

Mathematics

Professor Henry Africk, Chair
Namm 711
718.260.5380
email: hafrick@citytech.cuny.edu

PROGRAMS:

Computer Science/AS
Applied Mathematics–Financial Science/BS
Applied Mathematics–Information Science/BS

FACULTY:

Professors: Africk, Chosid, Ellner, Gelbwasser, Hill, Kramer, Rojas
Assoc Profs: Benakli, Cermele, Chen, Deraney, Han, Liou-Mark,
Natov, Taraporevala
Asst Profs: Bruno, Desantis, Ghosh-Dastidar, Greenstein, Halleck,
Harrow, Katz, Reth, Rozenblyum, Schoutens, Tradler, Umanskiy
Instructor: Singh
Lecturer: Beheshti

Associate in Science in COMPUTER SCIENCE

The Computer Science associate degree program provides students with the first two years of study leading to a baccalaureate degree in computer science, computer information science, computer systems technology, computer engineering technology or applied mathematics.

The language of mathematics is used to translate the solutions of real world problems into algorithms. Constructing efficient and effective algorithms to solve a particular problem is the business of computer science. An algorithm is a step-by-step procedure that tells a computer what to do. Algorithms search, sort, evaluate, analyze, transfer, code and decode information. The focus of this program is on problem solving with a heavy emphasis on applied mathematics.

Computer science is an excellent field of study for those seeking career opportunities in the worlds of business, education, government and industry. Employers value computer science graduates, not just for their specific technical skills, but for the broad analytic and problem-solving abilities that are developed in the study of computer science.

Medical, pharmaceutical and financial disciplines as well as the information and design industries depend heavily on computer science graduates. In addition, the massive amount of information generated by business, industry, government, science, and communications require algorithms to maintain, control, mine, warehouse and secure data.

The Computer Science program is sponsored by the Mathematics Department. The curriculum consists of a broad spectrum of mathematics, science, general education, computer science and computer engineering courses. The program is designed to prepare the student for the more advanced work required for the baccalaureate degree.

The first two years are devoted to establishing mathematical sophistication, constructing and analyzing algorithms, learning to write object-oriented programs and becoming familiar with the architecture of a computer. Internships are available to give students work experience.

To be eligible for admission into the Computer Science program, students must be CUNY certified in reading and mathematics. In order to begin the full first semester sequence of courses students must have also completed MAT 1375/MA 375 or the equivalent. Students not prepared to take MAT 1475/MA 475 will be required to take up to an additional 12 credits of the mathematics prerequisites, MAT 1175/MA 175, MAT 1275/MA 275, and MAT 1375/MA 375.

The College will grant an associate in science (AS) degree with a major in computer science upon satisfactory completion of the required 60 credits listed.

REQUIRED COURSES IN THE MAJOR

		Credits
MAT 1372/MA 372	Statistics with Probability	3
MAT 1440/MA 440	Discrete Structures and Algorithms I	3
MAT 1475/MA 475 ¹	Calculus I	4
MAT 1476L/MA 476L	Calculus Laboratory	1
MAT 2540/MA 540	Discrete Structures and Algorithms II	3
MAT 1575/MA 575	Calculus II	4
MAT 2580/MA 580	Introduction to Linear Algebra	3
MAT 2630/MA 630	or	
MAT 2680/MA 680	Numerical Methods or Differential Equations	3
CST 2403/CS 403 ²	Programming Fundamentals using C++	3
CST 2503/CS 503	Object-Oriented Programming with C++	3
CS 550	Data Structures or	
CST 47034/CS 703	Unix Networking or	
CST 4704/CS 704	Data Warehousing	3
PSY 1441/SC 441	Physics I	5
EMT 1250/EM 250 ³	or	
PSY 1442/SC 442	Digital Control or Physics II	4 or 5
CET 3510/EM 510	Microcomputer Systems or	
CST 2304/CS 304	Database Programming	3/4

ADDITIONAL REQUIRED COURSES⁴

ENG 1101/EG 101	English I	3
ENG 1121/EG 121	English II	3
ECON 1101/EN 101	Macro Economics	3
LIT	Literature	3
INTERN or RESEARCH	or	
MAT 2675/MA 675	Internship or Research Project or Calculus III	2/4

TOTAL CREDITS REQUIRED FOR THE DEGREE

60/64

¹ Student not prepared to take MAT 1475/MA 475 will be required to take up to an additional 12 credit of the mathematics prerequisites, MAT 1175/MA 175, MAT 1275/MA 275, and MAT 1375/MA 375.

² Students with no previous programming background will be required to take either CST 1101/CS 101 or EM 110 before CST 2403/CS 403. CST 1101/CS 101 is a prerequisite for all CST courses. EMT 1111/EM 111 is a prerequisite for all EM courses.

CST 1101/CS 101 and EMT 1111/EM 111 satisfy the BS degree requirements for Applied Mathematics and the BT degree requirements for Computer Systems Technology and Computer Engineering Technology respectively.

³ Students can satisfy the prerequisites for EMT 1250/EM 250 by either completing MAT 1440/MA 440 or by taking EMT 1111/EM 111, EMT 1130/EM 130 and EMT 1150/EM 150. The EM sequence of courses satisfies the AAS degree requirements in Electromechanical Engineering Technology and the BT degree requirements in Computer Engineering Technology.

⁴ See page 34 for detailed explanation of core required courses and categories.

Bachelor of Science in APPLIED MATHEMATICS

The Applied Mathematics program is designed for students with an interest in mathematics and real-world problem solving.

An applied mathematics degree is quite versatile, and graduates will have the skills needed to adapt to a rapidly changing work environment. Upon graduation students can begin careers in the financial, information, pharmaceutical and related industries. The program contains three options: Information Science, Financial Science and Science. Students must complete a set of common required courses, as well as one of the three sequences. A two-semester internship is also required, which is essential for finding employment.

COMMON COURSES FOR ALL APPLIED MATHEMATICS MAJORS:

REQUIRED COURSES		Credits
Mathematics Courses		
MAT 1440/MA 440	Discrete Structures and Algorithms I	3
MAT 1475/MA 475 ¹	Calculus I	4
MAT 1572/MA 572	Probability and Mathematical Statistics I	4
MAT 1575/MA 575	Calculus II	4
MAT 2580/MA 580	Introduction to Linear Algebra	3
MAT 2630/MA 630	Numerical Methods	3
MAT 2675/MA 675	Calculus III	4
MAT 3770/MA 770	Mathematical Modeling I-Optimization	3
MAT 4880/MA 880	Mathematical Modeling II-Dynamic	3
Subtotal		31
Internship		
MAT 4900/MA 900	Internship I	2
MAT 4901/MA 901	Internship II	2
Subtotal		4
Computer Science		
CST 2403/CS 403	Introductory C++ Language Programming I	3
CST 3503/CS 503	C++ Programming II	3
Subtotal		6

Applied Mathematics Electives-Select two for 6 credits

MAT 2540/MA 540	Discrete Structures and Algorithms II	3
MAT 2678/MA 678	Applied Mathematics: Algorithms	3
MAT 3777/MA 777	Applied Mathematics: Applications of the Wave Equations	3
MAT 3787/MA 787	Applied Mathematics: Finite Fields	3
MAT 3788/MA 788	Applications of the Heat Equation for Financial Mathematics	3
Subtotal		6

ADDITIONAL REQUIRED COURSES²

ENG 1101/EG 101	English Composition I	3
ENG 1121/EG 121	English Composition II	3
ENG 3700/EG 533	Advanced Technical Writing or	
SPE 1330/TS 330	Effective Speaking (or higher level TS course)	3
ECON 1101/EN 101	Macroeconomics	3
ECON 2301/EN 301	Money and Banking	3
LIT ²	Literature	3
BS ²	Behavioral Science	3
LAP ²	Aesthetics/Philosophy	6
Subtotal		27

TOTAL 74

CONCENTRATION IN INFORMATION SCIENCE (AIB)

Additional Telecommunications Courses

TCET 2101/TC 320	Analog and Digital Telephony	4
TCET 2242/TC 430	Microcomputer Interfacing	3
TCET 3102/TC 500	Digital and Data Communication	4
EET 1240/ET 212	Electronics	4
EET 12220/ET 242	Circuit Analysis II	5
EET 2140/ET 313	Communications Electronics	3
EET 2162/ET 382	Digital Electronics	3
Subtotal		26

Additional Computer Science

MSY 2307/MS 307	Local Area Networks	4
CST 3507/CS 507	Advanced Local Area Networks	3
Subtotal		7

Science

PHYS 1441/SC 441	Physics I	5
PHYS 1442/SC 442	Physics II	5
Subtotal		10
	Free elective	3

TOTAL FOR CONCENTRATION 46

CONCENTRATION IN FINANCIAL SCIENCE (AFB)

Additional Mathematics

MAT 1476L/MA 476	Calculus Laboratory	1
MAT 1490/MA 490	The Mathematics of Finance	3
MAT 2672/MA 672	Probability and Mathematical Statistics II	4
MAT 2680/MA 680	Differential Equations	3
MAT 3772/MA 772	Stochastic Models	3
MAT 4872/MA 872	Probability and Mathematical Statistics III	4

Subtotal 18

Additional Computer Science

CST 2304/CS 304	Database Programming	3
CST 3504/CS 504	Microcomputer Databases	3
CST 3603/CS 603	Object Oriented Programming	3
CST 3604/CS 604	Distributed Database	3
CS 550	Data Structures or	
CST 47034/CS 703	Unix Networking or	
CST 4704/CS 704	Data Warehousing	3

Subtotal 15

Science

PHYS 1441/SC 441	Physics I	5
PHYS 1442/SC 442	Physics II or	5
CHEM 1110/CH 110	Chemistry I	4
CHEM 1210/CH 210	Chemistry II	4

Subtotal 8 to 10

Free elective 3 to 5

TOTAL FOR CONCENTRATION 46

CONCENTRATION IN SCIENCE (ASB)

Additional Mathematics

MAT 1476L/MA 476L	Calculus Laboratory	1
MAT 2672/MA 672	Probability and Mathematical Statistics II	4
MAT 2680/MA 680	Differential Equations	3
MAT 3772/MA 772	Stochastic Models	3
MAT 4872/MA 872	Probability and Mathematical Statistics III	4

Subtotal 15

Science

CHEM 1110/CH 110	Chemistry I	4
CHEM 1210/CH 210	Chemistry II	4
CHEM 2223/CH 223	Organic Chemistry I	5
CHEM 2323/CH 323	Organic Chemistry II	5
BIO 2311/BY 301.1	Anatomy and Physiology I	4
BIO 2312/BY 301.2	Anatomy and Physiology II	4

Subtotal 26

Free elective 5

TOTAL FOR CONCENTRATION 46

TOTAL CREDITS REQUIRED FOR THE DEGREE 120

Concentration 1: (AIB) Applied Mathematics – Information Science

Graduates can work as analysts in the information industries with job titles that include data analyst, network engineer, and IT specialist. These analysts use computer-based mathematical models to optimize communication networks. The program includes hands on experience in designing telecommunication systems and the mathematical tools needed to analyze them.

Concentration 2: (AFB) Applied Mathematics – Financial Science

Job titles for graduates from this option include financial analyst, statistician, and quantitative programmer. Analysts in the financial industries use computer-based mathematical models to analyze securities (such as stocks) in order to project future prices and provide assessment of risk. They help businesses and individuals to make investment decisions. The curriculum places a heavy emphasis on statistics and on the computer programming skills needed in applications.

Concentration 3: (ASB) Applied Mathematics – Science

This concentration is designed for those interested in applying mathematics to medical and related industries. There is an emphasis on statistics, biology and chemistry. There are many options for graduates, including scientist, research analyst, scientific programmer, and statistician. The applications of mathematics in this industry include designing experiments to test drug safety and effectiveness, creating computer-based models of the spread of disease, and assessing the risks of different medical treatments.

Admission into the Program in Applied Mathematics

Students applying for admission must meet the college standards for admission into a baccalaureate program and must be eligible to enroll in MAT 1475/MA 475. Prospective transfer students should consult with the mathematics department at the earliest possible point to be certain that they gain maximum transfer credit and that they enter the program with the requisite background. Current City Tech students seeking to enter the program must secure the approval of the mathematics department to file a change of curriculum request with the Office of the Registrar. Students should be aware that the program requires a high level of math proficiency and that those unprepared for the rigorous course work may be obliged to complete prerequisites before beginning their upper-level course work in applied mathematics. This may add to the credits required for graduation.

The college will grant a bachelor of science degree in applied mathematics upon successful completion of the 120 credits of the degree requirements.

¹ Students without the necessary background for MAT 1475/MA 475 will be required to take prerequisite mathematics courses before they will be admitted to the program.

² See page 34 for detailed explanation of core required courses and categories.

Department of Mathematics

General Education Program Description

The Mathematics department seeks to provide students with the firm foundation in mathematics necessary for their careers as well as for today's increasingly technological society. It is the goal of the department to provide the student with an understanding of the methodology of mathematical thought.

The department offers a full range of courses, from non-credit courses for students whose mathematics preparation is insufficient for credit-level work, to courses designed for students in all degree programs at the College. Initial placement in mathematics courses is determined by the student's score on the CUNY mathematics placement test. All incoming and readmitted students must be certified in mathematics, as indicated by a passing score on the placement test. Students who are not certified must successfully complete MAT 0630/MA 063, MAT 0650/MA 065, or MAT 0670/MA 067 before enrolling in any other mathematics course.

All students are required to satisfy the mathematics component of the college's general education core curriculum. Students should consult the statement of requirements of their major department before selecting courses, since the mathematics requirements may vary from department to department. Note that these statements list only the minimum requirements in mathematics. Normally, students should enroll in the highest course for which they are eligible, as shown on their advisement forms. Students who have completed mathematics courses at other colleges should consult with their major department advisor or a Mathematics department advisor to see if they are eligible for transfer credit. This should be done before enrolling in any mathematics course.

In addition to the textbook(s), most mathematics courses require a scientific calculator. Some may also require a graphing calculator. Students who purchase calculators other than those recommended by the instructor are responsible for learning how to operate them on their own.

Some sections of various courses integrate the use of the computer into the curriculum. Students enrolled in these sections will have computers available in open computer labs or learning centers for use in the completion of assignments.

COURSES:

MAT 0630/MA 063
Elementary Algebra with Basic Mathematics Review
 7 cl hrs, 0 cr

Fundamentals of elementary algebra with an integrated review and reinforcement of arithmetic skills. Topics include the real number system, numerical evaluation, algebraic operations, algebraic and graphical solutions of one and two variable linear equations, word problems, algebraic fractions, quadratic equations, and the Pythagorean Theorem. For students with a limited knowledge of elementary algebra.

Prerequisite: New students: A score of 18 or less on the Algebra part of the CUNY Mathematics Placement Test; continuing students: R1 or withdrawal grade in MAT 0630/MA 063

MAT 0650/MA 065
Elementary Algebra
 5 cl hrs, 0 cr

Covers the same elementary algebra topics in MAT 0630/MA063 in fewer hours with less extensive review of arithmetic topics. For students with partial knowledge of elementary algebra.

Prerequisite: New students: A score of 26 or less on the Pre-Algebra part or a score from 19 to 26 on the Algebra part of the CUNY Mathematics Placement Test; continuing students: R2 in MAT 0630/MA 063 or non-passing grade in MAT 0650/MA 065

MAT 0670/MA 067
Elementary Algebra with Basic Mathematics Review
 2 cl hrs, 0 cr

A review of elementary algebra for students who came close to passing MAT 0630/MA063 or MAT 0650/MA 065. Offered during the intersession periods.

Prerequisite: Department approval required and recommendation of instructor in MAT 0630/MA 063 or MAT 0650/MA 065

MAT 1175/MA 175
Fundamentals of Mathematics*

4 cl hrs, 4 cr

Topics include linear and quadratic functions, intermediate algebra, plane geometry, and trigonometry of the right triangle.

Prerequisite: CUNY certification in math. Students who are not certified must first take and pass MAT 0630/MA 063 or MAT 0650/MA 065 or MAT 0670/MA 067.

MAT 1180/MA 180
Mathematical Concepts and Applications*

MATH Core

4 cl hrs, 4 cr

Topics are selected from algebra, geometry, graphs of functions, inequalities, probability, and statistics.

Prerequisite: CUNY certification in reading and mathematics. Students who are not CUNY certified must first take and pass MAT 0630/MA 063 or MAT 0650/MA 065 or MAT 0670/MA 067.

* Credit will not be given for both MAT 1175/MA 175 and MAT 1180/MA 180.

MAT 1272/MA 272
Statistics

MATH Core

3 cl hrs, 3 cr

An introduction to statistical methods and statistical inference. Topics include descriptive statistics, random variables, distributions, sampling, estimation and inference, t-tests, chi-square tests and correlation.

Prerequisite: MAT 1180/MA 180 or higher

MAT 1275/MA 275
Introduction to Mathematical Analysis

MATH Core

4 cl hrs, 4 cr

An intermediate and advanced algebra course. Topics include quadratic equations, systems of linear equations, exponential and logarithmic functions; topics from trigonometry including identities, equations and solutions of triangles.

Prerequisite: MAT 1175/MA 175 or for new students, a score of at least 27 on the Pre-Algebra part and of at least 40 on the Algebra part of the CUNY Mathematics Placement Test

MAT 1280/MA 280
Quantitative Mathematics
MATH Core

4 cl hrs, 4 cr

Topics include probability, statistics, mathematics of finance, matrices, linear programming and optimization.

Prerequisite: MAT 1180/MA 180

MAT 1372/MA 372
Statistics with Probability
MATH Core

2 cl hrs, 2 lab hrs, 3 cr

Topics include sample spaces and probabilities, discrete probability distributions (Binomial, Hypergeometric), expectation and variance, continuous probability distributions (Normal, Student, Chi-Square), confidence intervals, hypothesis testing, and correlation and regression. Spreadsheets are used throughout the semester.

Pre- or corequisite: MAT 1375/MA 375

MAT 1375/MA 375
Mathematical Analysis
MATH Core

4 cl hrs, 4 cr

A pre-calculus functions course including topics from advanced algebra and the theory of equations such as solutions of polynomial equations, DeMoivre's Theorem, Binomial Theorem, vectors, lines, conic sections and progressions. A graphing calculator is required.

Prerequisite: MAT 1275/MA 275 or for new students, a score of at least 50 on the Algebra part and of at least 36 on the College Algebra part and of at least 25 on the Trigonometry part of the CUNY Mathematics Placement Test

MAT 1376/MA 375.1
Mathematical Analysis with Laboratory
MATH Core

3 cl hrs, 2 lab hrs, 4 cr

A pre-calculus functions course including topics from advanced algebra and the theory of equations such as solutions of polynomial equations, DeMoivre's Theorem, Binomial Theorem, vectors, lines, conic sections and progressions. These topics are expanded and reinforced with the use of technology. A graphing calculator is required.

Prerequisite: MAT 1275/MA 275 or for new students, a score of at least 50 on the Algebra part and of at least 36 on the College Algebra

part and of at least 25 on the Trigonometry part of the CUNY Mathematics Placement Test

Note: MAT 1376/MA 375.1 satisfies the same degree requirements as MAT 1375/MA 375. Credit will not be given for both MAT 1375/MA 375 and MAT 1376/MA 375.1

MAT 1440/MA 440
Discrete Structures and Algorithms I
MATH Core

2 cl hrs, 2 lab hrs, 3 cr

This course introduces the foundations of discrete mathematics as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include functions, relations, sets, simple proof techniques, Boolean algebra, propositional logic, elementary number theory, writing, analyzing and testing algorithms.

Prerequisites: CST 2403/CS 403 and MAT 1375/MA 375

MAT 1475/MA 475
Calculus I
MATH Core

4 cl hrs, 4 cr

Topics include functions, limits, differentiation, tangent lines, Rolle's Theorem, the Mean Value Theorem, integration, and applications. (An honors section, designated MAT 1475/MA 475H, may be offered as demand indicates. The same material will be covered as in MAT 1475/MA 475 but from a more advanced perspective.)

Prerequisite: MAT 1375/MA 375 or MAT 1375/MA 375.1 or for new students, a score of at least 65 on the Algebra part and of at least 50 on the College Algebra part and of at least 36 on the Trigonometry part of the CUNY Mathematics Placement Test

MAT 1476L/MA 476L
Calculus Laboratory

2 lab hrs, 1 cr

Through computer projects, students will apply and reinforce concepts and skills learned in MAT 1475/MA 475.

Corequisite: MAT 1475/MA 475 or MAT 1575/MA 575. Not open to students who have completed MAT 1575/MA 575 or MAT 2630/MA 630 or who are currently enrolled in MAT 2630/MA 630

MAT 1490/MA 490
The Mathematics of Finance
MATH Core

3 cl hrs, 3 cr

The study of financial derivatives including options, futures and forward contracts and the mathematical models used to price them.

Prerequisites: ECON 1101/EN 101; pre- or corequisites: MAT 1475/MA 475, ECON 2301/EN 301, ECON 1401/EN 401

MAT 2540/MA 540
Discrete Structures and Algorithms II

2 cl hrs, 2 lab hrs, 3 cr

This course continues the discussion of discrete mathematical structures and algorithms introduced in MAT 1440/MA 440. Topics in the second course include predicate logic, recurrence relations, graphs, trees, digital logic, computational complexity and elementary computability.

Prerequisite: MAT 1440/MA 440; pre- or corequisite: CST 3503/CS 503

MAT 1572/MA 572
Probability and Mathematical Statistics I

4 cl hrs, 4 cr

The study of discrete and continuous probability distributions including the Binomial, Poisson, Hypergeometric, Exponential, Chi-Squared and Normal Distribution. Conditional distributions, covariance and correlation, confidence intervals, least square estimation, chi-square goodness of fit distribution and test for independence and randomness. Ends with an application to queuing.

Prerequisite: MAT 1475/MA 475

MAT 1575/MA 575
Calculus II
MATH Core

4 cl hrs, 4 cr

A continuation of MAT 1475/MA 475. Topics include further techniques of integration, derivatives and integrals of transcendental functions, polar and parametric equations.

Prerequisite: MAT 1475/MA 475

MAT 2580/MA 580
Introduction to Linear Algebra
MATH Core

3 cl hrs, 3 cr

An introductory course in Linear Algebra. Topics include vectors, vector spaces, systems of linear equations, linear transformations, properties of matrices, determinants, eigenvalues and eigenvectors.

Pre- or corequisite: MAT 1575/MA 575

MAT 2630/MA 630
Numerical Methods
MATH Core

3 cl hrs, 3 cr

An introduction to solving mathematical problems on the computer using a symbolic algebra program with applications drawn from science and engineering. Topics include roots of non-linear functions, interpolation, numerical differentiation, and numerical integration.

Prerequisites: CST 1101/CS 101, MAT 1575/MA 575, MAT 2580/MA 580

MAT 2672/MA 672
Probability and Mathematical Statistics II

4 cl hrs, 4 cr

The study of multivariate normal distribution, the distribution of transformed vectors and order statistics. Includes generating functions, t- and F- distributions, central limit theorem, hypothesis testing, multiple regression, statistical inference for regression, diagnostic testing and design of experiments.

Prerequisites: MAT 1572/MA 572, MAT 2580/MA 580

MAT 2675/MA 675
Calculus III
MATH Core

4 cl hrs, 4 cr

A continuation of MAT 1575/MA 575. Topics include improper integrals, series, vectors, solid analytic geometry, partial derivatives, and multiple integrals.

Prerequisite: MAT 1575/MA 575

MAT 2678/MA 678**Applied Mathematics: Algorithms**

3 cl hrs, 3 cr

An introduction to the analysis of the time complexity of sequential and parallel algorithms. Topics include: average complexity, lower bound theory, the greedy method, the divide and conquer paradigm, dynamic programming and probabilistic algorithms.

Prerequisites: MAT 1440/MA 440, MAT 2580/MA 580, CST 3503/CS 503

MAT 2680/MA 680**Differential Equations****MATH Core**

3 cl hrs, 3 cr

Topics include methods of solving ordinary differential equations and applications to various problems.

Prerequisite: MAT 1575/MA 575

MAT 3770/MA 770**Mathematical Modeling I - Optimization**

3 cl hrs, 3 cr

The study of different types of optimization problems arising in different fields of business and industry. Examples are provided on sensitivity analysis of parameters of a model and calculating shadow prices.

Prerequisites: MAT 2580/MA 580, MAT 2675/MA 675, CST 1101/CS 101

MAT 3772/MA 772**Stochastic Models**

3 cl hrs, 3 cr

The use of discrete and continuous distributions to construct deterministic and stochastic simulation models. Stochastic simulations may include Markov Processes, M/G/I Queuing Systems, Monte Carlo Simulation and Analytic Simulation.

Prerequisites: MAT 2672/MA 672, MAT 2675/MA 675, CST 2403/CS 403

MAT 3777/MA 777**Applied Mathematics: Applications of the Wave Equations**

3 cl hrs, 3 cr

The study of Laplace and Fourier transforms and their applications to analysis of continuous and discrete time signal processing. The sampling theorem and real-world digital-to-analog conversion.

Prerequisites: MAT 2580/MA 580, MAT 2675/MA 675

MAT 3787/MA 787**Applied Mathematics - Finite Fields**

3 cl hrs, 3 cr

The fundamentals of applied coding theory and various techniques in cryptography. Topics include: public-key cryptography, elliptic curves, digital signatures, error correcting codes and BCH codes.

Prerequisites: MAT 2580/MA 680, MAT 2675/MA 675, CST 2403/CS 403

MAT 3788/MA 788**Applications of the Heat Equation for Financial Mathematics**

3 cl hrs, 3 cr

Focuses on the Black-Scholes Model. Includes risk measures in a portfolio of financial assets: The Greek Letters and Value at Risk. Computer models will be used.

Prerequisites: MAT 2630/MA 630, MAT 1572/MA 572, MAT 2675/MA 675, CST 3503/CS 503

MAT 4872/MA 872**Probability and Mathematical Statistics III**

4 cl hrs, 4 cr

The study of exponential distribution and reliability and failure rates. Hypo- and Hyperexponential, Erland, Gamma and Weibull distributions. Expectation of multiple random variables and the computation of mean time failure. Transition probabilities and time birth-death process. Least squares curve fitting and analysis of variance.

Prerequisite: MAT 3772/MA 772

MAT 4880/MA 880**Mathematical Modeling II**

3 cl hrs, 3 cr

The study of continuous-time and discrete-time nonlinear dynamic models. Provides examples of chaotic behavior of solutions of some dynamic models.

Prerequisite: MAT 3770/MA 770

MAT 2899/MA 899.1**Independent Research Project - Computer Science AS Degree**

4 cl hrs, 2 cr

Students work with faculty to develop and complete a semester project for presentation.

Assignments include identifying and clearly stating a problem; writing a proposal on alternative ways to tackle the problem; estimating the time and materials needed to solve the problem; outlining a step by step procedure that can be used to solve the problem; writing the algorithms needed to solve the problem; proving the problem has been solved (or is impossible to solve); and testing the efficiency of the algorithm using inductive arguments. A final oral presentation will be required.

Prerequisites: MAT 2540/MA 540, MAT 2580/MA 580, CS 550 or CST 47034/CS 703 or CST 4704/CS 704 and EMT 1250/EM 250; *corequisite:* CET 3510/EM 510

MAT 4900/MA 900**Internship I**

120 field hrs, 2 cr

This is part 1 of a two-semester sequence. Students will complete 120 hours within an internship program in the financial or information industries. A student log/journal will be kept. The employer will make a final evaluation. It is expected that this evaluation will indicate that the student is eligible for MAT 4901/MA901. This course is graded pass/fail.

Prerequisite: MAT 3770/MA 770; *corequisite:* MAT 4880/MA 880

MAT 2900/MA 900**Internship - Computer Science AS Degree**

120 field hrs, 2 cr

Students will either find an employer who can employ his or her computer skills or a list of potential employers will be assigned to the students. The student's objective is to make a favorable impression with the employer and to identify and explain the job description. The student will keep a log/journal of each day's activities including objectives and progress towards those objectives. A faculty

supervisor and job supervisor will actively consult on the progress of the internship. The final grade will be based on the completeness and quality of the journal, the job supervisor's evaluation and the intern's ability to make a final oral presentation.

Prerequisites: MAT 2540/MA 540, MAT 2580/MA 580, CS 550 or CST 47034/CS 703 or CST 4704/CS 704 and EMT 1250/EM 250; *corequisite:* CET 3510/EM 510

MAT 4901/MA 901**Internship II**

120 field hrs, 2 cr

This is part 2 of a two-semester sequence. Students will complete 120 hours, in addition to MAT 4900/MA 900, within an internship program in the financial or information industries. The employer's evaluation, the student's log/journal and a written report will determine the course grade. A letter grade will be given for the course.

Prerequisite: MAT 4900/MA 900; *co-requisite:* ENG 3700/EG 533