Course Specification

— (Bachelor)

Course Title: Analytical Geometry	
Course Code: MTH2301	
Program: BSc. in Mathematics	
Department: Mathematics	
College: Al-Qunfudah University College	
Institution: Umm Al-Qura University	
Version: 2	
Last Revision Date: 17/07/2024	

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required			☐Elective	

3. Level/year at which this course is offered: (1/1)

4. Course general Description:

This course aims to equip students with foundational knowledge and skills in various mathematical concepts and geometric representations. The course begins with the identification of conic sections through their equations and the conversion of the general equation of a conic section into its standard form.

Students will explore both Cartesian and polar coordinate systems, learning how to convert between them. The curriculum covers different types of line equations and the conditions necessary for collinearity and concurrency. Analyzing second-degree equations, particularly pairs of straight lines, is also a key component.

The course delves into conic sections represented by the general equation of the second degree in two variables, including pairs of straight lines, circles, parabolas, ellipses, and hyperbolas. A significant focus is placed on understanding tangents and normals to circles, orthogonal circles, and the combined equation of a circle and a line.

Further study includes the general and standard equations of parabolas, ellipses, and hyperbolas, along with techniques for sketching these conic sections. In addition to planar geometry, the course covers three-dimensional geometry. Topics include coordinate conversions, direction cosines, and direction ratios. Students will study planes in space, various forms of planes, and systems of planes, including bisecting planes.

5. Pre-requirements for this course (if any):

6. Pre-requirements for this course (if any):

7. Course Main Objective(s):

After completing this course, students are expected to be proficient in several key areas. They will be able to apply analytic geometry to solve a variety of problems and have a thorough understanding of second-degree equations, particularly those related to pairs of straight lines and circles. Students will gain deep knowledge of conic sections and their relationship with different coordinate systems. Additionally, they will be familiar with software tools used for drawing figures of various conic sections, enhancing their ability to visualize and analyze geometric shapes.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4	100 %
2	E-learning	0	0
3	Hybrid • Traditional classroom • E-learning	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	36
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (***Exam, Quizzes, Activities…***)**	4
Total		40

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Distinguishing mathematical concepts relevant to pure and applied mathematics. Straight lines and their different forms with Cartesian and polar coordinate systems.	$K1$	Lecture and Tutorials	Exams, quizzes
1.2	Analysis structures and features of Mathematics problems in pair of straight lines and circles with angle and their bisectors, Conic sections and 3D geometries.	$K1, K3$	Lecture and Tutorials	Exams, quizzes
1.3	Outline required concepts in Parabola, ellipse and hyperbola with centered at origin and at other points. Line and plane equations in space.	$K3, K5$	Lecture and Tutorials	Exams, quizzes
2.0	Skills			
2.1	Apply aspects relevant to different forms of equations of lines, pair of straight lines, circles, tangent and normal to the circles, conic sections and plane in a space.	$S1, S3, S5$	Lecture and Tutorials	Exams, quizzes
2.2	Apply how to draw figures and explain their equations of pair of lines, types of circles their properties, parabola, ellipse and hyperbola, plane and line in a space.	$S1, S9$	Lecture and Tutorials	Exams, quizzes
2.3	Apply various math rules, techniques and theorems in drawing and classifying different figures, equations and their related line and angle bisector properties.	$S1, S9$	Lecture and Tutorials	Exams, quizzes
2.4	Apply mathematical problems using critical thinking and problem solving in lines, pair of lines, circles, conics, 3 dimensional concepts.	$S1, S6, S9$	Lecture and Tutorials	Exams, quizzes
3.0	Values, autonomy, and responsibility			
3.1	Ability to work individually or within a team by independently and responsibility during group work and/or assignments	$V2, V4$	Lecture/ Individual or group work	Exams, quizzes
3.2	Ability to practice mathematics knowledge and skills in different	$V2, V3$	Lecture/ Individual or group work	Exams, quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	situations during interactive discussion, group assignments, and web based activities.			
3.3	Ability to provide ethics and friendly-ship environment in the real life during class discussion, participation in college and university activities, and be members of department committees and college committees	*V2, V4*	Lecture/ Individual or group work	Exams, quizzes

C. Course Content

No	List of Topics	Contact Hours
1.	Basics concepts related to different forms of equations of lines	6
2.	Pair of straight lines their angles and bisectors of angles	6
3.	Circles and their types with tangent and normal concepts on them	6
4.	Conic Section basics and their rough sketches	6
5.	Parabola, ellipse and hyperbola with centered at origin and other points	6
6.	Three dimensional geometry their different concepts and coordinate system related to them	10
Total		**40**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam	6th	30 %
2.	Quizzes and homework's	During semester	20 %
3.	Final exam	End of semester	50 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Analytic Geometry 6th Edition, Brooks Douglas R. Riddle, Col. Publ., Co. 1995
Supportive References	

Electronic Materials	
Other Learning Materials	*None*

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data Show, Smart Board
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Courses Assessment survey
Effectiveness of Students assessment		Courses Assessment survey
Quality of learning resources	Students	Courses Assessment survey
The extent to which CLOs have been achieved	Faculty Member	Post-Rubric and Course report
Periodically reviewing course effectiveness and planning for improvement	Course committee	Annual report

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Curriculum Committees
REFERENCE NO.	**1**
DATE	17/07/2024