Department of Mathematics
The Ohio State University

1978-1979 Mathematics Courses

Course Number	Course Title
100	Introduction to College Mathematics
102	Basic College Mathematics I
103	Basic College Mathematics II
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
149	Trigonometry
150	Algebra and Trigonometry
151	Differential and Integral Calculus
152	Differential and Integral Calculus
151H	Calculus and Analytic Geometry
152H	Calculus and Analytic Geometry
263H	Calculus
153	Differential and Integral Calculus
254	Differential and Integral Calculus
180	Insights into Mathematics
190	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
415	Ordinary and Partial Differential Equations
416	Vector Analysis and Complex Variables
471	Matrices and Linear Algebra

Course Number	Course Title
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

Mathematics 100   5 cl.   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.

Purpose for having both 100A and 100B:

The content of both 100A and 100B is identical. The only difference is the format for instruction. 100A is done in a lecture-recitation situation. 100B is taught in small sections. The students with ACT composites of 10 or less are the audience for 100B.

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. Students who place Level 5 but do not need mathematical skills in their major programs can take Math 180.

Follow-up Courses:

Math 102

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.

Mathematics 102   4 cl.   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.

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 and 116.

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).

SYLLABUS FOR MATH 102

1. Review of straight lines

2. Solving inequalities

3. Absolute value, more inequalities

4. Inequalities in two variables, graphs

5. Systems of equations (two variables)

6. Applications

7. Systems of equations (three variables)

8. Polynomials

9. Products of polynomials

10. Factoring quadratics

11. Completing the square

12. More on factoring

13. Solving quadratic equations

14. Functions, graphs

15. Simplifying fractional expressions

16. Operations with fractions

17. Complex fractions, division of polynomials

Course Coordinator: Phil Huneke

Summer, 1978

Su, A, W, Sp   4 cr.

Prerequisites:

   Level III Placement on OSU Math Placement Test or Math 102.

Catalogue description:

   Fractional equations, variation, exponents and radicals, equations involving
   radicals, complex numbers, quadratic formula, distance, graphs of quadratic
   functions.

Purpose of course:

   To prepare students for Math 130 or 148.

Audience:

   The typical 103 student had Math Placement Level III or has completed Math
   102 and intends to take Math 130, Math 148 or Physics 111.

Follow-up courses:

   130 or 148   (A Math 103 student can schedule Math 150 only with the permission
                of the department.)

Possible Text:

   Keedy and Bittinger: Essential Mathematics: A Modern Approach (Addison-
   Wesley Publ. Co.)

Topics:

   Variation
   Integral exponents
   Simplifying radicals
   Arithmetic involving radicals
   Complex numbers
   Quadratic equations
   Fractional equations
   Completing the square
   The quadratic formula
   The Pythagorean Theorem
   The distance formula
   Graphs of quadratic equations

Course Coordinator: Archie Addison

Summer, 1978

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: Joan Leitzel
                                                  Jim Schultz

                         Summer, 1978

Mathematics 106   Mathematics for Elementary Teachers II

Au., Sp., S.   5 cl.

Required prerequisites:

   Mathematics 105

Follow-up courses -- 107

Course content:

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

                           Course coordinator: Joan Leitzel
                                                Jim Schultz

                       Summer, 1978

Sp.   5 Cl.

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 coordin-
atized plane).

                                  Course coordinator: Joan Leitzel
                                                        Jim Schultz
                        Summer, 1978

DEPARTMENT OF MATHEMATICS
THE OHIO STATE UNIVERSITY
231 WEST EIGHTEENTH AVENUE
COLUMBUS, OHIO 43210-1174

Mathematics 116   Survey of College Algebra

Su., A., W., Sp.   5 cl.

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.

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)

Possible text(s):

    <u>College Mathematics for Management, Life and Social Sciences.</u> 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	9
4-1 thru 4-2 (4-3?)	Linear inequalities, linear programming	5

Course Coordinator: Jack Tull

Summer, 1978

Mathematics 117   Survey of Calculus

Su., A., W., Sp.   5 cl.

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.

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

Course Coordinator: Jack Tull
Summer, 1978

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, absolute value, functions, exponential and logarithmic functions, systems of equations, and matrix algebra.

Purpose of Course:

To prepare students for the Administrative Science calculus courses Math 131, 132.

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. 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_, 2nd Edition (Reston).

Syllabus: (19 lectures)

Topics (Text, Chapter - Section)

1. Exponents and Radicals, Operations with   (0-5,6)
    Algebraic Expression
2. Linear Equations and Rational Equations   (1-1,2)
3. Quadratic Equations   (1-3,4)
4. Inequalities   (2-2,3)

Syllabus: (continued)

5.	Functions	(3-1)
6.	Review	

EXAM I

7.	Graphs	(3-3)
8.	Lines	(4-1)
9.	System of Linear Equations	(4-2,3)
10.	Exponential Functions	(5-1)
11.	Logarithmic Functions	(5-2)
12.	Matrix Algebra	(14-1,2,3)
13.	Review	

EXAM II

14.	Elementary Row Operations	(14-4,5)
15.	Inverses and Determinants	(14-6,7)
16.	Input-Output Analysis	(14-10)
17.	Graphing Inequalities	(15-1)
18.	Review	

EXAM III

19.	Introduction to Linear Programming	(15-2)

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Course Coordinator:
Bert Waits
Summer, 1978

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, 2nd Edition
    (Reston).

Syllabus: (19 lectures)

                        Topics (Text, Chapter - Section)

    1. Limits   (6-1)

    2. Limits and Continuity   (6-2,3)

    3. The Derivative and The Derivative as a Rate   (7-1,3)
        of Change

Syllabus: (continued)

4.	Rules for Differentiation	(7-2)
5.	Product and Quotient Rules	(7-5)
6.	Differentiability and Continuity and The Chain Rule and Power Rule	(7-4,6)
7.	Review	

MIDTERM I

8.	Derivatives of the Logarithmic and Exponential Functions	(7-7)
9.	Topics from Implicit Differentiation, Logarithmic Differentiation, Higher-Order Derivatives, and Differentiation Formulas	(7-8,9,10,11)
10.	Intercepts, Symmetry, and Asymptotes	(8-1)
11.	The First Derivative and Relative Maxima and Minima	(8-2)
12.	The Second Derivative and Concavity, and The Second-Derivative Test	(8-3,4)
13.	Applied Maxima and Minima	(8-5)
14.	Review	

MIDTERM II

15.	Differentials and Elasticity	(8-6,7)
16.	The Indefinite Integral	(9-1)
17.	Integration by Substitution	(9-2)
18.	More Techniques of Integration	(9-3)
19.	Review	

MIDTERM III

DEPARTMENT OF MATHEMATICS
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Course Coordinator:
Bert Waits
Summer, 1978

Mathematics 132

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: *Introductory Mathematical Analysis*, 2nd Edition
(Reston).

Syllabus: (19 lectures)

Topics (Text, Chapter - Section)

1. Review of The Indefinite Integral, Integration   (9-1,2,3)
   by Substitution and More Techniques of Integration
2. Summation and The Definite Integral   (9-4,5)
3. The Fundamental Theorem of Integral Calculus   (9-6)

Syllabus: (continued)

4.	Area	(9-7)
5.	Area Between Curves, and Consumers' and Producers' Surplus	(9-8,9)
6.	Integration by Parts	(10-1)
7.	Review	

MIDTERM I

8.	Improper Integrals	(10-4)
9.	Differential Equations	(10-5)
10.	Functions of Several Variables	(11-1)
11.	Partial Derivatives and Applications of Partial Derivatives	(11-2,3)
12.	Higher-Order Partial Derivatives, and Maxima and Minima for Functions of Two Variables	(11-5,7)
13.	Review	

MIDTERM II

14.	Lagrange Multipliers	(11-8)
15.	Lines of Regression	(11-9)
16.	Multiple Integrals	(11-11)
17.	Sequences and Series	(13-1,2)
18.	The Geometric Series, and Taylor's Theorem and Taylor's Series	(13-3,8)
19.	Review	

MIDTERM III

**DEPARTMENT OF MATHEMATICS
THE OHIO STATE UNIVERSITY
231 WEST EIGHTEENTH AVENUE
COLUMBUS, OHIO 43210-1174**

Course Coordinator:
Bert Waits
Summer, 1978

Mathematics 148   College Algebra

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

Recommended prerequisites:

   OSU Math Placement Level 2A without trigonometry, or Level 2B; or a
   grade of C or higher in Math 103.

Catalog description:

   Math 148 and 149 are equivalent to Math 150.

   Basic properties of real numbers, graphing, functions and relations,
   inverse functions, exponential and logarithmic functions, and appli-
   cations.

Purpose of course:

   The two courses, Math 148 and 149, 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 149

Over

Text:

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

Course Content:

Chapters 1 through 5 of the text

1. Review of fundamental concepts of algebra
2. Equations and inequalities
3. Functions
4. Polynomial functions, rational functions, conic sections
5. Exponential and logarithmic functions

Course coordinator: John Riner

Summer, 1978

Mathematics 149   Trigonometry

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

Recommended prerequisites:

    Math 120.01, 148, or permission of Department.

Catalog description:

    Math 148 and 149 are equivalent to Math 150. Trigonometry and complex
    numbers.

Purpose of the course:

    The two courses, Math 148 and 149, consist of a review of precalculus
    concepts and skills needed by the student entering the regular
    calculus sequence (151, 152, ...). The purpose of the course is
    to prepare the student for Math 151 (Calculus). Math 149 introduces
    the basic elements of trigonometry and complex numbers.

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 and the College of
    Biological Sciences also elect this course.

Background and attitude of audience:

    Almost all 149 students will have completed 148.

Follow-up courses:

    Math 151

Text:

    <u>Fundamentals of Algebra and Trig.</u>, Fourth Edition, by Swokowski

Course Content:

    Chapters 6, 7 and 9 of the text

        6. Trigonometric functions

        7. Analytic trigonometry

        9. Complex numbers

Course coordinator: John Riner

Summer, 1978

Mathematics 150   Algebra and Trigonometry

A.,W.,Wp.,Su.   5 Cr.

Recommended prerequisites:

   OSU Math Placement Level 2A and trigonometry in high school.
   Or
   A grade of "B" or higher in Math 103 and trigonometry in high school.

Catalog description:

   Inequalities, functions, graphs, exponential, logarithmic and
   trigonometric functions and their graphs, complex numbers, inverse
   functions.

Purpose of course:

   This course is a review of precalculus concepts and skills 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). The content of Math 150 is equivalent to that contained
   in Math 148 and 149.

Audience:

   Very strong 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. However
   their background should uniformly consist of a good knowledge
   of high school algebra and trigonometry. Students should be placed
   in Math 150 only if they have a strong background and are well
   motivated.

Follow-up courses: Math 151

Possible text(s):

   Hart and Walter College Algebra and Trigonometry

Course Coordinator: Arno Cronheim

Summer, 1978

Mathematics 151, 152, 153, 254   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

Lines, functions, limits, continuity, derivatives, tangent lines,
mean value theorem, linear motion, applications of derivatives
to problems of maxima and minima and related rates of change,
antidifferentiation. The definite integral, area, mean value
theorem and fundamental theorem of calculus. Limits, derivatives
and integrals of trigonometric functions.

152

Review of the fundamental theorem of calculus; area, volume,
other applications of integration; inverse functions; logarith-
mic, exponential, inverse trigonometric, and hyperbolic functions;
integration techniques, polar coordinates.

153

Vectors and analytic geometry in three dimensions; quadric sur-
faces, partial differentiation, directional derivatives, multiple
integrals, moments and centers of mass, triple integrals in cylin-
drical and spherical coordinates.

254

Indeterminant forms and l'Hospital's rule. Sequences and series,
line integrals, Green's Theorem, vector fields.

Mathematics H151-H152   5 Cr.   Calculus and Analytic Geometry

Mathematics H263   5 Cr.   Calculus

H151 - A
H152 - W
H263 - Sp.

The Honors courses are accelerated, more concept-oriented versions of the regular
sequence in calculus. They are designed to challenge well prepared, highly mo-
tivated 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. Students with strong mathematical po-
tential as shown by their high school performance and scores on standardized
tests are invited to enter Math H151 or Math H190 in the fall term depending on
their placement exams in Mathematics.

Math H151 will contain, as a minimum, the topics in regular calculus early in
the fall term so that a transfer may be made at the end of 3 weeks by those stu-
dents who decide not to continue the intensive track. After that time University
rules for adding and dropping courses apply.

The course sequences are the following:

(1) H151, H152, H263
(2) H190, H191, H263

Although completion of either sequence is considered by the Mathematics Department
to be equivalent in course content to Math 151, 152, 153, 254 and 551, 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 H152:   The calculus of one variable including differentiation with ap-
                 plications; integration with applications; logarithm, exponential,
                 and hyperbolic functions; techniques of integration; inverse func-
                 tions; sequences and series; topics in complex numbers, vector
                 geometry, and vector calculus of one variable.

H263:   Multivariable calculus (vector approach), surface integrals, line
                 integrals, Green's theorem, Stoke's theorem, divergence theorem,
                 vector differential operators.

                                              Course coordinator: Henry Colson

DEPARTMENT OF MATHEMATICS   Summer, 1978
THE OHIO STATE UNIVERSITY
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COLUMBUS, OHIO 43210-1174

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 in-
   volvement 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 mathe-
   matics.

   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 Num-
   ber 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 certi-
   fication requirement.

                              Course coordinator: James Leitzel

                              Summer, 1978

A.   5 Cr.

The main audience for this course will be honors students who advance place beyond Math 151. The material selected is designed to strengthen their mathematical background and to improve their technique with calculus through selected applications. There will be three main divisions of topics:

I. Geometry

   A. Vector geometry-forumlation and proofs of results in two and three dimensions using vectors.

   B. Mappings of the plane into the plane-affine maps, rigid motions, the plane identified with the complex numbers.

II. Calculus

   A. Antidifferentiation applied to solving elementary differential equations.

   B. Integrations from the viewpoint of numerical approximations.

III. Algorithms with emphasis on numerical techniques

   A. Zeros of functions.

   B. Sequences defined by iteration.

   C. Fixed points of mappings.

Course coordinator: Henry Colson

Summer, 1978

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.

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 engineer-
   ing, physics and some other branches of sciences.

Possible text(s):

   Martin Braun: Differential Equations and Their Applications, Short
                  Version (published by Springer-Verlag)

Suggested Content:

   Chap. 1:   2-2 1/2 weeks
   Chap. 2:
       Section 2.1-2.7   2-2 1/2 weeks
       Section 2.8-2.15   2-2 1/2 weeks
   Chap. 3:   1 1/2-2 weeks
   Chap. 4:   1 week

                          Course coordinator: Y. C. Lu

                       Summer, 1978

Mathematics 256   Differential Equations with Applications

S., A., W., Sp.   4 cl.

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 text(s):

   A Short Course in Differential Equations, Rainville and Bedient

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: (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

Course coordinator: Dan Eustice

Summer, 1978

H290-291-292   A,W,Sp   Linear Algebra & Multi-Variable
                      5 Cr.   Calculus

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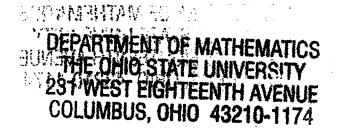

Topics Covered:

H290:   Vector spaces, linear maps, matrices, systems of equations,
        determinants 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. Introduction of
        topics in real analysis as needed.

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: Henry Colson

                              Summer, 1978

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:

   The course is presently being taught from notes which are supplied
   to the students by the lecturer.

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

                 Course coordinator: Tom Schwartzbauer

                Summer, 1978

Mathematics 415

Ordinary and Partial Differential
Equations

A., W., Sp. 5 cl.

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 De Prima, 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

Mathematics 416   Vector Analysis and Complex Variables

A., Sp. 5 cl.

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 Engi-
   neering 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

Summer, 1978

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 pro-
   cesses 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.

Possible text(s):

   Elementary Matrix Algebra with Linear Programming by Painter and Yantis

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;
   Eigenvalues and Eigenvectors;
   Quadratic forms; ·
   Linear transformations;
   *applications - Markov chains, linear programming.

                                   Course coordinator: Bostwick Wyman

                                   Summer, 1978

*indicates topics which must be included

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 under-
graduate 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 trigo-
nometric, 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

Summer, 1978

Mathematics 504   The History of Mathematics

A., Sp. 5 cl.

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 mathe-
   matics 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.)

Mathematics 504

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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 <u>Elements</u>

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 <u>Elements</u>
        axiomatics
        Boolean algebra

4) other outside reading
        (Note: There are many other good sources.)

Course coordinator: Charles Saltzer

Summer, 1978

Mathematics 507   Advanced Geometry

A., W. 5 cl.

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.

   The majority of students have weak backgrounds in the content of
   high school geometry and analytic geometry. The general attitude
   of students is highly favorable.

Follow-up courses:

   No follow-up course is required. Math 608 is designed especially
   for students who wish to continue the study of geometry on a more
   advanced level.

Possible text(s):

   Miller, An Introduction to Geometry

   Modenov and Parkhomenko, Geometric Transformations

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THE OHIO STATE UNIVERSITY
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COLUMBUS, OHIO 43210-1174

Suggested Course Content:

   *Review of high school geometry with generalizations

   *Euclidean and affine transformations

   Circular Inversion

   Projective Transformations

   Finite Geometries

Course Coordinator: Leslie Miller

Summer, 1978

Mathematics 512

<div align="right">Partial Differential Equations
and Boundary Value Problems</div>

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.

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 La-
    place'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). Trans-
    form of derivatives. Partial fractions. Inverse transform. Solution of
    ordinary linear differential equations with constant coefficients. Trans-
    forms 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

                                          Summer, 1978

Mathematics 513   Vector Analysis for Engineers

W.   3 cl.

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.

Sp.   3 cl.

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.

Mathematics 514

Page 2

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

Summer, 1978

Mathematics 530   Probability I

A., 5 cl.

Recommended prerequisites:

   M. 254

Catalog description:

   Combinatorial probability, examples of distributions, expectation,
   variance, generating functions, 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
   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):

   E. Parzen, Modern Probability Theory, K. L. Chung, Elementary
   Probability Theory with Stochastic Processes

Suggested course content:

   The catalog description is accurate.

Mathematics 531   Probability II

W.,   5 cl.

Recommended prerequisites:

   Math 530

Catalog description:

   Continuation of 530; Markov chains, stochastic processes.

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.

Suggested course content:

   The catalog description is accurate.

                              Course coordinator: Louis Sucheston

                              Summer, 1978

Mathematics 547   Introductory Analysis I

Su, A. W.   3 cl.

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

Mathematics 548   Introductory Analysis II

Su., W., Sp.   3 cl.

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

                              Summer, 1978

Mathematics 549   Introductory Analysis III

Sp.   3 cl.

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

Mathematics 551.01   Vector Analysis

Au., Sp.   5 cl.

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.

Mathematics 551.02   Advanced Calculus II

A.   5 cl.

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 analy-
sis as needed for the integral theorems of Stokes, Green, etc.,
Taylor expansions of functions of more than one variable.

                                    Course coordinator: Henry Colson

                                    Summer, 1978

Mathematics 552   Complex Variables I

Su., W. 5 cl.

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 engin-
   eering 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.

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 <u>initial
   value problems</u>.
                                        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.

Possible text: Bauer and Nobel, <u>Ordinary Differential Equations</u>, 2nd ed.

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.

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

                                    Summer, 1978

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

                                    Summer, 1978

Mathematics 560   Topology

Sp.   3 cr.

Prerequisites:

   Math 547 or 559 or permission of department.

Catalog description:

   Metric spaces, abstract topological spaces, limits, convergence, con-
   tinuity, 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

Summer, 1978

Mathematics 568   Linear Algebra I

Su., A., W., Sp.   3 cl.

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, Worth

                                                        (over)

Mathematics 568

Page 2

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

Summer, 1978

Mathematics 569   Linear Algebra II

Su., W., Sp.   3 cl.

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; Worth

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 $\operatorname{Hom}_{\mathbb{R}}(V, W)$ 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

Summer, 1978

Mathematics 573   Elementary Number Theory

W 5 cl.   **DEPARTMENT OF MATHEMATICS**
                                 THE OHIO STATE UNIVERSITY
                                 231 WEST EIGHTEENTH AVENUE
Recommended prerequisites: **COLUMBUS, OHIO 43210-1174**

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 foundation.

Audience:

   Audience is varied; for many a first course in presenting mathe-
   matical 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.

                              Course coordinator: J. R. C. Leitzel

                              Summer, 1978

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 under-
   graduate or graduate majors in Mathematics education. Not
   enough students signed up for the course this spring quarter (1975).

Texts:

   I tried to use SNAPPER & TROYER, Metric affine geometry, and PEDOE,
   A course of geometry for colleges and universities. Both texts
   have much too much material for a 10-week course. Next time I try
   FISHBACK, Projective and Euclidean geometry.

Course content:

   Construction of real projective plane from affine plane, barycentric
   and homogeneous coordinates, duality, affine and projective trans-
   formations, double ratio. Conic sections, and the group of a conic
   section. KLEIN's model of hyperbolic geometry. Exercises on
   projective planes over Z mod p.

                              Course coordinator: Arno Cronheim

                              Summer, 1978

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.

(over)

Possible text(s):

There has been some difficulty in selecting a suitable text. The following books have been used in the past, and at least give some indication of the subject matter.

1. C. L. Liu, "Introduction to Combinatorial Mathematics."

2. F. Harary, "Graph Theory."

3. H. Ryser, "Combinatorial Mathematics."

Suggested course content:

1. Permutations; the fifteen puzzle.

*2. Matching theory: the "Marriage Theorem" and a few applications.

3. Ramsey's Theorem for graphs.

*4. Elementary topology of graphs: paths, connectivity, cycles, cutsets, trees, bipartite graphs, Eulerian and Hamiltonian paths and circuits.

*5. Flows in networks; Menger's Theorem.

6. Linear programming.

7. Convexity; combinatorial geometry.

8. Planar graphs; map coloring.

*9. Combinatorial designs: Latin squares, magic squares, finite geometries, difference sets, Steiner triple systems; error-correcting codes.

*10. Enumeration theory: Inclusion - exclusion principle, possibly elementary Polya theory of counting.

Basic principles (sets, mappings, one-to-one correspondences and cardinality, incidence relations and combinatorial structures, the pigeonhole principle, the rules of sum and product and other elementary counting techniques, mathematical induction, etc.) are repeatedly emphasized.

Course coordinator:

Summer, 1978

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.

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. N. H. McCoy, "Fundamentals of Abstract 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 explicitly mentioned above, it is desirable to illustrate
and emphasize principles of finite mathematics (the pigeonhole
principle, counting techniques, etc.).

Depending on the wishes of the CIS faculty, the course in the future
may contain more material on graphs or Boolean algebra.

Course coordinator:

Summer, 1978

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.

(over)

Mathematics 577.01

Page 2.

Possible text(s):

The present texts for the sequence 576-577.01 are

   1.   Schaum's Outline "Linear Algebra."

   2.   N. H. McCoy, "Fundamentals of Abstract 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:

                              Summer, 1978

Mathematics 577.02   Discrete Algebraic Structures

Sp.   5 Cr.

Recommended prerequisites:

Math 571 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.

DEPARTMENT OF MATHEMATICS
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Mathematics 577.02

Page 2.

Possible text(s):

   The present text is N. H. McCoy's "Fundamentals of Abstract Algebra",
   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.

   Depending on the wishes of the CIS faculty, the course may in the
   future contain more material on graphs or Boolean algebra.

                              Course coordinator:

                              Summer, 1978

Mathematics 580, 581, 582   Three Quarter Algebra Sequence

580: A   580: 3 credits
581: W   581: 3 credits
582: Sp   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.

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
Summer, 1978

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

A., W., Sp.   5 cl. - H590; 3 cl. - 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.

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: J. R. C. Leitzel

Summer, 1978