

# CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

## NEW COURSE PROPOSAL

DATE NOVEMBER 8, 2006  
PROGRAM AREA MATHEMATICS

### 1. Catalog Description of the Course. *[Follow accepted catalog format.]*

Prefix MATH Course# 493 Title ABSTRACT ALGEBRA 2 Units (3)

3 hours lecture per week

hours lecture per week

☒ Prerequisites Math 393

☐ Corequisites

Description Field extensions, Galois theory, rings and modules, and further topics on groups, rings, and fields

☐ Gen Ed

Graded

☐ CR/NC

☐ Repeatable for up to units

Categories

☐ Lab Fee Required

☒ A - F

Total Completions Allowed 1

☐ Optional (Student's choice)

☐ Multiple Enrollment in same semester

### 2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment	Graded Component	CS # (filled in by Dean)
Lecture	3	1	18	<input type="checkbox"/>	
Seminar				<input type="checkbox"/>	
Laboratory				<input type="checkbox"/>	
Activity				<input type="checkbox"/>	

### 3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

Several of the Learning Objectives proposed below are taken from the Learning Objectives for Math 393, which themselves are being proposed in a Course Modification to exclude the learning objectives proposed below. The rationale is that the current learning objectives for Math 393 are appropriate for a full year long sequence of abstract algebra. Math majors with an emphasis in Education are required to take Math 393. With this proposal, students wanting to enter a mathematics graduate program will have the option of taking Math 493. To enter many graduate programs, a full year sequence of abstract algebra is required. Moreover, a year sequence of abstract algebra is standardly offered to undergraduate students.

Through this course, students will learn to

- Describe advanced topics in group theory, such as the Sylow Theorems
- Describe the basic theorems and examples of rings, ideals, and modules
- Describe the basic theorems and examples of field extensions
- Parametrize field extensions by groups and vice-versa (The Fundamental Theorem of Galois Theory)
- Determine the solvability of higher degree polynomial equations by radicals
- Prove the impossibility of certain ruler and compass geometric constructions, e.g. squaring of the circle
- Discuss some of the concepts and techniques of Abstract Algebra in both oral and written forms

This course is not designed to satisfy the University Writing or Language requirements.

### 4. Is this a General Education Course YES ☐ NO ☒

If Yes, indicate GE category and attach GE Criteria Form:

#### A (English Language, Communication, Critical Thinking)

A-1 Oral Communication ☐

A-2 English Writing ☐

A-3 Critical Thinking ☐

#### B (Mathematics, Sciences & Technology)

B-1 Physical Sciences ☐

B-2 Life Sciences – Biology ☐

- |   |                          |
|---|--------------------------|
| B-3 Mathematics – Mathematics and Applications                | <input type="checkbox"/> |
| B-4 Computers and Information Technology                      | <input type="checkbox"/> |
| <b>C (Fine Arts, Literature, Languages &amp; Cultures)</b>    |                          |
| C-1 Art   | <input type="checkbox"/> |
| C-2 Literature Courses  | <input type="checkbox"/> |
| C-3a Language   | <input type="checkbox"/> |
| C-3b Multicultural  | <input type="checkbox"/> |
| <b>D (Social Perspectives)</b>                                | <input type="checkbox"/> |
| <b>E (Human Psychological and Physiological Perspectives)</b> | <input type="checkbox"/> |
| <b>UD Interdisciplinary</b>                                   | <input type="checkbox"/> |

**5. Course Content in Outline Form.** *[Be as brief as possible, but use as much space as necessary]*

Groups: Advanced topics, such as the Sylow Theorems  
 Rings: Ideals, quotient rings, polynomial rings, basic isomorphisms  
 Modules: Definition, quotient modules, basic isomorphisms  
 Fields: Field extensions, degree of extensions, Tower Theorem, applications to geometric constructions  
 Galois Theory: Galois groups and fields, Fundamental Theorem of Galois Theory, applications to polynomial equations.

Does this course overlap a course offered in your academic program? YES ☒ NO ☐

If YES, what course(s) and provide a justification of the overlap? Math 513, Advanced Abstract Algebra (a Master's Course). Abstract algebra should be offered as a year long sequence for undergraduate students, as this is required to continue on at the graduate level by many graduate programs in mathematics. Currently CSUCI has only one semester long undergraduate abstract algebra course, so much of the material in Math 493 and Math 513 currently overlap. However, in the future, this overlap will become less as more students take Math 493. Eventually I would project that both Math 393 and 493 (or equivalents) will be required for entrance into our own Master's program in mathematics.

Does this course overlap a course offered in another academic area? YES ☐ NO ☒

If YES, what course(s) and provide a justification of the overlap?

Signature of Academic Chair(s) of the other academic area(s) is required on the signature sheet below.

**6. Cross-listed Courses (Please fill out separate form for each PREFIX)**

List Cross-listed Courses

Math 513, Advanced Abstract Algebra. Eventually, as our undergraduate and Master's programs grow, these two courses will not need to be cross-listed.

Signature of Academic Chair(s) of the other academic area(s) is required on the signature sheet below.

Department responsible for staffing: Mathematics

**7. References.** *[Provide 3 - 5 references on which this course is based and/or support it.]*

A First Course in Abstract Algebra, Seventh Edition, John B. Fraleigh, Addison-Wesley, 2002  
 Galois Theory, Second Edition, Ian Stewart, Chapman & Hall, 1989  
 Algebra, Michael Artin, Prentice Hall, 1991

**8. List Faculty Qualified to Teach This Course.**

Jesse Elliott, Geoffrey Buhl, Mathematics faculty

**9. Frequency.**

a. Projected semesters to be offered: Fall ☐ Spring ☒ Summer ☐

**10. New Resources Required. YES ☐ NO ☒**

If YES, list the resources needed and obtain signatures from the appropriate programs/units on the sheet below.

- a. Computer (data processing), audio visual, broadcasting needs, other equipment)
- b. Library needs
- c. Facility/space needs

**11. Will this new course alter any degree, credential, certificate, or minor in your program? YES ☐ NO ☒**

If, YES attach a program modification form for all programs affected.

Jesse Elliott

Proposer of Course

10/13/2006

Date

# Approval Sheet

Program/Course:

---

Program Chair(s)	Date
------------------	------

---

General Education Chair(s)	Date
----------------------------	------

---

Curriculum Committee Chair(s)	Date
-------------------------------	------

---

Dean of Faculty	Date
-----------------	------