

GE1358: COORDINATE GEOMETRY

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Coordinate Geometry

Subject Code

GE - Gateway Education

Course Number

1358

Academic Unit

Mathematics (MA)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

GE Area (Primary)

Area 3 - Science and Technology

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

MA1501 Coordinate Geometry

Exclusive Courses

Nil

Part II Course Details

Abstract

This course introduces students to coordinate geometry, which is closely related to art, design, architecture, computer graphics. The content includes curves in two-dimensional space, curves in three-dimensional space, surfaces in three-dimensional space. The emphasis is on developing the concept of coordinate representation of some basic geometric objects in both two- and three-dimensional spaces and understanding how to compute some important geometric quantities like distance, normal vector, etc.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Explain the concepts of points and lines in two-dimensional plane, and compute the distance between a point and a line, and the angle between two intersecting lines		x	x	
2	Explain the concepts of points, lines and planes in three-dimensional space, and compute the distance between two non-intersecting lines, the distance between a point and a plane, and the angle between two planes		x	x	
3	Explain the concept of curves based on Cartesian coordinates and polar coordinates in two-dimensional plane, and explain the concept of surfaces based on Cartesian coordinates, cylindrical coordinates and spherical coordinates in three-dimensional space		x	x	
4	Explain the concept of conic sections and describe their features in two-dimensional plane		x	x	
5	Explain the concept of quadric surfaces and describe their features in three-dimensional space		x	x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures to gain knowledge of topics in coordinate geometry	1, 2, 3, 4, 5	39 hours in total
2	Practice exercises	Students will engage with a series of practice exercises posted on the course website in advance to deepen their knowledge and skills	1, 2, 3, 4, 5	After-class
3	Math Help Centre	Students will receive extra help through learning activities in Math Help Centre	1, 2, 3, 4, 5	After-class

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Quizzes/Test/Midterm	1, 2	18	Questions are based on curves in both two- and three-dimensional spaces, and surfaces to assess students' understanding of basic concepts and skills	No
2	Hand-in assignments	3, 4	3	The questions enable students to apply basic concepts and techniques of coordinate geometry to a range of mathematical problems.	Yes
3	Formative take-home assignments	1, 2, 3, 4, 5	9	The assignments provide students chances to demonstrate their achievements on techniques of coordinate geometry learned in this course.	Yes

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

1. Quizzes/Test/Midterm

Criterion

Ability to apply the fundamental concepts and methodology of coordinate geometry to solve a range of mathematical problems

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts and techniques in coordinate geometry and can always apply this understanding to solve a range of mathematical problems

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts and techniques in coordinate geometry and can usually apply this understanding to solve some mathematical problems

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts and techniques in coordinate geometry and can sometimes apply this understanding to solve some mathematical problems

Marginal (D)

Demonstrate a partial understanding of the concepts and techniques in coordinate geometry and can rarely apply this understanding

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts and techniques in coordinate geometry and can rarely or almost never apply this understanding

Assessment Task

2. Hand-in assignments

Criterion

Ability to understand the basic concepts and techniques of coordinate geometry

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts and techniques in coordinate geometry and can always apply this understanding to solve a range of mathematical problems

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts and techniques in coordinate geometry and can usually apply this understanding to solve some mathematical problems

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts and techniques in coordinate geometry and can sometimes apply this understanding to solve some mathematical problems

Marginal (D)

Demonstrate a partial understanding of the concepts and techniques in coordinate geometry and can rarely apply this understanding

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts and techniques in coordinate geometry and can rarely or almost never apply this understanding

Assessment Task

3. Formative take-home assignments

Criterion

Ability to demonstrate students' achievements on the methods of coordinate geometry learned in this course

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts and techniques in coordinate geometry and can always apply this understanding to solve a range of mathematical problems

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts and techniques in coordinate geometry and can usually apply this understanding to solve some mathematical problems

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts and techniques in coordinate geometry and can sometimes apply this understanding to solve some mathematical problems

Marginal (D)

Demonstrate a partial understanding of the concepts and techniques in coordinate geometry and can rarely apply this understanding

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts and techniques in coordinate geometry and can rarely or almost never apply this understanding

Assessment Task

4. Examination

Criterion

Ability to solve problems of curves and surfaces in two and three dimensional space

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts and techniques in coordinate geometry and can always apply this understanding to solve a range of mathematical problems

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts and techniques in coordinate geometry and can usually apply this understanding to solve some mathematical problems

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts and techniques in coordinate geometry and can sometimes apply this understanding to solve some mathematical problems

Marginal (D)

Demonstrate a partial understanding of the concepts and techniques in coordinate geometry and can rarely apply this understanding

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts and techniques in coordinate geometry and can rarely or almost never apply this understanding

Part III Other Information

Keyword Syllabus

- Points and Lines in Space: point, line, plane, circle, distance
- Transforms and Coordinates: parameterization, polar coordinate, cylindrical and spherical coordinates
- The Conics: circle, ellipse, parabola, hyperbola
- The quadric surfaces: sphere, ellipsoid, elliptic paraboloid, hyperbolic paraboloid, cone, hyperboloid of one sheet, hyperboloid of two sheets
- Curves and Surfaces: intersection between curves and surface, surfaces in three dimensional space
- Geometry: Art, Design and Architecture

Reading List

Compulsory Readings

Title	
1	Coordinate Geometry (by Luther Pfahler Eisenhart) Dover Publications (March 4, 2005)

Additional Readings

Title	
1	The Complete Guide to Perspective Drawing: From One-Point to Six-Point (by Craig Attebery) Routledge (May 10, 2018)
2	Drawing Geometry: A Primer of Basic Forms for Artists, Designers and Architects (by Jon Allen) Floris Books (October 15, 2007)
3	Geometry and the Visual Arts (by Dan Pedoe) Dover Publications (March 17, 2011)

Annex (for GE courses only)

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

PILO 1: Demonstrate the capacity for self-directed learning

1, 2, 3, 4, 5

PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology

1, 2, 3, 4, 5

PILO 3: Demonstrate critical thinking skills

1, 2, 3, 4, 5

PILO 4: Interpret information and numerical data

1, 2, 3, 4, 5

PILO 5: Produce structured, well-organised and fluent text

4, 5

PILO 6: Demonstrate effective oral communication skills

1, 2, 3, 4, 5

PILO 7: Demonstrate an ability to work effectively in a team

1, 2, 3, 4, 5

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task

Examination Papers