

Applied Mathematics (BS)

Dual Degree Program in Engineering with the University of Missouri–Kansas City
and with Washington University in St. Louis

Mathematics for Secondary Education (BS)

Computer Science (BS)

Management Information Systems (BS)

The department of mathematics and computer science offers the bachelor of science degree with majors in applied mathematics, mathematics for secondary education, computer science, and management information systems. The degree in applied mathematics can be readily combined with a dual degree in engineering from University of Missouri in Kansas City or Washington University in St. Louis.

Students may also choose minors in mathematics, computer science, management information systems, and mathematics for educators. The department of mathematics and computer science, together with the department of fine arts, also offers a certificate in website development.

A graduate program in the department leads to a master of science degree in computer education. See the graduate programs' section in this catalog.

The rigorous curriculum in each program emphasizes thinking analytically, solving problems, and communicating effectively. Specifically, through its programs, the department seeks

- to acquaint students with current developments in computer science, information systems, applied mathematics, mathematics education, and computer education;
- to equip graduates with essential knowledge and skills to secure professional positions in their fields; and
- to prepare students for successful transitions from the classroom to the workplace.

To achieve these objectives, the department encourages students to interact with faculty by providing individual advising and creating an environment that is conducive to continued professional growth. With the assistance of the department, students may pursue their professional goals through internships.

If a student intending to major in the department is not ready for placement into MTH 150 upon matriculation, the student must meet the following minimum grade requirements in the prerequisite courses:

1. If placed into MTH 091, the student must earn a grade of at least A- to progress to MTH 095.
2. If placed into MTH 095, the student must earn a grade of at least A- to progress to MTH 105 and/or CIS 160.
3. If placed into MTH 105, the student must earn a grade of at least B- to progress to MTH 150.

A student pursuing a major in the department must:

- Earn a grade of B- or better in CIS 160 to progress to CIS 161, and in CIS 161 to progress to CIS 210 and above.
- Students who do not earn a grade of at least C- in CIS 160 or in CIS 161 must repeat the entire course.
- Students who earn grades higher than D but below a B-, must repeat the “lab” portion of the appropriate course and achieve the required level of competency. In either case, only one repetition is allowed.

FACULTY

Theresa L. Jeevanjee, associate professor of mathematics and computer science and chairperson of the department of mathematics and computer science

Mary Abkemeier, professor of mathematics and computer science; director of the master of science in computer education program

Nancy English, associate professor of mathematics and computer science

Kathryn Graves, assistant professor of mathematics and computer science

Jim Ma, assistant professor of computer science

M. Elizabeth Newton, professor of mathematics and computer science

UNDERGRADUATE PROGRAMS

Beginning students are required to earn a minimum cumulative grade point average of 2.5 in the courses specified below to continue in their major program at the time of application for major approval.

Mathematics Major:

MTH 115, MTH 120, MTH 150, MTH 151

Computer Science and Management Information Science Major:

MTH 120, MTH 150, CIS 160, CIS 161

For transfer students 12 credit hours of appropriate coursework will be stipulated by the faculty of the department. The department reserves the right to administer a test in the appropriate discipline for acceptance into its major programs when deemed necessary.

Major Approval

Major approval is required during the second semester of the sophomore year, or after the completion of 45 credit hours at Fontbonne. For transfer students, major approval is required after completing the equivalent of one full semester (*a minimum of 12 credit hours*) at Fontbonne.

MAJOR IN APPLIED MATHEMATICS

This major exposes students to various areas of applied mathematics, including mathematical modeling and statistics. Computer programming and software applications are also included in this major. Internships are available as MTH 184, 284, 384, and 484, but are not required.

Baccalaureate Degree and Residency Requirements

All requirements for an undergraduate degree are listed under academic policies and regulations in the undergraduate introductory section in this catalog. These requirements include a graduation requirement of at least one course in religion or theology.

General Education Requirements

The 42 credit hours of general education requirements are presented in the undergraduate academic information section in this catalog. A course that meets a general education requirement may also meet a course requirement in the major or a course requirement in another discipline.

Courses Required for the Major

- MTH 115 Introduction to Statistics (3 credits)
- MTH 120 Discrete Mathematics (3 credits)
- MTH 150 Calculus with Analytic Geometry I (4 credits)
- MTH 151 Calculus with Analytic Geometry II (4 credits)
- MTH 200 Linear Algebra (3 credits)
- MTH 250 Calculus with Analytic Geometry III (4 credits)
- MTH 300 Modeling and Numerical Approximation (3 credits)
- MTH 310 Differential Equations (3 credits)
- MTH 315 Advanced Statistics (3 credits)
- MTH 316 Non-Parametric Statistics (3 credits)
- MTH 330 Algebraic Structures (3 credits)
- MTH 495 Senior Project (3 credits)

Courses Required in Other Disciplines

Business, biology, general science, or a minor in chemistry may be selected as an application area.

Business Application Area

- BUS 203 Principles of Micro Economics (3 credits)
- BUS 205 Financial Accounting (3 credits)
- BUS 311 Financial Accounting and Reporting I (3 credits)
- BUS 314 Advanced Topics in Management Cost Accounting (3 credits)
- BUS 343 Managerial Finance (3 credits)
- CIS 111 Computer Applications: Database (3 credits)
- CIS 160 Computer Science I (4 credits)

One of the following:

- CIS 320 Systems Analysis and Design (3 credits)
- CIS 330 Database Management Systems (3 credits)

Biology Application Area

- BIO 112 General Biology I with Lab (4 credits)
- BIO 114 General Biology II with Lab (4 credits)
- BIO 312 General Genetics (3 credits)
- NOTE:** has biology and chemistry prerequisites
- BIO 318 Cell and Molecular Biology (3 credits)
- NOTE:** has biology and chemistry prerequisites
- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)
- CIS 210 Object-Oriented Programming (4 credits)

General Science Application Area

- CHM 106 General Chemistry I with Lab (4 credits)
- CHM 108 General Chemistry II with Lab (4 credits)
- PHY 208 College Physics I with Lab (calculus-based) (4 credits)
- PHY 210 College Physics II with Lab (calculus-based) (4 credits)
- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)
- CIS 210 Object-Oriented Programming (4 credits)

Chemistry Minor Application Area

The chemistry minor is defined in the department of biological and physical sciences section in this catalog. Students who elect this substitution will be required to take CIS 160, CIS 161, and CIS 210 for their three computer science courses.

MAJOR IN MATHEMATICS FOR SECONDARY EDUCATION

This program offers a curriculum designed specifically to meet the needs of the future secondary mathematics teacher. The curriculum for this major combines theory and applications of mathematics, principles and methods of secondary education, experience with mathematical software and computer programming, and field experience.

Baccalaureate Degree and Residency Requirements

All requirements for an undergraduate degree are listed under academic policies and regulations in the undergraduate introductory section in this catalog. These requirements include a graduation requirement of at least one course in religion or theology.

Teacher Certification Requirements

Full information on teacher certification may be found in the section titled *Teacher Certification at Fontbonne University* following the graduate programs' section in this catalog, as well as in the appropriate departmental sections of this catalog.

General Education Requirements

The 42 credit hours of general education requirements are explained in the undergraduate academic information section in this catalog. A course that meets a general education

requirement may also meet a course requirement in the major or a course requirement in another discipline.

The following specific general education courses must be chosen to meet the requirements for this major:

- PSY 200 Developmental Psychology (3 credits)
- BIO 112 General Biology I with Lab (4 credits)
- CHM 106 General Chemistry I with Lab (4 credits)
- PHY 208 College Physics I with Lab (4 credits)

Courses Required for the Major

- MTH 115 Introduction to Statistics (3 credits)
- MTH 120 Discrete Mathematics (3 credits)
- MTH 150 Calculus with Analytic Geometry I (4 credits)
- MTH 151 Calculus with Analytic Geometry II (4 credits)
- MTH 200 Linear Algebra (3 credits)
- MTH 250 Calculus with Analytic Geometry III (4 credits)
- MTH 300 Modeling and Numerical Approximation (3 credits)
- MTH 305 Readings in the History of Mathematics (2 credits)
- MTH 315 Advanced Statistics (3 credits)
- MTH 320 Elements of Geometry (3 credits)
- MTH 330 Algebraic Structures (3 credits)
- MTH 360 Teaching Mathematics in Middle/Secondary Schools (3 credits)
- MTH 495 Senior Project (3 credits)

Courses Required in Other Disciplines

- BUS 202 Principles of Macro Economics (3 credits)
- OR**
- BUS 203 Principles of Micro Economics (3 credits)
- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)

Either of the following science sequences:

- PHY 208 College Physics I with Lab (calculus-based) (4 credits)
- AND**
- PHY 210 College Physics II with Lab (calculus-based) (4 credits)
- OR**
- CHM 106 General Chemistry I with Lab (4 credits)
- AND**
- CHM 108 General Chemistry II with Lab (4 credits)

Professional Courses Required For Certification

- EDU 120 Psychology of the Exceptional Child (3 credits)
- EDU 201 Introduction to Classroom Teaching (2 credits)
- EDU 222 Educational Psychology (3 credits)
- EDU 234 Philosophical Foundations of Education (3 credits)
- EDU 401 Classroom/Behavior Management (Middle School and Secondary) (3 credits)
- EDU 350 Methods of Teaching Reading in the Content Area (2 credits)
- EDU 447 Planning for Instruction and Assessment—Middle and Secondary (3 credits)
- EDU 451 Student Teaching at the Secondary Level (10-16 credits)

Concentration in Mathematics for Middle School

This concentration offers majors in middle school education exposure to areas of higher mathematics, which will enhance their understanding of the middle school mathematics curriculum. A student must successfully complete, at Fontbonne, a minimum of 50 percent of the credit hours required for the concentration.

Courses Required for the Concentration:

- MTH 105 College Algebra (4 credits) (if needed)
- MTH 108 Trigonometry (2 credits) (if needed)
- MTH 115 Introduction to Statistics (3 credits)
- MTH 120 Discrete Mathematics (3 credits)
- MTH 150 Calculus with Analytic Geometry I (4 credits)
- MTH 320 Elements of Geometry (3 credits)
- MTH 330 Algebraic Structures (3 credits)
- MTH 360 Teaching Mathematics in Middle/ Secondary Schools (3 credits)
- MTH 495 Senior Project (3 credits)

MAJOR IN COMPUTER SCIENCE

This major includes both theory and application and prepares students for a variety of challenging careers in the field of computer science.

Baccalaureate Degree and Residency Requirements

All requirements for an undergraduate degree are listed under academic policies and regulations in the undergraduate introductory section in this catalog. These requirements include a graduation requirement of at least one course in religion or theology.

General Education Requirements

The 42 credit hours of general education requirements are presented in the undergraduate academic information section in this catalog. A course that meets a general education requirement may also meet a course requirement in the major or a course requirement in another discipline.

Courses Required for the Major

- CIS 120 An Overview of Computer and Information Science (3 credits)
- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)
- CIS 210 Object-Oriented Programming (4 credits)
- CIS 250 Algorithms and Data Structures (4 credits)
- CIS 310 Computer Architecture and Assembly Language (3 credits)
- CIS 340 Concepts of Telecommunications and Networking (3 credits)
- CIS 350 Compiling Theory and Programming Languages (3 credits)
- CIS 355 Principles of Operating Systems (3 credits)
- CIS 495 Senior Project (3 credits)
- Plus three electives chosen from the following:**
- CIS 170 Visual Programming (3 credits)
- CIS 300 Modeling and Numerical Approximation (3 credits)

CIS 316 Business Application Development (3 credits)
 CIS 320 Systems Analysis and Design (3 credits)
 CIS 330 Database Management Systems (3 credits)
 CIS 360 Artificial Intelligence (3 credits)
 CIS 375 Software Engineering (3 credits)
 CIS 394 Topics in Computer Science (1-4 credits)
 CIS 494 Advanced Topics in Computer Science (1-4 credits)

Courses Required in Other Disciplines

MTH 115 Introduction to Statistics (3 credits)
 MTH 120 Discrete Mathematics (3 credits)
 MTH 150 Calculus with Analytic Geometry I (4 credits)
 MTH 151 Calculus with Analytic Geometry II (4 credits)
 MTH 200 Linear Algebra (3 credits)
 MTH 330 Algebraic Structures (3 credits)

MAJOR IN MANAGEMENT INFORMATION SYSTEMS

This program emphasizes the relationship between computer science and business and prepares students for professional careers such as systems analysis and design.

Baccalaureate Degree and Residency Requirements

All requirements for an undergraduate degree are listed under academic policies and regulations in the undergraduate introductory section in this catalog. These requirements include a graduation requirement of at least one course in religion or theology.

General Education Requirements

The 42 credit hours of general education requirements are presented in the undergraduate academic information section in this catalog. A course that meets a general education requirement may also meet a course requirement in the major or a course requirement in another discipline.

Courses Required for the Major

CIS 120 An Overview of Computer and Information Science (3 credits)
 CIS 160 Computer Science I (4 credits)
 CIS 161 Computer Science II (4 credits)
 CIS 210 Object-Oriented Programming (4 credits)
 CIS 250 Algorithms and Data Structures (4 credits)
 CIS 316 Business Application Development (3 credits)
 CIS 320 Systems Analysis and Design (3 credits)
 CIS 330 Database Management Systems (3 credits)
 CIS 340 Concepts of Telecommunications and Networking (3 credits)
 CIS 355 Principles of Operating Systems (3 credits)
 CIS 495 Senior Project (3 credits)

Plus three electives chosen from the following:

CIS 170 Visual Programming (3 credits)
 CIS 300 Modeling and Numerical Approximation (3 credits)
 CIS 310 Computer Architecture and Assembly Language (3 credits)
 CIS 350 Compiling Theory and Programming Languages (3 credits)

CIS 360 Artificial Intelligence (3 credits)
 CIS 375 Software Engineering (3 credits)
 CIS 394 Topics in Computer Science (1-4 credits)
 CIS 494 Advanced Topics in Computer Science (1-4 credits)

Courses Required in Other Disciplines

BUS 202 Principles of Macro Economics (3 credits)
 BUS 203 Principles of Micro Economics (3 credits)
 BUS 205 Financial Accounting (3 credits)
 BUS 230 Management Principles (3 credits)
 BUS 233 Marketing Principles (3 credits)
 BUS 343 Managerial Finance (3 credits)
 MTH 115 Introduction to Statistics (3 credits)
 MTH 120 Discrete Mathematics (3 credits)
 MTH 150 Calculus with Analytic Geometry I (4 credits)

MINORS

A student must successfully complete, at Fontbonne, a minimum of 50 percent of the credit hours required for the minor.

Minor in Mathematics

This minor provides students in other majors with a solid practical background in major branches of modern mathematics.

Courses Required for the Minor:

MTH 115 Introduction to Statistics (3 credits)
 MTH 120 Discrete Mathematics (3 credits)
 MTH 150 Calculus with Analytic Geometry I (4 credits)
 MTH 151 Calculus with Analytic Geometry II (4 credits)
Plus two of the following:
 MTH 300 Modeling and Numerical Approximation (3 credits)
 MTH 315 Advanced Statistics (3 credits)
 MTH 316 Non-Parametric Statistics (3 credits)
 MTH 320 Elements of Geometry (3 credits)
 MTH 330 Algebraic Structures (3 credits)

Minor in Mathematics for Educators

Courses Required for the Minor:

MTH 115 Introduction to Statistics (3 credits)
 MTH 120 Discrete Mathematics (3 credits)
 MTH 150 Calculus with Analytic Geometry I (4 credits)
 MTH 300 Modeling and Numerical Approximation (3 credits)
 MTH 305 Readings in the History of Mathematics (2 credits)
 MTH 320 Elements of Geometry (3 credits)
 MTH 330 Algebraic Structures (3 credits)

In addition to these 21 credit hours, students will, for certification purposes, be required to take MTH 360 Teaching Mathematics in the Middle/Secondary Schools.

Minor in Computer Science

This minor provides a solid background in computer science.

Courses Required for the Minor:

- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)
- CIS 210 Object-Oriented Programming (4 credits)
- CIS 250 Algorithms and Data Structures (4 credits)

Plus two of the following:

- CIS 310 Computer Architecture and Assembly Language (3 credits)
- CIS 340 Concepts of Telecommunications and Networking (3 credits)
- CIS 355 Principles of Operating Systems (3 credits)

Minor in Management Information Systems

This minor offers exposure to the fundamentals of information systems.

Courses Required for the Minor:

- CIS 160 Computer Science I (4 credits)
- CIS 161 Computer Science II (4 credits)
- CIS 210 Object-Oriented Programming (4 credits)
- CIS 250 Algorithms and Data Structure (4 credits)

Plus two of the following:

- CIS 316 Business Application Development (3 credits)
- CIS 320 Systems Analysis and Design (3 credits)
- CIS 330 Database Management Systems (3 credits)

CERTIFICATE**Certificate in Website Development**

This certificate provides a solid foundation in all aspects of website development: graphics design, programming, and installation. See certificate program in the undergraduate academic policy and regulations section in this catalog.

Courses Required for the Certificate:

- ART 115 Graphics Design I (3 credits)
- ART 302 Designing for the Web (3 credits)
- ART 402 Designing for the Web (Advanced) (3 credits)
- CIS 150 Fundamentals of Programming for Business (3 credits)
- CIS 115 Introduction to Server Technology (1 credit)
- CIS 215 Database Fundamentals and SSP (Server-Side Programming) (2 credits)
- CIS 315 Advanced SSP (Server-Side Programming) (3 credits)

ADVANCED PLACEMENT

An entering student who scores four or five on the Advanced Placement (AP) Test will receive equivalent placement and university credit. For students who score a four or five on the Calculus AB Examination, four credit hours are awarded for MTH150. For students who score a four or five on the Calculus BC Examination, eight credit hours are awarded for MTH150 and MTH151. For students who score a four or five on the Computer Science A Examination, eight credit hours are awarded for CIS160 & CIS 161. For students who score a four or five on Computer Science AB Examination, eight credit hours are awarded for CIS160 and CIS161. For students who score a four or five on Statistics Examination, three credit hours are awarded for MTH115.

DUAL DEGREE PROGRAM IN ENGINEERING WITH THE UNIVERSITY OF MISSOURI–KANSAS CITY OR WITH WASHINGTON UNIVERSITY IN ST. LOUIS

Fontbonne University students may choose a dual degree program of study in collaboration with either the School of Computing and Engineering at the University of Missouri-Kansas City or the School of Engineering and Applied Science at Washington University in St. Louis. This program may be combined with any major, but is most easily achieved in conjunction with a major in applied mathematics or in biology. Because of the many engineering avenues, students must work closely with the dual degree advisor to map out a curriculum plan. Students must have completed the first three years of required work in a major at Fontbonne. A minimum cumulative grade point average (GPA) of B+ (3.25 on a 4.0 scale) or better, both overall and in science and mathematics courses, is required for admission to the dual degree program. Applicants with lower GPAs are considered on a case-by-case basis. Upon satisfactory completion of the program, the student will be awarded bachelor's degrees from both Fontbonne University and University of Missouri-Kansas City or from both Fontbonne University and Washington University in St. Louis.

COURSES**Computer and Information Science****CIS 100 Computer Technology: Issues and Applications (3 credits)**

Introductory course to computer technology and applications designed for non-computer science majors. Covers general computer knowledge associated with computer history, hardware, software, operating systems and computer networks, Windows based applications such as word processors, presentation tools, spreadsheets, database systems, introduction to web page creation, and Internet browsers. Social and ethical issues related to technology are considered, such as software privacy, viruses, and security issues. Course will include development of an application project by the student. FA, SP

CIS 103 Microcomputer Applications in Education (3 credits)

Development of proficiency in the use of an integrated software package. All of the applications will be education-oriented, such as creating subject area databases and developing electronic grade sheets. Evaluation and use of educational software will also be included. FA, SP

CIS 110 Microcomputer Applications: Spreadsheet (3 credits)

Covers capabilities of Windows-based spreadsheet software. Presents spreadsheet terminology, basic commands, and features for data formatting, calculation, and creating tables and charts. Additional topics include building applications for data referencing, analysis and reports, advanced functions, and macros. Course will include development of a significant spreadsheet project by the student. FA, SP

CIS 111 Microcomputer Applications: Database (3 credits)

Covers the skills to design and implement a database as well as data entry, editing, and manipulation using Windows-based DBMS software. Includes applications of managing tables and files, using and creating queries, and designing forms and reports. Course will include development of a significant database project by the student. FA, SP

CIS 115 Introduction to Server Technology (1 credit)

An introduction to server technology. Topics include system architecture, file servers, FTP servers, web servers, database servers with an emphasis on server installation and configuration. SP

CIS 120 An Overview of Computer and Information Science (3 credits)

An introduction to computer and information science. Covers issues associated with both hardware and software, such as computer history, computer terminology, algorithm development and analysis with an emphasis on flowcharting, pseudocode and design, basic number systems, data storage, data manipulation, operating systems, networks, and computer engineering. Additional topics include programming languages, software engineering, data structures, file structures, database systems, the Internet, and artificial intelligence. FA

CIS 150 Fundamentals of Programming for Business (3 credits)

This course introduces programming for solving business-related application problems. Topics include program design, the integrated development environment, graphical user interface, data types, control structures, and sub/function procedures. Additional topics include database programming and exception handling. SP

CIS 160 Computer Science I (4 credits)

Emphasis on programming in C and introduction to C++, including structural programming concepts, simple data types and structures, C and C++ syntax, operators, control structures and pointers. Lab exercises include techniques

of coding, program design, and debugging. Students in this course who are majoring in mathematics, computer science, or management information science must earn grades of B- or better in this course to progress to CIS 161 and/or CIS 210. Prerequisite: Grades of A- or better in MTH 091 and MTH 095, or competency in arithmetic and algebra. For CS or MIS majors, CIS120 is a pre- or co-requisite. FA

CIS 161 Computer Science II (4 credits)

Continuation of Computer Science I, with extensive programming in C++ language and introduction to Java. Includes string handling, file I/O, storage and static variables, structures, bitwise operations, and C++ library. Students in this course who are majoring in mathematics or in computer science or management information systems must earn grades of B- or better to progress to CIS 210 and above. Prerequisite: CIS 160. SP

CIS 170 Visual Programming (3 credits)

Introduction to visual programming using Windows-based packages. Exploring tools and utilities of Windows graphic user interface and multimedia capacity, such as menus, buttons, and other controls. Topics also include using object-linking and embedding, dynamically-linked libraries, dynamic data exchange, and Internet-related applications. Lab exercises include language syntax and coding, data structures, links and controls, parameter passing. Prerequisite: CIS 160 or consent of instructor. Offered as needed.

CIS 184-484 Internship (1-3 credits)

Supervised work experience in computer science and management information systems. Credits are determined by the number of hours working in an approved job; course number is determined by the level of complexity likely to be involved. The internship is cooperatively administered by an employer-supervisor and a member of the faculty. Each internship also requires a paper summarizing the work done at the culmination of the work experience.

Prerequisites:

- For CIS184: CIS120 and CIS160;
- For CIS284: CIS120, CIS160 and CIS 161;
- For CIS384: CIS210 and CIS250;
- For CIS484: At least two 300-level courses.

CIS 210 Object-Oriented Programming (Java) (4 credits)

Introduction to concepts of abstract data type and inheritance. Topics include the fundamentals of object-oriented program design, object-oriented programming using Java. Lab exercises include introductory to intermediate level software analysis and design. Prerequisite: CIS 161. FA

CIS 215 Database Fundamentals and SSP (Server-side Programming) (2 credits)

An introduction to database fundamentals and server-side programming. Topics include table design and management, creating and using queries, file management, and writing programs on the server to support a web site. FA

CIS 250 Algorithms and Data Structures (4 credits)

Introduction to the principles of algorithm analysis, abstract data types covering stacks, queues, lists, trees and recursion, algorithms of sorting and searching. Additional topics include graph algorithms, text compression, dynamic programming, and randomized algorithms. Prerequisite: CIS 210 and MTH 120. SP

CIS 293 Topics in the Business Computing Environment (3 credits)

Course addresses topics of current interest in the business computing environment. Offered as needed.

CIS 300 Modeling and Numerical Approximation (3 credits)

Principles of model construction with selected case studies from various fields. Also, techniques of numerical approximation. Prerequisites: CIS 160; MTH 150. Offered alternate years. SP (Odd)

CIS 310 Computer Architecture and Assembly Language (3 credits)

Topics covering theoretical aspects and concepts of hardware and computer systems including logic gates, combinational and sequential circuits, memory and registers, control logic design, instructions and addressing. Teaches programming in one assembly language. Prerequisites: CIS 160; MTH 120. Offered alternate years. SP (Odd)

CIS 315 Advanced Server-side Programming (3 credits)

This course teaches the advanced techniques of server-side programming over the Internet. Topics include using session control, accessing back-end database servers, E-commerce security issues, interacting with file systems, implementing secure transactions, and using network and protocol functions. SP

CIS 316 Business Application Development (3 credits)

Course covers the essentials of the COBOL programming language in the context of business application development. Topics include the fundamental design principles of business applications, application development processes, and program implementations using COBOL. Prerequisite: CIS 150 or CIS 160 or consent of the instructor. SP

CIS 320 Systems Analysis and Design (3 credits)

Includes the technological and managerial aspects of the analysis, design, and implementation of systems. Prerequisites: CIS 160 or consent of instructor. Offered alternate years. SP (Odd)

CIS 330 Database Management Systems (3 credits)

Fundamental design principles of database systems. Implementational design using data models, relational algebra, and relational calculus. Relational implementation with SQL, Microcomputer DBMS, and distributed database systems. Prerequisite: CIS 111 or consent of instructor. Offered alternate years. FA (Odd)

CIS 340 Concepts of Telecommunications and Networking (3 credits)

Introduction to the principles and practice of data communication and computer networking. Topics include the theoretical aspects of various methods, media, protocols, data compression, and security in telecommunication. Also includes lab exercises of network and remote access configuration and data exchange. Prerequisites: CIS 160; MTH 120; either MTH 150 or consent of the instructor. Offered alternate years. FA (Odd)

CIS 350 Compiling Theory and Programming Languages (3 credits)

Comparative study of programming languages and concepts such as grammars and parse trees, interpretation and compilation, and generation of optimal code. A number of programming languages will be studied relative to their history, design implementation, and evaluation. Prerequisites: CIS 160; MTH 120. Offered alternate years. SP (Even)

CIS 355 Principles of Operating Systems (3 credits)

Topics cover the theoretical aspects and concepts of operating systems including system structures, scheduling, concurrent processes and deadlock handling, storage and file management, system protection and security. Also includes lab exercises in UNIX system configuration. Prerequisites: CIS 160; MTH 120. Offered alternate years. SP (Even)

CIS 360 Artificial Intelligence (3 credits)

A survey of concepts, techniques, and applications of AI, including knowledge abstraction and representation, knowledge-based systems, heuristic searching, natural language understanding, machine learning, and automated reasoning. Use of LISP or PROLOG, or other appropriate language, to develop a substantial project in expert systems is required. Offered as needed. Prerequisite: CIS 250 or consent of the instructor. Alternate Years FA (Even)

CIS 375 Software Engineering (3 credits)

Course introduces classical and object-oriented software engineering principles. Topics include the scope of software engineering, the software process, software life cycle models, documentation, tools, testing, quality assurance, project management, object-oriented analysis and design, system views, patterns, and modeling using UML, in the context of generic object-oriented development process. Students are required to design and build software projects through team effort. The projects cover the principal system development life-cycle phases. Offered as needed. Alternate Years FA (Even)

CIS 394 Topics in Computer Science (1-4 credits)

Course generated by the department to supplement regular course listings. Addresses topics in computer science. Prerequisite: Junior or senior status, or consent of instructor. Offered on a one-time or irregular basis.

CIS 490 Independent Study (1-4 credits)

Study in a specialized area, to be arranged according to student need and interest. Prerequisite: Junior or senior status.

CIS 494 Advanced Topics in Computer Science (1-4 credits)

Topics similar to those offered in CIS 394, offered on an as-needed basis, at a more advanced level.

CIS 495 Senior Project (3 credits)

Prerequisite: Senior status. FA, SP

Mathematics

MTH 091 College Mathematics Skills (3 credits)

Emphasizes computing with whole numbers and fractions, both common and decimal; percentages; application of the ability to compute word problems. In general, students must earn a grade of C- or better in this course to satisfy the prerequisite for further mathematics courses. However, students in this course who intend to choose a major in the department must earn grades of A- or better in this course to progress to MTH 095. Credit does not apply toward the 128-hour degree requirement. Offered as needed.

MTH 095 Fundamentals of Algebra (4 credits)

Study of basic algebra required for all mathematics courses at Fontbonne. Topics include: real numbers, exponents, radicals, rational expressions, linear equations and inequalities, polynomials, quadratic equations, systems of linear equations, functions, and graphing. In general, students must earn a grade of C- or better in this course to satisfy the prerequisite for further mathematics courses. However, students in this course who intend to choose a major in the department must earn grades of A- or better in this course to progress to MTH 105 and/or CIS 160. Prerequisite: A grade of C- or better in MTH 091 or competency in arithmetic. Credit will be applied as elective credit to the 128-hour degree requirement. FA, SP

MTH 100 Topics in Algebra for Statistics (2 credits)

This course covers the essential topics in algebra that are needed specifically to do common statistical calculations. Topics include: sets, signed numbers, exponents and radicals, algebraic and rational expressions, factoring, linear equations, an introduction to two-dimensional graphing, and an introduction to quadratic equations. Application problems are included. (Topics may be added at the instructor's discretion, as time allows, but not deleted from the preceding list.) Offered in the OPTIONS program only.

MTH 102 Contemporary Topics in Mathematics for Educators (3 credits)

Problem solving, elementary set theory and logic, development of the real number system. Topics in geometry and statistics. Education certification majors only. Prerequisites: Grades of C- or better in MTH 091 and MTH 095 or competency in arithmetic and algebra. FA, SP

MTH 103 Excursions into Modern Mathematics (3 credits)

This course presents mathematics in such a way that the student can see immediate connections between what is learned in the mathematics classroom and real-life problems. It is geared toward liberal arts majors. The choice of topics is such that a heavy mathematical infrastructure is not needed. A fundamental objective of the course is to develop an appreciation for the aesthetic elements of mathematics. Prerequisites: Grades of C- or better in MTH 091 and MTH 095 or competency in arithmetic and algebra. FA, SP

MTH 105 College Algebra (4 credits)

Topics covered: sets, number systems, polynomials, equations and graphing, inequalities, relations and functions, systems of equations, exponential and logarithmic equations, rational zeros of polynomials, matrices and determinants, sequences and series. Students in this course who choose a major in the department must earn grades of B- or better in this course to progress to MTH 150. Prerequisites: Grade of C- or better in MTH 091 and MTH 095, or competency in arithmetic and algebra. FA, SP

MTH 108 Trigonometry (2 credits)

Covers the standard introductory trigonometry topics—the six standard trigonometric functions, right triangle trigonometry, radian measure, graphs of function and their inverses, identities and formulas, equations and triangles. MTH 108 is a prerequisite for MTH 150. FA

MTH 115 Introduction to Statistics (3 credits)

Topics covered: descriptive statistics, probability, binomial, chi-squared and normal probability distributions, tests of hypotheses, linear correlation and regression, and analysis of variance. Prerequisites: Grades of C- or better in MTH 091 and MTH 095 or competency in arithmetic and algebra. FA, SP

MTH 120 Discrete Mathematics (3 credits)

Topics include: truth tables, propositional logic, sets, binary and equivalence relations, functions, matrices, binary, octal and hexadecimal number systems, combinatorics, proof by induction and recursion, and algorithms. Prerequisites: Competency in arithmetic and algebra. FA

MTH 150 Calculus with Analytic Geometry I (4 credits)

Differential and integral calculus of the algebraic and transcendental functions associated with analytic geometry. Prerequisite: Three years of high school mathematics including trigonometry with grades of B or better, or MTH 105, MTH 108 with grades of C- or better, or the consent of the instructor. SP

MTH 151 Calculus with Analytic Geometry II (4 credits)

A continuation of MTH 150, continuation of differential and integral calculus; infinite series. Prerequisite: MTH 150 with grades of C- or better. FA

MTH 184, MTH 284, MTH 384, and MTH 484 Internships in Applied Mathematics (1-3 credit hours each)

Supervised work experience in applied mathematics. Credits are determined by the number of hours working in an approved job; course number is determined by the level of mathematical complexity likely to be involved. The internship is cooperatively administered by an employer-supervisor and a member of the faculty. Each internship also requires a comprehensive paper at the culmination of the work experience. Grading is pass/no pass only. Prerequisite: Student must be pursuing a major in mathematics, and have completed the following courses:

For MTH184: MTH150 required and MTH115 recommended;

For MTH284: MTH151 and MTH115;

For MTH384: At least one of: MTH200 Linear Algebra, MTH250 Calculus with Analytic Geometry III, and MTH310 Differential Equations;

For MTH 484: At least two 300-level courses.

MTH 200 Linear Algebra (3 credits)

Topics include: vector spaces, linear transformations, and matrices. Prerequisite: MTH 151. Offered alternate years. FA (Even)

MTH 250 Calculus with Analytic Geometry III (4 credits)

Vector calculus, the differential, multivariate calculus with applications. Prerequisite: MTH 151. SP

MTH 294 Topics in Mathematics (1-4 credits)

Course generated by the department to supplement regular course listings. Addresses topics in mathematics. Offered on a one-time or irregular basis.

MTH 300 Modeling and Numerical Approximation (3 credits)

Principles of model construction with selected case studies from various fields. Also, techniques of numerical approximation. Prerequisites: MTH 150; CIS 160. Offered alternate years. SP (Odd)

MTH 305 Readings in the History of Mathematics (2 credits)

Readings in the history of mathematics and in the mathematics contributions of both Western and non-Western cultures. The interplay between mathematics and culture is emphasized. Prerequisites: MTH 150; MTH 120. SP

MTH 310 Differential Equations (3 credits)

Techniques for solving ordinary differential equations. Investigation of existence and uniqueness of solutions; a variety of applications. Prerequisite: MTH 151. Offered alternate years. SP (Odd)

MTH 315 Advanced Statistics (3 credits)

Uses statistical software to analyze data sets. Topics include widely used statistical tools such as linear and nonlinear regression, analysis of variance, expected mean squares, pooling. Prerequisites: MTH 115; MTH 150 or consent of instructor. Offered alternate years. FA (Even)

MTH 316 Non-Parametric Statistics (3 credits)

An introduction to nonparametric statistical procedures. Topics include order statistics, rank order statistics and scores, tests of goodness of fit, linear rank tests for location and scale problems, applications. Prerequisite: MTH 115. Offered alternate years. FA (Odd)

MTH 320 Elements of Geometry (3 credits)

Transformational approach to isometries and similarities; studies of Euclidean and non-Euclidean geometries. Prerequisite: MTH 150 or consent of instructor. Offered alternate years. FA (Odd)

MTH 330 Algebraic Structures (3 credits)

Covers discrete algebraic structures including Boolean algebra, groups, rings, integral domains and fields and their applications. Prerequisites: MTH 120; MTH 150. Offered alternate years. SP (Even)

MTH 350 Methods of Teaching Mathematics in the Early Childhood and Elementary School (3 credits)

Methods for teaching the real number system, diagnostic mathematics and remedial methods, probability, statistics, geometry, metric system, algebra, applications of computer to mathematics education. Education certification majors only. Prerequisite: MTH 102. FA, SP

MTH 360 Teaching Mathematics in Middle/Secondary Schools (3 credits)

Study of models of teaching mathematics, diagnostic mathematics, and remedial methods at the middle school or secondary level. Education certification majors only. Prerequisite: Junior or senior status. Offered alternate years. FA (Even) (Background check required)

MTH 490 Independent Study (1-4 credits)

Study in a specialized area, to be arranged according to student need and interest. Prerequisite: Junior or senior status.

MTH 494 Advanced Topics in Mathematics (1-4 credits)

Course generated by the department to supplement regular course listings. Addresses topics in mathematics. Prerequisite: Junior or senior status, or consent of instructor. Offered on a one-time or irregular basis.

MTH 495 Senior Project (3 credits)

Prerequisite: Senior status. FA, SP