Toxicology

toxmajor@iastate.edu (interdepartmental graduate major)

Toxicology is the science of studying the adverse effects of substances on living organisms. Students observe, gather data and predict risks and outcomes in populations. Whole organism research and cellular and molecular approaches are used to determine toxicant exposure and mechanisms. Work is offered for the degrees doctor of philosophy and master of science. Students majoring in toxicology will be affiliated with one of the following cooperating departments: Agricultural and Biosystems Engineering; Animal Science; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Chemistry; Entomology; Food Science and Human Nutrition; Genetics, Development and Cell Biology; Geological and Atmospheric Sciences; Natural Resource Ecology and Management; Physics; Plant Pathology and Microbiology; Veterinary Diagnostic and Production Animal Medicine; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The prerequisites for entrance into the graduate toxicology major include an undergraduate degree in a relevant area of study; for example, chemical engineering, biology, biochemistry, chemistry, ecology, entomology, food science and technology, microbiology, nutritional science, zoology, or veterinary medicine. Minimum undergraduate coursework should include the following or their equivalent:

- 1 year of college mathematics, including calculus
- 1 year of inorganic chemistry with quantitative analysis
- 1 course in physics
- 1 year of organic chemistry
- 2 years of biological sciences including 1 course in physiology

Other courses that are considered desirable in undergraduate preparation include: biochemistry, physical chemistry, qualitative analysis, and some specialized courses such as histology or advanced physiology.

Facilities and faculty are available for fundamental research in such areas as agricultural toxicology, drug discovery and prevention, ecotoxicology, environmental fate and effects of chemicals, insect toxicology, aquatic toxicology, food safety, nutritional toxicology, mycotoxins, neurotoxicology, cellular and molecular toxicology, reproductive toxicology, and veterinary toxicology.

Ph.D. and M.S. Students should register for TOX 689X (R) every fall and spring semester during their training.

Students majoring in toxicology will be affiliated with a cooperating department. All Ph.D. students take a core curriculum consisting of:

- TOX 501 Principles of Toxicology 3
- TOX 502 Toxicology Methods 3
- TOX 504 Toxicology Seminar (taken twice) 1
- 7 additional credits in approved toxicology courses 7
- 8 credits in biochemistry from courses listed below 8
  - BBMB 404 Biochemistry I
  - BBMB 405 Biochemistry II
  - BBMB 420 Physiological Chemistry
  - BBMB 542 Introduction to Molecular Biology Techniques
- 3 credits in physiology, histology, pathology, neuroscience, immunobiology or cellular and molecular biology 3
- STAT 401 Statistical Methods for Research Workers 4
- STAT 402 Statistical Design and the Analysis of Experiments 3
- GR ST 565 Responsible Conduct of Research in Science and Engineering (or) 1
- V PTH 554 Ethics in Scientific Research and Writing 1

Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests.

M.S. students take a core of:

- TOX 501 Principles of Toxicology 3
- TOX 502 Toxicology Methods 3
- TOX 504 Toxicology Seminar 1
- 3 additional credits in approved toxicology courses 3
- BBMB 404 Biochemistry I 3
- BBMB 405 Biochemistry II 3
- STAT 401 Statistical Methods for Research Workers 4

A graduate minor in toxicology is available for students enrolled in other majors.

A minor for an M.S. degree includes one semester of TOX 689X and:

- TOX 504 Toxicology Seminar 1
- TOX 501 Principles of Toxicology 3
- 3 credits in other approved toxicology courses 3

A minor at the Ph.D. level includes one semester of TOX 689X and:

- TOX 504 Toxicology Seminar 1
- TOX 501 Principles of Toxicology 3
- 6 credits in other approved toxicology course work 6

One member of the student’s program of study committee will be a member of the toxicology faculty.

Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U.S. or abroad in preparation for research and/or teaching positions in academia, industry, the military, veterinary research, or government environmental and public health institutions. A few go directly to permanent research positions in industry. Many students awarded master’s degrees continue their training as doctoral students; however, some choose research support positions (i.e., technician, chemist, research associate) in academia, industry, or government. A more thorough list of outcomes is available at our Web site.

Graduates of the Toxicology major will be able to carefully design, execute and analyze experiments that extend the knowledge of toxicology and closely related sciences. They will be able to clearly communicate research findings, and thoroughly evaluate the literature of toxicology, contributing significantly to the advancement of the field.