Course Specification

(Postgraduate Programs)

Course Title:	**Algebraic Geometry**
Course Code:	**MAT 7273**
Program:	**Doctor of Philosophy in Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (4 Lectures, 0 Lab, 0 Tutorial)					
2. Course type					
A.	☐ University	☐ College	☒ Program	☐ Track	☐ Others
B.	☐ Required		☒ Elective		
3. Level/Year at which this course is offered: Level 3 / Year 2					
4. Course general Description:					
This course describes the basic ideas of Affine and Projective Varieties, Coordinate Rings, Morphisms and Rational Maps, Local Ring of a point, Function Fields, Dimension of a Variety. Also, the course discusses Singular Points and Tangent Lines, Multiplicities and Local Rings, Intersection Multiplicities, Bezout's Theorem for plane curves, Max Noether's Theorem and Applications, Group Operation on Cubic Curve, rational Paramerization, Branches and Valuations.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The objective of this course is to give a detailed knowledge of Varieties, Dimension of a Variety, Curves, Intersection multiplicities, Bezout's Theorem, Max Noether's Theorem, and Rational Parametrization.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	60
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0

5.	**Others (specify)**	**0**
Total		**60**

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	**Identify the basic concepts and applications of algebraic Geometry**	**K1, K2**	**4 lecture hours\week**	**Direct: Regular Exams**
1.2	**Define Bezout's Theorem for plane curves, Max Noether's Theo rem, Group Operation on cubic Curve.**	**K1, K2**	• **4 lecture hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Use techniques of proof in algebraic geometry.**	**S1, S2**	**Self-study**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Develop oral communication and technical writing skills through function fields and varieties.**	**S3**	**Real-life problems**	**Direct: Homework and Mini projects**
2.3	**Analyse Internet in searching for singular points of curves.**	**S4**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**demonstrate proofs of main theorems.**	**S1, S2**	**Self-study**	**Direct: Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**Work with independence.**	**V1, V3**	**Personal questions**	**Direct: Participation**
3.2	**Lead team works.**	**V1, V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	• Varieties: Affine and Projective Varieties. • Coordinate Rings, Morphisms and Rational Maps, Local Ring of a point.	20
2.	• Function Fields, Dimension of a Variety. • Curves: Singular Points and Tangent Lines, Multiplicities and Local Rings.	20
3.	• Bezout's Theorem for plane curves, Max Noether's Theorem and Applications. • Group Operation on Cubic Curve, Rational Parametrization, Branches and Valuations.	20
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the semester	30%
2.	Midterm	Week 9-10	30%
3.	Final Exam	Week 15-16	40%

*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	R. Walker: *Algebraic Curves*, Springer-Verlag 2013.
Supportive References	1. E. Kunz, *Introduction to Plane Algebraic Curves*, Birkhauser 2005. 2. W. Fulton, *Algebraic Curves*, The Benjamin/Cummings 1969.
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and 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	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	Instructor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	Instructor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	8/1446
DATE	05/04/1446 (08/10/2024)