The information presented here is as of 7/29/2011.

**QUANTITATIVE/FORMAL REASONING COURSES**

Williams students should be adept at reasoning mathematically and abstractly. The ability to apply a formal method to reach conclusions, to use numbers comfortably, and to employ the research tools necessary to analyze data lessen barriers to carrying out professional and economic roles. Prior to their senior year, all students must satisfactorily complete a Quantitative/Formal Reasoning (QFR) course—those marked with a “(Q)”.

Students requiring extra assistance (as assessed during First Days) are normally placed into Mathematics courses that fulfill the QFR requirement. Prior to their senior year, all students must satisfactorily complete a QFR course. Courses that may be used to meet the requirement in 2011-2012:

**Courses that employ the research tools necessary to analyze data lessen barriers to carrying out professional and economic roles. Prior to their senior year, all students must satisfactorily complete a Quantitative/Formal Reasoning (QFR) course—those marked with a “(Q)”:**

- **ASTR 111(F)** Introduction to Astrophysics (Q)
- **ASTR 211(F)** Observation and Data Reduction Techniques in Astronomy (Q)
- **BIMO 321(S)** Biochemistry I—Structure and Function of Biological Molecules (Same as Biology 321 and Chemistry 321) (Q)
- **BIMO 322(S)** Biochemistry II—Metabolism (Same as Biology 322 and Chemistry 322) (Q)
- **BIOL 202(F)** Genetics (Q)
- **BIOL 203(F)** Ecology (Same as Environmental Studies 203) (Q)
- **BIOL 305(S)** Evolution (Q)
- **BIOL 319(F)** Integrative Bioinformatics, Genomics, and Proteomics Lab (Same as Chemistry 319, Computer Science 319, Mathematics 319 and Physics 319) (Q)
- **BIOL 321(F)** Biochemistry I—Structure and Function of Biological Molecules (Same as Biochemistry and Molecular Biology 321 and Chemistry 321) (Q)
- **BIOL 322(S)** Biochemistry II—Metabolism (Same as Biochemistry and Molecular Biology 322 and Chemistry 322) (Q)
- **CHEM 151(F)** Introductory Concepts of Chemistry (Q)
- **CHEM 153(F)** Introductory Concepts of Chemistry: Advanced Section (Q)
- **CHEM 155(F)** Principles of Modern Chemistry (Q)
- **CHEM 156(S)** Organic Chemistry: Introductory Level (Q)
- **CHEM 319(F)** Integrative Bioinformatics, Genomics, and Proteomics Lab (Same as Biology 319, Computer Science 319, Mathematics 319 and Physics 319) (Q)
- **CHEM 321(F)** Biochemistry I—Structure and Function of Biological Molecules (Same as Biochemistry and Molecular Biology 321 and Biology 321) (Q)
- **CHEM 322(S)** Biochemistry II—Metabolism (Same as Biochemistry and Molecular Biology 322 and Biology 322) (Q)
- **CSCI 109(F)** The Art and Science of Computer Graphics (Q)
- **CSCI 134(F)** Introduction to Computer Science (Q)
- **CSCI 136(F)** Data Structures and Advanced Programming (Q)
- **CSCI 237(F)** Computer Organization (Q)
- **CSCI 256(S)** Algorithm Design and Analysis (Q)
- **CSCI 319(F)** Integrative Bioinformatics, Genomics, and Proteomics Lab (Same as Biology 319, Chemistry 319, Mathematics 319 and Physics 319) (Q)
- **CSCI 334(S)** Principles of Programming Languages (Q)
- **CSCI 337(F)** Digital Design and Modern Architecture (Q)
- **CSCI 339(S)** Distributed Systems (Q)
- **CSCI 356(F)** Advanced Algorithms (Q)
- **CSCI 361(F)** Theory of Computation (Same as Mathematics 361) (Q)
- **CSCI 373(F)** Artificial Intelligence (Q)
- **CSCI 434(T)** Compiler Design (Q)
- **ECON 101(F, S)** Principles of Microeconomics (Q)
- **ECON 120(F)** Principles of Macroeconomics (Q)
- **ECON 213(S)** Introduction to Environmental and Natural Resources Economics (Same as Environmental Studies 213) (Q)
- **ECON 229(S)** Law and Economics (Q)
- **ECON 251(F)** Price and Allocation Theory (Q)
- **ECON 252(S)** Macroeconomics (Q)
- **ECON 253(F)** Empirical Methods in Political Economy (Same as Political Economy 253) (Q)
- **ECON 255(F)** Econometrics (Q)
- **ECON 378(F)** Long-Run Perspectives on Economic Growth (Q)
- **ECON 386(S)** Environmental Policy and Natural Resource Management (Same as Economics 515 and Environmental Studies 386) (Q)
- **ECON 389(S)** Tax Policy in Emerging Markets (Same as Economics 517) (Q)
- **ECON 392(S)** Finance and Capital Markets (Q)
- **ECON 464(S)** Empirical Methods in Macroeconomics (Same as Economics 514) (Q)
- **ECON 514(S)** Empirical Methods in Macroeconomics (Same as Economics 464) (Q)
- **ECON 515(S)** Environmental Policy and Natural Resource Management (Same as Economics 386 and Environmental Studies 386) (Q)
- **ECON 517(S)** Tax Policy in Emerging Markets (Same as Economics 389) (Q)
- **ENVI 203(S)** Ecology (Same as Biology 203) (Q)
- **ENVI 213(S)** Introduction to Environmental and Natural Resources Economics (Same as Economics 213) (Q)
- **ENVI 215(S)** Climate Changes (Same as Geosciences 215) (Q)
- **ENVI 386(S)** Environmental Policy and Natural Resource Management (Same as Economics 386 and Environmental Studies 515) (Q)
- **GEOS 215(S)** Climate Changes (Same as Environmental Studies 215) (Q)
- **GEOS 301(F)** Structural Geology (Q)
- **MATH 103(F)** Calculus I (Q)
- **MATH 104(F)** Calculus II (Q)
- **MATH 105(F)** Multivariable Calculus (Q)
- **MATH 106(F)** Multivariable Calculus (Q)
- **MATH 209(S)** Differential Equations (Q)
- **MATH 210(S)** Mathematical Methods for Scientists (Same as Physics 210) (Q)
- **MATH 211(F)** Linear Algebra (Q)
- **MATH 251(F)** Discrete Mathematics (Q)
- **MATH 301(F)** Real Analysis (Q)
- **MATH 305(S)** Applied Real Analysis (Q)
- **MATH 309(F)** Introduction to Complex Analysis (Q)
- **MATH 312(F)** Abstract Algebra (Q)
- **MATH 314(T)** Galois Theory (Q)
- **MATH 315(F)** Groups and Characters (Q)
- **MATH 319(F)** Integrative Bioinformatics, Genomics, and Proteomics Lab (Same as Biology 319, Chemistry 319, Computer Science 319 and Physics 319) (Q)
- **MATH 321(S)** Knot Theory (Q)
- **MATH 322(F)** Differential Geometry (Q)
- **MATH 357(S)** Phylogenetics (Q)
- **MATH 361(F)** Theory of Computation (Same as Computer Science 361) (Q)
- **MATH 378(S)** Game Theory (Q)
- **MATH 404(F)** Ergodic Theory (Q)
- **MATH 419(S)** Algebraic Number Theory (Q)
- **MATH 433(F)** Mathematical Modeling and Control Theory (Q)
- **MATH 437(F)** Electricity and Magnetism for Mathematicians (Q)
- **STAT 101(F)** Elementary Statistics and Data Analysis (Q)
- **STAT 201(F)** Statistics and Data Analysis (Q)
- **STAT 231(F)** Statistical Design of Experiments (Q)
- **STAT 346(F)** Computational Statistics and Data Mining (Q)
- **PHYS 107(F)** Newton, Einstein, and Beyond (Q)
- **PHYS 109(S)** Sound, Light, and Perception (Q)
- **PHYS 111(S)** Introduction to Mechanics (Q)
- **PHYS 112(S)** Electromagnetism and the Physics of Matter (Q)
- **PHYS 141(F)** Mechanics and Waves (Q)
- **PHYS 142(S)** Foundations of Modern Physics (Q)
- **PHYS 151(F)** Seminar in Modern Physics (Q)
- **PHYS 201(F)** Electricity and Magnetism (Q)
- **PHYS 202(S)** Vibrations, Waves and Optics (Q)
- **PHYS 210(S)** Methods for Scientists (Same as Mathematics 210) (Q)
PHYS 301(F) Quantum Physics (Q)
PHYS 302(S) Statistical Mechanics and Thermodynamics (Q)
PHYS 319(F) Integrative Bioinformatics, Genomics, and Proteomics Lab (Same as Biology 319, Chemistry 319, Computer Science 319 and Mathematics 319) (Q)
PHYS 405(F) Electromagnetic Theory (Q)
PHYS 418(S) Gravity (Q)
POEC 253(F) Empirical Methods in Political Economy (Same as Economics 253) (Q)
PSYC 201(F,S) Experimentation and Statistics (Q)