Albertson
College of Idaho

CATALOG
2003-2004

Mathematics

For centuries Mathematics has been a core element of the liberal arts. The college reaffirms this tradition by including a course in mathematics among its general graduation requirements. Although Mathematics is the intense study of a large variety of problems whose solutions have immediate application in many other subject areas, Mathematics retains a unique thread of viewpoint with focus on patterns, structure, and representations. Mathematics presents a way of structuring the world of knowledge and explicitly employs logical deduction to examine the consequences of knowledge.

An introduction to college level Mathematics can generate a continuing interest in Mathematics beyond the levels required for applications in a particular subject area. Competency in Mathematics and methodologies based on computation have become a prerequisite for many areas of study. The college's mathematics courses reflect these prerequisites while endeavoring to exceed minimal competency.

Entry into the mathematics curriculum is determined by previous coursework. Typically, students with a strong interest and a good background in mathematics begin their mathematics curriculum with Calculus. Some students with very strong high school backgrounds may begin in sophomore-level courses, while others might begin with Pre-calculus or College Algebra.

Because Mathematics and Computer Science have applications in many fields, students frequently choose a second area of concentration such as biology, business, chemistry, or physics to complement their mathematical studies.

Note: Generally, an understanding of first-year calculus is assumed for mathematics courses numbered 231 or higher.

Mathematics Major

Consists of 32 credits, of which 18 must be upper-division. An independent study is required as well as MAT 137 or MAT 138, and two of the following four courses:

- MAT 431 Complex Variables
- MAT 441 Topology
- MAT 451 Real Analysis
- MAT 461 Algebraic Structures

Note: Students interested in graduate work in mathematics are strongly encouraged to take MAT 451 and/or MAT 461.

Computer Science/Mathematics Major

This major is designed for students who want to emphasize computer-oriented courses within their mathematics program. The major consists of 32 credits in mathematics, of which 15 must be upper-division. Required courses include:

- MAT 138 Introduction to Computer Programming
- MAT 231.1-332.1 Computer Architecture & Assembly Language Programming I & II

- MAT 233.1-334.1 Data Structures & Algorithms I & II
- PHY 230 Digital Electronics

Also recommended: MAT 437-438, Topics in Computer Science.

Mathematics Minor

Consists of 12 upper-division credits in mathematics.

Computer Science Minor

Consists of:

- MAT 137 **or** MAT 138
- MAT 231.1-332.1 **or** MAT 233.1-334.1
- PHY 230 (or equivalent).

Mathematics (MAT)

LOWER DIVISION

MAT-105.1 Algebra 3.0 cr.

Fall. Intensive study of algebra, graphs and functions. The emphasis will be on gaining college level proficiency in algebra and understanding the graphs and properties of functions. Topics include linear, quadratic, radical, rational, exponential and logarithmic functions. Intended to prepare students for MAT 107, 110, 111, 123, 149, 211 and POE 261. One credit will count toward the General Graduation Requirement in mathematics.

MAT-107 Physical Models in Mathematics 3.0 cr.

Winter. Prereq.: MAT 105 or equivalent. Mathematical concepts including ratios, functions, statistics, and matrix algebra are developed through hands-on physical science activities in geology, chemistry and physics. Included will be an introduction to scientific inquiry, practice with experimental methods, microcomputer-based instruction, statistical software (including MINITAB and EXCEL), and mathematical software (Mathcad). Two credits will count toward the general graduation requirement in mathematics, and one credit will count toward the natural science laboratory requirement.

MAT-110 College Algebra & Trigonometry 4.0 cr.

Spring. Prereq.: MAT 105 or permission. Topics include more work on systems of equations and quadratics along with inequalities, functions, graphing and trigonometry. Five hours per week.

MAT-111 Contemporary Mathematics 3.0 cr.

Fall. Prereq.: MAT 105 or permission. A course designed to explore some of the great ideas in mathematics, and to discover the power of mathematical thinking in everyday life. Topics include counting techniques, infinity, geometry, shape and space, chaos

and fractals, and decision science.

MAT 123-124 Applied Mathematics & Calculus 3.0 cr. each

Winter, spring. Prereq.: MAT 105 or permission for MAT 123. MAT 124 is a continuation of MAT 123. An introduction to the concepts and techniques of differential and integral calculus using polynomial, rational, exponential and logarithmic functions. Applications are selected primarily from business, economics and the social sciences.

MAT-137 Introduction to Computer Programming I 3.0 cr.

Fall. Prereq.: some previous computer experience is useful but not essential. The fundamentals of programming using a high level programming language. Emphasis on building applications in a graphical user interface environment. Current offerings include Visual Basic and Java.

MAT-138 Introduction to Computer Programming II 3.0 cr.

Spring. Prereq.: MAT 137 or permission. A continuation of MAT 137 with emphasis shifting to topics including recursion, algorithms, basic data structures, objects and the environment in which programs exist. Recent offerings include C++ and Delphi.

MAT-149 Pre-Calculus Mathematics 2.0 to 5.0 cr.

Fall. Prereq.: one year of high school mathematics beyond geometry and algebra 2 or permission. Intended primarily for students planning to major in mathematics, science or pre engineering. Approximately the first three-fifths of the course covers algebra, functions, inequalities, analytic geometry of lines and trigonometry. The last part of the course covers the material contained in the first part of MAT 151. Students may enroll for the first three-fifths of the course and earn 3 credits of credit, or for full course and earn 5 credits of credit. (Exception: Students who have taken and passed MAT 110 may not earn additional credit if they enroll for the first three-fifths of MAT 149, and may earn only 2 credits if they enroll for the whole course).

MAT-150 Calculus 2.0 cr.

Winter. Prereq.: MAT 149. The contents of this course, combined with MAT 149, gives the student the equivalent of MAT 151. Upon completion of this course, students may enroll in MAT 152.

MAT-151-152 Analytic Geometry & Calculus 4.0 cr. each

Fall, spring. Prereq.: four years of high school mathematics or permission. A study of analytic geometry, function and their graphs, differentiation of algebraic, trigonometric, logarithmic, and exponential functions, applications of the derivative, the integral and its applications, and introductory differential equations. MAT 152 is a continuation of MAT 151.

MAT-211 Introduction to Statistics 3.0 cr.

Fall, winter, spring. Prereq.: MAT 105 or equivalent, or permission. An applications-oriented approach to the use of statistics. Topics covered include descriptive statistics, frequency distributions, mean, standard deviations, probability and probability

distributions, inferential statistics, confidence intervals and hypothesis testing and bivariate statistics.

MAT-212 Advanced Statistical Methods 3.0 cr.

Spring. Prereq.: MAT 211 or equivalent. A continuation of MAT 211. Topics covered include analysis of variance, multiple regression, chi square and nonparametric statistics, time series, index numbers and decision theory.

MAT-231.1 Computer Architecture & Assembly Language Programming I 3.0 cr.

Fall. Alt. years. Prereq.: MAT138. Computer, processor, and memory components. Basic circuits and digital logic. Binary number systems, arithmetic, and data representation. Instruction set and addressing modes. Machine language, assembly language, and assembly language programming.

MAT-232.1 Special Programming Languages 2.0 cr.

Winter. Prereq.: MAT137 or permission. This course may be repeated by choosing different topics. Computer programming using a high level programming language which is not taught in MAT137 or MAT138.

MAT-233.1 Data Structures & Algorithms I 3.0 cr.

Fall. Alt. years. Prereq.: MAT138. Abstract data types, sorting, and searching, using recursion, linked lists, trees, and applications of data structures implemented in an object oriented language.

MAT-251.1 Intermediate Calculus 4.0 cr.

Fall. Prereq.: MAT 152 or permission. A continuation of MAT 152. Also includes an introduction to vectors and to the study of functions of several variables.

MAT-252 Discrete Mathematics 3.0 cr.

Fall. Alt. years. Prereq.: MAT 152 or permission. Systems of linear equations, matrix operations, combinatorics, graph theory.

MAT-294 Independent Study 1.0 to 3.0 cr.

Fall, winter, spring. Prereq.: permission. Independent study of selected areas of mathematics not available in the regular curriculum. This course does not fulfill the general graduation requirement for independent work. See independent study guidelines.

MAT-298 Lower Division Seminar 1.0 cr.

Fall. Prereq.: permission. Strongly recommended for those planning to major in mathematics and computer science. May be repeated for credit.

UPPER DIVISION

MAT-311-312 Probability & Mathematical Statistics 3.0 cr. each

Fall, spring. Alt. years. Prereq.: MAT 251 or permission. MAT 312 is a continuation of MAT 311. A study of finite sample spaces, conditional probability and independence, functions of random variables, random variables of one or more dimensions, discrete random variables, continuous random variables, moment generating functions, sampling distribution, estimation and testing of hypotheses.

MAT-332.1 Computer Architecture & Assembly Language Programming II 3.0 cr.

Spring. Alt. years. A continuation of MAT231.1. Processor architecture, interrupt handling external device interfacing. Advanced assembly language programming. Device communication and relation to the runtime environment.

MAT-334.1 Data Structure & Algorithms II 3.0 cr.

Spring. Alt. years. A continuation of MAT 233.1. Design and analysis of algorithms and data structures, finite automata, lexical search, graph algorithms, NP complete problems. Introduction context free grammars and parsing.

MAT-352 Differential Equations 3.0 cr.

Spring. Prereq.: MAT 251 or 251.1 permission. A study of the solution and applications of ordinary differential equations. Includes one 1 ½ hour laboratory weekly.

MAT-361 Linear Algebra 3.0 cr.

Spring. Alt. years. Prereq.: MAT 251 or permission. A study of general vector spaces, linear transformations, eigenvalues and eigenvectors.

MAT-370 Geometry 3.0 cr.

Winter. Alt. years. Prereq.: MAT 251 or permission. A study of Euclidean geometry and the development of non-Euclidean geometry, one of the most significant occurrences in the history of mathematics.

MAT-372 History of Mathematics 3.0 cr.

Winter. Alt. years. Prereq.: MAT 251 or permission. A historical survey of the ideas, tools, and symbols of mathematics and the people who developed them. For upper-division students who are planning to teach or otherwise pursue mathematics as a profession.

MAT-399T.01 Digital Image Analysis 3.0 cr.

(Same as PHY 399T.01) Spring 2003. Prereq.: MAT 150 or 151 and MAT 137 or permission. MAT 233.1 recommended. Topics covered include color concepts, display devices, image compression algorithms and storage formats, two- and three-dimensional graphics concepts, digital imaging, and simple pattern matching algorithms. The collection, processing, and analysis of digital images will be demonstrated mainly through astronomical applications. Other imaging techniques such as Magnetic Resonance Imaging, Ultrasound, and Computer Tomography will also

be explored. This course does not fulfill any general graduation requirement.

MAT-431 Complex Variables 3.0 cr.

Spring. Alt. years. Prereq.: MAT 361 or 370. A study of the calculus of functions of a complex variable. Topics include elementary functions, series representation, analytic functions, complex integration and conformal mappings.

MAT-437-438 Selected Topics in Computer Science 2 - 3.0 cr. each

Fall, spring. Alt. years. Prereq.: MAT 332.1 or 334.1. Past topics included grammars and parsing, declarative programming languages, computer graphics, artificial intelligence, and network communications. (INDEPENDENT WORK)

MAT-441 Topology 3.0 cr.

Spring. Alt. years. Prereq.: MAT 361 or 370. An introduction to the techniques and theorems of point-set topology and metric spaces. Topics include: cardinality, separation axioms, compactness, connectedness, continuity and finite products.

MAT-451 Real Analysis 3.0 cr.

Fall. Alt. years. Prereq.: MAT 361 or 370. A study of the basic concepts of real analysis. Topics include limits, sequences, series, continuity, differentiation and integration.

MAT-461 Algebraic Structures 3.0 cr.

Fall. Alt. years. Prereq.: MAT 361 or 370. An introduction to the study of abstract algebra. Topics will be primarily from the theory of groups and rings.

MAT-494 Independent Study 1.0 to 3.0 cr.

Fall, winter, spring. Prereq.: permission. Research studies for qualified mathematics majors. See independent study guidelines. (INDEPENDENT WORK)

MAT-498 Upper-Division Seminar 1.0 cr.

Spring. Prereq.: senior standing with major in mathematics or permission. Study of topics in mathematics not covered in previous mathematics courses. May be repeated for credit.