Mathematics Program

Purpose Statement

The purpose of the mathematics program is to develop students who understand mathematics as an academic discipline, who can use mathematics as a problem-solving tool in other disciplines, and who are skilled in mathematical reasoning, problem solving, critical thinking and communication.

The mathematics program achieves this purpose when its students

- have received a coherent, broad-based coverage of the discipline of mathematics;
- demonstrate conceptual and procedural understanding of mathematics;
- can apply their knowledge to specific, constrained problems and produce solutions;
- possess a foundation of theory that will enable lifelong learning and development;
- meet State Department of Education standards for licensure in the area of mathematics (applies to education majors in mathematics only).

The information technology program at McPherson College commits itself to producing graduates who understand the field of computing as an academic discipline and as a profession within the context of a larger society.

The program achieves this purpose when its students

- have received a coherent and broad-based coverage of the discipline of computing;
- are prepared for graduate study as well as for the programming profession;
- understand the ethical and societal issues associated with the computing field;
- can apply their knowledge to specific, constrained problems and produce solutions;
- possess a foundation of theory that will enable lifelong learning and development;
- have experience with contemporary tools that lead to good experimental methods

Mathematics Major

The department offers a major and minor in mathematics. Mathematics is a discipline essential to all facets of the employment world and an excellent background for a variety of specific professions; the emphasis of our program is teacher preparation, and secondary teaching licensure is available. Mathematics is also an excellent background for graduate studies in diverse fields.

Requirements

42 hours of mathematics courses including the following:

G-MA111 Calculus I (4 hours)
MA112 Calculus II (4 hours)
G-MA123 Discrete Mathematics (3 hours)
G-MA153 Principles of Geometry (3 hours)
G-MA201 Survey of Mathematics (3 hours)
MA212 Calculus III (4 hours)
G-MA221 Elementary Applied Statistics (4 hours)
MA366 Differential Equations (4 hours)
***G-MA290** History of Mathematics (3 hours)
MA411 Introduction to Algebraic Structures (4 hours)
MA342 Modern Geometry (4 hours)
MA375 Junior Seminar (1 hour)
***MA475** Senior Project (2 hours)

Required Supporting courses (all mathematics majors)

IT 100 Computers and Information Technology (3 hours)
IT 200 Introduction to Programming (3 hours)
IT 201 Data Structures (3 hours)
PH205 College Physics I (5 hours)

Required Supporting Courses (students seeking teaching licensure)

See Teacher Education Handbook

Required Supporting Course (students not seeking teaching licensure)

PH205 College Physics II (5 hours)

Mathematics Minor

Requirements

G-MA 111 Calculus I (4 hours)
MA 112 Calculus II (4 hours)
G-MA 221 Elementary Applied Statistics (4 hours)

Plus one course from the following list
G-MA123 Discrete Math (3 hours)
G-MA153 Principles of Geometry (3 hours)
G-MA201 Survey of Mathematics (3 hours)
***G-MA290** History of Mathematics (3 hours)

Plus one course from the following list
MA212 Calculus III (4 hours)
MA366 Differential Equations (4 hours)
MA342 Modern Geometry (4 hours)
MA411 Algebraic Structures (4 hours)

Mathematics Course Descriptions

G-MA 105 College Algebra

4 hours
A study of elementary concepts of sets, fundamental properties of the real number system, linear and nonlinear relations, functions and their graphical representations, matrices and determinants, permutations and combinations, and mathematical induction. (Spring)

MA 106 Pre-Calculus

4 hours
A detailed study and analysis of algebraic and transcendental functions. Includes their properties, related analytic geometry, limits and continuity. This course is recommended for student who have taken College Algebra with a grade of C or better, or have successfully completed a high school Trigonometry course. (on demand)

G-MA 111 Calculus I

4 hours
Review of functions, graphs and models; introduction to limits, derivatives and integrals of algebraic and trigonometric functions; applications of differentiation and integration. (Spring)

MA 112 Calculus II

4 hours
Limits, derivatives and integrals of exponential, logarithmic and inverse trigonometric functions; techniques of integration; calculus of parametric and polar-coordinate equations; infinite sequences and series; first-order differential equations. Prerequisite: G-MA 111 Calculus I with a grade of C or better. (Fall)

G-MA 123 Discrete Mathematics

3 hours
A study of some of the basic topics of discrete mathematics, including elementary logic, properties of sets, functions and relations, mathematical induction, counting problems using permutations and combinations, trees, elementary probability, and an introduction to graph theory. (Fall, even years)

G-MA153 Principles of Geometry

3 hours
A coverage of the basic principles of Euclidean geometry. Topics include points, lines, segments, rays, angles, congruence, parallel lines, polygons (special attention is given to triangles and quadrilaterals), geometric similarity, properties of right triangles, area of various plane regions, solid geometry, and an introduction to trigonometry. (Fall)

G-MA 201 Survey of Mathematics

3 hours

A study of the philosophy, nature, significance and use of mathematics from early times to the present. Topics may include the use of graph theory to solve optimization problems in management science; conflict resolution using fair division; mathematical analysis of voting systems; applications of geometry to the size and shape of objects and to calculating inaccessible distances; geometric growth and decay; non-Euclidean geometry; number systems; logic; and probability and statistics. (Spring)

MA 212 Calculus III

4 hours

Three-dimensional coordinate systems; vectors and vector-valued functions; partial derivatives; multiple integrals; vector calculus; second-order differential equations. Prerequisite: MA 112 Calculus II with a grade of C or better. (Spring)

G-MA 221 Elementary Applied Statistics

4 hours

A study of the principles of descriptive statistics, probability, sample and population relationships, estimation, and hypothesis testing. The computer is used as an aid in problem solving. This course is recommended for students who have completed three years of high school math or Discrete Math with a C or better. (Fall and Spring)

G-MA 290 History of Mathematics

3 hours (Language Intensive) **This course satisfies the Global/Intercultural general education requirement; it does not count as a math general education course.**

Study of some of the most influential mathematicians from antiquity to the modern era, and their impact on the development of mathematical thought. Particular emphasis is given to the contributions of different ethnic groups and cultures. (Interterm, odd years)

MA 342 Modern Geometry

4 hours

A survey of selected topics in Euclidean geometry, projective geometry, non- Euclidean geometry, foundations of geometry and convex figures. Required for secondary education mathematics majors. Prerequisite: MA 112 Calculus II with a grade of C or better. (Spring, even years)

MA 366 Differential Equations

4 hours

Introduction to methods and applications of ordinary differential equations. Topics include first order differential equations and applications, higher order linear differential equations with applications, Laplace transforms and an introduction to numerical methods. Prerequisite: MA 112 Calculus II with a grade of C or better. (Fall, odd years)

MA 375 Junior Seminar

1 hour

A colloquium-type seminar. Junior mathematics majors prepare for an independent senior project in mathematics and select a project topic. (Fall)

MA 411 Algebraic Structures

4 hours

A survey of abstract algebra, with an emphasis on linear algebra. Topics include bijections, projections, groups, rings, matrices, modules, vector spaces and eigen values. Prerequisite: MA 112 Calculus II with a grade of C or better (Spring, odd years)

MA 441 Combinatorics and Graph Theory

3 hours

A study of directed graphs, trees, circuits, paths, network flows, basic combinatorics, generating functions, difference equations. Emphasis on applications and on use of computer in problem solutions. Prerequisite: MA 112 Calculus II with a grade of C or better. (on demand)

MA 475 Senior Project

2 hours (Language Intensive)

Students will investigate an advanced topic in a field of mathematics outside their classroom experience. Students will work in continual consultation with their research advisor. Regular informal oral and written updates of the project are required. The project culminates with a formally written project and a formal oral presentation of the project. (Fall)

Special Course Options

295/495 Field Experience (1-4 hours)
297 Study Abroad (12-16 hours)
299/499 Independent Study (1-4 hours)

388 Career Connections (3-10 hours)
445 Readings and Research (1-4 hours)

Information Technology Program – Dormant

Information Technology Major – *This program is dormant at present*

The department offers a major and minor in information technology. The major will prepare students for a variety of careers in computer science but emphasizes data management with web site development applications..

Requirements

39 hours of information technology courses including:

IT 100 Computers and Information Technology (3 hours)
IT 110 Web Development Tools (3 hours)
IT 200 Introduction to Programming (3 hours)
IT 201 Data Structures (3 hours)
IT 210 Information Technology Systems (3 hours)
IT 220 Programming in a Second Language (3 hours)
IT 301 Computer Systems (3 hours)
IT 360 Human Computer Interaction (3 hours)
IT 401 Operating Systems (3 hours)
IT 421 Database Management Systems (3 hours)
IT 431 Data Communications and Networks (3 hours)
IT 460 Information Security (3 hours)
IT 375 Junior Seminar (1 hour)
IT 475 Senior Project (2 hours)

Required supporting courses:

MA 123 Discrete Mathematics (3 hours)
G-MA221 Elementary Applied Statistics (4 hours)
AR340 Web-Based Design (3 hours)

Recommended supporting courses

AR230 Graphic Design I

Information Technology Minor

Requirements

21 hours of information technology including:

IT 100 Computers and Information Technology (3 hours)
IT 200 Introduction to Programming (3 hours)
IT 201 Data Structures (3 hours)
IT 210 Information Technology Systems (3 hours)
IT 301 Computer Systems (3 hours)
IT 360 Human Computer Interaction (3 hours)

Two courses at the 300 or above level (6 hours)

Required supporting courses

MA 123 Discrete Mathematics (3 hours)
G-MA221 Elementary Applied Statistics (4 hours)
AR240 Web-Based Design (3 hours)

Recommended supporting courses

AR 320 Graphic Design I

Information Technology Course Descriptions

IT 100 Computers and Information Technology

3 hours
An overview of computer technology and its relation to society. Through a hands-on approach, students will learn basic concepts of computer architecture, operating systems, computer communications, software engineering, programming languages, and applications software. Students will have the opportunity to reflect on the integration of computer technology and society (past/present/future).

IT 110 Web Development Tools

3 hours
This course introduces students to one or more web development tools. The specific tool(s) introduced will vary depending on the interest and needs of the students and faculty. The list of tools that may be introduced includes but is not limited to the following: Flash, Dreamweaver, Photoshop, Adobe Premiere, or 3-D Studio Max. This course may be taken multiple times provided the emphasis is different for each time enrolled.

IT 200 Introduction to Programming

3 hours
An introductory course for computer science majors. A rigorous study of problem solving using a high-level procedural language. Topics covered will include simple types, expressions, structure types, fundamental control structures, simple and formatted input and output, procedures, documentation, file manipulation, design methodologies, and debugging techniques. Students will complete several programming projects. Prerequisite: Mathematics equivalent to high school algebra.

IT 201 Data Structures

3 hours
A continuation of Introduction to Programming. The improvement of design skills and programming style is emphasized through practice with increasingly complex data structures and programming projects. Students are introduced to several classic algorithms, pointers, functions, recursion, and a second programming language. Prerequisite: IT200 Introduction to Programming

IT 210 Information Technology Systems

3 hours
Information Technology (IT) is a field which includes the development of systems for educational, business, and civil use. This course provides a foundation for the student of Information Technology. Various IT systems and terminology used in the field will be introduced. The systems development lifecycle, project management, and the role of IT personnel in selecting and developing new systems will be explored.

IT 220 Programming in a Second Language

3 hours
This course introduces students to current languages used in web development. The specific language(s) or language applications introduced will vary depending on the interest and needs of the students and faculty. The list of languages that may be introduced includes but is not limited to the following: Visual BASIC .NET or Visual C++ .NET Implementing Web Applications; or Visual BASIC .NET or Visual C++ .NET developing XML Web Services; or Javascript; or PHP. This course may be taken multiple times provided the emphasis is different for each time enrolled. Prerequisite: IT 201 Data Structures in C++.

IT 301 Computer Systems

3 hours
A study of machine organization, using assembly language. Alternative architectures, instruction formats, addressing modes, logic and arithmetic operators, and appropriate programming techniques are explored through several programming projects and lectures. Prerequisite: IT 201 Data Structures.

IT 360 Human Computer Interaction

3 hours
The discipline of Information Technology (IT) requires an understanding of the user when developing IT applications and systems. This course provides a basis for learning user centered systems design and development. An introduction to the basic concepts of human-computer interaction, including human factors, performance analysis, cognitive processing, usability studies, environment, and training will be given.

IT 375 Junior Seminar

1 hour
A colloquium-type seminar studying an advanced topic or a collection of topics. Junior computer science majors prepare for an independent senior project in computer science and select a project topic.

IT 401 Operating Systems

3 hours
An introduction to the major concept areas of operating systems, including process, memory, device, and file systems management; concurrency; synchronization; historical development of operating systems; and system structure. Prerequisite: IT 301 Computer Systems.

IT 421 Database Management Systems

3 hours
Levels of abstraction found in typical database management systems. A study of various models for databases. Query processing and data manipulation. Database design theory. Implementations of various models discussed. Security and integrity of system. Role of database administration. Prerequisite: IT 201 Data Structures in C++ and IT 110 Information Technology Systems.

IT 431 Data Communications and Computer Networks

3 hours
A survey of data communications and networks. Covers practice, theory and applicable standards in the areas of transmission systems, network architectures, network controllers and virtual environments for application programs. Prerequisite: CS 301 Computer Systems.

IT 460 Information Security

3 hours
Information Security is paramount in today's business world. This course provides an overview of the field of Information Security. Students will be exposed to security issues, practices, and tools. In addition, disaster recovery planning, security planning and threat analysis will be fully explored.

IT 475 Senior Project

2 hours (Language Intensive)
Students will investigate an advanced topic in a field of information technology outside their classroom experience. Students will work in continual consultation with their research advisor. Regular informal oral and written updates of the project are required. The project culminates with a formally written project and a formal oral presentation of the project.

Special Course Options
295/495 Field Experience (1-4 hours)
297 Study Abroad (12-16 hours)
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