FINANCIAL TECHNOLOGY, BACHELOR OF SCIENCE (B.S.) WITH A CONCENTRATION IN ACTUARIAL SCIENCE

The Bachelor of Science in Financial Technology offers concentrations in actuarial science and financial engineering. The program provides quantitatively oriented students the opportunity to apply mathematical, statistical and programming tools to the financial, risk management and actuarial disciplines. Designed to meet the growing need for quantitative modeling and analysis in finance, risk management and actuarial science, the program is technical and interdisciplinary in nature. The curriculum emphasizes courses in finance, statistics and mathematics with supporting courses in related areas.

The actuarial science concentration provides excellent preparation for the basic professional examinations and continued study in actuarial science. Students who complete this concentration also may find employment in areas such as quantitative applications in corporate and public financial policy, actuarial modeling and forecasting, reserves computation and rate making, and computer and information systems in the financial services and risk management industries.

Learning goals

- To support career advancement over time by giving students the academic foundation in information systems needed for continued professional development
- To help students develop the professional skills that will be needed by the businesses and organizations that hire graduates
- To help students develop ethical awareness so that they are able to deal with an ethical dilemma in the workplace

Learning outcomes

Upon completing this program, students will know and know how to do the following.

- Students will be able to identify and use relevant data to calculate appropriate quantitative measures that help in making informed financial decisions.
- Students will be able to describe and expound on competing propositions in a structured, organized and deliberate manner with comparisons, anecdotal evidence and descriptive analysis.
- Students will be able to express the analytic, quantitative and ethical dimensions of a business problem and proposed solutions in a clear, well-organized manner that is free of bias or distortions.
- Students will be able to identify and analyze ethical dimensions of a business situation and relate those dimensions to general and professional ethical standards.
- Students will develop a global perspective regarding the financial management of firms conducting business and investing across national borders.

Special requirements

To complete a degree, a minimum of 123 credits is required with no more than four of those credits in physical education and no more than another four credits from INFO 160, INFO 161, INFO 162 and INFO 163.

All students should schedule a meeting with the faculty program adviser prior to declaring a financial technology major. Students admitted into this program must place into MATH 200 to continue in the program. Students in the financial technology program must attain a minimum grade of C in UNIV 112, UNIV 200, and all MATH/STAT and 300/400 level courses. Further, students in the actuarial science concentration must attain a minimum grade of C in STAT 513. A student receiving a grade below C may repeat the course one time to raise the grade to the required level. In addition, a minimum GPA of 2.5 must be maintained. Students who fall below a GPA of 2.5 will be placed on program probation and will be given one semester to return to the minimum GPA of 2.5. Students who do not return to the required GPA will be advised out of the program. A student must have a minimum GPA of 2.5 to graduate from the program. At least 30 hours of the required business courses for the Bachelor of Science must be taken at VCU.

Many courses are offered irregularly, please work with an adviser for optimal course sequencing.

Credit for SPCH 121 or SPCH 321 will substitute for BUSN 225, and no more than three credits of these courses may be applied toward a business degree. Students who earned a minimum grade of B in ECON 203 at VCU may substitute that credit for ECON 210.

Degree requirements for Financial Technology, Bachelor of Science (B.S.) with a concentration in actuarial science

General Education requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>UNIV 111</td>
<td>Play course video for Focused Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>UNIV 112</td>
<td>Play course video for Focused Inquiry II</td>
<td>3</td>
</tr>
<tr>
<td>UNIV 200</td>
<td>Inquiry and the Craft of Argument</td>
<td>3</td>
</tr>
<tr>
<td>Approved humanities/fine arts</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Approved natural/physical sciences</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Approved quantitative literacy</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Approved social/behavioral sciences</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>22-24</td>
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Business education requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSN 225</td>
<td>Winning Presentations</td>
<td>3</td>
</tr>
<tr>
<td>ECON 210</td>
<td>Principles of Microeconomics</td>
<td>6</td>
</tr>
<tr>
<td>&amp; ECON 211</td>
<td>Principles of Macroeconomics</td>
<td></td>
</tr>
<tr>
<td>MATH 200</td>
<td>Calculus with Analytic Geometry I (satisfies quantitative literacy)</td>
<td></td>
</tr>
<tr>
<td>MATH 201</td>
<td>Calculus with Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 211</td>
<td>Mathematical Structures</td>
<td>3</td>
</tr>
</tbody>
</table>
MATH 307  Multivariate Calculus  4  
MATH 310  Linear Algebra  3  
Total Hours  23  

Major courses  
Course  
Title  
Hours  
ACCT 203  Introduction to Accounting I  3  
ACCT 204  Introduction to Accounting II  3  
ACCT 303  Intermediate Accounting I  3  
ACCT 304  Intermediate Accounting II  3  
BUSN 325  Organizational Communication  3  
FIRE 309  Risk and Insurance  3  
or FIRE 419  Advanced Risk and Insurance  3  
FIRE 311  Financial Management  3  
FIRE 312  Financial Modeling  3  
FIRE 317  Investments  3  
FIRE 321  Intermediate Financial Management  3  
FIRE 417  Security Analysis and Portfolio Management  3  
FIRE 451  Options, Futures and Swaps  3  
FIRE 459  Insurance Law  3  
FIRE 479  Managing Financial Risk  3  
INFO 202  Introduction to E-business Technologies  3  
INFO 350  Programming  3  
INFO 361  Systems Analysis and Design  3  
INFO 364  Database Systems  3  
INFO 450  Advanced Programming  3  
OPER 327  Mathematical Modeling  3  
STAT 212  Concepts of Statistics  3  
STAT 309  Introduction to Probability Theory  3  
STAT 321  Introduction to Statistical Computing  3  
STAT 513  Mathematical Statistics I  3  
STAT 514  Mathematical Statistics II  3  
Approved actuarial science elective (choose one)  3  
   FIRE 359  Issues in Risk Management and Insurance  3  
   FIRE 429  Property and Liability Insurance  3  
   FIRE 439  Life and Health Insurance  3  
   FIRE 449  Employee Benefit Planning  3  
   FIRE 493  Internship in Finance, Insurance and Real Estate  3  
   SCMA 303  Business Analytics  3  
Total Hours  78  

Total minimum requirement 123 credits  
What follows is a sample plan that meets the prescribed requirements within a four-year course of study at VCU. Please contact your adviser before beginning course work toward a degree.  

Freshman year  
Fall semester  
ECON 210  Principles of Microeconomics  3  
MATH 200  Calculus with Analytic Geometry I  4  
UNIV 111  Focused Inquiry I  3  
Play course video for Focused Inquiry I  3  
Approved University Core humanities/fine arts  3  
Approved University Core natural/physical sciences  3  
Total Hours  16  

Spring semester  
BUSN 225  Winning Presentations  3  
ECON 211  Principles of Macroeconomics  3  
MATH 201  Calculus with Analytic Geometry II  4  
MATH 211  Mathematical Structures  3  
UNIV 112  Focused Inquiry II  3  
Play course video for Focused Inquiry II  3  
Total Hours  16  

Sophomore year  
Fall semester  
ACCT 203  Introduction to Accounting I  3  
INFO 202  Introduction to E-business Technologies  3  
MATH 200  Multivariate Calculus  4  
STAT 212  Concepts of Statistics  3  
UNIV 200  Inquiry and the Craft of Argument  3  
Total Hours  16  

Spring semester  
ACCT 204  Introduction to Accounting II  3  
FIRE 311  Financial Management  3  
INFO 350  Programming  3  
MATH 307  Linear Algebra  3  
Approved University Core social/behavioral sciences  3  
Total Hours  15  

Junior year  
Fall semester  
ACCT 303  Intermediate Accounting I  3  
BUSN 325  Organizational Communication  3  
FIRE 309  Risk and Insurance  3  
or FIRE 419  Advanced Risk and Insurance  3  
INFO 361  Systems Analysis and Design  3  
STAT 309  Introduction to Probability Theory  3  
Total Hours  15  

Spring semester  
ACCT 304  Intermediate Accounting II  3  
FIRE 312  Financial Modeling  3  
FIRE 317  Investments  3  
INFO 364  Database Systems  3  
OPER 327  Mathematical Modeling  3  
Total Hours  15  

Senior year  
Fall semester
Semester course; 3 lecture hours. 3 credits. Nature of risk; insurance and other risk-handling methods; examination of basic life, health, property and liability principles and coverages.

FIRE 311. Financial Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisites: MGMT 212, MATH 200 or SCMA 212; and ACCT 203 or ACCT 202 (for non-business majors). This course is restricted to students who have completed at least 54 credit hours (junior standing) or 24 credits with minimum cumulative GPA of 2.5. Principles of optimal financial policy in the procurement and management of wealth by profit-seeking enterprises; the application of theory to financial decisions involving cash flow, capital structure and capital budgeting.

FIRE 312. Financial Modeling. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 311 with a minimum grade of C. Enrollment is restricted to students with majors or concentrations offered by the Department of Finance, Insurance and Real Estate who have completed at least 54 credit hours (junior standing). This course is designed to introduce students to a wide array of primarily Excel techniques used in financial model building. Students will be introduced to techniques such as data tables, solver, matrix manipulation, array formulas, pivot tables, etc., to create financial models that are common in the areas of finance, risk management and real estate finance.

FIRE 313. Financial Management for Small Business. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 311. This course is restricted to students who have completed at least 54 credit hours (junior standing). This course emphasizes financial management needs for entrepreneurs or persons who expect to be employed in closely held corporations.

FIRE 315. Real Property Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. This course is restricted to students who have completed at least 54 credit hours (junior standing). Real property economics, planning, construction, marketing and management of leased properties.

FIRE 316. International Financial Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 311. This course is restricted to students who have completed at least 54 credit hours (junior standing). Financial management of business in an international environment. Emphasis on tools and techniques to prepare financial managers of multinational firms to effectively respond to the challenges of the international environment. Crosslisted as: INTL 416.

FIRE 317. Investments. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 311; and SCMA 301, STAT 210, STAT 212, STAT 312 or STAT 541. This course is restricted to students who have completed at least 54 credit hours (junior standing). An analysis of the market for long-term corporate securities. Emphasis is given to the valuation of bonds, common stocks, options and convertible securities, and portfolio concepts. Designed to provide an understanding of the functioning of an efficient market.

FIRE 321. Intermediate Financial Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 312 with a minimum grade of C. Pre- or corequisite: SCMA 302, MATH/STAT 309, STAT 314 or STAT 321. This course is restricted to students who have completed at least 54 credit hours (junior standing). Advanced topics in financial management with emphasis on the theoretical bases for the valuation of the firm.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Term Hours:</th>
<th>Total Hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE 291</td>
<td>Topics in Finance, Insurance and Real Estate. 1-3 Hours. Variable hours. Variable credit. Maximum of 3 credits per topic. Prerequisite: permission of instructor. An in-depth study of selected business topics. Graded as pass/fail at the option of the department.</td>
<td>3</td>
<td>123</td>
</tr>
<tr>
<td>FIRE 301</td>
<td>Personal Financial Planning. 3 Hours.</td>
<td>3</td>
<td>123</td>
</tr>
<tr>
<td>FIRE 305</td>
<td>Principles of Real Estate. 3 Hours.</td>
<td>3</td>
<td>123</td>
</tr>
<tr>
<td>FIRE 306</td>
<td>Regulatory Aspects of Safety and Risk Control. 3 Hours.</td>
<td>3</td>
<td>123</td>
</tr>
<tr>
<td>FIRE 307</td>
<td>System Safety. 3 Hours.</td>
<td>3</td>
<td>123</td>
</tr>
<tr>
<td>FIRE 308</td>
<td>Incident Investigation and Analysis. 3 Hours.</td>
<td>3</td>
<td>123</td>
</tr>
</tbody>
</table>

Summary:

- **FIRE 291**: Topics in Finance, Insurance and Real Estate (1-3 hours, variable credit). Focuses on selected business topics, graded pass/fail.
- **FIRE 301**: Personal Financial Planning (3 hours). Designed to assist individuals in understanding financial decisions.
- **FIRE 305**: Principles of Real Estate (3 hours). Covers real estate enterprise and principles.
- **FIRE 306**: Regulatory Aspects of Safety and Risk Control (3 hours). Examines the regulation of societal hazards and threats.
- **FIRE 307**: System Safety (3 hours). Examines system safety concepts and practices.
- **FIRE 308**: Incident Investigation and Analysis (3 hours). Reviews investigation strategies and reporting systems.
FIRE 325. Real Estate Law. 3 Hours.
Semester course; 3 lecture hours. 3 credits. This course is restricted to students who have completed at least 54 credit hours (junior standing). Legal fundamentals of real estate including contracts, risk management, environmental and ethical issues, concepts of title, title examination, easements, conveyances, liens and recording statutes affecting real estate.

FIRE 329. E-business Risk Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: INFO 202. This course is restricted to students who have completed at least 54 credit hours (junior standing). An analysis of the risks associated with e-business and the practice of e-commerce.

FIRE 359. Issues in Risk Management and Insurance. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: junior standing. The course focuses on timely issues in the field of risk management and insurance. Students will consider the role of government and the insurance industry as well as the use of other financial solutions in handling risks faced by businesses and individuals. The topics covered change to reflect current societal and industry issues and to explore new risk management innovations.

FIRE 417. Security Analysis and Portfolio Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 317 with a minimum grade of C; and SCMA 302, MATH 309/STAT 309, STAT 314 or STAT 321. This course is restricted to students who have completed at least 54 credit hours (junior standing). A detailed analysis of stocks and bonds as well as options and futures. Emphasis is on models for portfolio selection, revision and performance evaluation.

FIRE 419. Advanced Risk and Insurance. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 311. This course is restricted to students who have completed at least 54 credit hours (junior standing). It is a risk and insurance course with emphasis on more mathematical computations and analysis. Market, credit and operational risks are covered, along with legal and catastrophic risk assessments. Sustainability is important to this course. Topics covered include (but not limited to) forecasting of losses -- loss triangles and computations of reserves; risk mapping and the risk management matrix; cost/benefit and risk/return analyses; pricing; capital structure, risk-based capital and economic capital; financial statements using audit techniques (accounting); insurance regulation; life cycle financial risks; insurance solutions to property/casualty and life/health risks.

FIRE 424. Property and Liability Insurance. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 309. This course is restricted to students who have completed at least 54 credit hours (junior standing). Property and liability risk identification and measurement. Major commercial line coverages including fire, marine, automobile, general liability, worker’s compensation, fidelity and surety bonds.

FIRE 425. Real Estate Appraisal. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 305 or FIRE 316. This course is restricted to students who have completed at least 54 credit hours (junior standing). Theory and practice of real property valuation from fundamental concepts to complex income-producing properties and partial-interest valuations. Technology-related tools are employed in the course, including financial modeling with various software programs.

FIRE 429. Property and Liability Insurance. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 309 or FIRE 333. This course is restricted to students who have completed at least 54 credit hours (junior standing). Property and liability risk identification and measurement. Major commercial line coverages including fire, marine, automobile, general liability, worker’s compensation, fidelity and surety bonds.

FIRE 435. Real Estate Finance and Capital Markets. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 305. This course is restricted to students who have completed at least 54 credit hours (junior standing). Instruments, techniques and institutions of real estate finance; the mortgage market; financing process; mortgage risk analysis; creative financing; emphasis on policies and procedures used in financing residential and commercial properties and their interaction with the capital markets. Technology-related tools are employed in the course, including financial modeling with various software programs.

FIRE 439. Life and Health Insurance. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: junior standing. The function, nature and uses of life and health insurance and annuities; operational aspects of life insurance companies. The course covers insurance solutions for life cycle risks: death; health and longevity -- sustainability; legal and tax aspects. Full-time students who pass this course can receive credit for the CLU HS323 examination from the American College. See instructor for details.

FIRE 441. Funds Management in Financial Institutions. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 312 with a minimum grade of C. This course is restricted to students who have completed at least 54 credit hours (junior standing). Funds management techniques for selected financial institutions including investment companies (mutual funds), life and casualty insurers, savings and loans, mutual savings banks, commercial banks, and pension funds.

FIRE 444. Occupational Safety, Health and Security. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Covers the principles and practices, and regulatory dimensions of occupational safety, health and security. Causes of workplace health hazard exposures, accidents and domestic and international industrial violence are studied with an emphasis on prevention. Characteristics of effective occupational safety, health and workplace security programs are studied to facilitate understanding and application in the workplace.

FIRE 445. Real Estate Investment Analysis. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 425 and FIRE 435. This course is restricted to students who have completed at least 54 credit hours (junior standing). This is the capstone course for real estate majors and covers the analytical methods and tools useful for analyzing commercial real estate investments, including a multidisciplinary approach to financial, spatial and social economics, which builds a cohesive framework for analyzing complex investment decisions emphasizing fundamentals of property and financial markets.

FIRE 449. Employee Benefit Planning. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Management of group life, health, disability and retirement plans. Governmental and employers’ solutions to life cycle risks -- sustainability through social insurance programs, group insurance and innovations. The course reflects the dynamic nature of this field and requires cost/benefits analysis, best solutions to risks and a complete portfolio project of plan design, cost considerations, funding, regulation and tax considerations.
FIRE 451. Options, Futures and Swaps. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 321 with a minimum grade of C or FIRE 317 with a minimum grade of C. This course is restricted to students who have completed at least 54 credit hours (junior standing). Analysis and valuation of speculative securities and markets, including options, futures and swaps, with emphasis on their use for hedging and speculative purposes. Major valuation models and term structure models are discussed with applications to problems in finance considered.

FIRE 459. Insurance Law. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: junior standing. The course covers the legal concepts and doctrines applicable to insurance. Fundamental legal aspects of all risks and aspects of sustainability. The course provides legislative issues for all solutions to life cycles risks: life and health insurance, pensions, catastrophes (natural and man-made such as terrorism) and property and liability insurance.

FIRE 461. Cases in Financial Management. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 321 with a minimum grade of C. This course is restricted to students who have completed at least 54 credit hours (junior standing). Cases involving financial decisions for various forms of business enterprises.

FIRE 469. Advanced Property/Casualty Insurance: Alternative Markets. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: FIRE 309 or FIRE 419. This course is restricted to students who have completed at least 54 credit hours (junior standing). Property and liability risk with emphasis on alternative, less-regulated insurance solutions to all types of risks. The course includes sustainability issues and the way to mitigate natural and man-made catastrophes including sophisticated modeling and techniques. The course covers Lloyd's of London; excess and surplus lines carriers; risk retention group, self-insurance, captives and shadow insurance; reinsurance; multilayers of coverage; catastrophe bonds; terrorism; regulation; liability issues globally; social responsibility.

FIRE 479. Managing Financial Risk. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisites: FIRE 309 and FIRE 317. This course is restricted to students who have completed at least 54 credit hours (junior standing). Sources of financial risk. Measurement and uses of enterprisewide financial risk techniques. A variety of analytical tools will be used to learn about value at risk, credit risk, stress testing, financial risk management and actuarial models, and how to manage financial risk.

FIRE 491. Topics in Finance, Insurance and Real Estate. 1-3 Hours.
Semester course; variable hours. Variable credit. Maximum of 3 credits per course; maximum total of 6 credits for all topic courses. Prerequisite: junior standing. An in-depth study of a selected business topic, to be announced in advance.

FIRE 492. Independent Study in Finance, Insurance and Real Estate. 1-3 Hours.
Semester course; 1-3 credits. Maximum total of 3 credits. Prerequisites: junior or senior standing as a major in a business curriculum and approval of adviser and department chair prior to course registration. Intensive study under supervision of a faculty member in an area not covered in-depth or contained in the regular curriculum.

FIRE 493. Internship in Finance, Insurance and Real Estate. 3 Hours.
Semester course; 3 credits. Course restricted to students with junior standing and a concentration in finance or risk management and insurance or a declared major in financial technology or real estate, a minimum GPA of 2.5, and permission of the Department of Finance, Insurance and Real Estate chair or the director of the insurance or real estate programs. Involves students in a meaningful experience in finance, insurance or real estate. Intention to enroll must be indicated to the chair or appropriate program director.