MATH109 : Basics of Abstract Mathematics

General Information

Author:	• Suzanne Palermo • Djrbashian, Ashot
Course Code (CB01) :	MATH109
Course Title (CB02) :	Basics of Abstract Mathematics
Department:	MATH
Proposal Start:	Fall 2024
TOP Code (CB03) :	(1701.00) Mathematics, General
CIP Code:	(27.0101) Mathematics, General.
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000642844
Curriculum Committee Approval Date:	12/13/2023
Board of Trustees Approval Date:	01/09/2024
Last Cyclical Review Date:	12/13/2023
Course Description and Course Note:	MATH 109 is devoted to the theory of algebraic equations and the basic notions of abstract mathematics: sets, groups, rings, fields. Special topics include logic, methods of mathematical proofs and one of the most celebrated topics of the abstract algebra, Galois theory.
Justification:	New Course
Academic Career:	• Credit
Author:	• Suzanne Palermo

Academic Senate Discipline

Primary Discipline:	• Mathematics
Alternate Discipline:	
Alternate Discipline:	

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Grading Basis

- Grade with Pass / No-Pass Option

Allow Students to Gain Credit by Exam/Challenge

Pre-Collegiate Level (CB21)

Not applicable.

Course Support Course Status (CB26)

Course is not a support course

Transferability & Gen. Ed. Options

General Education Status (CB25)

Not Applicable

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B4-Mathematics/Quantitative Reasoning	Mathematics/Quantitative Reasoning	Denied	09/03/2024	No Comparable Course defined.

IGETC Area	Area	Status	Approval Date	Comparable Course
2-Math	Mathematical Concepts and Quantitative Reasoning	Pending	No value	UCI - MATH 13

Units and Hours

Summary

Minimum Credit Units (CB07)	3
Maximum Credit Units (CB06)	3
Total Course In-Class (Contact) Hours	54
Total Course Out-of-Class Hours	108
Total Student Learning Hours	162

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

Cooperative Work Experience Education Status (CB10)

Variable Credit Course

Weekly Student Hours

Course Student Hours

In Class	Out of Class	
Lecture Hours	3	6
Laboratory Hours	0	0
Studio Hours	0	0

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	0
Studio	0
Total	54
Course Out-of-Class Hours	
Lecture	108
Laboratory	0
Studio	0
Total	108

Time Commitment Notes for Students

No value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

MATH103E - Calculus & Analytic Geometry I

Objectives

- Find limits of functions at real values and at infinity using numerical, graphical, and algebraic approaches.
- Use the derivative for rate of change problems.

Entry Standards

Entry Standards

Solve algebraic equations.

Apply the Fundamental Theorem of Algebra and related theorems to find the roots of a polynomial.

Solve linear systems of equations.

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Methods of Instruction	Presentations
Methods of Instruction	Discussion

Out of Class Assignments

- Homework assignments (e.g. problem sets related to course content)
- Group or individual projects (e.g. solving more challenging problems from other sources and applications of the underlying theory)
- Reading assignments (e.g. reading biographies of the principal creators of the theory Niels Henrik Abel and Evariste Galois)

Methods of Evaluation	Rationale
Exam/Quiz/Test	Quizzes
Exam/Quiz/Test	Three to four regularly scheduled exams
Exam/Quiz/Test	Comprehensive final examination

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Djrbashian, Ashot	From Polynomial Equations to Galois Theory	Yerevan, Zangak Publications	2022	9939684134

Other Instructional Materials (i.e. OER, handouts)

No Value

Materials Fee

No value

Learning Outcomes and Objectives

Course Objectives

Prove and apply basic results about solving algebraic equations.

Use basic notions of set theory, including cardinality of sets.

Evaluate differences among basic algebraic structures: groups, rings, integral domains, ideals, vector spaces, and fields.

Apply the notion of field extension and solvable groups.

Apply the basic ideas of Galois theory to determine solvability of an equation by radicals.

SLOs

Distinguish between different types of algebraic structures, such as groups, rings, fields, integral domains, vector spaces and prove statements related to them. Expected Outcome Performance: 70.0

Apply basic notions of Galois theory to determine if a given equation is solvable by radicals. Expected Outcome Performance: 70.0

Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No

Is this proposal submitted in response to learning outcomes assessment data?

No

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Review of Solutions of Equations and Mathematical Proofs (10 hours)

- Solutions of equations of degree three and higher
- Trigonometric form of complex numbers and roots of unity
- Rules of logic, truth tables and methods of proof: constructive, by contradiction, method of Mathematical Induction
- Operations on sets: unions, intersections, difference, cardinality of a set

Groups (15 hours)

- Definitions and simplest examples of groups
- Properties of groups, subgroups, cosets, and factor groups
- Permutations: the symmetric and alternating groups

Rings, Fields, Vector Spaces (14 hours)

- Definitions of rings and fields, examples
- Vector spaces, linear independence and bases, an overview
- Field extensions, the main ideas

Elementary Galois Theory (15 hours)

- The overview of the theory. What are the reasons of solvability?
- Solvable groups and solvable equations, relationships between groups and fields
- The Fundamental Theorem of Galois Theory and solutions by radicals. The most elementary approach.

Total hours: 54