Department of Mathematics
The Ohio State University

1980-1981 Mathematics Courses

Course Number	Course Title
100	Introduction to College Mathematics
102	Basic College Mathematics
105	Mathematics for Elementary Teachers I
106	Mathematics for Elementary Teachers II
107	Mathematics for Elementary Teachers III
116	Survey of College Algebra
117	Survey of Calculus
130	Elements of Algebra
131	Elements of Calculus I
132	Elements of Calculus II
148	College Algebra
150	Elementary Functions
151	Differential and Integral Calculus
152	Differential and Integral Calculus
151H	Calculus and Analytic Geometry
152H	Calculus and Analytic Geometry
151C	Calculus and Analytic Geometry
152C	Calculus and Analytic Geometry
263H	Calculus
263C	Calculus
153	Differential and Integral Calculus
254	Differential and Integral Calculus
180	Insights into Mathematics
190H	Elementary Analysis
191H	Elementary Analysis
263H	Elementary Analysis
221	Elements of Calculus III
255	Differential Equations and Their Applications
256	Differential Equations with Applications
290H	Linear Algebra and Multivariable Calculus
291H	Linear Algebra and Multivariable Calculus
292H	Linear Algebra and Multivariable Calculus
345	Foundations of Higher Mathematics

Course Number	Course Title
415	Ordinary and Partial Differential Equations
416	Vector Analysis and Complex Variables
471	Matrices and Linear Algebra
501	Fundamentals of Mathematics
502	Fundamentals of Mathematics
503	Fundamentals of Mathematics
504	The History of Mathematics
507	Advanced Geometry
512	Partial Differential Equations and Boundary Value Problems
513	Vector Analysis for Engineers
514	Complex Variables for Engineers
530	Probability
531	Probability II
547	Introductory Analysis I
548	Introductory Analysis II
549	Introductory Analysis III
551.01	Vector Analysis
551.02	Advanced Calculus II
552	Complex Variables I
556	Differential Equations I
557	Differential Equations II
559	Topology
560	Topology
568	Linear Algebra I
569	Linear Algebra II
573	Elementary Number Theory
574	Geometry
575	Combinatorial Mathematics & Graph Theory
576	Linear Algebra and Discrete Algebraic Structures
577.01	Linear Algebra and Discrete Algebraic Structures
577.02	Discrete Algebraic Structures
580	Three Quarter Algebraic Sequence
581	Three Quarter Algebraic Sequence
582	Three Quarter Algebraic Sequence
590H	Algebraic Structures I
591H	Algebraic Structures II
592H	Algebraic Structures III

1980

Mathematics 100 5 cr. Introduction to College Mathematics

Su, A, W, Sp

Credit may not count toward graduation in some degree programs.

Prerequisite:

Level 5 Math placement on OSU Placement Test.

Catalog Description:

Topics will include the arithmetic of fractions and decimals, basic algebra, graphing equations, geometry.

Purpose of course:

Mathematics 100 is designed to meet the needs of the students entering The Ohio State University with Math Placement Level 5. The course will prepare students for 102.

Audience:

Students are placed in Math 100 only if scores on both the mathematics portion of the ACT and on the OSU Mathematics Placement Test show serious mathematical difficulties. There are also serious difficulties in general scholastic aptitude indicated by low ACT composite scores. The typical student has had at most two years of high school mathematics and there is usually a significant time gap in the students math training. We assume that all students who take Math 100 will need at least a next mathematics course for their chosen major. A 100 student should normally go into 102 as a follow-up course unless the students is an Arts and Sciences major intending to take 180.

Follow-up Courses:

Math 102

OVER

SYLLABUS FOR MATH 100

1. Review of Arithmetic, use of calculator.
2. Fractions, mixed numbers, decimal notation.
3. Properties of numbers.
4. Open sentences, solving equations.
5. Word problems, percent, geometric formulas.
6. The number line, rational numbers.
7. Arithmetic of signed numbers, properties of real numbers.
8. Integral exponents.
9. Story problems.
10. Basic geometric figures, angles.
11. Polygons.
12. Circles.
13. Solving linear equations.
14. Applied problems, formulas.
15. Graphs of equations
16. Linear equations, slope.
17. Equations of lines, parallel and perpendicular lines.

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Course Coordinator: Frank Demana

Spring, 1980

Mathematics 102 4 cr. Basic College Mathematics I

Su, A, W, Sp

Credit may not count toward graduation in some degree programs.

Prerequisite:

Level 4 Math placement or Mathematics 100.

Catalog Description:

Inequalities, absolute value, systems of equations, arithmetic of polynomials, factoring, quadratic equations, functions and graphs, algebraic fractions, right-angle trigonometry.

Purpose of Course:

To meet the needs of students entering the University with Math Placement Level 4 or with credit for 100. It prepares students for Math 103, 105, 116, and 130.

Format:

2 lectures, 2 recitations per week except, perhaps, during the Summer Quarter and evening sections.

Audience:

We assume that all students in the course need mathematics as a tool, at least in some science course, and are likely to take more mathematics courses. Many students will have had two or three years of high school math. Many will have had less than two years. In many instances there has been a significant time interval since the student last took a math course.

Follow-up Courses:

Math 103 for many students.
Math 105 for elementary education majors.
Math 116 for others (usually agriculture or social science students).
Math 130 for students in the college of administrative science.

OVER

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SYLLABUS FOR MATH 102

1. Review of straight lines
2. Systems of equations (two variables)
3. Applications
4. Systems of equations (three variables)
5. Polynomials
6. Products of polynomials
7. Factoring quadratics
8. Completing the square
9. More on factoring
10. Solving quadratic equations
11. Functions, graphs
12. Simplifying fractional expressions
13. Operations with fractions
14. Complex fractions, division of polynomials
15. Fractional Equations
16. Variation
17. Right angle trigonometry

Course Coordinator: Frank Demana

Spring, 1980

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Math 105 - 106
Autumn Quarter, 1980 — Wi 82

Text: Mathematics for Elementary School Teachers, Schultz (Merrill, 1977)
plus Supplements A - F, Ferrar and Leitzel (OSU Dept. of Mathematics)

Math 105

Schultz text:
Chapter 2 -- Whole Numbers and Place Value
Chapter 3 -- Operations in Whole Numbers
Chapter 4 -- Number Theory (divisibility, primes, GCF, LCM, etc)

Supplements:
A: Sets, Set Operations, Matching Sets
B: Segments, Angles
C: Measurement of Segments and Angles
D: Techniques of Counting
E: Measuring Area

Math 106

Schultz text:
Chapter 5 -- Fractions
Chapter 6 -- Applications
Ratio and Proportion
Decimals and Percents
Probability
Chapter 7 -- Integers
Chapter 8 -- Rational Numbers and Real Numbers

Supplements:
F: Congruence of Triangles, Parallel Lines, Angle Measures of Polygons, Area of Circle, Pythagorean Theorem, Ratios in Measurement

Further Topics:
Repeating Decimals
Coordinate Geometry
Clock Arithmetic

J. Schultz
Cockins Hall 221
422-8434

Mathematic 105 Mathematics for Elementary Teachers I

W., Sp., Su. 5 Cr.

Required prerequisites:

Level III placement or Math 102

Catalog Description:

Development of basic ideas of arithmetic, algebra and geometry as appropriate for elementary school teachers.

Purpose of course:

To develop an appreciation of, and basic competency in, the use of analytical thought in the development of a cohesive body of useful mathematical knowledge. Special emphasis on topics encountered in the elementary school mathematics program.

Audience:

Elementary education majors, mainly at the sophomore level. (This course, together with 106, satisfies the mathematic requirements of the certification program for teachers in the State of Ohio.) Students have very wide range of abilities, background, and interests. Many students have a negative view of mathematics. Students on the whole are very hard-working and conscientious.

Follow-up courses -- 106

Course content

Basic concepts dealing with natural numbers, integers, combinatorial counting procedures, elementary intuitive geometry, linear measurement, area and volume measure, angle measurement.

Course coordinator: Joe Ferrar
Jim Schultz

Spring, 1980

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Mathematics 106 Mathematics for Elementary Teachers II

Au., Sp., S. 5 cr.

Required prerequisites:

Mathematics 105

Follow-up courses -- 107

Course content:

Rational numbers, decimal representation, elementary probability, geometric constructions, congruence, similarity, real numbers.

Course coordinator: Joe Ferrar
Jim Schultz

Spring, 1980

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Mathematics 107 Mathematics for Elementary Teachers III

Sp. 5 Cr.

Required prerequisites:

Mathematics 106

Catalog description:

Further topics in mathematics selected by the instructor to broaden the mathematical perspectives of elementary teachers.

Audience:

Same as 105 and 106 but much reduced in number as this is not required for certification. Only the most interested of the 105 and 106 students will enroll.

Course content:

Optional with instructor. Should closely relate to content of 105 and 106 and serve to tie together topics previously encountered (for example--a study of the group of rigid motions in the coordinatized plane).

Course coordinator: Joe Ferrar
Jim Schultz

Spring, 1980

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Mathematics 116 Survey of College Algebra

Su., A., W., Sp. 5 cr.

Recommended prerequisites:

Math 102 or Math Placement Level III

Catalog Description:

The sequence 116, 117 treats topics applicable to non-physical sciences. Topics in 116 include college algebra, analytic geometry, linear algebra, and linear programming.

Purpose of course:

Emphasis is on intuitive understanding. It is hoped that students may feel less intimidated by terminology and symbolism. Primary goal of the sequence is an appreciation of calculus as a great invention of man.

Audience:

Generally apprehensive about mathematics. Backgrounds will vary although most have two years of high school mathematics.

Areas listing 116, 117 as suggested courses include: Agriculture (General and Industrial programs); School of Allied Medical Professions; College of the Arts (Division of Design, Visual Communication); Economics, Psychology, Biological Sciences.

Follow-up courses:

Students may elect 117 to complete the ASC 10 hour requirement for Skills and Understandings of Analysis and Interpretation: Symbolic Communication.

Note: Students may also elect 116 and any course from CIS or Statistics or Philosophy 150, 250, 650, 653, and 674 or Math 180.

(over)

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Possible text(s):

College Mathematics for Management, Life and Social Sciences. R. A. Barnett, Dellen Publishing Co., San Francisco.

Suggested course content:

Sections	Topics	Approximate Number of days
1-1 thru 1-5	Sets, numbers, exponents, radicals, polynominals, fractions	5
1-6 thru 1-8	Linear equations and inequalities, quadratic equations, binomial formula	9
2-1 thru 2-3	Graphs, lines, inequalities	6
2-4, 2-5	Relations, functions	5
2-6 thru 2-8	Exponential, log	5
5-3	Compound interest	2
3-1 thru 3-5	Linear systems, matrices	10
4-1 thru 4-2 (4-3?)	Linear inequalities, linear programming	5

Course Coordinator: Jack Tull

Spring, 1980

Mathematics 117 Survey of Calculus

Su., A., W., Sp. 5 cr.

Recommended prerequisites:

Mathematics 116

Catalog description:

An introduction to differential and integral calculus.

Audience:

Generally apprehensive about mathematics. Backgrounds will vary although most have two years of high school mathematics.

Areas listing 116, 117 as suggested courses include: Agriculture (General and Industrial programs); School of Allied Medical Professions; College of the Arts (Division of Design, Visual Communication); Economics, Psychology, Biological Sciences.

Follow-up courses:

Math 221 or Math 153 depending on student's need. Students interested in further course work in mathematics should consult with Professor Riner or the mathematics counselors in Math 150D.

Text:

College Mathematics for Management, Life and Social Sciences. Barnett. Dellen Publishing Co., San Francisco.

Suggested course content:

Sections	Topics	Approximate Number of Days
2-1 thru 2-8	Review of functions	3
9-1 thru 9-4	Rate, slope, limit	4
9-5 thru 9-8	Derivative, formulas	10
10-1 thru 10-6	Implicit, rates, higher order, max., min., differential	10
11-1 thru 11-7	Integration	7
12-1 thru 12-5	Exponential and log	3
12-7	Improper integrals	3
13-1 thru 13-3	Several variables	5

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Course Coordinator: Jack Tull
Spring, 1980

Mathematics 130 Elements of Algebra

Su, A, W, Sp 4 cr.

Prerequisites:

Placement Level 3 or Math 102 (C or better is strongly recommended, otherwise 103 is recommended)

Catalogue Description:

Equations, inequalities, linear functions, exponential and logarithmic functions, systems of equations, and matrix algebra.

Purpose of Course:

To introduce students to the pre-calculus mathematics needed in the Administration Sciences with emphasis on problems from economics.

Audience:

Primarily freshmen or sophomores with majors in Administrative Science

Background and Attitude of Audience:

The students electing this course have a very wide range of abilities and interests. Their background consists of some knowledge of high-school algebra. They are generally a difficult audience to motivate.

Follow-up Courses:

Math 131, 132

Possible Text:

Haeussler and Paul: Introductory Mathematical Analysis, 3rd Edition (Reston)

Syllabus: (16 lectures, 3 exams)

Topics (Text, Chapter-Section)

1. Exponents and Radicals, Operations with Fractions (0-5,8)
2. Linear Equations and Rational Equations (1-3,2)
3. Quadratic Equations, Applications (1-3,2)

OVER

Syllabus: (Continued)

4.	Inequalities and Applications	(2-2,3,4)
EXAM I		
5.	Functions and Graphs	(3-1,2,3)
6.	Lines and Parabolas	(4-1,4-2)
7.	System of Equations	(4-3,4-4)
8.	Applications of Linear Equations	(4-5)
9.	Expoential Functions	(5-1)
10.	Logarithmic Functions	(5-1,2)
EXAM II		
11.	Compounded Interests	(6-1)
12.	Matrix Algebra	(15-1,2,3)
13.	Reduction of Matrices	(15-4)
14.	Same	(15-5)
EXAM III		
15.	Inverses, and (or) Determinants and Cramer's Rule	(15-6,7,8)
16.	Review	

Course Coordinator: Monique Vuilleumier

Spring, 1980

Mathematics 131 Elements of Calculus I

A, W, Sp, Su 4 cr.

Recommended Prerequisites:

Math 130 or 150 or OSU Math Placement Level I .

Catalog Description:

Limits, tangent lines, continuity, differentiability, mean value theorem, graphing techniques, sequences, Taylor's theorem, definite integral, fundamental theorem of calculus, applications of calculus to business.

Purpose of Course:

The 131 and 132 courses are designed to introduce students in the College of Administrative Sciences to differential and integral calculus and related business applications. The courses are problem oriented and little rigor is introduced.

Audience:

Primarily freshmen or sophomores with majors in Administrative Science and some students in the biological sciences or agriculture.

Background and Attitude of Audience:

The students electing this course have a very wide range of abilities and interests. They are generally a difficult audience to motivate.

Follow-up Courses:

Math 132.

Possible Text:

Haeussler and Paul: Introductory Mathematical Analysis, 3rd Edition (Reston).

OVER

Syllabus: (Topics, Chapter-Section)

1.	Limits	(7-1, 7-2)
2.	Interest Compounded Continuously	(7-3)
	Continuity	(7-4)
3.	Continuity Applied to in Equalities	(7-5)
4.	Derivatives	(8-1)
5.	Rules for Differentiations	(8-2)
	Derivative as a Rate of Change	(8-3)
6.	Differentiability and Continuity	(8-4)
	Product and Quotient Rule	(8-5)
7.	Chain Rule and Power Rule	(8-6)
	Higher Order Derivatives	(8-11)
8.	Derivatives of Logarithmic Functions	(8-7)
	Derivatives of Exponential Functions	(8-8)
9.	Implicit Differentiation	(8-9)
	Logarithmic Differentiation	(8-10)
10.	Intercepts and Symmetry	(9-1)
11.	Asymptotes	(9-2)
12.	Relative Maxima and Minima	(9-3)
13.	Concavity	(9-4)
14.	Second Derivative Test	(9-5)
15.	Applied Maxima and Minima	(9-6)
16.	Differentials	(9-7)
	Elasticity	(9-8)

Course Coordinator: Surinder Sehgal

Spring, 1980

Mathematics 132 Elements of Calculus II

A, W, Sp, Su 4 cr.

Recommended Prerequisites:

Math 131 (or 117 or 151)

Catalog Description:

Antiderivatives, techniques of integration, calculus of the logarithmic and exponential functions, surfaces in R^3, partial derivatives, Lagrange multipliers, applications of calculus to business.

Purpose of Course:

The 131 and 132 courses are designed to introduce students in the College of Administrative Sciences to differential and integral calculus and related business applications. The courses are problem oriented and little rigor is introduced.

Audience:

Primarily freshmen or sophomores with majors in Administrative Science and some students in the biological sciences or agriculture.

Background and Attitude of Audience:

The students electing this course have a very wide range of abilities and interests. They are generally a difficult audience to motivate.

Follow-up Courses:

Math 221.

Possible Text:

Haeussler and Paul: (Reston). Introductory Mathematical Analysis, 2nd Edition (Fall 1980) 3rd Edition (Winter 1981 and after)

OVER

Syllabus: (Topics, Chapter-Section)

1.	Indefinite Integral	(10-1)
&	Integration Formulas	(10-2)
2.	Techniques of Integration	(10-3)
3.	Summation	(10-4)
	Definite Integral	(10-5)
	Fundamental Theorem	(10-6)
4.	Area	(10-7)
&	Area Between Curves	(10-8)
5.	Consumers '+Ps' Surplus	(10-9)
6.	Integration by Tables	(11-3)
7.	Average Value	(11-4)
8.	Improper Integrals	(11-6)
9.	Differential Equations	(11-7)
10.	Functions of Several Variables	(12-1)
11.	Partial Derivatives	(12-2)
12.	Applications of Partial Derivatives	(12-3)
	Higher-Order Partials	(12-5)
13.	Maxima and Minima	(12-7)
14.	Lagrange Multipliers	(12-8)
15.	Lines of Regression	(12-9)
16.	Multiple Integrals	(12-11)

Course Coordinator: Bob Gold

Spring, 1980

Mathematics 148 College Algebra

A., W., Sp., Su. 4 Cr.

Recommended prerequisites:

OSU Math Placement Level 3A or Math 102

Catalog description:

Basic properties of real numbers, graphing, functions and relations, and applications.

Purpose of course:

The two courses, Math 148 and 150, consist of precalculus concepts and skills needed by the student entering the regular calculus sequence (151, 152, ...). The purpose of the two courses is to prepare the student for Math 151 (calculus).

Audience:

Students with majors in the College of Engineering and the College of Mathematics and Physical Sciences generally elect this course. Some students in the College of Agriculture, Education and the College of Biological Sciences also elect this course.

Background and attitude of audience:

The students in this course have a very wide range of abilities and interests. Their background consists of some knowledge of high-school algebra. The overall attitude of the student audience is good. They are usually well motivated.

Follow-up courses:

Math 150.

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Over

Text:

Fundamentals of Algebra and Trig., Fourth Edition, by Swokowski

Course Content:

Chapters 1 through 4 and parts of 8, 9 and 10 of the text.

1. Expondents and radicals
2. Equations and inequalities
3. Functions
4. Polynomial functions, rational functions, conic sections
8. Systems of inequalities
9. Complex roots of equations
10. Zeros of polynomials, properties of division

Course Coordinator: Norman Levine

Spring, 1980

Mathematics 150 Elementary Functions

A., W., Sp., Su. 5 cr.

Recommended prerequisites:

OSU Math Placement Level 2A or Math 148.

Catalog description:

Expoential, logarithmic and trigonometric functions and their graphs, complex numbers, inverse functions.

Purpose of course:

This course treats the (non-algebraic) functions needed by the student entering the regular calculus sequence (151, 152, ...). The purpose of Math 150 is to prepare the student for Math 151 (calculus). With 148, the course covers traditional pre-calculus mathematics.

Audience:

Students with majors in the College of Engineering and the College of Mathematics and Physical Sciences generally elect this course. Some students in the College of Agriculture, Education and the College of Biological Sciences also elect this course.

Background and attitude of audience:

The students in this course have a wide range of interests but all need to take calculus. Students should be placed in Math 150 only if they have a strong algebra background and are well motivated.

Follow-up courses: Math 151

Possible text(s): Swokowski: Fundamentals of Algebra and Trigonometry

Syllabus: Section 3.6, Chapters 5, 6, 7 and 9.

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Course Coordinator: John Riner

Spring, 1980

Mathematics 151, 152 Differential and Integral Calculus

A. W. Sp. S. 5 Cr.

Prerequisites:

Math Placement 1 or 149 or 150.

Audience:

Students who plan to major in mathematics, engineering, or the physical sciences; also strong students in the social sciences or other areas that make significant use of mathematics.

Content:

151

Preliminaries (review of functions and graphing), limits, derivatives, tangents, max-min problems, curve sketching, related rates, trig func.

152

The integral, Fundamental Theorem of Calculus, applications, area and volume, derivative and integrals of log, exp, hyperbolic, inverse trig functions; methods of integration, polar coordinates.

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Course coordinator: Tom Schwartzbauer

Spring, 1980

Mathematics H151-H152 or H151C-H152C	5 Cr.	Calculus and Analytic Geometry
Mathematics H263 or H263C	5 Cr.	Calculus

H151, H151C - A
H152, H152C - W
H263, H263C - Sp

The Honors courses are accelerated versions of the regular sequence in calculus. They are designed to challenge well prepared, highly motivated students irrespective of their chosen major area of study. More personal responsibility is expected from the students in achieving the standard skill techniques than in the regular courses. Honors sections with a C suffix will make use of computation with programmable calculators in teaching the honors syllabus.

For the first half of the fall quarter, Math H151 and H151C will cover, at an intensive pace, the topics of Math 151, so that a transfer to Math 151 or 151C may be made at the end of three weeks by those students who decide not to continue the accelerated track. After that time, University rules for adding and dropping courses apply.

Although completion of this sequence is considered by the Mathematics Department to be equivalent in course content to Math 151, 152, 153 and 254, only 15 hours of credit will be earned. Students whose degree programs require mathematics through Math 254 will gain by having 5 more elective hours available to them as they pursue their own goals.

Students, who decide to leave the Honors Track at the end of fall term, will be advised as to future placement in mathematics sequences.

Topics Covered:

H151 and H151C: The calculus of one variable including differentiation with applications; integration with applications; logarithmic, exponential, trigonometric and hyperbolic functions; techniques of integration; vector geometry, and vector calculus of one variable.

H263: Multivariable calculus (vector approach), gradients, multiple integrals, line and surface integrals, Green's theorem, divergence theorem, Stokes' theorem, sequences and series.

Course Coordinator: Ron Solomon

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Mathematics 153, 254 Differential and Integral Calculus

A. W. Sp. S. 5 Cr.

Prerequisites.

Math 152

Audience:

Students who plan to major in mathematics, engineering, or the physical sciences; also strong students in the social sciences or other areas that make significant use of mathematics.

Content:

153

Vectors and analytic geometry in two and three dimensions. Functions of several variables, partial derivatives, directional derivatives, gradient, extrema. Multiple integrals and applications. Cylindrical and spherical coordinates.

254

Indeterminant forms, L'Hospital's rule, improper integrals. Sequences and series, Taylor's formula with remainder, power series. Vector calculus, line and surface integrals, Green's Theorem, vector fields.

Course coordinator: Ted Scheick

Spring, 1980

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Mathematics 180 Insights Into Mathematics

S., A., W., Sp. 5 cr.

Prerequisite:

Sophomore Standing or permission of department.

Catalog Description:

A liberal arts course intended to involve students with mathematics rather than to develop computational and problem-solving skills; topics chosen by the instructor.

Purpose of course:

Many students at The Ohio State University take mathematics courses for the purpose of satisfying a graduation requirement but with no need for specific problem solving skills. The courses that have been used by such students in the past are skill oriented rather than liberal arts type courses. This course is one that emphasizes involvement with problems in mathematics. There is no fixed course content. Rather, a faculty member offers a course treating topics in which he or she is interested in a manner that is accessible to students without prior training and without a "tool" need for mathematics.

We feel that this approach is the proper one for a liberal arts course. It enables us to take advantage of the interests of faculty members to avoid problems inherent in offering a fixed subject matter course to a large audience. To date we have involved several faculty members offering a variety of topics. Four of the many topics used have been Computers in Society, Symmetry (in art and music), Topology, and Number Theory.

Audience:

Predominantly students in the Colleges of Arts and Sciences and students from the College of Education who must meet a 5 hour mathematics certification requirement.

Course coordinator: James Leitzel

Spring, 1980

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Mathematics H190, H191, H263 Elementary Analysis

H190 - A 5 Cr.
H191 - W 5 Cr.
H263 - Sp 5 Cr.

This three-quarter sequence comprises the first year of the honors program in mathematics. It is designed to challenge talented, highly motivated students who enter the University with some familiarity with computational calculus, regardless of their chosen major area of study. The courses introduce students to the mathematical underpinnings of calculus and stimulate the development of mathematical thinking, in addition to covering the material of the traditional calculus sequence. This sequence will substitute for Math 151, 152, 153, 254 and 551. It is taught by faculty members in small sections with considerable teacher-student interaction.

Topics Covered: Properties of real numbers. Mathematical Induction. Definition of integral. Integrals of polynomials and trig functions. Applications. Continuity, limits, derivative and applications. Fundamental theorem and integrations techniques. Taylor series. Some 1st order differential equations. Complex number field. Sequences and series of numbers and functions. Uniform convergence. Power series. Functions of several variables. Vectors.

Possible Text: Apostol, Calculus Volume I

Note: It has been the practice to have a separate section of H263 in spring continuing the H190-191 sequence. The content is similar to that of the other H263 sections but the treatment is more rigorous.

Possible Text: Apostol, Calculus Volume II
Chapters 8-12

Course Coordinator: Ron Solomon

Spring, 1980

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Mathematics 221 Elements of Calculus III

A, Sp 5 cr.

Prerequisites:

Math 132 or equivalent with written permission of the Department.

Catalog Description:

A continuation of Math 132. Topics in calculus.

Purpose of Course:

(a) To prepare the student for Statistics 425.

(b) To prepare the student for additional work in mathematics.

Audience:

Generally Math-Stat or CIS majors in the College of Administrative Science.

Follow-up Courses:

Math 471, Statistics 425.

Possible Text(s):

See the Course Coordinator.

Suggested Course Content:

See the Course Coordinator.

Course Coordinator: Bert Waits

Spring, 1980

Mathematics 255

Differential Equations
and Their Applications

A., W., Sp., Su. U G 5

Recommended prerequisites:

Math 254

Catalog description:

Basic concepts and methods in solving ordinary differential equations, first and second order, linear differential equations, series solutions, numerical methods, Laplace transforms, physical applications.

Purpose of course:

This course is an introduction to the most basic concepts and methods in solving ordinary differential equations. The emphasis of this course is on problem-solving. Students after this course should know some applications of ordinary differential equations in engineering, physics and some other branches of sciences.

Content:

1. First order Differential Equations with Applications
2. Second Order Linear Equations with Applications
3. Series Solutions of Second Order Linear Differential Equations
4. Higher Order Linear Equations
5. The Laplace Transform
6. Numerical Methods

*7. An Introduction to Systems of First Order Linear Equations.

*This will be taught if time is allowed.

Course coordinator: Y. C. Lu

Spring, 1980

DEPARTMENT OF MATHEMATICS
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Mathematics 256 Differential Equations with Applications

S., A., W., Sp. 4 cr.

Recommended prerequisites:

Math. 254

Catalog description:

First order differential equations, linear equations with constant coefficients, systems of linear equations, applications to vibrations problems and electrical networks. Not open to students with credit for 255, 415, 556.

Purpose of course:

This differential equations course is designed to meet the specific needs of the Mechanical Engineering students.

Audience:

Almost all students will be from Mechanical Engineering.

Possible Texts:

A Short Course in Differential Equations, Rainville and Bedient

Introduction to Ordinary Differential Equations, A.L. Rabenstein.

Content:

The content of 256 does not contain Laplace transformation and power series method. It contains most of the other topics in 255 as well as systems of equations and additional applications.

(OVER)

Suggested Outline I (from Rainville and Bedient)

Chapter 2, Sections 5-12	5 days
Chapter 3, Sections 13-15	3 days
Chapter 5, Sections 24-29	2 days
Chapter 6, Sections 33-37	2 days
Chapter 7, Sections 38-41	1 day
Chapter 8, Sections 44-45	1 day
Chapter 12, Sections 67-70	3 days
Chapter 13, Sections 71-79	7 days
Chapter 14, Sections 81-82	2 days
Supplementary Application	2 days
Review before tests	9 days
Tests	3 days
	40 days

Suggested Outline II (from Rabenstein)

Chapter 1. Introduction to Differential Equations (all sections)
Appendices A1, A2, A3, A4, and matrix multiplication
Chapter 2. Linear Differential Equations, Sections 1-12
Chapter 8. Systems of Differential equations (all sections)

Course Coordinator: Dan Eustice

Spring, 1980

Mathematics H290-291-292

Linear Algebra & Multi-Variable Calculus

A-W-Sp 5 Cr.

(Substitutes for Math 568, 569; Math 556 (255, 256, 415) and Math 547 and 552.)

Topics Covered:

H290: Vector spaces, linear maps, matrices, systems of equations, eigenvalues, eigenvectors, and determinants. Change of basis and triangular form. Positive definite matrices and spectral theory. Linear methods applied to multivariable calculus such as implicit function theorems.

H291: Linear differential equations, systems of linear differential equations, partial differential equations. Picard's existence and uniqueness theorem. Laplace transforms. Fourier series. Heat and wave equations. Sturm-Liouville boundary value problems.

H292: Convergence properties of sequences of real and complex numbers, sequences of functions, complex variable theory, including Cauchy Integral Theorem, elementary functions and mappings, residue theory.

Course Coordinator: Ron Solomon

Spring, 1980

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Mathematics 345 Foundations of Higher Mathematics

A., Sp. 4 Cr.

Recommended prerequisites:

153 or permission of instructor

Catalog description:

Designed to prepare students for higher mathematics: an introduction to logic, proof techniques, set theory, number theory, integers, real numbers, transfinite numbers.

Purpose of course:

The intention of Math 345 is to build a solid foundation in those topics generally assumed, or only lightly touched upon, in advanced mathematics courses. It is a transitional course intended to follow calculus (153) and precede advanced calculus (547), abstract algebra (580), linear algebra (568), and/or topology (560).

Our 100 and 200 level math courses are basically designed to teach the tool aspect of algebra, geometry, and calculus, whereas in the 500 level mathematics courses it is important that the student be familiar with the concepts of proof and generalization. Some students are not ready to handle the abstraction of these courses without a preliminary introduction to the nature of mathematical proof.

Audience:

Students will generally be sophomores who have completed a calculus sequence and anticipate some 500-level courses.

Text:

Sentilles: A Bridge to Advanced Mathematics

Suggested course content: Topics include: (not necessarily in order of coverage)

1. Introduction to logic, including proof techniques: indirect proof, direct proof, mathematical induction.
2. Basic Set theory
3. Elementary number theory
4. Integers and their properties
5. Real numbers including a proof of the Archimedian principal
6. Transfinite numbers (Never seem to get to this)

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Course Coordinator: Jim Leitzel
Spring, 1980

Mathematics 415 — Ordinary and Partial Differential Equations

A., W., Sp. 5 cr.

Recommended prerequisites:

Math. 254

Catalog description:

Ordinary, partial, linear and non-linear differential equations, fourier series, boundary value problems, eigen-value theory, and Bessel functions.

Purpose of course:

One hopes to introduce the standard techniques of elementary ordinary differential equations, Fourier trigonometry series, and separation of variables in Partial Differential Equations. It is a combination of 255 (Differential Equations) and 512 (Fourier Series and Boundary Value Problems).

Audience:

The students usually come to the course from the Calculus sequence.

Background and attitude of audience:

This course is designed by a committee (primarily of engineers) which intended to expose electrical and aeronautical engineering students to problem solving in differential equations.

Possible text(s):

Boyce and DePrima, Differential Equations

Suggested course content:

Using Boyce and DePrima:

Section Numbers	Days Spent
1.1, 1.2, 2.1 - 2.7	7
3.1 - 3.62	10
4.1 - 4.7	10
10.1 - 11.8	13
11.1 - 11.6	5
Optional Material	3 - 5 Systems

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Course coordinator: Dan Eustice

Spring, 1980

Mathematics 416 Vector Analysis and Complex Variables

A., Sp. 5 cr.

Recommended prerequisites:

Math. 254

Catalog description:

Vector algebra and vector operators, line integrals, analytic functions, complex integral theorems, power series, residues, and conformal mapping.

Purpose of course:

The vector analysis portion is needed for engineering courses which many students take concurrently and for this reason should be covered first. The course is a prerequisite for Electrical Engineering and Aeronautical Engineering. Minimal proofs should be the rule (e.g., Cauchy Theorem by Green's Theorem rather than Cauchy-Goursat) or intuitive explanations.

Audience:

This is primarily an application or problem solving course for undergraduate engineering students.

Possible text(s):

Vector analysis, Schaum's Outline

Complex variables, Churchill, Brown, and Verhey

(over)

Suggested course content:

A combination of 514 (complex variables) and 513 (vector calculus).

Suggested Schedule:

Vector analysis -- 15 classes including test

Complex variable -- 35 classes including test

1. COMMENT -- Use first 3 weeks of quarter. Line integrals and Green's Theorem needed for complex variable. Gauss and Stokes Theorems needed for engineering courses taken concurrently.

   Schedule:

   Chap. 1-4 -- 4 classes -- treat as review

   Chap. 5 -- 5 classes -- included independence of path

   Chap. 6 -- 5 classes -- Gauss, Green, Stokes. Omit p. 107.

2. Schedule:

   Chap. 1 -- 3 classes
   Chap. 2 -- 4 classes
   Chap. 3 -- 4 classes
   TEST
   Chap. 4 -- 5 classes
   Chap. 5 -- 5 classes
   Chap. 6 -- 4 classes
   TEST
   Chap. 7 -- 6 classes

OVERALL COMMENT -- Run as a problem course . Minimal proofs.

Course coordinator: Dan Eustice

Spring, 1980

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Mathematics 471 Matrices and Linear Algebra

A., W. 5 cr.

Recommended prerequisites:

Math 153 or 221 or equivalent with permission of department

Catalog description:

Not open to students with credit for 571, 568, or 576. Matrices, systems of equations, R^n, determinants; vector spaces; applications.

Purpose of course:

The purpose of the course is to provide an elementary introduction to the concepts, vocabulary, notation, and results of matrix and linear algebra. It does not contain the depth of material of H290, 569, or 576. Further, emphasis is placed on the topics as tools rather than as development of structure; applications are chosen from Markov processes and linear programming.

Audience:

The course is required for CIS majors in the College of Administrative Science.

Students are not too strong mathematically and not always well motivated. They have a strong desire to see applications of this material. They also have a dislike for formalism and often bring quite a bit of computer experience to the course, i.e. a "how-to-solve-it" approach.

Text, 1980-81: Elementary L.P. with Applications, Kalman & Beck
In addition some mimeographed notes by B. Wyman will be provided.

Suggested course content:

matrices - arithmetic, inverse, transpose, rank;
systems of equations - homogeneous and nonhomogeneous;
vector spaces - R^n, independence, spanning sets, basis;
determinants - elementary properties, cofactors;
Linear Programming
Eigenvalues and Eigenvectors;
Markov chains and Difference equations

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Course Coordinator: Bostwick Wyman

Spring, 1980

501 - A. 4 Cr.
502 - W. 4 Cr.
503 - Sp. 4 Cr.

Catalog description:

The integrated sequence 501, 502 and 503 covers the calculus of one and several variables with applications to statistics, economics and the social sciences.

Purpose of course:

This course serves those graduate students in departments outside the College who need mathematics in their majors but whose undergraduate training in mathematics is insufficient.

Audience:

This course is intended for advanced students in areas other than the mathematical and physical sciences.

Suggested course content:

It is an integrated sequence in calculus with topics from algebra and analytic geometry introduced as needed. The course content is essentially the same as the mathematics sequence 151, 152, 153 and 254, with the exception that some of the theory is deleted and the emphasis is on applications to statistics, economics and social sciences.

Content includes lines, slopes, derivatives, limits, mean-value theorem; applications of derivatives to curve sketching, maxima and minima, approximations; antidifferentiation, the definite integral, fundamental theorem of calculus; area, volume, other applications of integration; inverse functions, logarithmic, exponential, trigonometric, inverse trigonometric, and hyperbolic functions; integration techniques, indeterminate forms; improper integrals; Taylor's formula; infinite series, differential calculus of functions of several variables; multiple integration.

Course coordinator: Archie Addison

Spring, 1980

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Mathematics 504 The History of Mathematics

A., Sp. 5 cr.

Recommended prerequisites:

Math 580 or 571 or 568 or 507 or permission of instructor

Catalog description:

Development of mathematics from primitive origins to present form; topics include development of arithmetic, algebra, geometry, trigonometry, and calculus.

Purpose of course:

This course is an introduction to the History of Mathematics. The purpose of this course is to expose the students to the good mathematics of yesteryear. Also, an attempt is made to tie the evolution of mathematics to the socio-economic conditions of the times.

Audience:

This course is principally a service course for the Math Education department. It is not recommended in the 40-hour requirement necessary for a straight math major. However, if taken as an elective, it could benefit the math major greatly. (95% of the audience are Math-Ed students)

Background and attitude of audience:

The background and motivation of the average student in this course is poor.

Follow-up courses:

This course is terminal.

Possible text(s):

Eves: An Introduction to the History of Mathematics (3rd ed.)

OVER

Suggested course content:

(Note: A * means that this will be included in the course.)

1) * reading: (1) Eves or some other general history on mathematics
(2) at least 2 books of Euclid's Elements

2) * term paper: this paper is to be at least 80% mathematics and the rest history. The purpose of the paper is to have the student dig in and learn a certain portion of mathematics well, and then present it.

3) lecture topics (most probable): At least one will be explored thoroughly

counting and the abacus
general solution of the polynomial equation
irrational numbers
astronomy and its effect on the development of math
Cantor theory
conic sections
calculus
the parallel postulate and non-Euclidean geometry
Euclid's Elements
axiomatics
Boolean algebra

4) other outside reading

(Note: There are many other good sources.)

Course Coordinator: Tom Schwartzbauer
Spring, 1980

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Mathematics 507 Advanced Geometry

A., W. 5 cr.

Recommended prerequisites:

Math 152 (Integral Calculus)

Catalog description:

Advanced topics from Euclidean Geometry.

Purpose of course:

The course introduces advanced topics as extensions of elementary Euclidean geometry. The material should be useful both to mathematicians and to teachers.

Audience:

The course is required for Education College students specializing in the teaching of secondary school mathematics. About one-fourth of the students are enrolled in Arts and Sciences.

Many students have weak backgrounds in high school geometry and analytic geometry. The general attitude of students is favorable.

Text: Geometry by Transformations, by E.A. Maxwell, Cambridge U. press.

OVER

Math 507

Suggested Course Content:

*Review of high school geometry

*Euclidean and affine transformations

Circular Inversion

Finite Geometries

Course Coordinator: Arno Cronheim

Spring, 1980

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Mathematics 512

Partial Differential Equations
and Boundary Value Problems

A., W. 5 Cr.

Recommended prerequisites:

255 or 556

Catalog description:

Among the topics considered are: Fourier series, orthogonal relations, vibrating string, steady state heat, Laplace transform, and applications.

Purpose of course:

Lots of problem-solving and little theory.

Audience:

Graduate and advanced undergraduate engineers.

Background and attitude of audience:

Derivation of the partial differential equations of vibrating string, transmission lines, etc. is not expected. Solutions of these equations and interpretation of the solutions is expected.

Possible text(s):

1. Kreyszig, Advanced Engineering Mathematics, Wiley.

   This book contains most of the material needed, and much more. It is a good reference book for engineers to own, especially if they intend to take further mathematics courses. It can also be used for 513 and 514.

3. a) Miller, Partial Differential Equations in Engineering Problems, Prentice Hall.

   b) Rainville, The Laplace Transform, McMillan.

Suggested course content:

This course is a three hour course with a lot of material with little emphasis on theory. A detailed outline based on the following texts is available and should be followed.

Fourier Series

Separation of Variables and Linear Partial Differential Equations

Laplace Transform: Definition and Elementary Properties

Applications to ordinary linear differential equations.

OVER

Math 512 Partial Differential Equations and Boundary Value Problems

Suggested Syllabus:

1. Fourier Series: 8 days including a test.

   Trigonometric and fourier series. Convergence theorem. Even and odd functions and extensions of functions. Half range expansions. Other topics may be included if you have time, eg. Complex Fourier Series, double Fourier series.

   Kreszig - Chapter 9, Sections 9.1 to 9.5. 9.7 and 9.8 optional.

   Miller - Sections 15 to 40, except 20, 21, 27, 28, 34, 35, 38, 39.

2. Partial Differential Equations: 8 days including a test.

   Boundary value problems are to be considered for: one dimensional wave equation (series and D'Alembert solution); one dimensional diffusion equation; and Laplace's equation in the plane. The method of separation of variables is used. The differential equations need not be derived. Do many examples of each type. No use of Bessel functions.

   Kreszig - Chapter 10, Sections 10.1, 10.3, 10.4, 10.5. Skimpy on Laplace's equation.

   Miller - Sections 42, 43, 45, 47, 49, 53.

3. Laplace Transform: 9 days including a test.

   Basic properties of the Laplace transform. Existence theorem (stated). Transform of derivatives. Partial fractions. Inverse transform. Solution of ordinary linear differential equations with constant coefficients. Transforms of periodic functions. The "Second Shifting Theorem" and applications. Systems of differential equations and Convolution formula, if time allows.

   Kreszig - Chapter 4, Sections 4.1 to 4.9.

   Rainville: Chapters 1, 2, 3, 4.

4. Application of Laplace transform to solving partial differential equations, or other topics you feel are interesting or important: 3 days.

   This will depend on the text you use.

Course coordinator: J. T. Scheick

Spring, 1980

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Mathematics 513 Vector Analysis for Engineers

W. 3 cr.

Recommended prerequisites:

Calculus and differential equations.

Catalog description:

Vector algebra, vector operators, line integrals, vector integral theorems, curvilinear coordinates; applications.

Purpose of course:

A "skills" course designed to give familiarity with vector notation, vector operations, line surface integrals. Ample class time should be devoted to problems.

Audience:

Students are mainly graduate engineers whose last course was several years ago.

Possible text(s):

Vector Calculus - Lindgren

Advanced Engineering Mathematics - Kreyszig, chapters 7, 8. This is also a good general reference book for engineers. It can also be used for 512, 514.

Suggested course content:

Fron Lindgren: Level of text is about right. Supplementary problems (e.g., Vector Calculus--Schaums) will be needed.

Suggested Schedule:

Ch. 1 -- Vector Algebra, geometry, operations
As this is review, more time produces less interest. 3 days.

Ch. 2 -- Vector functions of 1 variable, space curves, arc length
Parametrization of curves is difficult 6 days.

Ch. 4 -- Vector functions of position, chain rule surfaces, del operator, line and surface integrals
Parametrization of surfaces. 10 days.

Ch. 5 -- Integral Theorems
Gauss, Green, Stokes, path independence 7 days.

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Course coordinator: J. T. Scheick

Spring, 1980

Mathematics 514 Complex Variables for Engineers

Sp. 3 cr.

Recommended prerequisites:

513 or equivalent (so some time on line integrals may be saved and Green's Theorem may be used to get the Cauchy integral theorem).

Catalog description:

Introduction to complex variables, analytic functions, complex integral theorems, power series, residues, conformal mapping.

Purpose of course:

Subject matter needed in engineering courses.

Audience:

A "skills" course for undergraduates and graduate engineers.

Background and attitude of audience:

Do not overestimate the students' computational skills because they are engineers; in fact, class discussion of assigned problems is helpful. Discuss the theory, but spend most of the time sharpening computational skills and showing them how to use the theory.

Possible text(s):

1. Churchill, Complex Variable and Applications (a bit hard to read for students)

2. Smith, Elementary Complex Variables, Merrill

3. Kreyzig, Advanced Engineering Math

The last contains much diverse material. It is an excellent reference for engineers on many topics in mathematics.

Every suggested text has too much material, so it is helpful to give a review sheet before tests. These students want the text for reference and the lectures to make the text understandable.

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(Over)

Suggested course content:

Syllabus based on Churchill:

1.	Complex Numbers, polar form	3 days
2.	Analyticity, Cauchy-Riemann Eq.	3 days
3.	Elementary Functions	4 days
		Test
4.	Mapping by elementary functions	3 days
5.	Cauchy integral Theorem and consequences	5 days
		Test
6.	Power series	3 days
7.	Residues, definite integrals	6 days

Syllabus based on Kreyzig: (2 tests and a final exam).

11.	Complex Analytic Functions	9 days
12.	Conformal Mapping (omit 12.6)	4 days
13.	Complex Integrals	5 days
14.	Sequences, Series (Just state definitions and the theorems on power series)	1/2 day
15.	Taylor and Laurent Series	2 1/2 days
16.	Integration by Residues	6 days
17.	Complex functions and Potential Theory: only if you have some time left over and the students are well versed with the above material	

Course coordinator: J. T. Scheick

Spring, 1980

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Mathematics 530 Probability I

A., 3 cr.

Recommended prerequisites:

M. 254

Catalog description:

Axioms of probability, combinatorial probability, random variable, expectation, variance.

Purpose of course:

The student is exposed to the foundations of modern probability theory and its applications. His understanding of analysis is strenthened by its use in probability theory.

Audience:

Majors in mathematics, physics, engineering (especially electrical engineering), biological sciences.

There are many students in the course who are not mathematics majors. For the most part the students are interested and hard-working.

Follow-up courses:

Mathematics 531

Possible text (s):

K.L. Chung, Elementary Probability Theory with Stochastic Processes

Syllabus:

Sets
Probability
Counting
Random Variables
Mean, Variance and Transforms
Exams and Review

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Course Coordinator: Louis Sucheston

Spring, 1980

Mathematics 531 Probability II

W., 3 cr.

Recommended prerequisites:

Math 530

Catalog description:

Continuation of 530; examples of distributions, independence, conditional and marginal distribution, laws of large numbers, central limit theorem.

Purpose of course:

The student is exposed to the foundations of modern probability theory and its applications. His understanding of analysis is strengthened by its use in probability theory.

Audience:

Majors in mathematics, physics, engineering (especially electrical engineering), biological sciences.

Background and attitude of audience:

There are many students in the course who are not mathematics majors. For the most part the students are interested and hard-working.

Follow-up courses:

Before a student takes further probability theory, he will need 651-653.

Possible text(s):

K.L. Chung, Elementary Probability Theory with Stochastic Processes

Syllabus:

Conditioning and Independence
Poisson and Normal Distributions
Markov Chains
Additional Topics
Exams and Review

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Course Coordinator: Louis Sucheston

Spring, 1980

Mathematics 547 Introductory Analysis I

Su, A. W. 3 cr.

Recommended prerequisites:

254 or permission of instructor
Not open to students with credit for 550

Catalog description:

The first course of a three-course sequence designed to develop analytic intuition and proof skills; student participation is emphasized; real numbers, sequences, series, continuous functions.

Audience:

The content of 547 and 548 is that of Math 550. The students will be principally mathematical and physical science majors and engineers.

Follow-up courses:

548, 549

Possible text(s):

Avner Friedman
Watson Fulks
Anthony Labarre

Suggested course content:

547, 548, 549 is a sequence designed to develop analytic intuition and proof skills. Student participation is emphasized. Real numbers, sequences, series continuous functions.

Topics to be covered (not necessarily in order of coverage)

1. The structure of the real numbers.
2. A careful study of limits of sequences, series, and properties of the limit process; here it is proved that a bounded sequence of real numbers has a convergent subsequence.
3. A study of continuous functions including the proofs of the intermediate value theorem and the theorem that a continuous function on a closed bounded interval is uniformly continuous.

Course coordinator: David Dean

Spring 1980

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Mathematics 548 Introductory Analysis II

Su., W., Sp. 3 cr.

Recommended prerequisites:

547 or permission of instructor
Not open to students with credit for 550

Catalog description:

Continuation of 547; sequences of functions, differentiation, the Riemann integral.

Audience:

The content of 547 and 548 is that of Math 550. The students will be principally mathematical and physical science majors and engineers.

Follow-up courses:

549 or 551.02 or 552.02

Possible text(s):

Avner Friedman
Watson Fulks
Anthony Labarre

Suggested course content:

547, 548, 549 is a sequence designed to develop analytic intuition and proof skills. Student participation is emphasized. Sequences of functions, differentiation, the Riemann integral.

548 is a continuation of 547 including the following topics:

1. Properties of limits of sequences of functions.
2. An exploration of functions having a derivative, with proofs of the mean-value theorem and Taylor's theorem with remainder.
3. The development of the fundamental theorem of the calculus, substitution formulas and an examination of functions having a Riemann integral.

Course coordinator: David Dean

Spring, 1980

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Mathematics 549 Introductory Analysis III

Sp. 3 cr.

Recommended prerequisites:

548 or 550 or permission of instructor

Catalog description:

Continuation of 548; the Riemann-Stieltjes integral; an introduction to the calculus of several variables.

Audience:

The students will be principally mathematical and physical science majors and engineers.

Follow-up courses:

551.02 or 552.02

Possible text(s):

Watson Fulks

Suggested course content:

547, 548, 549 is a sequence designed to develop analytic intuition and proof skills. Student participation is emphasized. Riemann-Stieltjes integral, an introduction to the calculus of several variables. 549 is a continuation of 548. After completion of 548 the student is ready to begin the study of the calculus of several variables.

Topics included would be:

1. An introduction to functions of bounded variation through the study of the Riemann-Stieltjes integral.
2. The calculus of several variables with the emphasis on differentiable functions, Green's theorem and then multiple integration; including proofs that iterated integrals do compute volumes under sufficiently strong hypotheses.

Course coordinator: David Dean

Spring, 1980

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Mathematics 551.01 Vector Analysis

Au., Sp. 5 cr.

Recommended prerequisites:

Math 254

Purpose of course:

This course was designed primarily for physics majors and is not recommended for math majors. The course is designed to enable students to understand and use the techniques of vector analysis in 2 and 3 dimensional space. Applications in geometry should be emphasized.

Possible texts:

Kaplan - Advanced Calculus, with supporting problems from Schaum.

Suggested Course content:

Partial differentiation - Transformations of variables, Vector algebra and vector calculus for curves, Vector differential operators, Line and surface integrals, Theorems of Stokes, Green, and the divergence theorem, Emphasis on techniques and calculations.

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Course coordinator: Henry Colson
Spring, 1980

Mathematics 551.02 Advanced Calculus II

A. 5 cr.

Recommended prerequisites:

Math 547 and 548

Purpose of course:

The course continues as a follow-up to Math 547 and 548. Students are introduced to functions of more than one variable, integration, and transformation of variable theorems.

Audience:

Primarily math majors

Possible text(s):

Avner Friedman
Watson Fulks

Suggested course content:

Continuity and differentiability for functions of more than one variable. Jacobians and their uses, Definite integration 1, 2, and 3 dimensional with ideas presented mostly from 1 and 2 dimensions, Line and surface integrals, Topics from vector analysis as needed for the integral theorems of Stokes, Green, etc., Taylor expansions of functions of more than one variable.

Course coordinator: Henry Colson

Spring, 1980

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Mathematics 552 Complex Variables I

Su., W. 5 cr.

Recommended prerequisites:

M. 254

Catalog description:

Topics discussed include power series expansions, the formula of Cauchy, residues, conformal mappings, and elementary functions in the complex domain.

Purpose of course:

The students are to learn the basic facts and techniques of complex variables, as done in, for instance, the first 8 chapters of Churchill. The fact that it is a 5 hour course permits more depth than is possible in, say 514 or 416. Because the course has minimal prerequisites, the emphasis will be on problem techniques.

Audience:

Recommended in a math major program. Required in the Physics program (they take 551 and 552, but not advanced calculus). Occasional engineering grad student.

Background and attitude of audience are good.

Follow-up courses:

All graduate applied math, and many science and engineering courses.

Possible text(s):

Churchill, Kaplan, a dozen others.

Suggested course content:

Algebra of complex numbers, geometry of the complex plane, elementary functions and mappings, Taylor's and Laurent's series , residue calculus.

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Course coordinator: F. W. Carroll

Spring, 1980

Mathematics 556 Differential Equations

A., Sp. 3 cr.

Recommended prerequisite:

Mathematics 254

Purpose of course:

This is not intended to be a cookbook problem solving course in ordinary differential equations, but should be considered as a brief introduction to the theory and solution of initial value problems.

The emphases of the course are (1) 1st and 2nd order linear differential equations (2) Series solutions of linear differential equations and (3) Euler's proof of existence and uniqueness of solutions for linear equations and naturally the Euler's numerical method of solutions.

Audience:

The sole prerequisite is the calculus sequence. We can expect the students in this course to have a wide range of mathematical backgrounds. Therefore knowledge of uniform convergence and familiarity with power series cannot be assumed.

We are likely to find a large portion of the audience to be physics, CIS and math majors. In view of the first group, examples are in order; for the second group, it will be interesting to get some computer time and do a little numerical work in conjunction with approximation of solutions. For math majors, the ph losophy in this course is to build a bridge in between the calculus sequence and more advance analysis courses. For instance, uniform convergence naturally be introduced in finding solutions by approximation.

Syllabus:

Topics (not necessarily in order of coverage):

1. First order Differential Equations.
2. The existence-uniqueness theorem: Picard iteration.
3. Difference Equations, numerical approximations.
4. Second Order Linear Differential Equations.
5. Series solutions of linear equations.

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Course coordinator: Y. C. Lu

Spring, 1980

Mathematics 557

W. 3 cr.

Recommended Prerequisites: Math 556

Course Objectives:

This is a continuation of the course Math 556. Systems of First Order Equations and Qualitative Theory of Differential Equations are essential ingredients in this course. Examples and applications of Differential Equations are expected to be emphasized. Partial Differential Equations are also to be introduced

Syllabus:

Topics (not necessarily in order of coverage):

1. Reviews of vector spaces as introduced in the basic calculus sequence.

2. Systems of first order equations - the eigenvalue-eigenvector method of finding solution.

3. Qualitative theory of differential equations:
   Stability of equilibrium solutions
   Poincare-Bendixon Theorem

4. Introduction to Partial Differential Equations:
   Separation of Variables and Fourier series

Course coordinator: Y. C. Lu

Spring, 1980

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Mathematics 559 Topology

W. 3 cr.

Prerequisites:

Math 254 or permission of department.

Catalog description:

Rubber sheet and combinatorial geometry, networks, four-color theorem, surfaces, Euler characteristic, applications to fixed point theory and calculus.

Follow-up courses:

Math 560, 655, 656, 657

Suggested Text:

B. Arnold, Intuitive Concepts in Elementary Topology

Suggested Course Content:

The catalog description is accurate.

Course Coordinator: Norman Levine

Spring, 1980

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Mathematics 560 Topology

Sp. 3 cr.

Prerequisites:

Math 547 or 559 or permission of department.

Catalog description:

Metric spaces, abstract topological spaces, limits, convergence, continuity, compactness and connectedness.

Follow-up courses:

Math 655, 656, 657

Possible text(s):

(1) Undergraduate Topology - - - Kasriel

(2) Elementary General Topology - - - Moore

(3) Elementary Topology - - - Gemignani

(4) Foundations of General Topology - - - Pervin

Suggested course content:

The catalog description is accurate.

Course coordinator: Norman Levine

Spring, 1980

DEPARTMENT OF MATHEMATICS
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Mathematics 568 Linear Algebra I

Su., A., W., Sp. 3 cr.

Recommended prerequisites:

153 or permission of department
Not open to students with credit for 471, 576, 571

Catalog description:

The space $\mathbb{R}^n$ and its subspaces; matrices as mappings; matrix algebra; systems of equations; determinants; dot product in $\mathbb{R}^n$; geometric interpretations.

Audience:

The sequence 568 and 569 is equivalent to the old course 571 with emphasis placed on techniques and computational skills. The students would be predominantly sophomores having no prior experience with linear algebra or "proof". Along with servicing mathematics majors, the course will probably also enroll students in the physical sciences, secondary math education, CIS, engineering, and mathematical sciences.

Follow-up courses:

For Math and education majors: the sequence 580, 581, 582
For service: 569

Possible text(s):

Elementary Linear Algebra, Shields, 3rd Edition.

(over)

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Suggested course content:

The purpose of the course is to provide an introduction to the concepts, vocabulary, notation and results of matrix algebra with interpretations in the space $\mathbb{R}^n$. Emphasis is on techniques rather than development as algebraic structure.

Topics to be covered (not necessarily in order of coverage).

1. The space $\mathbb{R}^n$ (addition and scalar multiplication).
2. Subspaces of $\mathbb{R}^n$ (geometric descriptions; independence; spanning sets, basis and dimension).
3. Matrices as descriptions for mappings of $\mathbb{R}^n \to \mathbb{R}^m$; informal introduction of characteristic roots and vectors.
4. Algebra of matrices (addition, multiplication, transpose, inverses).
5. Determinants and properties (relation to matrix inverses).
6. Systems of equations (homogeneous; non-homogeneous, kernel and image spaces of matrix as mappings; rank; nullity, Cramer's rule, Echelon forms).
7. Standard inner product (dot product) in $\mathbb{R}^n$; orthogonality and orthonormal bases.

Suggested additional topics, as time permits: further experience with characteristic roots and vectors; other vector spaces over $\mathbb{R}$, e.g. the space of matrices, function spaces.

Course coordinator: Bostwick Wyman

Spring, 1980

Mathematics 569 Linear Algebra II

Su., W., Sp. 3 cr.

Recommended prerequisites:

568 or permission of department
Not open to students with credit for 471, 576, or 571

Catalog description:

Vector spaces over $\mathbb{R}$ and $\mathbb{C}$; linear transformations; the polynomial ring $\mathbb{R}[x]$; characteristic values and vectors; inner product spaces; quadratic form reduction; Principal Axis Theorem.

Audience:

Predominantly a service course for physical sciences, CIS, engineering and mathematical sciences majors. The two course sequence 568 and 569 substitutes for 571.

Follow-up courses:

Any course having a linear algebra prerequisite.

Possible text(s):

Elementary Linear Algebra, Shields; 3rd Edition.

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Suggested course content:

The purpose of the course is to provide an introduction to vector spaces as an algebraic structure. Relying on the techniques and interpretations established in 568 more emphasis is placed here on abstraction and proof.

Topics to be covered (not necessarily in order of coverage).

1. Definitions and examples of vector spaces over $\mathbb{R}$ and $\mathbb{C}$ (include $M_{m,n}(\mathbb{R})$ and function spaces).

2. Definition of linear transformations; kernel, image, isomorphisms; dimension relations.

3. Vector space structure of $\mathrm{Hom}_{\mathbb{R}}(V, W)$ and relation to $M_{m,n}(\mathbb{R})$ with choice of bases.

4. Elementary properties of the polynomial ring $\mathbb{R}[x]$ ($\mathbb{C}[x]$); definition of minimal polynomial and characteristic polynomial.

5. Characteristic roots and characteristic vectors; diagonalization of matrix.

6. Symmetric matrices; inner products and quadratic forms.

7. Principal Axis theorem (least squares and spectral theory).

For the service aspects of the course (statistics, physics, engineering) the latter two topics are of importance. A fairly thorough treatment of these should be included; If time permits we could treat canonical forms.

Course coordinator: Bostwick Wyman

Spring, 1980

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Mathematics 573 Elementary Number Theory

W 5 cr.

Recommended prerequisites:

Sophomore standing

Catalog description:

Utilization of concrete examples to introduce concepts of modern algebra; prime numbers, congruences, Diophantine equations, elementary combinatorial analysis.

Purpose of course:

To give students an introduction to some ideas in abstract algebra, and more particularly the discipline of number theory; to develop reasonable facility in the student of proof formulation.

Audience:

Audience is varied; for some a first course in presenting mathematical proof.

Possible text(s):

Niven and Zuckerman: An Introduction to Theory of Numbers (3rd Edition)

Suggested course content: (Not necessarily in order of coverage.)

1. Divisibility properties of Z; primes, euclidean algorithm, unique factorization, greatest common divisors, least common multiples.
2. Linear diophantine equations.
3. Congruences; Euler's function, Euler-Fermat Theorem.
4. Linear Congruences, Chinese Remainder Theorem, Quadratic Congruences, Reciprocity Law.
5. Extensions and generalizations: Polynomial rings over fields; Quadratic Number Fields.

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Course coordinator: Jim Leitzel

Spring, 1980

Mathematics 574 Geometry

A. 5 cr.

Prerequisites:

Permission of instructor, or some linear algebra.
(In the future, the 3-hour sophomore linear algebra would be appropriate.)

Catalog description:

Euclidean and non-Euclidean geometry, emphasizing algebraic connections; affine and projective planes, duality. Topics from: geometry of groups, finite planes, HILBERT's postulates, n-dimensional geometry.

Purpose of course:

To strengthen geometric intuition, to stress geometric aspects of linear algebra, to introduce the student to geometries different from high school geometry. KAPLANSKY's little book, "Linear algebra and geometry; a second course", conveys the ideal spirit one should try to approach.

Audience:

Anyone interested in geometry. Mathematics majors, and undergraduate or graduate majors in Mathematics education.

Text :

FISHBACK, Projective and Euclidean geometry, (John Wiley & Sons).

Course content:

Construction of real projective plane from affine plane, barycentric and homogeneous coordinates, duality, affine and projective transformations, double ratio. Conic sections, and the group of a conic section. KLEIN's model of hyperbolic geometry. Exercises on projective planes of order 2 and 3.

Course coordinator: Arno Cronheim

Spring, 1980

Mathematics 575

Combinatorial Mathematics and Graph Theory

W., Sp. 5 Cr.

Recommended prerequisites:

Math 568 or permission of instructor.

Catalog description:

Some classical puzzles of recreational mathematics; matching theory, graph theory, network flows, and optimization; enumeration techniques; combinatorial designs and coding theory.

Purpose of course:

The purpose of this course is to acquaint the student with some aspects and applications of modern combinatorial theory; in particular, to communicate the meaning of the word "combinatorial" and to develop the student's facility for dealing with discrete and essentially non-algebraic mathematical problems. The primary emphasis is on theory, but numerous illustrations and applications are presented. In addition, much of the theory (e.g. network flow theory, matching theory) has developed in response to practical optimization problems of various kinds.

The course is designed to serve both the prospective mathematics graduate student as well as the student with an interest in or need for combinatorial techniques and tools.

Audience:

In addition to math majors, there will be students from CIS, education, and miscellaneous arts and sciences majors.

Background and attitude of audience:

The mathematical background and ability of the students varies through a wide spectrum. This nonuniformity creates some problems - but all students seem to benefit from the course.

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(over)

Present Text: Introductory Combinatorics, R.A. Brualdi

Suggested Course Content:

1) Basic counting principles: sets, mappings, one-to-one correspondences and cardinality, the rules of sum and product, pigeonhole principle and Ramsey's Theorem, binomial coefficients.

2) Enumeration theory: Inclusion - exclusion principle, recurrence relations, generating functions.

3) Combinatorial designs: Latin squares, magic squares, finite geometries, difference sets, Steiner triple systems.

4) Matching theory: bipartite graphs, Konig's Theorem, the "Marriage Theorem," the assignment problem.

5) Elementary graph connectivity: paths, connectivity, cycles, cutsets, trees, Eulerian and Hamiltonian paths and circuits.

6) Graph coloring: planar graphs and the Euler characteristic, Five Color Theorem, chromatic polynomials.

7) Flows in networks: Maxflow-Mincut Theorem, transportation problems, Menger's Theorem.

Course Coordinator: Tom Dowling

Spring, 1980

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Mathematics 576

Linear Algebra and Discrete Algebraic Structures

A., W., 5 cr.

Catalog description:

Linear algebra (vector spaces, linear maps, matrices, systems of equations) and an introduction to discrete and finite algebraic structures with applications to computer and information science.

Purpose of course:

This course is intended primarily for CIS majors. The purpose of this course and its sequel Math 577.01 is to provide a foundation in linear algebra and discrete structures. This is important for all CIS students and would be essential, in particular, for those desiring to go on to graduate studies.

The course has been designed with input from the CIS faculty, and it is their wish that it be an honest algebra course. But topics are chosen with the audience in mind, and relevancies to computing are pointed out as they arise.

Important Remark:

CIS students who wish to take both a linear algebra and a structure course have two options:

I. Math 571 or equivalent, and then Math 577.02 in the Autumn.

II. Math 576 in Winter, and Math 577.01 in Spring.

It is greatly preferable for students to take this second option; indeed, the courses in II (which are taught as a sequence) were introduced because of difficulties experienced in relating the courses in I. Students who desire only a course in linear algebra should probably take 571 rather than 576.

Audience:

The students are upper level undergraduates with the exception of a few beginning graduate students. All have taken at least Math 254, but have no background in algebra.

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Background and attitude of audience:

With several notable exceptions each quarter, the mathematical sophistication of the audience is poor. It is necessary (and desirable) to choose the subject matter and problems carefully to exploit their talents and keep their interest. They will work hard and are always interested in learning how to do things. Communication is a problem - the students do not speak our algebraic language. However, in the end, the majority of students seem to appreciate the course.

Follow-up courses:

It is expected that students will continue with Math 577.01.

Possible text(s):

The present texts for the sequence 576-577.01 are

1. Schaum's Outline "Linear Algebra."
2. Lindsay Childs, "A Concrete Introduction to Higher Algebra."

These need to be augmented with notes on primitive elements, polynomial congruences, and error-correcting codes.

Suggested course content:

I. Introduction to algebraic structures and elementary number theory.

Remarks on logic. Sets and binary operations. The integers, g.c.d.'s and the Euclidean algorithm. Congruences and the rings of residue classes modulo n.

II. Fields.

The fields Z_p and GF(4). The rationals.

III. Linear algebra (over arbitrary fields).

Linear independence, bases, dimension. Standard inner product. Matrices, row operations, and systems of equations. Group codes over Z_p (illustrating matrices as transformations).

While not explecitly mentioned above, it is desirable to illustrate and emphasize principles of finite mathematics (the pigeonhole principle, counting techniques, etc.).

Mathematics 577.01 — Linear Algebra and Discrete Algebraic Structures

W.,S. 5 cr.

Recommended prerequisites:

Math 576

Catalog description:

A continuation of 576.

Purpose of course:

This course is intended primarily for CIS majors. The purpose of this course and its prerequisite 576 is to provide a foundation in linear algebra and discrete structures. This is important for all CIS students and would be essential, in particular, for those desiring to go on to graduate studies.

The course has been designed with input from the CIS faculty, and it is their wish that it be an honest algebra course. But topics are chosen with the audience in mind, and relevancies to computing are pointed out as they arise.

Audience:

The students are upper level undergraduates with the exception of a few beginning graduate students. All have taken at least Math 254, but have no background in algebra.

Background and attitude of audience:

With several notable exceptions each quarter, the mathematical sophistication of the audience is poor. It is necessary (and desirable) to choose the subject matter and problems carefully to exploit their talents and keep their interest. They will work hard and are always interested in learning how to do things. Communication is a problem - the students do not speak our algebraic language. However, in the end, the majority of students seem to appreciate the course.

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Possible text(s):

The present texts for the sequence 576-577.01 are

1. Schaum's Outline "Linear Algebra."
2. Lindsay Childs, "A Concrete Introduction to Higher Algebra."

These need to be augmented with notes on primitive elements, polynomial congruences, and error-correcting codes.

Suggested course content:

I. Continuation of linear algebra from 576.

Transformations and the algebra of matrices. Orthogonal projections and curve fitting. Determinants, eigenvalues, diagonalization, and linear recursions. Canonical forms.

II. Groups.

Groups of permutations, Cayley graphs. Lagrange's Theorem. Groups of units modulo n and primitive elements modulo p.

III. Polynomial rings.

Roots, rational roots. Divisibility and the Euclidean algorithm. Congruences and factor rings. Rinite fields and polynomial codes.

Course coordinator: Tom Dowling

Spring, 1980

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Mathematics 577.02 Discrete Algebraic Structures

Sp. 5 Cr.

Recommended prerequisites:

Math 571, or 568 and 569, or equivalent.

Catalog description:

An introduction to discrete and finite algebraic structures with applications to computer and information science.

Purpose of course:

This course is intended primarily for CIS majors and provides a foundation in discrete and finite algebraic structures. 577.02 is offered as an alternative to the sequence 576-577.01 for those students who have already seen some linear algebra, perhaps at another university.

Audience:

The students are upper level undergraduates with the exception of a few beginning graduate students.

Background and attitude of audience:

With several notable exceptions each quarter, the mathematical sophistication of the audience is poor. It is necessary (and desirable) to choose the subject matter and problems carefully to exploit their talents and keep their interest. They will work hard and are always interested in learning how to do things. Communication is a problem - the students do not speak our algebraic language. However, in the end, the majority of students seem to appreciate the course.

(over)

Possible text(s):

The present text is Lindsay Childs, "A Concrete Introduction to Higher Algebr. augmented by notes on primitive elements, polynomial congruences, and error-correcting codes.

Suggested course content:

I. Elementary number theory and an introduction to structure.

Remarks on logic. Sets and binary operations. The integers, g.c.d.'s and the Euclidean algorithm. Congruences and the rings of residue classes modulo n.

II. Groups.

Groups of permutations, Cayley graphs. Lagrange's Theorem. Units in Z_n, and primitive roots modulo p. Group codes over Z_p.

III. Polynomial rings.

Euclidean algorithm and factorization. Congruences and factor rings. Finite fields and polynomial codes.

Course coordinator: Tom Dowling

Spring, 1980

Mathematics 580, 581, 582 — Three Quarter Algebra Sequence

580: A
581: W
582: Sp

580: 3 credits
581: 3 credits
582: 3 credits

Recommended prerequisites:

Math 568 or Math 571 (may be taken concurrently with 580).

Catalog description:

The integrated algebra sequence 580, 581, 582 includes elementary number theory, group theory, vector spaces and linear transformations, field theory.

Purpose of course:

This sequence permits students to study topics of number theory, linear algebra, and algebraic structures in a unified and integrated way.

Audience:

The audience is primarily junior and senior majors in mathematics and mathematics education. Sometimes a few students will develop especially well and we have added small seminars to the course for these students in the winter and/or spring quarters. Instructors need to watch for students who should be moved to H590 early in autumn quarter.

Possible text(s):

McCoy, Goldstein, Dean, Paley and Weichsel, Fraleigh

Suggested course content:

This course does not follow a syllabus. Each instructor can develop the topics according to his own preference. When there are two or more sections, instructors are asked to coordinate the content between sections. Teachers are also urged to put heavy emphasis on problems.

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The following list of topics can be regarded as the core of the course:

Elementary number theory: arithmetic of rational integers, divisibility, primes, Euclidean algorithm, congruences, groups of units; analogous theory in polynomial rings and Gaussian integers.

Elementary group theory: permutation groups, dihedral groups, cyclic groups; subgroups, cosets, LaGrange Theorem, normal subgroups, quotient groups, homomorphisms and isomorphisms.

Linear algebra: independence, basis, subspaces, linear transformations, inner products, orthogonal transformations, matrices and determinants, similarity, systems of linear equations and algorithmic methods of solution, eigenvalues and vectors.

Field theory: complex numbers, algebraic number fields; finite fields; ruler and compass constructions; field automorphisms.

In addition to the core, one or more of the above areas may be investigated in greater detail. Examples of how this has been done follow. Some of these topics have also been used for added seminars:

Foundations: relations, equivalence relations, order relations, functions and their algebraic properties, transfinite arithmetic.

Elementary number theory: linear diophantine equations, Chinese Remainder Theorem, continued fractions.

Rings and ideal theory: Euclidean domains, principal ideal domains, unique factorization domains.

Group theory: direct sums, Cauchy's Theorem, p-groups, Sylow Theorems; structure of finite abelian groups.

Linear algebra: quotient spaces, Jordan canonical form, spectral theory, quadratic forms, quadric surfaces in R^2 and R^3, linear programming, multi-linear algebra.

Field theory: Galois theory

Course coordinator: Joan Leitzel
Spring, 1980

Mathematics H590, H591, H592 Algebraic Structures I, II, III

A., W., Sp. 5 cr. - H590; 3 cr. - H591, H592

Recommended Prerequisites:

H590: 290 or equivalent with permission of department
The content of 580, 581, 582 is contained in H590, H591, H592.

Catalog description:

Integers, congruence relations, structure preserving maps, topics from groups, rings, modules, vector spaces, fields.

Audience:

The students are our strongest undergraduates. They will have had some prior exposure to formal argument and proof. This sequence continues the axiomatic development of mathematics and provides a general framework for students to grasp essential algebraic concepts. Problems and examples are emphasized.

Follow-up courses:

Graduate level courses in mathematics

Possible text(s):

Topics in Algebra, Herstein, Xerox

Basic Algebra, Jacobson, Freeman
A Survey of Modern Algebra, 4th, Birkhoff and MacLane, MacMillan

Suggested course content (not necessarily in order of coverage):

H590: 1. Integers, unique factorization; congruences, Euler function; Chinese Remainder Theorem.

2. Groups, subgroups, homomorphisms and isomorphisms, normal subgroups, quotient groups, permutation groups, cyclic groups, Cauchy Theorems; Sylow's theorems; direct products, fundamental theorem for finite abelian groups; Solvable and Simple groups.

3. Rings, subrings, ideals, morphisms, polynomial rings, prime and maximal ideals, finite fields.

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H591: 1. Commutative Rings, factorization theory, Euclidean rings, principal ideal rings, unique factorization domains, Gauss lemma; illustrations in the integers of quadratic number fields.

2. Modules over commutative rings, submodules, quotients and direct sums; order ideals; fundamental theorem for modules over Principal ideal domains.

3. Vector spaces (as special case of modules); linear maps and matrices, canonical forms; dual spaces.

4. Multilinear algebra and the theory of determinants.

H592: 1. Bilinear and quadratic forms; inner product and unitary spaces; principal axis theorem; relation to geometry.

2. Fields, extensions, algebraic and transcendental, existence of closure (over countable fields), tests for polynomial irreducibility; normal, separable, automorphisms of fields.

3. Galois theory, the subgroup-subfield correspondence theorem, group theory interrelations; extensions of finite fields; cyclotomic extensions.

4. Solvable groups and solvability by radicals.

Prepared by: Jim Leitzel

Spring, 1930

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