concurrence and its significance in geometric constructions.
- Explore Ceva's theorem and its applications in proving concurrency.
- Identify and analyze common points of concurrence in geometric figures.
- Define collinearity and its importance in geometry.
- Investigate Menelaus' theorem and its role in establishing collinear points.
- Study Desargues' and Pappus' theorems to understand their applications in collinearity.
- Review basic properties of circles and their geometric significance.

- Understand and analyze coaxal circles and orthogonal pairs of pencils of circles.
- Learn Pascal's and Brianchon's theorems and their implications in circle geometry.
- Study homothety and its applications.
- Explore a generalized Ptolemy theorem and its proofs.
- Introduce basic concepts of coordinate geometry.
- Understand and utilize barycentric and homogeneous coordinates.
- Explore the projective plane and its geometric properties.
- Analyze quadratic curves and their characteristics.

12. Student's obligation

a. Students reign an commitment to come on time and remain in the classroom for the duration of scheduled classes and Labs.

b. Nothingness speak students with each other during lecture.

c. All devices must be turned off.

d. When teacher ask question, Students will be to raise your hand before answer his question.

e. Students own an obligation to write tests and final examinations at the times scheduled by the teacher or the College.

13. Forms of teaching

I give hard copy of My lecture notes to students before coming lecturer time. first I remember students about previous lecture, and then I start new lecture. At the end of the lecture give a homework for the next lecture. During this proses I am use presentation and whiteboard.

14. Assessment scheme

1. *Practical:* 20% (Homework, Assignments and Quizzes).
2. *Theoretical:* 20% (Midterm exams).
3. *Final Exam: Practical:* 0% and *Theoretical:* 60% .

15. Student learning outcome:

By the end of this course, students should be able to:

- Prove the concurrency of lines using Ceva's theorem.
- Identify and analyze common points of concurrence in various geometric figures.
- Apply Menelaus' theorem to determine collinear points.
- Use Desargues' and Pappus' theorems to prove collinearity in geometric constructions.
- Demonstrate understanding of basic properties of circles and apply them to solve problems.
- Analyze the properties and applications of coaxal circles and orthogonal pairs of pencils of circles.
- Identify the orthocenter in different geometric configurations.
- Apply Pascal's and Brianchon's theorems to solve problems involving circles**.**
- Understand and apply the concept of homothety in geometric transformations.
- Use the Apollonius circle and Soddy's theorem in problem-solving.
- Prove and apply a generalized Ptolemy theorem in geometric contexts.
- Solve geometric problems using basic coordinate geometry.

- Utilize barycentric and homogeneous coordinates in problem-solving.
- Understand and apply concepts of the projective plane in geometry.
- Analyze and solve problems involving quadratic curves.

16. Course Reading List and References:

- Carl W. Lee, Axiomatic Systems, University of Kentucky, Revised Spring (2002)
- H.S.M.Coxeter and S.L.Greitzer, Geometry Revisited, New Mathematical Library 19, MAA (1967)
- Michael Hvidsten, Geometry with Geometry Explorer, McGraw Hill (2005)
- Dan Pedoe, Geometry - A Comprehensive Course, Dover (1988)

17. The Topics:	Lecturer's name
1. Concurrence • Ceva's theorem • Common points of concurrence **2. Collinearity** • Menelaus' theorem • Desargues' theorem • Pappus' theorem **3. Circles** • Basic properties • Coaxal circles • Orthogonal pair of pencils of circles • The orthocentre • Pascal's theorem and Brianchon's theorem • Homothety • The Apollonius circle of two points • Soddy's theorem • A generalized Ptolemy theorem **4. Using Coordinates** • Basic coordinate geometry • Barycentric and homogeneous coordinates • Projective plane • Quadratic curves	This Column are not applicable because timetables of holidays will change that is I cannot Determine a week by week review of the topics.
18. Practical Topics (If there is any)	
	This Column are not applicable because timetables of holidays will change that is I cannot Determine a week by week review of the topics.

19. Examinations:

Questions in the examination will be arranged the matching mode by way of the examples and exercises that I give delivered in the lecture notes.
Sometimes will be have extra mark in examination for worthy students.

20. Extra notes:

Answers of examination will be find in the board's declaration Mathematics department after every examination.

21. Peer review