FACULTY

DEAN
Lanny C. Morley

PROFESSORS
Wayne P. Bailey, Robert Cacioppo, Ruthie Dare-Halma, Kevin Easley, John V. Erhart, Martin J. Erickson, Suren Fernando, James M. Guffey, Eric Howard, Ronald A. Knight, John Neitzke, Steven J. Smith, Shingmin Wang

ASSOCIATE PROFESSORS
Michael J. Adams, K. Scott Alberts, Jon Beck, Jay Belanger, Nancy Bissey, David Garth, Alan Garvey, Todd Hammond, Hyun-Joo Kim, Susan LaGrassa, Samuel Lesseig, Jason E. Miller, Pam Ryan, Philip Ryan, Carol Thatcher, Scott Thatcher, Anthony M. Vazzana, Dana R. Vazzana

ASSISTANT PROFESSORS
Don Bindner, Dean De Cock

INSTRUCTORS
Donna J. Bailey

DEGREES OFFERED

Bachelor of Science, BS
Bachelor of Arts, BA

At Truman State University, the professional teaching degree is the Masters of Arts in Education, built upon a strong liberal arts and sciences undergraduate degree. Students who wish to become teachers should consult with their academic advisors as early as possible. The professional preparation component of the Master's degree program is administered in the Division of Education. Please contact that office for further information (660-785-4383).

UNDERGRADUATE MAJORS

Computer Science
Mathematics

THE COMPUTER SCIENCE MAJOR

The goal of the bachelor's degree program in Computer Science is to educate a graduate with a broad intellectual base, well-developed interpersonal, analytical and problem-solving skills, and a mastery of the appropriate elements of the discipline of Computer Science. Graduates should be well-qualified for advanced study in strong graduate programs or employment in a professional career requiring extensive preparation in computer science.

THE DEGREE PROGRAM
The major requirements for the BS degree program for Computer Science majors follow the curriculum recommendations of the Association for Computing Machinery. In addition to the university's Liberal Studies Program, the major requires support in the form of a substantial mathematics foundation including two semesters of calculus, linear or matrix algebra, statistics, and at least one semester of General Chemistry or General Physics. Courses in ethics and logic are strongly recommended in the Liberal Studies Program.

The major program consists of a core of courses followed by five elective courses. The core begins with a three-course sequence which includes a high level language (Ada) and stresses the theoretical foundations of computing. Additional languages, computer architecture, and data structures comprise the remainder of the core. The program requires five elective courses selected from three categories and approved by a faculty advisor to allow the student to develop expertise according to his/her interests.

A freshman seminar introduces the students to faculty in the major and gives them immediate exposure to and experience on both the mainframe and microcomputer systems. The seminar also gives freshmen opportunities for interaction with fellow majors. Graduating Computer Science majors take a senior seminar to assist their transition from undergraduate study to graduate study or the work force. The senior seminar includes a review for exit exams, résumé writing and job search techniques. A capstone experience is also required of Computer Science majors giving them the opportunity to integrate the areas of knowledge acquired in the major.

ENRICHMENT OPPORTUNITIES
Several opportunities are available in the division to promote the development of leadership skills and to become

involved in learning communities. A student chapter of the Association for Computing Machinery, a national professional society for computer scientists, affords opportunities for Computer Science majors to hear from professionals in the field of computing and to get acquainted with peers and faculty outside classroom settings. Student teams participate in programming competitions to test their capabilities. They also assist in holding such contests for high school students.

A second student organization, Truman State Linux Users Group, provides support and activities for students and faculty who use the Linux operating system.

Many students gain valuable experience and provide needed service to faculty and students by working as supervisors in the computer lab while others assist faculty as graders or tutors for courses. Some undertake special projects directed by faculty. Those who have attained junior status are encouraged to seek internships to acquire experience which may prove valuable in obtaining a position upon graduation. Interaction with peers and faculty helps the student develop confidence in his or her ability to succeed in the next stage of a career in computer science.

DEPARTMENTAL HONORS IN COMPUTER SCIENCE

Honors in Computer Science may be earned by:

1. Maintaining an overall grade point average of 3.5,
2. Maintaining a major grade point average of 3.5,
3. Scoring at or above the 80th percentile on the senior exam,
4. Demonstrating excellence in scholarship by producing a scholarly paper or project, and
5. Receiving the approval of a majority of the regular faculty in Computer Science.

COMPUTER SCIENCE

BACHELOR OF SCIENCE

			Semester Hours
Liberal Studies Program Requirements			**.32-57**
Missouri Statute Requirement			**.1-3**
Required Support			**.5-17**
MATH	198	Analytic Geometry and Calculus I**	
MATH	263	Analytic Geometry and Calculus II	
STAT	290	Statistics**	
CHEM	120	Chemical Principles I** **OR**	
PHYS	195	Physics with Calculus I** **OR**	
BIOL	107	Introductory Biology I**	

**May be used to fulfill Liberal Studies Program Requirements

Bachelor of Science Requirements			**.6-8**
MATH	357	Linear Algebra **OR**	
MATH	285	Matrix Algebra	

One additional course from the following list:

MATH	200	Foundations of Mathematics
MATH	264	Analytic Geometry and Calculus III
CHEM	121	Chemical Principles II with Inorganic Chemistry
PHYS	196	Physics with Calculus II
BIOL	108	Introductory Biology II
BIOL	200	Cell Biology
BIOL	300	Genetics

Any MATH course numbered 300 or above
Any STAT course numbered 300 or above

MAJOR REQUIREMENTS

FOUNDATIONS

CS	100	Computer Science Seminar	.1
CS	180	Foundations of Computer Science I	.3
CS	185	Foundations of Computer Science II	.3
CS	285	Foundations of Computer Science III	.3
CS	310	Data Structures and Algorithms	.3
CS	330	Computer Architecture and Organization	.3

LANGUAGE SUPPORT

CS	250	Systems Programming	.3
CS	260	Object-Oriented Programming	.3

ADVANCED COURSES*

Area A: Choose two courses from the following list 6

CS	315	Internet Programming
CS	360	Systems Analysis and Design
CS	370	Software Engineering
CS	430	Database Systems

Area B: Choose one course from the following list 3

CS	390	Operating Systems
CS	420	Compilers
CS	435	Parallel and Distributed Processing
CS	470	Networks and Teleprocessing

Area C: Choose two courses from the following list: 6

CS	380	Programming Languages
CS	420	Compilers
CS	430	Database Systems
CS	435	Parallel and Distributed Processing
CS	460	Computer Graphics
CS	480	Artificial Intelligence
CS	490	Automata Theory and Formal Languages

***Note:** A course cannot be used to fulfill the requirements for more than one of Areas A, B or C above.

SENIOR SEMINAR

CS	495	Senior Computer Science Seminar	.1

Capstone Experience (See Below)

Electives to Total **124**

Computer Science majors should elect to take MATH 198 Analytic Geometry and Calculus I as the Mathematics requirement in the Liberal Studies Program. Either CHEM 120 Chemical Principles I or PHYS 195 Physics with Calculus I should be taken as partial fulfillment of the Scientific: Physical Science Mode of Inquiry.

Transfer students majoring in Computer Science must complete at least 18 semester hours in the major at Truman. This coursework must include 15 semester hours at the 300 level or higher.

Capstone Experience for Computer Science

Each senior shall present to the Computer Science faculty for acceptance a project demonstrating the ability to work independently and to integrate the knowledge gained in the major. It is anticipated that most students will present a substantial software development project, which could take diverse forms. No project undertaken as part of a course taken for credit in the major will be accepted.

Avenues which are acceptable include:

- ✦ An internship
- ✦ A readings class (CS 485, 2-3 hours) undertaken with a Computer Science faculty member.

- ✦ With prior approval, a project directed by a faculty member in another discipline
- ✦ With prior approval, a project for an employer, or as a volunteer, or for a faculty member at KCOM.

Each capstone experience shall be supervised by a Computer Science faculty member who will monitor progress and provide direction as needed.

THE MATHEMATICS MAJOR

The mission of the mathematics program is to develop and maintain an active community of students and faculty whose common pursuit is the learning and teaching of mathematics in a liberal arts and sciences environment. This community encourages the view and use of mathematics both as a universal logical language and as a mode of inquiry. The mathematical mode of inquiry requires studying assumptions critically, reasoning logically, evaluating objectively, and arriving at sound conclusions. The goal of the bachelor's degree program is to provide each graduate with the foundation needed to pursue a professional career in mathematics through advanced study or employment. Graduates should be well-qualified to enter strong graduate programs to prepare for teaching, research, or other professional employment. The major includes an extensive core of traditional and contemporary courses capped by four elective courses which enable a student to develop a concentration which prepares them for a career in statistics, pure, applied, or computational mathematics, or mathematics education.

THE DEGREE PROGRAM

The program of study for a major in mathematics is based on the University's Liberal Studies Program and includes a substantial component of science, including a year sequence in either General Chemistry or General Physics. Mathematics majors gain computer programming expertise through at least one computer science course. The major requirements are based upon a core of classical and contemporary mathematics courses which follow recommendations of the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America. At least one course in Statistics is required. Finally, majors build upon the required core with four elective courses, chosen with the approval of their advisor, to develop a concentration compatible with their interests and career goals. Beginning freshmen take a seminar which provides an opportunity for career exploration and interaction with faculty and other mathematics majors. A senior seminar facilitates the transition from undergraduate to graduate school or to a first position in the work force. Review for senior exit exams and résumé writing are included in the senior seminar. As a graduation requirement Mathematics majors complete a capstone experience which provides an opportunity for them to study independently an area of mathematics and to synthesize and communicate the results obtained.

ENRICHMENT OPPORTUNITIES

Several activities are available to encourage interaction among faculty and students and promote the development of learning communities. Problem-solving groups meet with faculty to sharpen and challenge their skills and prepare for regional and national competitions such as the Mathematical Modeling contest and the Putnam Exam. The groups also attempt to solve problems posed in professional journals, thereby gaining insight and experience in the methods and techniques used by research mathematicians.

Student organizations, such as Kappa Mu Epsilon, a student chapter of the Mathematical Association of America, and Mathematics Students for Secondary Education provide opportunities for students to learn more about careers, to develop leadership skills, and to hear from professionals engaged in careers in mathematics. Students may obtain credit and research experience by participating for a summer or a semester in established research programs for undergraduates available at several national laboratories or universities.

The Division of Mathematics and Computer Science holds a regular colloquium series featuring presentations about exciting developments in mathematics and the mathematical sciences. The talks are given by faculty from the division or other divisions, visiting faculty, and, on occasion, students. The talks may cover new areas of mathematical research, uses of mathematics in the "real world," or aspects of mathematical culture. Students may find that the talks give them ideas for possible capstone or other undergraduate projects. The talks are also a great way to learn about the faculty members' scholarly activities.

Opportunities to develop expertise in communicating mathematics are available to students through jobs as departmental tutors and as instructors of non-credit algebra courses. Many also serve as grader/assistants to faculty. These opportunities for faculty-student interaction provide valuable service to faculty and experience for students.

DEPARTMENTAL HONORS IN MATHEMATICS

Honors in mathematics may be earned by
1. Maintaining an overall grade point average of 3.5,
2. Maintaining a major grade point average of 3.5,
3. Scoring at or above the 80th percentile on the MFAT in mathematics,
4. Demonstrating excellence in scholarship with a scholarly paper or project, or by an exemplary showing on an approved Mathematics competition.
5. Receiving the approval of a majority of the non-abstaining faculty in Mathematics.

MATHEMATICS

BACHELOR OF SCIENCE (OR)
BACHELOR OF ARTS

			Semester Hours
Liberal Studies Program Requirements			**32-57**
Missouri Statute Requirement			**1-3**
Required Support			**15-16**
A. CS	180	Foundations of Computer Science I	
B. STAT	290	Statistics	
C. MATH	198	Analytic Geometry and Calculus I	
D. One of the following list:			
PHYS	195	Physics with Calculus I	
CHEM	120	Chemical Principles I	

Note: Courses listed in B through D which have been approved for Liberal Studies Program requirements may be counted in both areas.

Bachelor of Arts Requirement	**0-6**

Intermediate proficiency in ONE foreign language
OR

MATHEMATICS AND COMPUTER SCIENCE

Bachelor of Science Requirement 6
Complete six hours from the following areas. These courses **MAY NOT** be used to fulfill a requirement in the Liberal Studies Program or in A through D above:

1. Courses designated CS, BIOL, CHEM, or PHYS which fulfill a major requirement for a bachelor's degree in that major.
2. Statistics

STAT	374	Statistical Quality Control
STAT	375	ANOVA/Experimental Design
STAT	376	Nonparametric Statistics/Sampling
STAT	378	Linear Regression/Time Series

3. Philosophy

PHRE	342	Symbolic Logic
PHRE	382	Philosophy of Mathematics

4. Natural Sciences

NASC	400	History of Science to 1700
NASC	401	History of Science since 1700

5. Economics

ECON	300	Intermediate Microeconomics
ECON	303	Intermediate Macroeconomics
ECON	304	Mathematical Economics
ECON	373	Econometrics

MAJOR REQUIREMENTS 37-38
Required Mathematics Courses 22-23

MATH	101	Freshman Seminar 1
MATH	263	Analytic Geometry and Calculus II 5
MATH	264	Analytic Geometry and Calculus III 3
MATH	200	Foundations of Mathematics 3
MATH	357	Linear Algebra 3
MATH	451	Algebraic Structures I 3
MATH	461	Advanced Calculus I 3
MATH	498	Senior Seminar 1

Capstone Experience 0-1

Mathematics Electives 15
(See Elective Mathematics Courses Section)
Capstone Experience (see below)

Electives to Total 124

Note: Most mathematics courses having a prerequisite mathematics course require a grade of "C" or higher in that course. Students should check prerequisites in the course descriptions.

Students seeking Missouri teacher certification as a secondary mathematics teacher should select MATH 363 College Geometry in order to meet Missouri certification requirements and MATH 455 History of Mathematics I or MATH 456 History of Mathematics II for entry into the MAE program.

ELECTIVE MATHEMATICS COURSES
Choose courses totaling 15 credit hours from the following lists with at least one course from List A:

List A

MATH	363	College Geometry
MATH	440	Topology
MATH	447	Combinatorial Analysis
MATH	452	Algebraic Structures II
MATH	454	Theory of Numbers
MATH	462	Advanced Calculus II
MATH	465	Differential Geometry
MATH	467	Logic and Set Theory
MATH	515	Complex Variables I
STAT	570	Mathematical Probability and Statistics I

List B

MATH	300	Introduction to Numerical Analysis
MATH	325	Introduction to Operations Research
MATH	330	Mathematics of Finance
MATH	345	Introduction to Mathematical Biology
MATH	347	Discrete Mathematics
MATH	364	Vector Analysis
MATH	365	Ordinary Differential Equations
MATH	400	Methods of Optimization
MATH	455	History of Mathematics I
MATH	456	History of Mathematics II
MATH	464	Higher Geometry
MATH	511	Numerical Analysis
MATH	521	Partial Differential Equations
MATH	530	Topics in Mathematical Modeling
MATH	564	Advanced Linear Algebra
STAT	571	Mathematical Probability and Statistics II

Courses offered under the numbers MATH 473, MATH 488, MATH 489, MATH 503, STAT 486, and STAT 487 may substitute for List B with the approval of the mathematics faculty.

Mathematics majors may substitute at most one course from another discipline for a course in List B. Such a course must be at the 300 level or above, contain a strong mathematical component, and be approved by the mathematics faculty. A list of approved courses may be obtained in the Division Office of the Mathematics and Computer Science.

Transfer students majoring in Mathematics must complete 18 semester hours in the major at Truman. This coursework must include 15 semester hours at the 300 level or higher.

CAPSTONE EXPERIENCE FOR MATHEMATICS
Each student pursuing a bachelors degree in mathematics is required to complete a project demonstrating his/her ability to study independently some area of mathematics. The project will include a written report and an accompanying public presentation. Each project should be of such a nature that all three of the following criteria are satisfied:

1. The student should learn some mathematics outside the classroom setting.
2. The student should synthesize material obtained from different sources.
3. The student should clearly communicate, orally and in writing, what he or she has learned.

Students are responsible for choosing a project and a supervisor. The project must be approved by the supervisor and by the Undergraduate Committee.

Three months prior to graduation, the student's written report, approved by his/her supervisor should be submitted to the Undergraduate Committee. Upon committee approval, the supervisor will arrange the public presentation. Information about acceptable types of projects will be available in the division office.

NOTE: Students who double-major in Mathematics and another discipline are allowed to meet the Capstone Integrating Experience requirement in the other discipline provided it requires a Capstone Integrating Experience.

MINORS OFFERED

Students are encouraged to pursue study in an academic minor to provide contrasting and parallel study to the major. Serving to complement the major and help students further expand and integrate knowledge, academic minors are offered in a variety of disciplinary and interdisciplinary subjects. Students who choose to pursue minors should seek advice from faculty members in their minor disciplines as well as from their advisors in their major program.

Minimum requirements for all Academic Minor Programs:

1. A minimum GPA of 2.0 for all coursework within the Academic Minor Program.
2. A minimum of nine credit hours of the coursework for Academic Minor Programs must be taken through Truman State University, unless the discipline specifies a greater number of hours at Truman.

COMPUTER SCIENCE MINOR

The Computer Science Minor requires the successful completion of 18 semester hours of the following courses or their equivalents, at least 9 of which must be taken at Truman State University:

Required Courses:

CS	180	Foundations of Computer Science I	3
CS	185	Foundations of Computer Science II	3
CS	310	Data Structures	3

Elective Courses:

Additional 9 semester hours from CS courses numbered 250 or above with at most 3 hours in the following language courses:

CS	250	Systems Programming	3
CS	260	Object Oriented Programming	3
CS	275	Computer Science Language Lab	2

MATHEMATICS MINOR

The Mathematics Minor requires the successful completion of the following 15 semester hours of coursework.

Required Course:

MATH	264	Analytic Geometry and Calculus III	3
Mathematics Electives			12

The Mathematics Electives must consist of twelve hours. Any course listed as a required course for the Mathematics Major or in List A or List B as an elective may be used for the Minor except that MATH 101 Freshman Seminar and MATH 263 Analytic Geometry and Calculus II may not be counted. No course from another discipline may be substituted for the Mathematics Minor. Special topics courses taken under the numbers MATH 473, MATH 488, MATH 489, MATH 503, STAT 486, and STAT 487 may be used if approved by the Mathematics Faculty.

STATISTICAL METHODS MINOR

The Statistical Methods Minor requires the successful completion of the following courses or equivalent:

A. (4-5 hours)*

MATH	192	Essentials of Calculus **OR**	
MATH	198	Analytic Geometry and Calculus I	4-5

B. (3 hours)*

MATH	285	Matrix Algebra **OR**	
MATH	357	Linear Algebra	3

C. (9 hours)

Choose three of the following four courses:

STAT	374	Statistical Quality Control	3
STAT	375	ANOVA/Experimental Design	3
STAT	376	Nonparametric Statistics/Sampling	3
STAT	378	Linear Regression/Time Series	3

D. (3-6 hours)**

Choose one course from the list below:

BIOL	502	Biometry	3
BSAD	352	Production and Operations Management	3
BSAD	360	Marketing Research	3
ECON	373	Econometrics	3
ES	247	Data Interpretation in Exercise Science **AND**	
ES	270	Research Methods in Exercise Science	2
HLTH	334	Physiological Assessment **AND**	
HLTH	367	Introduction to Epidemiology	6
PSYC	466	Psychological Research	3
NU	410	Introduction to Nursing Research	3

One additional course from list C

*Courses in this minor may double count for major requirements, as well as any part of the LSP

**Statistical courses at the 300-level or above may be substituted for the section D requirement of the Statistical Methods Minor with approval of the mathematics faculty. Courses from section D may have limited or no enrollment for non-majors in that area.

STATISTICS MINOR

The Statistics Minor will require the successful completion of the following coursework or their equivalent:

A. Required Courses (12 hours)*

STAT	290	Statistics	3
MATH	285	Matrix Algebra **OR**	
MATH	357	Linear Algebra	3
STAT	570	Mathematical Probability and Statistics I	3
STAT	571	Mathematical Probability and Statistics II	3

B. Choose one from the list below (3 hours)**

STAT	374	Statistical Quality Control	3
STAT	375	ANOVA/Experimental Design	3
STAT	376	Nonparametric Statistics/Sampling	3
STAT	378	Linear Regression/Time Series	3

*Courses in this minor may double count for major requirements, as well as any part of the LSP

**Statistical courses at the 300-level or above may be substituted for the section B requirement of the Statistics Minor with approval of the mathematics faculty.

MATHEMATICS REQUIREMENTS

All students who seek the Bachelor's degree at Truman must successfully complete the Essential Skills requirement in Elementary Functions and the Mode of Inquiry requirement in Mathematics, as specified in the Liberal Studies Program.

The Elementary Functions requirement may be satisfied by a) successfully completing Elementary Functions (MATH 186), b) successfully completing both College Algebra (MATH 156) and Plane Trigonometry (MATH 157), or c) sufficient performance on the Elementary Functions

Essential Skills Place-Out Examination (not to be confused with the self-administered placement test sent to incoming students). The Elementary Functions Place-Out Examination is administered by the Mathematics and Computer Science Division in the first week of the Fall Semester and at other times as need indicates. Please contact the Mathematics and Computer Science Division Office (VH2100, x4547) to arrange a time to take the Place-Out test. Students who have been placed by the Mathematics and Computer Science Division into a calculus course will satisfy the Elementary Functions requirement by d) successful completion of that course.

The Mode of Inquiry requirement in Mathematics may be satisfied by successfully completing any of Truman's calculus courses: Essentials of Calculus (MATH 192), Liberal Arts and Sciences Calculus (MATH 194), or Analytic Geometry and Calculus I (MATH 198). One of these courses may be specifically required for a certain degree program. For example, MATH 198 is required for majors in Mathematics, Science, and Computer Science and for the BS in Economics, whereas Business majors and the BA in Economics students may choose either MATH 198 or MATH 192. The goals and approaches of these courses differ. For example, MATH 194 may be highly conceptual, MATH 198 may be more algebraic, MATH 192 may have a stronger emphasis on modeling. The most appropriate course will depend on the individual student. One should not conclude that any single course is "harder" or "easier" for all students.

Note that a calculus course is only available to students who have a) demonstrated sufficient performance in the classes meeting the Essential Skills requirement in Mathematics, b) demonstrated sufficient performance on the Elementary Functions Essential Skills Place-Out Examination, or c) been placed into that course by the Mathematics and Computer Science Division according to the procedure outlined below. Students cannot “waive” the prerequisites to the calculus courses.

Mathematics Placement
The Mathematics and Computer Science Division determines what mathematics courses may or may not be appropriate for incoming students on the basis of a variety of factors, including the courses taken in high school, the level of success in those courses, the two scores on the mathematics placement exam, and the scores and sub scores on the ACT. A student who feels that he or she was under placed can demonstrate achievement using the Elementary Functions Place-Out test.

COURSE DESCRIPTIONS

Students who do not meet prerequisites for a course can request permission to take a course by meeting with the faculty member teaching the course, who in turn will recommend to the Dean that the student be enrolled in the class if appropriate.

COMPUTER SCIENCE

CS 100 — Computer Science Seminar
1 hour
Orientation to the university experience and the computer science program. Introduction to mainframe and microcomputing systems and applications. Discussion of academic and career planning.

CS 120 — Computer Literacy
3 hours
An overview of computer technologies and services with an emphasis on integrating information from a variety of sources into an appropriate type of end product. Includes a discussion of the practical, social, and ethical implications of the information age.

CS 180 — Foundations of Computer Science I
3 hours
An introduction to Computer Science and programming. Discussion of the algorithmic approach to problem solving and the use of a high-level language to design and implement problem solution. Includes a one-hour lab.

CS 185 — Foundations of Computer Science II
3 hours
An introduction to the foundations of the discipline of Computer Science, integrating discrete mathematics with the study of abstraction, recursion, algorithms, machine organization, and data structures. Prerequisite: CS 180.

CS 250 — Systems Programming
3 hours
An introduction to systems level programming utilizing both assembly and highlevel languages. Prerequisite: CS 185.

CS 260 — Object-Oriented Programming
3 hours
An introduction to object oriented programming. Discussion of the basic elements of object-oriented analysis and design. Prequisiste: CS 185.

CS 275 — Computer Science Language Lab
2 hours
An independent study course whereby students may investigate a programming language not offered elsewhere in the curriculum. May be repeated for up to four semester hours of credit with the consent of the instructor.

CS 284 — Introductory Topics in Computer Science
1-3 hours
Introductory topics in Computer Science.

CS 285 — Foundations of Computer Science III
3 hours
A continuation of CS 185. Topics include automata theory, language theory, and multitasking. Prerequisites: CS 185.

CS 290 — Exploratory Readings in Computer Science
1-3 hours
A course whereby students may pursue topics in Computer Science not normally included in the curriculum with the approval of their advisor and the supervision of a faculty member.

CS 310 — Data Structures and Algorithms
3 hours
A continuation of the study of abstract data types and their implementations in a high-level language. Topics include lists, trees, priority queues, and graphs as well as efficient searching and sorting algorithms. Prerequisite: CS 185. NOTE: General Honors Course.

CS 315 — Internet Programming
3 hours
Teaches programming concepts that are particularly relevant to building large applications for the World Wide Web. This is primarily a programming course, so significant programming experience is required. Possible topics include: HTML, Perl, Javascript, Java applets, servlets, Java Server pages, and XML. Prerequisite: CS 260.

CS 330 — Computer Architecture and Organization
3 hours
An introduction to the levels of hardware and software in a computer system. Topics include digital logic, addressing, primary and secondary storage, microcode, interrupts, and alternate architectures. Prerequisite: CS 250.

CS 360 — Systems Analysis and Design
3 hours
Tools and techniques of systems analysis and design. Team projects involve the development of systems specification documentation. Prerequisite: junior status.

CS 370 — Software Engineering
3 hours
The study of software life cycles, development methodology process improvement, and project management, with emphasis on an engineering approach to the software development process. Relies on a project-based approach for applying software engineering principles. Prerequisites: CS 310 and junior status.

CS 380 — Programming Languages
3 hours
Formal language concepts, and structures of algorithmic languages. A study of the variety of programming languages and techniques used to reason about programming. Prerequisite: CS 310.

CS 390 — Operating Systems
3 hours
A survey of the characteristics of current popular computer operating systems as well as a detailed examination of the functions that operating systems perform and how those functions may be performed. Prerequisite: CS 330.

CS 420 — Compilers
3 hours
Principles of compiler design, including structure of compilers, lexical analysis, parsing, type analysis, code generation, and optimization. Prerequisite: CS 250, CS 310 and CS 285.

CS 430 — Database Systems
3 hours
Fundamentals of current design approaches in database systems, including extensive work with a commercially available system. Prerequisite: junior status.

CS 435 — Parallel and Distributed Processing
3 hours
An introduction to parallel and distributed processing and programming concepts and techniques. Course content will include discussions of different types of parallel and distributed machines and machine models, data parallelism, the design and analysis of parallel algorithms, and the development of parallel programs. Prerequisites: CS 310 and CS 330.

CS 460 — Computer Graphics
3 hours
An introduction to basic topics including graph plotting, windows, viewports and clipping, graphics hardware and software, interactive devices and techniques, polygons and geometric transformations, projections, modeling and object hierarchy, hidden surfaces, shading models, ray tracing, and intensity and color. Prerequisites: CS 250, CS 310 and MATH 285 or MATH 357. NOTE: General Honors Course.

CS 470 — Computer Networks
3 hours
An introduction to current computer communication technology including protocol structures and overview of physical media usage. Additional topics include privacy, security, data representation, and data compression. Prerequisite: junior status.

CS 471 — Internship in Computer Science
4-12 hours
Professional work experience in business and industry. The level of computer projects and involvement must be approved by the Division of Mathematics and Computer Science prior to enrollment. Grade will be pass/fail only. Prerequisite: Junior/Senior Computer Science Major with a 2.75 GPA.

CS 472 — Analysis and Evaluation of Internship
1-3 hours
Evaluation of internship experience by the campus director and the supervisors of the organization sponsoring the internship. Documentation may be required. Grade will be pass/fail only. Prerequisite: Junior/Senior Computer Science Major with a 2.75 GPA.

CS 480 — Artificial Intelligence
3 hours
Overview of some basic concepts of artificial intelligence. Designed to give insight into areas of active research and application. Programming in a language commonly used for artificial intelligence applications. Typical topics covered include expert systems, knowledge engineering, learning, natural language understanding, symbolic computation, automated reasoning, and neural networks. Prerequisite: senior status. NOTE: General Honors Course.

CS 484 — Topics in Computer Science
1-3 hours
Selected topics in computer science. May be repeated for credit up to 6 hours.

CS 485 — Undergraduate Readings in Computer Science
1-3 hours
A course whereby students may pursue topics in computer science not normally included in the curriculum with the approval and supervision of their advisor.

CS 490 — Automata Theory and Formal Languages
3 hours
Finite Automata, regular and context free grammars, the pumping theorem, Turing machines, undecidability, LR grammars, complexity theory, NP-completeness. Prerequisite: CS 285. NOTE: General Honors Course.

CS 495 — Senior Computer Science Seminar
1 hour
Topics designed to aid preparation for employment, graduate study, and life as a computer science professional.

MATHEMATICS

MATH 101 — Freshman Seminar
1 hour
Orientation to the university experience and foundations for the study of mathematics, emphasis on academic planning, goal-setting, and problem-solving.

MATH 156 — College Algebra
3 hours
A review and study of algebraic topics including equations and inequalities, algebraic, exponential, and logarithmic functions, stystems of equations and inequalities. Emphasis will be placed on application and review of skills. A student who has earned credit in MATH 186 may subsequently enroll in MATH 156 and/or MATH 157, counting all grades in grade point averages, but receiving only 3 credit hours toward graduation. *MATH 156 & 157 satisfy the Elementary Functions Essential Skills requirement in the Liberal Studies Program (3 credit hours maximum).* Prerequisites: placement based on sufficiently strong high school background and score on the Mathematics Placement Exam. This is not a course designed to introduce algebra to students for the first time.

MATH 157 — Plane Trigonometry
2 hours
The essentials of trigonometry with some applications. Practical skills, problem solving and computational skills will be emphasized. A student who has earned credit in MATH 186 may subsequently enroll in MATH 156 and/or MATH 157, counting all grades in grade point averages, but receiving only 3 credit hours toward graduation. *MATH 156 & 157 satisfy the Elementary Functions Essential Skills requirement in the Liberal Studies Program (3 credit hours maximum).* Prerequisites: Grade of "C" or better in MATH 156 or placement based on sufficiently strong high school background and score on the Mathematics Placement Exam.

MATH 186 — Elementary Functions
3 hours
A study of the fundamental concept of a function with emphasis on algebraic, trigonometric, exponential, and logarithmic functions. Provides basic algebra skills as well as experience with mathematical reasoning in a variety of applications that demonstrate the prevalence of elementary functions in the world around us. Prepares students for more advanced mathematics courses such as basic statistics, calculus, and other mathematical mode of inquiry courses. *Satisfies the Elementary Functions Essential Skills requirement in the Liberal Studies Program.* Prerequisites: sufficiently strong high school background and score on the Mathematics Placement Exam.

MATH 192 — Essentials of Calculus
4 hours
An intuitive approach to differential and integral calculus. Prerequisites: Completion of the Elementary Functions Essential Skills requirement, placement based on sufficiently strong high school background and score on the Mathematics Placement Exam, or sufficient score on the Elementary Functions Essential Skills Place-Out Test. A student who has completed MATH 198 may subsequently enroll in MATH 192, counting both grades in grade point average, but receiving credit toward graduation only for MATH 192.

MATH 194 — LAS Calculus
3 hours
An introduction to fundamental concepts of calculus. The emphasis will be on gaining an intuitive understanding of fundamental concepts through the construction of mathematical models of real-world phenomena and of the historical role of calculus in the development of our modern view of the physical universe. This course does not substitute for MATH 192 or MATH 198. Prerequisites: Completion of the Elementary Functions Essential Skills requirement, placement based on sufficiently strong high school background and score on the Mathematics Placement Exam, or sufficient score on the Elementary Functions Essential Skills Place-Out Test.

MATH 198 — Analytic Geometry and Calculus I
5 hours
Functions, limits, continuity, derivatives, definite integrals, exponentials, logarithms, and applications. Prerequisites: Completion of the Elementary Functions Essential Skills requirement, placement based on sufficiently strong high school background and score on the Mathematics Placement Exam, or sufficient score on the Elementary Functions Essential Skills Place-Out Test.

MATH 200 — Foundations of Mathematics
3 hours
A transition from lower-level computational courses to upper-level proof-based courses. Emphasis will be placed on reading and writing formal mathematical proofs in a variety of mathematical systems. Prerequisites: Grade of "C" or better in MATH 198. NOTE: General Honors Course.

MATH 225 — Matrix Theory and Multi-variable Calculus
3 hours
Systems of equations and matrix theory; topics in integration; partial derivatives, optimization of functions of several variables. Examples to be drawn from business and economics. MATH 225 may not be taken for credit after successfully completing MATH 264 or MATH 285.

MATH 240 — Concrete Behavioral Foundations of Mathematics
3 hours
The foundations and structure of number systems, emphasis on the whole numbers, the integers, the nonnegative rational numbers, and finite number systems, as well as informal geometry. This course does not satisfy Liberal Studies Program requirements in Mathematics. Prerequisite: MATH 186 or (MATH 156 and MATH 157) or (MATH 192, MATH 194, or MATH 198).

MATH 263 — Analytic Geometry and Calculus II
5 hours
Transcendental functions, techniques and applications of integration, improper integrals, infinite series, topics from analytic geometry, polar coordinates, vectors and vector valued functions. Prerequisite: Grade of "C" or better in MATH 198. NOTE: General Honors Course if degree program does not specifically list this course as a requirement for graduation.

MATH 264 — Analytic Geometry and Calculus III
3 hours
Partial differentiation, multiple integration, topics in vector calculus, and differential equations. Prerequisite: Grade of "C" or better in MATH 263. NOTE: General Honors Course if degree program does not specifically list this course as a requirement for graduation.

MATH 275 — Finite Mathematics
3 hours
Set theory and counting techniques, finite probability, matrix algebra, linear programming, and decision-making applications. Prerequisite: MATH 186 or the equivalent.

MATH 285 — Matrix Algebra
3 hours
An introduction to matrices and computational linear algebra, with applications drawn from the Social Sciences, the Physical Sciences, Mathematics and Business Administration. A student who has completed MATH 357 may subsequently enroll in MATH 285, counting both grades in grade point average, but receiving credit toward graduation only for MATH 285. Prerequisite: Grade of "C" or better in MATH 186.

MATH 288 — Topics in Mathematics
3 hours
Selected topics in Mathematics. May be repeated for credit up to 6 hours.

MATH 300 — Introduction to Numerical Analysis
3 hours
Tools and techniques for the numerical solution of mathematical problems. Topics include description and implementation of algorithms on the computer, floating-point arithmetic, error analysis, root-finding, interpolation, numerical integration, and Gaussian elimination for linear systems of equations. Prerequisites: Grade of "C" or better in MATH 285 or MATH 357, grade of "C" or better in MATH 263 (note: MATH 264 highly recommended), and ability to use some programming language. NOTE: General Honors Course.

MATH 325 — Introduction to Operations Research
3 hours
Simulation, inventory, and queuing problems, PERT, game theory, and decision theory. Forecasting and writing computer programs. Prerequisites: Grade of "C" or better in MATH 263, STAT 290 (MATH 264 is highly recommended.) NOTE: General Honors Course.

MATH 330 — Mathematics of Finance
3 hours
An introduction to the basic measures of interest, annuities, discounted cash flow analysis, and their applications. This course is intended to help students prepare for an actuarial exam covering the theory of interest. Prerequisite: MATH 263.

MATH 345 — Introduction to Mathematical Biology
3 hours
Students will study papers drawn from research literature in which mathematics is used to model biological systems, encompassing the molecular level to the community level of organization. Topics from matrix algebra, differential equations, discrete mathematics, probability and statistics will be introduced and developed through lectures, readings, and a computer lab. Data will be drawn from a variety of sources, including student laboratory experiments, research papers, and scientific databases. The course meets for two hours of lectures and two hours of biology/computer lab each week. Cross-listed as BIOL 345, this course will be team-taught by a biologist and a mathematician. Prerequisites: MATH 198 and (BIOL 100 or BIOL 107) with grades of C or better.

MATH 347 — Discrete Mathematics
3 hours
A proof-based introduction to discrete mathematics. Topics will be selected from each of the following areas: enumeration; recursion; incidence structures; theory of computation. Prerequisite: MATH 200. NOTE: General Honors Course.

MATH 357 — Linear Algebra
3 hours
Systems of linear equations, linear mappings, matrices, determinants, quadratic forms, and geometric applications. Prerequisite: Grade of "C" or better in MATH 200. NOTE: General Honors Course.

MATH 363 — College Geometry
3 hours
Selected material from finite geometry, transformations, convexity, projective geometry, geometric topology, and other topics from modern college geometry. Prerequisite: Grade of "C" or better in MATH 200. NOTE: General Honors Course.

MATH 364 — Vector Analysis
3 hours
An introduction to vector algebra and vector calculus. Prerequisite: Grade of "C" or better in MATH 264. NOTE: General Honors Course.

MATH 365 — Ordinary Differential Equations
3 hours
Solving ordinary differential equations. Includes the general linear differential equation with constant coefficients, introduction to the Laplace transform theory, and application to physical problems. Prerequisite: Grade of "C" or better in MATH 264. NOTE: General Honors Course.

MATH 400 — Methods of Optimization
3 hours
A study of optimization techniques applied to industrial and economic problems. The course will cover linear programming, search techniques, integer programming, nonlinear programming, and additional topics. Prerequisites: Grade of "C" or better in MATH 263 and MATH 357 (or MATH 285). (MATH 264 is highly recommended.) NOTE: General Honors Course.

MATH 440 — Topology
3 hours
An undergraduate introduction to topology. Topics may be chosen by the instructor from point set topology, the fundamental group and covering spaces, manifold theory, deRham's theorem, and the Riemannian geometry of surfaces. NOTE: General Honors Course.

MATH 447 — Combinatorial Analysis
3 hours
An introduction to the theory and techniques of discrete enumeration, combinatorial designs, and existence theorems with applications drawn from computer science, the physical sciences, information theory, electrical engineering, and various areas of mathematics. Prerequisite: Grade of "C" or better in MATH 347. NOTE: General Honors Course.

MATH 451 — Algebraic Structures I
3 hours
An introduction to integral domains, groups, rings, fields, and Boolean algebra. Prerequisite: Grade of "C" or better in MATH 200; and MATH 357. NOTE: General Honors Course.

MATH 452 — Algebraic Structures II
3 hours
Sylow's theorems, polynomial rings, modules, Galois Theory, and other advanced topics in algebra. Prerequisite: MATH 367 or MATH 451. NOTE: General Honors Course.

MATH 454 — Theory of Numbers
3 hours
Numerical systems, divisibility properties of the integers, prime numbers, congruences, Diophantine problems. Prerequisite: Grade of "C" or better in MATH 200. NOTE: General Honors Course.

MATH 455 — History of Mathematics I
3 hours
A study of the growth of mathematical thought from antiquity through the Sixteenth Century. NOTE: General Honors Course.

MATH 456 — History of Mathematics II
3 hours
A study of mathematical thought from the beginning of the Seventeenth Century into the Twentieth Century. NOTE: General Honors Course.

MATH 461 — Advanced Calculus
3 hours
A rigorous development of one-variable calculus, series and uniform convergence. Prerequisites: Grade of "C" or better in MATH 200, MATH 264, and MATH 357. NOTE: General Honors Course.

MATH 462 — Advanced Calculus II
3 hours
A continuation of MATH 461 covering topics chosen by the instructor. Possible topics include multivariable calculus, the inverse function theorem, the implicit function theorem, integration of differential forms, Lebesgue integration and the theorems of Gauss, Green, and Stokes. Prerequisite: MATH 461. NOTE: General Honors Course.

MATH 464 — Higher Geometry
3 hours
Selected studies from Euclidean, non-Euclidean, and projective geometry by analytic and synthetic methods. Prerequisite: Grade of "C" or better in MATH 363. NOTE: General Honors Course.

MATH 465 — Differential Geometry
3 hours
Geometry of curves and surfaces, Serret-Frenet frame of a space curve, normal and Gaussian curvatures, Gauss-Bonnet formula, and fundamental equations. Prerequisite: Grade of "C" or better in MATH 357. NOTE: General Honors Course.

MATH 467 — Logic and Set Theory
3 hours
First order logic, consistency, the completeness theorem. Recursive functions. An introduction to axiomatic set theory including ordinal and cardinal arithmetic and the axiom of choice. Prerequisite: MATH 367 or MATH 451. NOTE: General Honors Course.

MATH 473 — Undergraduate Research
9-12 hours
Participation in an established undergraduate research program for students at the junior or senior level. Program and number of credit hours must be approved by the Division of Mathematics and Computer Science prior to enrollment. A written paper and oral presentation to the faculty will be required and graded on a pass/fail basis only. Credit hours will be divided equally between mathematics and free electives. Prerequisite: Acceptance into an established undergraduate research program and GPA of at least 3.0.

MATH 488 — Topics in Mathematics
1-3 hours
Selected topics in mathematics. May be repeated for credit up to 6 hours. Prerequisite: Approval of instructor. NOTE: General Honors Course only if taken as 3 credit hours.

MATH 489 — Undergraduate Readings in Mathematics
1-3 hours
Advanced independent study in topics from undergraduate mathematics courses. May be repeated for credit up to 6 semester hours. NOTE: General Honors Course only if taken as 3 credit hours.

MATH 497 — Capstone Seminar
1 hour
This seminar for math majors completing their Mathematics Capstone project provides students with guidance in the areas of researching, writing, and presenting their Capstone topic. Dicussions will focus on and be motivated by the work each student is concurrently engaged in with their Capstone supervisor. Prerequisite: Mathematics major.

MATH 498 — Senior Seminar
1 hour
Special topics to prepare for graduate study or employment; includes preparation for senior exams, graduate school opportunities, career opportunities, and the role of an alumnus/a. Prerequisite: Senior standing.

MATH 502 — Topics in Mathematics Education: Technology
3 hours
The use of technology in teaching high school mathematics. Emphasis on curricular issues, assessment, and methods of instruction. NOTE: General Honors Course.

MATH 503 — Topics in Mathematics
1-3 hours
Selected topics in mathematics. May be repeated for credit up to 6 hours. Prerequisite: Approval of instructor. NOTE: General Honors Course only if taken as 3 credit hours.

MATH 511 — Numerical Analysis
3 hours
The propagation of errors in computing, solution of linear systems of equations, solution of nonlinear equations, approximation of functions, numerical quadrature, numerical solution of ordinary differential equations. Prerequisite: MATH 300. NOTE: General Honors Course.

MATH 515 — Complex Variables I
3 hours
An introduction to complex variables including sequences, series, continuity, analytic functions, Cauchy's Theorems, residues, poles, conformal mapping, and analytic continuation. Prerequisite: MATH 461. NOTE: General Honors Course.

MATH 521 — Partial Differential Equations
3 hours
Includes linear and quasi-linear equations, series solutions, Cauchy-Kovalevsky theorem, characteristics, canonical form, principle of superposition, and mathematical physics equations. Prerequisite: MATH 365. NOTE: General Honors Course.

MATH 530 — Topics in Mathematical Modeling
3 hours
Selected topics in mathematical modeling. Prerequisite: MATH 365 and MATH 461. NOTE: General Honors Course.

MATH 561 — Mathematical Analysis I
3 hours
Real numbers, topological properties of sets, sequences, and series. Multivariable functions including continuity, limits, etc. Prerequisites: MATH 461. NOTE: General Honors Course.

MATH 562 — Mathematical Analysis II
3 hours
Partial differentiation, implicit functions, transformations. The theory of measure and integration. Fourier series and differential equations. Prerequisite: MATH 561. NOTE: General Honors Course.

MATH 564 — Advanced Linear Algebra
3 hours
Vector spaces, linear transformation, linear functionals, eigenvalues, reduced forms of systems of equations, selected application of linear algebra. Prerequisite: MATH 357. NOTE: General Honors Course.

STATISTICS

STAT 190 — Basic Statistics
3 hours
An introduction to descriptive and inferential statistics with practical applications. Prerequisite: satisfactory completion of the essential skills requirement in mathematics. A student who has completed STAT 290 may subsequently enroll in STAT 190, counting both grades in grade point average, but receiving credit toward graduation only for STAT 190.

STAT 286 — Introductory Readings in Statistics
1-3 hours
Introductory independent study in topics from undergraduate statistics courses.

STAT 290 — Statistics
3 hours
An introduction to descriptive and inferential statistics with practical applications and an introduction to probabilty including both discrete and continuous models. Prerequisite: Grade of C or better in MATH 263. NOTE: General Honors Course.

STAT 374 — Statistical Quality Control
3 hours
An introduction to statistical quality control including control charts, process performance, and total quality management. Prerequisite: STAT 190 or STAT 290.

STAT 375 — ANOVA/Experimental Design
3 hours
Statistical inference for variances and for more than two means including one-way and multifactor analysis of variance and other experimental designs. Prerequisite: STAT 190 or STAT 290.

STAT 376 — Nonparametric Statistics/Sampling
3 hours
Sampling and non-parametric statistical techniques. Prerequisite: STAT 190 or STAT 290.

STAT 378 — Linear Regression/Time Series
3 hours
Simple and multiple linear regression, correlation, and time series. Prerequisite: STAT 190 or STAT 290.

STAT 486 — Undergraduate Reading in Statistics
1-3 hours
Advanced independent study in topics from undergraduate statistics courses. May be repeated for credit up to 6 semester hours.

STAT 487 — Topics in Statistics
1-3 hours
Selected topics in statistics. May be repeated for credit up to 6 hours.

STAT 570 — Mathematical Probability and Statistics I
3 hours
Mathematical development of discrete and continuous distributions, expected values, moments, and measures of dispersion. Prerequisite: STAT 290. NOTE: General Honors Course.

STAT 571 — Mathematical Probability and Statistics II
3 hours
Large and small sampling theory, correction analysis, tests of hypotheses, and other aspects of statistical inference. Prerequisite: STAT 570. NOTE: General Honors Course.

FACULTY CREDENTIALS

Note: Date in parentheses indicates year of employment at Truman. *Indicates graduate faculty.

Michael Adams
Associate Professor of Mathematics
BS, University of Nebraska–Lincoln; MS, Ohio State University; PhD, University of Wyoming. (1997)

K. Scott Alberts
Associate Professor of Mathematics
BA, BMus, Oberlin College; MS, PhD, Northwestern University. (2000)

Donna J. Bailey
Instructor in Mathematics; Coordinator of Freshman Mathematics
BSE, MA, Northeast Missouri State University. (1983)

Wayne P. Bailey
Professor of Computer Science
BS, BSE, Northeast Missouri State University; MS, PhD, University of Missouri-Rolla. (1980)

Jon Beck
Associate Professor of Computer Science
BS, George Washington University; MS, Hood College; PhD, West Virginia University. (1993)

Jay P. Belanger
Associate Professor of Mathematics*
BS, University of Michigan; MA, PhD, Princeton University. (1993)

Donald J. Bindner
Visiting Assistant Professor of Mathematics; Mathematics and Computer Science Computing Support
BS, Truman State University; Graduate Study, University of Georgia. (1998)

Nancy Wood Bissey
Associate Professor of Mathematics
BSE, Northeast Missouri State University; MA, Colorado State University; PhD, University of Missouri-Columbia. (1983)

Robert Cacioppo
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BA, BS, University of Missouri-St. Louis; MS, University of Illinois at Urbana-Champaign; PhD, University of Iowa. (1987)

Ruthie Dare-Halma
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BS, BSE, Northeast Missouri State University; MS, PhD, University of Missouri-Rolla. (1984)

Dean De Cock
Assistant Professor of Mathematics
BS, Iowa State University; MS. University of Iowa; PhD, Iowa State University. (2001)

Kevin Easley
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BA, Loras College; PhD, Southern Illinois University; Graduate Study, California State University-San Luis Obispo. (1970)

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BS, Fort Hays Kansas State College; MS, Kansas State University; Graduate Study, Southern Illinois University, Kent State University. (1963)

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Lanny C. Morley
Dean, Division of Mathematics and Computer Science and Professor of Mathematics*
BSE, MA, Northeast Missouri State University; MA, University of Illinois; PhD, University of Missouri-Columbia. (1970)

John Neitzke
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Carol Thatcher
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