



MAJOR DESCRIPTION & FLOWCHART

AS OF DECEMBER, 2022



APPLIED MATHEMATICS

(Starting from academic year 2022-2023)

Description

Applied Mathematics is the study and application of mathematical concepts and methods to solve complex problems in a wide range of areas such as natural science, engineering, architecture, business, industry and even psychology and social science. Its omnipresent power to deliver optimum answers is felt and enjoyed in many aspects of life from apparently simple activities such as booking a Grab trip and using the suggestion feature of Netflix to grander-scale projects such as bridge building and sending satellites into space. A close-knit family with data science and artificial intelligence, Applied Mathematics unleashes the enormous computing power that could solve unlimited conventional and unconventional problems that arise from natural phenomena and social needs. At Fulbright University Vietnam, the Applied Mathematics major offers a unique approach that is both theoretically rigorous and highly interactive in a truly interdisciplinary environment. The major will provide strong foundations and advanced knowledge on Linear Algebra, Calculus, and Statistics. The students will explore and be fascinated by real-life applications of Mathematics in many other majors, such as Economics, Engineering, Psychology, Social Sciences, etc., by taking applied elective courses and doing Capstone research. Graduated students would be well equipped with solid knowledge and skills to undertake postgraduate degrees in Mathematics or Statistics as well as to pursue careers in data science (machine learning, AI), engineering (signal processing, financial, optimization and simulation), or social sciences.

Learning Outcomes

Students in the Applied Mathematics major will:

1. Explain and answer questions about topics and objects in fundamental modern mathematics.
2. Explain and answer questions about topics in at least one area of specialization within mathematics or its applications in other fields
3. Demonstrate mathematical thinking skills, progressing from a procedural and computational understanding of mathematics to logical reasoning, generalization, and to formal proof.
4. Actively find and analyze research resources and learn new knowledge and skills as needed.

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5. Build and solve mathematical models for real world problems in a broad range of intellectual domains.
6. Communicate mathematical ideas orally and in writing, with precision, clarity and organization, using proper terminology and notation.
7. Use computer programming, software, and algorithmic processes necessary in quantitative analysis and mathematical modeling.
8. Cooperate well in a multidisciplinary team.

Degree Requirements

A Bachelor of Science in Applied Mathematics is awarded following the successful completion of:

1. 5 Core courses (20 credits) and 8 Exploratory courses (32 credits), of which up to two Exploratory courses (8 credits) can be counted towards the major.
2. Experiential Learning (4 – 12 credits).
3. Required foundation courses: Linear Algebra, Calculus, Introduction to Data Analysis, Multivariable Calculus (16 credits).
4. 1 writing course (History of Mathematics/Ideas in Mathematics) (4 credits).
5. 2 intermediate courses (8 credits).
6. 1 Pure Mathematics course (4 credits).
7. 2 advanced courses in specialized areas of study (8 credits).
8. 2 elective applied courses approved by the major coordinator (at least one at 300 level) (8 credits).
9. Research seminar (4 credits)
10. Capstone I and Capstone II (8 credits) for Honors program.
11. OR 2 advanced courses (at most one elective applied course).

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Sample Student Journey

Year 1	Year 2	Year 3	Year 4
Core Courses Exploratory Courses Linear Algebra Intro to Data Calculus	Core Courses Exploratory Courses Multivariable Calculus Ideas in Mathematics Intermediate Courses	Research Seminar Experiential Learning Elective Applied courses Advanced courses Pure Math Course	Elective Applied courses Capstone I Capstone II OR 2 Advanced Courses

Mapping of Learning outcomes

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
Foundation	I		I		I	I		I
Intermediate	R	I	R		R		R	R
Advanced	M	R	M		R			
Writing	I		I	I		R		
Computing			R				I	
Pure Math	M	R	M	R				
Applied		M		R	M		M	M
Seminar				M		M		
Capstone		M	M	M	M	M	M	

Major Outline

Foundation Courses (100 level): Foundation courses are required for all students who wish to pursue a major in Applied Mathematics. These courses introduce students to the essential elements of modern mathematics.

Sample Foundation Courses

- Linear Algebra
- Single variable Calculus
- Introduction to Data analysis

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- Multivariable Calculus

Intermediate Courses (200 level): Intermediate courses explore Mathematics in more specific flavors. In these courses students begin to narrow their areas of study. Students will take at least 2 intermediate courses.

Sample Intermediate Courses

- Probability
- Differential Equations
- Discrete Mathematics

Advanced Courses (300 level): Advance courses help students shape their study path into one of the applied fields. There are, but not limited to, three main categories of areas with applications in Mathematics:

- Applied Statistics (Economics, Social Sciences, Mathematical Finance, Bioinformatics...)
- Engineering Mathematics (Signal processing, Numerical simulation, Inverse problems...)
- Data Science (Machine learning, Artificial intelligence ...)

Students will take at least 2 advanced courses. Consultation with an academic advisor is required for course selection.

Sample Advanced Courses

- Advanced Statistics
- Statistical Learning
- Stochastic Calculus
- Numerical Analysis
- Optimization
- Partial Differential Equations

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Elective Applied courses: These are the courses from other majors that emphasize the applications of Mathematics. Students will have to take at least 2 applied courses (at least one at 300 level). If there is any prerequisite, students need to either complete the course's prerequisites or obtain the instructor's approval.

Sample Applied Courses

Applied Statistics

- Econometrics
- Bioinformatics
- Neuroscience
- Mathematical Finance

Engineering Mathematics

- Digital signal processing
- Image/Audio/Video processing
- Numerical simulation of engineering systems
- Inverse problems in engineering
- Operation Research

Data science

- Machine learning
- Deep learning
- Artificial intelligence
- Cryptography
- Database management

Pure Mathematics courses: These courses provide the essential abstract concepts and structures that connect various branches of Mathematics and help students understand the adaptability of Mathematics to different types of problems. Students are required to take at least 1 Pure mathematics course.

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Sample Pure mathematics courses

- Abstract Algebra
- Real Analysis

Research seminars: The seminars provide chances for students to understand about faculty's research as well as recent developments in mathematical research. Students will also practice basic research skills such as finding resources, writing literature review, and identifying research methodology.

Capstone project (optional): This is a one year long research project to be completed in the last year of study. The project deliverable is either a research paper or a product which contributes to the knowledge of mathematics or its applications.

Requirements for Declaring Applied Mathematics Major and Minor

Students need to complete at least 2 Foundation courses or 1 Foundation and 1 Intermediate courses.

Graduation with Honors Requirements

- Students must complete Capstone I and Capstone II
- The Capstone must be graded Honors

Minor Requirements

The goal of the Minor in Applied Mathematics is to provide the student with significant mathematical skills and a perspective on the discipline. Students with a great interest in Mathematics can deepen his/her knowledge while pursuing a major in another field. The course requirement for a Minor in Applied Mathematics is as follows:

- Linear Algebra
- Intro to Data Analysis
- Calculus
- Multivariable Calculus

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- Intermediate courses (2 required)
- Advanced course (1 required)

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