



DE LA SALLE UNIVERSITY – MANILA
COLLEGE OF SCIENCE
Mathematics Department

SYLLABUS

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| COURSE CODE | MTH711M/D |
| COURSE TITLE | Abstract Algebra 2 |
| CLASS DAY & TIME | |
| ROOM | |
| NAME OF FACULTY | |
| COURSE CREDIT | 3 units |
| CONTACT NO. (DEPT) | (02) 536-0270, (02) 524-4611 loc. 420/413 |
| TERM/SCHOOL YEAR | |

COURSE DESCRIPTION

This second course in Abstract Algebra covers the topics on rings and ideals, fields, integral domains, quotient rings, ring homomorphisms, polynomial rings, divisibility in integral domains and field extensions.

PREREQUISITE: Abstract Algebra 2 (MTH611M/D)

COURSE OBJECTIVES

The students will:

1. define and illustrate the concepts of rings, fields, integral domains, ideals and quotient rings.
2. define and illustrate the concepts of prime, principal and maximal ideals, and give characterizations for both.
3. define and illustrate the characteristic of a ring.
4. define concepts and prove and illustrate properties of polynomial rings.
5. define and illustrate the concept of ring homomorphisms and kernels, and state, prove and illustrate the fundamental theorems of ring homomorphisms.
6. construct the field of quotients of an integral domain.
7. define and illustrate concepts related to divisibility in integral domains, such as irreducibility, primitive polynomials, prime elements, units and associates.
8. define, illustrate and give the relationship among principal ideal domains, unique factorization domains, and Euclidean domains.
9. construct extension fields containing the zeros of given polynomials.
10. Exhibit values like:
 - cooperation through group study;
 - honesty by claiming credit only for the work he has done;
 - zeal and seriousness of intent to learn by participating actively in class discussions, doing homework regularly and consulting with his mentor;
 - patience, perseverance and diligence by solving assigned exercises completely;
 - faith in doing what is right and giving his best in performing any assigned task;
 - show concern for the community through sharing of know-how and resources during group discussions; and
 - self-reliance by being able to solve problems independently.

| Topic/Subtopic | Learning Strategies/ Activities | Week/Meeting/ Hours |
|--|--|------------------------|
| I. RINGS, FIELDS AND INTEGRAL DOMAINS 1. Basic Concepts 2. Units in a Ring 3. Integral Domains and Fields 4. Characteristic of a Ring | Lecture Facilitated group discussion Problem solving | 6 Hours |
| II. IDEALS AND QUOTIENT RINGS 1. Subrings 2. Ideals 3. Quotient Rings 4. Principal and Maximal Ideals | Lecture Facilitated group discussion Problem solving Problem Set | 7.5 Hours |
| LONG TEST 1 | | 1.5 Hours |
| III. RING HOMOMORPHISMS 1. Basic Concepts 2. The Isomorphism Theorems 3. The Field of Quotients of an Integral Domain | Lecture Facilitated group discussion Problem solving Individual Inquiry | 5 Hours |
| IV. POLYNOMIAL RINGS 1. Basic Concepts 2. The Division Algorithm 3. Principal Ideal Domains 4. Factorization of Polynomials | Lecture Facilitated group discussion Problem solving Problem set | 6 Hours |
| V. DIVISIBILITY 1. Prime and Irreducible Elements 2. Unique factorization Domains 3. Euclidean Domains | Lecture Facilitated group discussion Problem solving Problem set | 6 Hours |
| LONG TEST 2 | | 2 Hours |
| VI. EXTENSION FIELDS 1. Basic Concepts 2. Algebraic Extensions 3. Finite Fields | Lecture Facilitated group discussion Problem solving Problem set | 6 Hours |
| FINAL EXAMINATION | | 2 Hours |

*OPTIONAL

COURSE REQUIREMENTS

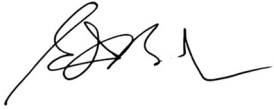
- Long Tests 50%
- Final Examination 30%
- Problem Sets 20%

SOURCES

- Ayres, Frank, *Schaum's Outline of Theory and Problems of Abstract Algebra*, McGraw-Hill, New York, 2004.
- Bloch, Ethan. *Proofs and Fundamentals: A First Course in Abstract Algebra*, Springer New York, 2011.
- Dummit, David. *Abstract Algebra*. Wiley Hoboken, NJ, 2004.
- Fraleigh, John B. *A First Course in Abstract Algebra*, Addison-Wesley Boston, 2003
- Gallian, Joseph. *Contemporary Abstract Algebra*, Houghton Mifflin, Boston, 2002.
- Herstein, I. N. *Abstract Algebra*, Macmillan New York, 1986.
- Hungerford, Thomas. *Algebra*, Springer-Verlag New York, 1974.
- Klima, Richard. *Applications of Abstract Algebra with Maple*. CRC Press, 2000.

- Lang, Serge. *Algebra*, Addison-Wesley, 1995.
- Solomon, Ronald. *Abstract Algebra*, Thompson Brooks/Cole Belmont, CA, 2003.

Noted by:

A handwritten signature in black ink, appearing to be 'IBJ', written in a cursive style.

DR. ISAGANI B. JOS
Chair, Mathematics Department

DR. JOSE SANTOS R. CARANDANG VI
Dean, College of Science