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Mathematics Collection Development Policy

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Mathematics Collection Development Policy

University Libraries, University of Nebraska-Lincoln

Jolie Graybill, Mathematics Liaison Librarian, December 2009

Approved: CDC, January 6, 2010

I. GENERAL ACADEMIC PROGRAM INFORMATION

The mathematics collection supports the teaching, research, and service activities of the entire university community; although its primary audience is the faculty, staff, and students of the Department of Mathematics in the College of Arts and Sciences, and secondary audience is the faculty, staff, and students in Computer Science. Its primary focus is support for the undergraduate and graduate curricula for mathematics; its secondary focus is support for research and teaching in mathematics. Specific and transient research needs of mathematics faculty and graduate students should be supplemented through Interlibrary Loan. Materials are not purchased for the general public, though they may benefit from the collection. While the collection focuses on works classified in Mathematics (QA), curriculum and research support is also provided by works classified as belonging to, for example, Statistics (HA), Biology (QH), Engineering and Technology (T-TA).

The bulk of the mathematics collection is housed in the Math Library housed in Avery Hall. Additional titles, depending upon the cross-discipline use, may be housed in the Engineering Library or Love Library. Usage statistics for the mathematics collection show consistent high circulation.

The Department of Mathematics offers both the BA and BS degree. Graduate work is offered leading to the degrees of MA, MS, MAT (Master of Arts for Teachers), MScT (Master of Science for Teachers) and Ph.D.

Currently, four options for undergraduate mathematics majors are offered: Option C (Concentration) for students wishing to combine a strong math education with another discipline; Option E (Education) for students interested in teaching math at the secondary level; Option R (Research) for students planning to pursue graduate work in math or interested in independent work; and Options S (Statistics) for students interested in a math major and a strong emphasis in statistics. Two plans for the minor in mathematics are available.

Three options for the master's degree with all allowing a minor, however, Option 2 *requires* a minor: Option 1 requires a thesis; Option 2 requires a minor; Option 3 may elect an Area of Specialization in Pure Mathematics or Applied Mathematics. The Mathematics Department offers Ph.D. degree programs, both major and minor. In addition, the Department in cooperation with the Computer Science Department offers a Ph.D. degree with specialization in computer science.

The Mathematics faculty consists of 38 professors who regularly teach nearly all courses at or above the calculus level. Research is particularly strong in the following areas:

- **Commutative Algebra and Algebraic Geometry**

The commutative algebra group has research interests which include algebraic geometry,

algebraic and quantum coding theory, homological algebra, representation theory, and K-theory.

- **Discrete Mathematics and Coding Theory**
Research interests in this group center around structural problems in combinatorics, and coding theory, the study of schemes for encoding data to, for example, efficiently detect errors in transmission.
- **Groups, Semigroups, and Topology**
The interplay between topology, group theory and semigroup theory has yielded a wealth of information in all three mathematical fields. These connections are central to the research of our faculty working in this area.
- **Applied Mathematics and Differential Equations**
The Applied Mathematics and Differential Equations group within the Department of Mathematics have a great diversity of research interests, but a tying theme in each respective research program is its connection and relevance to problems or phenomena which occur in the engineering and physical sciences.
- **Functional Integration**
Functional integration deals with the mathematical foundations of the Feynman Integral, originally introduced in the 1950s by Richard Feynman. Research with this group involves placing this work on a rigorous foundation.
- **Operator Theory/Operator Algebras**
Operator Theory and Operator Algebras are concerned with the study of linear operators, usually on vector spaces whose elements are functions. The subject is analysis, but because the vector spaces are usually infinite dimensional, the subject has a nice blend of techniques from other areas of mathematics, ranging from algebra to topology to dynamical systems.
- **Mathematical Biology**
Several faculty in the department have a strong interest in problems originating in the life sciences, especially from ecology. They collaborate with faculty in Natural Resources and in the School of Biological Sciences to study the dynamics of populations and their interactions, diseases, nutrient cycling, and the effects of global climate change on ecosystems. Their research involves modeling biological systems and applying mathematical techniques to investigate the behavior of these systems.
- **Mathematics Education**
Several of our faculty have made significant contributions to mathematics education, in areas such as teacher preparation, the design of online testing software, and leading programs for high school and middle school students

Graduate courses are offered in the following major areas: algebra (algebra, fields, semigroups, rings); analysis and applied mathematics (differential equations, calculus, complex variables, mathematical analysis, tensor analysis, numerical analysis, stochastic processes); combinatorics

and geometry (geometry, graph theory, combinanatorial analysis); logic and foundations of mathematics (logic, set theory, recursive theory, lattice theory); number theory; topology. Currently, the Mathematics department supports approximately 180 full-time undergraduate majors, 100 secondary education majors seeking their endorsement in mathematics, 70 full-time graduate students in the Masters and Ph.D. program, and an additional 4,000 students taking mathematics courses to support other degree programs.

Most undergraduate mathematics majors are from the upper quartile of their high schools, and share a strong interest in the mathematical sciences, are also a diverse group. There are almost as many students from small towns and rural areas as there are from the larger urban areas. Also, about one-third of the students are women. In addition to mathematics, their academic interests cover the spectrum from the traditional sciences to teaching to business to the arts.

The Department serves as a basic resource for the whole University community. The Colleges of Engineering and Business Administration account for 20% and 13% respectively of the total student class hour production. College of Arts and Sciences accounts for another 24% of students.

No accrediting body exists for Mathematics and Statistics.

II. GEOGRAPHICAL COVERAGE

Materials are selected for scientific importance; consequently, no geographical coverage limitations exist.

III. CHRONOLOGICAL COVERAGE

There are no chronological coverage restrictions or emphases.

IV. IMPRINT DATE

Current publications are of primary importance. Retrospective collecting is selective to support current research.

V. FORMAT/TYPE AND LEVEL OF MATERIALS

Print Materials

Most materials are acquired in the form of periodicals, series, and monographs. Statistical research is also reliant on technical/methodological reports, occasional papers, and research reports released by universities, research centers, and state and federal agencies. Some of these items are published in paperback, and some are spiral bound. The collection should also include the proceedings and symposia of the major associations. Reference works dealing with the technology/methodology and with the history of the field should be collected. Given the field's wide-ranging interests, abstracting and indexing services for numerous related fields are desirable. Textbooks are collected if they are of graduate level, of "classic" stature, and/or have been requested by faculty; lower-level textbooks may be very selectively collected.

Non-print Materials

With respect to periodicals/series and to reference works, preference should be given to materials available online or in dual print/online format, especially if such materials are free of continuing "maintenance" fees and if such materials allow for simultaneous access. Micro-format collections, especially microfiche, are rarely collected; if funding allows, preference should be given to

affordable online versions of such collections, especially if they offer value-added features such as full-text searching.

VI. LANGUAGES

There are no language restrictions.

V. SPECIAL FACTORS

All materials published by the American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics are considered essential by the Department.

While the Mathematics Library is of primary importance and support to the programs, the Biological Sciences and Engineering libraries are used by the applied mathematicians. In addition, a large collection of mathematics materials are housed in Love Library.

VI. CLASSIFICATION AND INTENSITY LISTING

(The following are listed by LC Class, Subject, and then by Intensity Level)

BC 80 Inductive and empirical logic STUDY

Q 175 Science philosophy and methodology STUDY

QA 1-7 Mathematics RESEARCH

QA 8-10 Mathematical logic RESEARCH

QA 11-20 Study and teaching STUDY

QA 150-161 Algebra RESEARCH

QA 162 Abstract algebra RESEARCH

QA 164 Combinatorics RESEARCH

QA 166 Graph theory RESEARCH

QA 169 Homological algebra RESEARCH

QA 171 Theory of groups RESEARCH

QA 184-205 Linear algebra RESEARCH

QA 211-224 Theory of equations RESEARCH

QA 241-250 Theory of numbers RESEARCH

QA 251 Universal algebra RESEARCH

QA 251.3 Commutative rings & algebra RESEARCH

QA 251.5 Associative rings & algebra RESEARCH

QA 269-271 Game theory RESEARCH
QA 273 Probabilities RESEARCH
QA 274 Stochastic processes RESEARCH
QA 276-295 Mathematical statistics RESEARCH
QA 278 Multivariate analysis RESEARCH
QA 279 Analysis of variance RESEARCH
QA 280 Time series analysis RESEARCH
QA 297 Numerical analysis RESEARCH
QA 300-302 Analysis RESEARCH
QA 303 Calculus RESEARCH
QA 320 Functional analysis RESEARCH
QA 329 Operator theory RESEARCH
QA 331-360 Theory of functions RESEARCH
QA 371-387 Differential equations RESEARCH
QA 379 Boundary value problems RESEARCH
QA 401-433 Analytic methods used in solution of physical problems RESEARCH
QA 402.3 Control theory RESEARCH
QA 402.5 Mathematical optimization RESEARCH
QA 433 Vector and tensor analysis RESEARCH
QA 440-699 Geometry STUDY
QA 551 Analytic geometry RESEARCH
QA 564 Algebraic geometry RESEARCH
QA 601 Transformations RESEARCH
QA 611 Topology RESEARCH
QA 613 Manifolds and cell complexes RESEARCH
QA 641-699 Differential geometry RESEARCH
QA 801-939 Analytic mechanics RESEARCH
QA 809 Statics RESEARCH
QA 841 Kinematics RESEARCH
QA 845 Dynamics RESEARCH

QA 865-871 Theory of vibrations. Oscillations RESEARCH

QA 927 Wave motion RESEARCH

QC 20 Mathematical physics RESEARCH

T 57.8 Nonlinear optimization RESEARCH