

Tentative: Mathematical Biology PhD Degree Track

by Donald A. French

This document provides general curriculum requirements and guidelines for Department of Mathematical Sciences PhD students wishing to concentrate on mathematical applications in the biosciences. At this time, their thesis research would be under one of the following Professors, French, Leung, Lim, or Pelikan.

Many of these offerings will be of interest to students in other disciplines such as engineering, chemistry, physics, bioengineering, the GRI's emerging graduate programs, Children's Hospital's computational programs, and the Neuroscience graduate program.

Prelim Courses:

1. **Numerical Analysis (514, 515, 516).**
2. **Partial Differential Equations (627, 628, 629).**
3. **Pure Mathematics or Statistics:** Students can take their third prelim in either a pure mathematics area choosing Complex Variables (601, 602, 603), Real Analysis (607, 608, 609), or Topology (604, 605, 606) or in Statistics/Probability choosing either Advanced Theory of Statistics (631, 632, 633) or Probability (634, 635, 636).

Breadth Requirement:

1. **Differential Equations (616, 617)** Two quarters. Also, one other 2-quarter 600-level sequence different from those chosen for prelim courses.
2. **Mathematical Biology Specialization:** (At least three courses).
 - (a) **Applied Mathematics:** Students must take Applied Mathematics Practicum (517) and Numerical Methods in Applied Mathematics (561).
 - (b) **Mathematical-Biology:** Students must take the topics course in Mathematical-Biology (15-MATH-562)
 - (c) **Biology:** Students are strongly encouraged to take some courses outside of mathematics in the biosciences. Recommended electives come from Biology (German or Rogstadt), the College of Medicine (Gruenstein, Pun, Kleene or Menon), Bioengineering (Johnson), Philosophy (Bickle), and Computer Science (Chang or Minai). Examples include *Ecological Modeling (15-BIOL-626) Steve Matter*, *Neuroscience (20-BME-620) Jeff Johnson*, or *Complex Systems (20-ECECS-854) Ali Minai*.

Dissertation Research: The student's thesis would optimally involve a collaboration with a Professor outside of Mathematics in, for instance, the College of Medicine, Biology, the GRI, Philosophy and Bioengineering to accommodate this. Such collaborations have already taken place (e.g. Pelikan's work with Rogstad, French's work with Gruenstein and Kleene, etc.).

Program of Study: (Sample course schedule).

First Year Courses:

1st Qtr	2nd Qtr	3rd Qtr
NA 514	NA 515	NA 516
Adv Calc 504	Adv Calc 505	Adv Calc 506
Appl Lin Alg 555	PDE & FA 553	PDE & FA 554

Second Year Courses:

1st Qtr	2nd Qtr	3rd Qtr
ODE 616	ODE 617	Biology Elective
Pure Math I or Stat I	Pure Math II or Stat II	Pure Math III or Stat III
PDE 627	PDE 628	PDE 629

Third Year Courses:

1st Qtr	2nd Qtr	3rd Qtr
Applied Math Practicum 517	Numerical Methods in Appl Math 561	Math-Biology 562
600-level breadth I	600-level breadth II	

The student would take the NA prelim after the first year and then the PDE and Pure Math or Statistics/Probability prelims after the second.