

studies requirements completed at least concurrently. Offered each semester.

407 Senior Seminar: Small Business Planning (3)

By preparing a comprehensive business plan, students sharpen their understanding of management, integrate strategic thinking with operational constraints, and explore the role of small business in the American economy. Emphasis is on synthesizing knowledge and skills gained in previous courses. Prerequisite: senior status, MBE 301, 316, 322, 400 and all other general studies requirements completed at least concurrently. Offered each semester.

408 Senior Seminar: Comparative Economic Systems (3) (I)

Students engage in an in-depth, integrated study of the development and functioning of the American economic system compared with that of other countries. Prerequisite: senior status, MBE 301, 316, 322, 400 and all other general studies requirements completed at least concurrently. Offered each semester.

414 Internship Exploration & Design (3)

Designed to educate the student (who hopes to take MBE 416/417 the following semester) in how to find, design, and maximize independent learning in an internship. A major outcome is the negotiation of a learning plan agreement with a sponsoring organization. Prerequisites: LAMP major with a B (3.0 GPA) or better, English Proficiency Exam passed, all required major and general studies courses completed at least by the end of the semester in which this course is taken, a minimum 50-page autobiography completed during the summer and ready for submission at the first class; application to be made no later than early registration in the previous spring semester. Offered each fall.

416 Management Internship (12)

Students implement their work-and-learning agreement devised in MBE 414 for full-time placement (16 weeks or a minimum of 600 total hours) as a pre-professional in their sponsoring organization, where they gain practical experience in the application of previously acquired knowledge and managerial skills. Students self-evaluate and are evaluated by their organizational supervisor. Pass/fail grading. Prerequisite: MBE 414; must co-register with MBE 417. Offered each spring.

417 Internship Seminar (3) (I)

Offered concurrently with the internship. Intended to enhance academic learning and to provide integration of general studies knowledge (particularly that of ethical analysis and action) and management theory and principles with the experiential learning undertaken in MBE 416. Involves weekly written reports, oral reports, readings in texts and internship-related periodicals, and a major integrative paper as the culminating academic experience. Prerequisite: MBE 414; must co-register with MBE 416. Offered each spring.

490 Independent Study in Management (1-6)

Designed to allow students to undertake an experience-based project and/or to do specific reading, research, and report writing on a topic in management not covered through the regular curriculum. To be taken only upon approval of a supervising professor within the department. Applications must be made no later than the end of the preceding semester. Credit: one–three semester hours per semester; may be repeated for up to a maximum of six semester hours. Offered on demand, but preferably during the summer.

491 Independent Integrated Study in Management (3)

Has the same design purpose and application procedure as MBE 490, but with the further requirements that (1) it must be taken for three semester hours, and (2) the enrolled student must bring synthesis to the particular area of study (and the process of learning) chosen. This synthesis will be a paper putting the particular study into the context of historical perspective, world-view or paradigm perspective, the technological (empirical) perspective (including communications) and its consequences for the cultural or institutional system. Offered on demand, but preferably during the summer.

**MATHEMATICS/
COMPUTER SCIENCE**

MRS. KATHY R. AMES, (adjunct)
 DR. LYDIA KENNEDY
 DR. J. PATRICK LANG
 MR. STANFORD C. PEARSON
 DR. MARGARET REESE
 DR. Z. JOHN WANG
 MS. DENISE POCTA WILKINSON, Program Coordinator

Mission Statement

To think mathematically and to understand the role mathematics plays in human enterprise are characteristics of liberally educated people. Mathematics contributes two of the seven original liberal arts. Its inherent beauty, its search for pattern, form and irrefutable truth, and its ability to provide a language through which the natural world can be described are examples of its power. Mathematics, always a practical and useful art, beckons as well as a path toward freedom of thought.

The mission of the Mathematics/Computer Science department is to provide an opportunity for all students to gain computational dexterity, to understand the value of mathematics as a human and social endeavor, and to develop the power of mathematical reasoning, while promoting the rigorous reasoning skills that allow students to investigate the interplay between the abstract and the concrete. The mission of the department with respect to computer science is to provide basic instruction in end-user skills for all students and in-depth instruction in theory and

applications for both mathematics and computer science majors. One goal of the department with respect to the education department is to enable our students to pass required PRAXIS exams related to mathematics.

The department has two majors: Mathematics and Computer Science. Within each, students may choose between a theoretical emphasis or one which is more applied. Students are encouraged to take advanced courses in both mathematics and computer science.

A requirement for both mathematics and computer science majors is the Junior Comprehensive Exam (JCE). The goal of the JCE is to ensure that VWC mathematics and computer science majors can exhibit competency in the following areas: basic differential and integral calculus of a single variable; matrix algebra and the fundamental concepts of vector spaces; and the programming language C++.

The department, in conjunction with the VWC Education Department, has created four-year programs which meet the Virginia Standards of Education 2000 for teaching certification at the primary, middle school and secondary levels.

Major Requirements: Mathematics

COURSE NUMBER AND TITLE	SEM. HRS.
MATH/CS 205 Discrete Mathematics	3
MATH 171, MATH 172, MATH 271 Calculus I, II, & III	9
MATH 303 Multivariable Calculus	3
MATH 307 Linear Algebra	3
MATH 317 Introduction to Algebraic Structures (Satisfies oral competency requirement for mathematics majors.)	3
MATH 323 Introduction to Real Analysis	3
CS 207 Computer Programming I	3
PHYS 221 & PHYS 222 Physics	8
12 hours from the following, with at least 6 hours at the 300/400 level: MATH 226 Introduction to Statistical Modeling MATH 315 Ordinary Differential Equations MATH 316 Probability MATH 340 Modern Geometries MATH/CS 350 Numerical Methods	

MATH 418 Advanced Algebraic Structures MATH 424 Advanced Real Analysis MATH 480 Advanced Seminar CS 212 Computer Programming II CS 311 Data Structures CS 310 Introduction to Computer Systems CS 380 Programming Languages CS 430 Database Management Systems Design CS 440 Operating Systems CS 480 Advanced Topics in Computer Science	12
Junior Comprehensive Exam	
TOTAL	47
REQUIRED FOR SECONDARY EDUCATION CERTIFICATION	
MATH 226 Introduction To Statistical Modeling	3
MATH 340 Geometry	3
MATH 300 Teaching Assistants' Program Membership in TCTM as junior or senior	1
Pass PRAXIS II	
TOTAL FOR SECONDARY EDUCATION CERTIFICATION	48-53
REQUIRED MATH COURSES FOR MIDDLE SCHOOL CERTIFICATION	
MATH 104 Algebra and its Applications OR MATH 105 College Algebra	3
MATH 106 Statistics	3
MATH 113 Precalculus	3
MATH 125 Principles of Mathematics	3
MATH 171 Calculus I	3
MATH 172 Calculus II	3

See continuation of choices next page

Chart continued from previous page

MATH 205 Discrete Mathematics	3
MATH 300 Teaching Assistantship	1
A 2.0 GPA average is required for all of the mathematics courses listed above.	
Membership to TCTM as junior or senior.	
Also recommended: MATH 307 Linear Algebra CS 110 Introduction to Programming with visual in BASIC	0-9
TOTAL	22-31

Major Requirements: Computer Science

COURSE NUMBER AND TITLE	SEM. HRS.
CS 202 Introduction to OOP and Java	3
MATH/CS 205 Discrete Mathematics <i>(Satisfies oral competency requirement for computer science major)</i>	3
CS 207 and 212 Computer Programming I & II	6
CS 311 Data Structures	3
CS 310 Introduction to Computer Systems <i>(Satisfied oral competency requirement for CS majors)</i>	3
MATH 171 Calculus I	3
MATH 172 Calculus II	3
MATH 307 Linear Algebra	3
PHY 221 Physics	4
12 semester hours at the 300/400 level such as: MATH 316 Probability MATH/CS 350 Numerical Methods* CS 380 Programming Languages CS 430 Database Management Systems Design	12

CS 440 Operating Systems CS 480 Advanced Topics in Computer Science <i>*Suggested for graduate studies in math or computer science.</i>	
Junior Comprehensive Exam	
TOTAL	43

***Currently the Commonwealth of Virginia does not offer a secondary endorsement area in computer science. However, a student who majors in computer science may choose to seek secondary certification in mathematics by following the requirements for the mathematics major.*

Minor Requirements: Mathematics

COURSE NUMBER AND TITLE (See p. 31 for general minor requirements)	SEM. HRS.
MATH 307 Linear Algebra	3
MATH 171 Calculus I	3
MATH 172 Calculus II	3
Two of the following: MATH 303 Multivariable Calculus MATH 315 Ordinary Differential Equations MATH 316 Probability MATH 317 Introduction to Algebraic Structures MATH 323 Introduction to Real Analysis MATH/CS 350 Numerical Methods MATH 418 Advanced Algebraic Structures MATH 424 Advanced Real Analysis MATH 480 Advanced Seminar	6
One additional from above or from the following: CS 110 Introduction to Programming with visual in BASIC CS 207 Computer Programming I	3
TOTAL	18

Minor Requirements: Computer Science

COURSE NUMBER AND TITLE (See p. 31 for general minor requirements)	SEM. HRS.
CS 202 Introduction to Object-Oriented Programming and Java	3
CS 207 Computer Programming I	3
CS 212 Computer Programming II	3
MATH/CS 205 Discrete Mathematics	3
MATH 171 Calculus	3
Two of the following: CS 310 Introduction to Computer Systems MATH/CS 350 Numerical Methods CS 311 Data Structures CS 380 Programming Languages CS 430 Database Management Systems Design CS 440 Operating Systems CS 480 Advanced Topics in Computer Science	6
TOTAL	21

COMPUTER SCIENCE COURSES (CS)**100 Computer Concepts and Applications (3)**

In this survey of computer concepts and applications, topics include the historical development and future of the computer, applications software including word processors, spreadsheets, database, and presentation software; web page development and programming using HTML; and the social concerns that have arisen with the widespread use of the computer. It is strongly suggested that students with no prior computer experience take CS 100 before taking other CS courses. Prerequisite: MATH 105 placement or consent. Offered each semester.

110 Introduction to Programming with Visual BASIC (3)

The Visual BASIC programming language is used in this introductory programming course. Topics include the program development process, structured programming, data types, assignment, selection, looping, subroutines, one-dimensional arrays, files, and random numbers. This course does not count toward a degree in mathematics nor

in computer science/mathematics. Prerequisite: MATH 105 (grade of C- or better) or placement. Offered on demand.

202 Introduction to Object-Oriented Programming and Java (3)

Introduces the basic concepts and techniques to Object-Oriented Programming (OOP) with Java. Topics include OOP concepts, data types, syntax, control/loop structures and objects. Students use OOP to solve practical problems and develop the potential to learn other OOP languages. Prerequisite: grade of C or better in MATH 113 or consent. Offered each fall.

205 Discrete Mathematics (3)

Identical to MATH 205.

207 Computer Programming I (3)

The C++ language is introduced and used for all programs. Topics include the program development process, structured programming, data types, assignment, selection, looping, functions, files, and arrays. Prerequisite: MATH 113, or placement into MATH 171. Offered each fall.

212 Computer Programming II (3)

A continuation of CS 207, topics include advanced programming design in user-defined data types, arrays, structures, pointers, array-based lists, binary searching, recursion, and introduction to object-oriented programming techniques. Prerequisite: CS 207 or consent. Offered each spring.

310 Introduction to Computer Systems (3)

The basic concepts of computer organization and assembly language are introduced. Specific topics include CPU and memory organization, machine language, addressing techniques, macros, program segmentation and linkage, and assembler construction. This course satisfies the oral competency requirement for computer science majors. Prerequisites: MATH 171 and CS 212, or consent. Offered fall of odd-numbered years.

311 Data Structures (3)

An introduction to commonly used computer data structuring techniques. Topics include abstract data types, classes, queues, stacks, linked lists, algorithm analysis, sorting, searching, tree and graph. Prerequisites: MATH 171 and CS 212, or consent. Offered fall of even-numbered years.

350 Numerical Methods (3)

Identical to MATH 350.

380 Programming Languages (3)

Beginning with a study of the historical development of programming languages, students are introduced to the decisions involved in the design and implementation of

such programming language features as elementary, structured, and user-defined data types, subprograms, sequence control, data control and storage management. Selected features of several existing languages are examined in the context of these issues. Prerequisites: CS 212 or consent. Offered on demand.

411 Introduction to Algorithms (3)

Introduces the fundamental computer algorithms, their performance analysis and the basic technique to design algorithms. Topics include the standard algorithms and performance analysis for search and sorting, advanced data structures, graph theory, and algebraic computations. Students have the capability to design algorithms for solving various computational problems. Prerequisite: CS 311 and MATH 172 or consent. Offered on demand.

430 Database Management Systems Design (3)

Emphasizes the concepts and structures necessary to design and implement database systems using a relational database management system. Various database management system architectures, illustrating hierarchical, network, and relational models are discussed. Physical data storage techniques, file security, data integrity, and data normalization are also explored. Prerequisite: CS 212 or consent. Offered on demand.

440 Operating Systems (3)

The principles of operating systems are introduced with an emphasis on intrasystem communication. The concepts and techniques necessary for understanding and designing these systems are examined. Topics include I/O and interrupt structure, concurrent processes, process scheduling, and memory management and protection. Prerequisite: CS 212 or consent. CS 310 is recommended. Offered on demand.

480 Advanced Topics in Computer Science (3)

An in-depth study of an area of advanced computer science. The specific content varies according to the interests of students and the instructor. May be repeated for credit as the topic varies. Prerequisites: CS 212 and consent.

MATHEMATICS COURSES (MATH)

001 Computational Math (0)*

Basic arithmetic computational skills are developed in this non-credit class that allows students to strengthen their understanding of fundamentals in preparation for the course Algebraic Preliminaries. In particular, students with very low mathematics placement scores must complete this course with a grade of C- or better before attempting MATH 005. Topics include: operations with fractions, decimals (with calculators), ratio and proportion, percents, metric system, statistics, geometry, operations on whole and signed numbers, and algebraic translations. Traditional grading only. **While students receive no credit from this course, the course grade does count toward their overall grade point average (as if this were a three-semester hour course).* Offered on demand.

005 Algebraic Preliminaries (0)*

Basic computational and algebraic skills are developed in this non-credit class that allows students to strengthen their understanding of fundamentals in preparation for courses that involve more difficult quantitative concepts. In particular, students with very low mathematics placement scores must complete this course with a grade of C- or better before attempting MATH 104 or 105. Topics include: operations on whole and signed numbers, fractions, decimals, exponents, variables, linear equations, and elementary problem solving. Traditional grading only. **While students receive no credit from this course, the course grade does count toward their overall grade point average (as if this were a three-semester-hour course).* Prerequisite: MATH 001 (grade of C- or better), placement or consent. Offered each semester.

104 Algebra and its Applications (3)

Constructed to provide a choice for students who must fulfill the general studies requirement for math but do not need an in-depth treatment of algebra as a prerequisite for further course work such as might be encountered in MATH 113 and MATH 125. This course introduces students to modern and pertinent applications of algebra and other mathematical processes. While the emphasis in content is on the utility of algebra instead of algebra itself, an understanding of and skill with the rudiments of algebraic techniques is a prerequisite. Topics include percentages and ratios, functions and graphs, linear and quadratic functions, descriptive statistics and probability, exponentials and logarithms, and right triangle trigonometry. Prerequisite: MATH 005 (grade of C- or better), placement or consent. Does not provide sufficient preparation for Math 113. Must have a TI-83 or TI-84 graphing calculator. Offered each semester.

105 Algebra (3)

Prepares students for any course which uses algebra. Topics include variables, word problems, exponents, factoring, rational and radical expressions, linear equations in one or two variables, quadratic expressions, and functions. Prerequisites: MATH 005 (grade of C- or better), placement or consent. Must have a TI-83 or TI-84 graphing calculator. Offered each semester.

106 Statistics (3)

Introduces students in the behavioral, social, and natural sciences to the basic statistical tools required to analyze experimental data. Topics include frequency distributions, graphing techniques, measures of central tendency and dispersion, the normal distribution, point estimation, hypothesis testing and confidence intervals. Prerequisites: MATH 104 or MATH 105, placement, or consent. Must have a TI-83 or TI-84 graphing calculator. Offered each spring.

113 Precalculus Mathematics (3)

Prepares students for calculus. Topics include linear and quadratic equations, factoring, exponents, inequalities, functions and their graphs, basic trigonometry, and

logarithmic and exponential functions. Graphing calculators are used extensively in this course. Prerequisites: MATH 105 (grade of C- or better), placement, or consent. Offered each semester.

125 Principles of Mathematics (3)

Introductory treatment of the nature of mathematical knowledge, history of mathematics, geometry, elementary number theory, and basic trigonometry. Prerequisites: placement (equivalent to the current MATH 113 placement), MATH 104 or MATH 105 (grade of C- or better). Offered each semester.

171 Calculus I (3)

Calculus is the mathematical language used to describe changing and accumulating quantities. It consists of computational and graphical tools for analyzing the relationships between such quantities. In this course, we learn the basic tools of calculus, why they work, and how to apply them in various contexts. Calculus I develops the differential calculus through symbolic, graphical and numerical approaches. Topics include differentiation of algebraic and transcendental functions, applications in modeling and optimization, and the Fundamental Theorem of calculus. Graphing calculator required. Prerequisites: Math 113 (grade of C- or better), placement, or consent. Offered each fall.

172 Calculus II (3)

A continuation of Calculus I. In this course, more advanced techniques are studied and used to solve quantitative problems in various contexts. Topics include integration techniques, applications of definite integration, differential equations and sequences and series. Graphing calculator required. Prerequisite: Math 171. Offered each spring.

205 Discrete Mathematics (3)

Discrete mathematics is the analysis of finite step-by-step processes. It develops reasoning skills, enhances software-writing abilities and introduces elementary computer circuitry. Topics include Boolean algebra, digital logic circuits, the nature of valid argument, mathematical induction, recursive sequences, and counting techniques, including combinatorics methods. Many class examples will be drawn from computer science. Prerequisites: MATH 113, MATH 171 placement, or consent. Identical to CS 205. Offered spring of odd-numbered years.

226 Introduction to Statistical Modeling (3)

An introductory course in applied data analysis. Emphasis will be on interpretation of statistical measures and procedures. Statistical software is used extensively for analyzing real data sets from various contexts. Topics include measures of location, dispersion, correlation, parametric and nonparametric tests, simple and multiple regression, and ANOVA. Prerequisite: MATH 106 or 113 or consent. Offered each spring.

271 Calculus III (3)

Completes the coverage of the standard topics in the introductory calculus sequence. The topics covered include an introduction to differential equations, parametric equations, polar coordinates, sequences, infinite series, power series and power series representations. Prerequisite: MATH 172. Offered each fall.

300 Teaching Assistants' Program for Math (1)

Designed to allow qualified students to assist math instructors in the teaching of their classes. Although MATH 300 will prove to be useful for those students seeking secondary education certification, enrollment is not open solely to them. Enrollment is by invitation of the MATH/CS department. A student may enroll for MATH 300 more than once, but may apply no more than a total of three semester hours earned in this manner toward graduation. This course cannot be used to satisfy mathematics or computer science/mathematics major or minor requirements, although one semester hour of MATH 300 is required for secondary education certification. Offered each semester.

303 Multivariable Calculus (3)

Topics include functions of several variables, curves, surfaces, partial differentiation, multiple integrals and vector analysis. Prerequisite: MATH 271. Offered spring of even-numbered years.

307 Linear Algebra (3)

Linear algebra is the study of linear equations in several variables. In this course, we develop the theoretical structure underlying answers to the questions: When does a solution for a system of linear equations exist? When is it unique? How do we find it? How can we interpret it geometrically? Topics include vectors spaces, linear independence, bases, dimension, transformations, matrices, determinants, and applications. Prerequisite: MATH 172, MATH/CS 205 or consent. Offered each fall.

315 Ordinary Differential Equations (3)

Explores the theory and applications of ordinary differential equations and their solutions. Topics include linear and non-linear first order equations, higher order linear equations, series solutions, systems of linear differential equations, Laplace transforms and numerical methods. Prerequisites: Math 303 and 307. Offered on demand.

316 Probability (3)

The meaning, basic concepts, and applications of probability are explored. Topics include classical, empirical, subjective, and axiomatic probability, random variables, probability measures, distributions, density functions, expectation and standard deviation and their physical interpretation, conditional probability, independence, counting techniques, binomial, Poisson, and normal distributions. Prerequisites: MATH/CS 205 and MATH 172. MATH 271 and MATH 303 is recommended. Offered on demand.

317 Algebraic Structures (3)

Introduces algebraic structures in modern algebra with particular emphasis on groups and their properties. This course satisfies the oral competency requirement for mathematics majors. Prerequisites: CS/MATH 205 and 307. Offered spring of even-numbered years.

323 Introduction to Real Analysis (3)

A theoretical treatment of sets, relations, functions, numbers, inequalities, sequences, series, limits, and the derivative is developed in this course. Prerequisites: MATH 205 and one 300-level math course other than MATH 300. Offered spring of odd-numbered years.

340 Modern Geometries (3)

Explores Euclidean and non-Euclidean geometries with an emphasis on the analytic method. The cultural impact of non-Euclidean geometries is discussed. Topics include complex numbers, geometric transformations, plane geometries, including non-Euclidean geometries, the projective plane, quaternions, Hilbert's axioms. Prerequisites: MATH 172 and 205 or consent. Either MATH 303 or 307 is recommended. Offered fall of odd-numbered years.

350 Numerical Methods (3)

Examines efficient methods used in solving numerical problems with the aid of a computer. Topics include floating point arithmetic, interpolation and approximation, integration, roots of nonlinear equations, ordinary differential equations, and systems of linear equations. Prerequisites: MATH 172 and CS 207. MATH 307 is recommended. Identical to CS 350. Offered on demand.

480 Advanced Seminar (3)

Enables students to explore areas of advanced mathematics which are otherwise not included in the curriculum. The specific content varies each year and is individually tailored to the interests of the students enrolled. Prerequisite: consent. Offered on demand.

MUSIC

MS. SANDRA BILLY, Director, Center for Sacred Music

MS. BILLYE BROWN YOUMANS, Applied Music,

Voice (adjunct)

DR. R. DAVID CLAYTON

MR. SAM DORSEY, Applied Music, Guitar (adjunct)

MS. LEE JORDAN-ANDERS, Program Coordinator

MR. GEORGE STONE, Staff Accompanist, Piano (adjunct)

Music is a unique expressive language, a special way of knowing as essential to basic education as the mastery of verbal and numerical skills. The study of this language provides individuals with personal fulfillment, enhances and complements everyday life, and creates a window through which the viewer can discover and experience aesthetic beauty. The music department at Virginia Wesleyan provides a program of study that educates its learners in a way that enables them to appreciate as well as

critically articulate their responses to this important part of our culture. Virginia Wesleyan offers majors in applied music, music in the liberal arts, music concentration within the humanities division, and endorsement in vocal music education (K-12) for those who wish to teach. The department also offers courses for the non-musician, the "Familiar Faces" concert series, and a non-credit certificate program through the Center for Sacred Music, which includes an annual summer conference. The curriculum can help prepare students for careers in private teaching, public school teaching, church music, music merchandising, arts management, music librarianship, or graduate studies in music or humanities.

Major Requirements:**Music with Applied Music track**

COURSE NUMBER AND TITLE	SEM. HRS.
MUS 225 Intermediate Musicianship I	4
MUS 226 Intermediate Musicianship II	4
MUS 325 Advanced Musicianship I	4
MUS 326 Advanced Musicianship II	4
MUS 313 Music History I	3
MUS 314 Music History II	3
MUS 480 Senior Project	3
APMU 300 Chamber Music	2
APMU 133-494 Applied Music Study (six hours must be at the 300 level or above)	10
One of the following: MUS 100 Introduction to Listening MUS 200 Survey of Music MUS/ARTH 201 Introduction to Music & Art in the Western World MUS 310 Topics in Sacred Music HUM 301 Aesthetic Communication: Understanding and Experiencing the Arts	3

See continuation of choices next page