

## Program Proposal for a Pharm/Tox Minor

1. Name of the proposed minor.  
Pharmacology and Toxicology
2. Name of the department(s) involved.  
Department of Biomedical Sciences and Interdepartmental Toxicology
3. Name of contact person(s).  
Richard Martin, BMS (rjmartin@iastate.edu) and Anumantha Kanthasamy, BMS (akanthas@iastate.edu)
4. General description of the minor.  
Train undergraduate students interested in pharmacology and toxicology for careers in toxicology, toxicant effects in animal and environmental systems, and drug action.
5. Need for the proposed minor.  
It is desirable for undergraduate students have a basic knowledge of drugs and toxins to foster healthy lives. Undergraduate instruction at Iowa State in toxicology and pharmacology is not available.  
Toxicology: “wise use of chemicals is an essential component of the high standard of living we enjoy; ensuring that we are not endangering our health or the environment with products and by-products of modern and comfortable living” <http://www.toxicology.org/careers/toxicologist/becomeTox.asp>  
Pharmacology: “science of drug action on biological system; embraces knowledge of the sources, chemical properties, biological effects and therapeutic uses of drugs” <https://www.aspet.org/knowledge/what-is-pharmacology/>  
Many Universities do not offer toxicology classes as part of their undergraduate curriculum. An undergraduate minor in pharmacology and toxicology will train undergraduate students interested in pharmacology and toxicology for a career in drug action, toxicology, and their effects on living animal and environmental systems.  
A large number of new chemicals and pharmaceuticals enter the environment every year. Jobs in industry, government, and academia need an understanding of toxicological and pharmacological concepts.  
We believe this is an area of focus that both benefits the students’ understanding within their present major but also provides training that can be beneficial in obtaining future employment and higher education.  
*The target demographic will include pre-professional students and pre-graduate biomedical students*

6. Objectives of the proposed minor including the student learning outcomes and how the learning outcomes will be assessed.

Objectives: Provide an opportunity for undergraduates to explore and apply fundamentals of pharmacology and toxicology to facilitate their preparation for careers in these areas, especially careers involving graduate education and the medical related professions.

Learning outcomes

Define key terms and concepts related to pharmacology and toxicology.

Apply concepts and standard practices in pharmacology and toxicology to solving practical problems relevant to these fields.

Analyze scientific data in pharmacology and toxicology.

Synthesize detailed and accurate descriptions of current knowledge on key topics in pharmacology and toxicology.

Make informed decisions about current controversies in pharmacology and toxicology, using appropriate scientific methods and ethical reasoning.

Assessment

Learning outcomes assessment will include course-embedded and performance-based assessment. Direct program assessments based on assignments and student exams as part of the student normal coursework. Course syllabi, exams and projects will be systematically and regularly monitored to see how the class coverage aligns with the Strategic Learning Outcomes.

7. Relationship of the minor to other programs at Iowa State University.

Core Courses for minor are taught by BMS, Toxicology, and Biology

Will likely have students from the life sciences, nutrition, agriculture, pre-med, pre-vet, environmental science and analytical chemistry programs interested in completing a PHARM and TOX minor

8. Relationship of the minor to the strategic plans of the university, of the college, and of department or program.

Meeting the challenges of the 21<sup>st</sup> Century will include the wise use of chemicals and how chemicals and drug action effects a biological system.

<http://www.president.iastate.edu/sp> "Iowa State University will lead in developing more sustainable ways to produce and deliver safe and nutritious food, water, materials, and energy; integrate the protection of plant, animal, and human health; and care for our environment."

Mission: Create, share and apply knowledge to make Iowa and the world a better place.

Goal 3: Improve the quality of life for all Iowans through services and programs dedicated to economic development and the promotion of healthy communities, people, and environments

By exposing undergraduates to pharmacology and toxicology, we expect, in addition to students improving their life-styles to live longer, that more students will pursue pharmacology and toxicology for graduate studies and more students will follow a medically related profession.

9. Comparison of the proposed minor with similar programs at other universities, including the Regent's universities.

- No other Regents University in Iowa offers an undergraduate minor or major in Pharmacology or Toxicology including Iowa State University. The University of Iowa does offer a specialized pharmacy pre-professional program (not a minor or major) that acts to provide advice and coursework for students planning to apply to the Doctor of Pharmacy degree program.

<http://admissions.uiowa.edu/academics/pharmacy-pre-professional-program>

- The University of Minnesota is no longer accepting students into their toxicology graduate program as of 2013. We were not able to locate within the U of MN system undergraduate minors or majors in Toxicology.

<http://www.catalogs.umn.edu/programs.html>

- U of MN has a pharmacology minor:

<http://www.catalogs.umn.edu/documents/UndergraduateDegreePrograms2014.pdf>

- No mention of toxicology or pharmacology coursework was found for the University of Missouri: <http://catalog.missouri.edu/degreesanddegreeprograms/>

- University of Nebraska offers a course in general pharmacology and toxicology (VBMS 410) but does not appear to offer undergraduate majors or minors in pharmacology or toxicology:

<https://bulletin.unl.edu/undergraduate/courses/search?q=pharmacology>

- No undergraduate majors or minors in toxicology or pharmacology were found at the University of Illinois:

<http://provost.illinois.edu/ProgramsOfStudy/2013/fall/programs/undergrad/majors.html>

9. Program requirements and procedures, including:

- a. prerequisites for prospective students;
  - a. those required by the coursework to be taken to complete the minor
- b. application and selection process;
  - a. open to all who have met prerequisites for coursework
- c. language requirements;
  - a. none
- d. courses and seminars presently available for credit toward the Pharmacology and Toxicology undergraduate minor program;

- a. 15 total credits required to complete minor including 10-11 credits of required courses
- b. 3 credits of Physiology. Choose from Biology 335 (4 credits), Biology 336 (3 credits), or BMS 329 (3 credits)
- c. Electives (4 to 5 credits) from approved existing courses
- e. proposed new courses or **modifications** of existing courses;
  - a. BMS 539 to dual-list with 439X (4 credits)
  - b. TOX 501 to dual-list with 401X (3 credits)
- f. advising of students;
  - a. program coordinator of minor (PCM)
  - b. office staff in support of the PCM
- g. implications for related areas within the university.  
Would add a small increase in students to courses already being taught

10. General description of the resources currently available and future resource needs, in terms of:

- a. faculty members;
 

Courses are already being taught. For the two 500 level dual-listing with 400 level courses, grading of examinations of undergrads will be different than graduate students.

Faculty willing to participate in the governance of this program.
- b. computers, laboratories, and other facilities;
 

No additional needs
- c. library facilities (journals, documents, etc.) in the proposed area;
 

No additional needs
- d. supplies, field work, student recruitment, etc.;
 

Supplies in support of existing courses for small increased enrollments. Because of few opportunities in the Midwest for undergraduate training in pharmacology and toxicology the opportunity for a minor in this area could lead to recruitment of a few additional students to Iowa State University

11. Describe the needs for new resources and/or reallocated resources. Attach to the program proposal memos from the department chair(s), the college dean(s), and other appropriate persons, agreeing to the allocation of new resources and/or the reallocation of resources.

The Department of Biomedical Sciences (BMS) agrees to be home department and provide filing space for documents in support of this minor that can be accessed by the Program Coordinator of Minor (PCM). Information on the minor will be displayed on the BMS homepage.

12. Attach to the program proposal, letters of support, recommendations, and statements when appropriate, from programs and departments at ISU which are associated with the proposed program or have an interest in the proposed program.

Department of Biomedical Sciences: Chair, Anumantha Kanthasamy, BMS, TOX, Akanthas@iastate.edu

Interdepartmental Toxicology Supervisory Committee: Chair, Richard Martin, BMS, TOX, rjmartin@iastate.edu

13. If the new program is interdisciplinary, a governance document should be created and submitted to the Associate Provost for Academic Programs. Indicate here that it has been completed.

Completed.

**APPENDIX:  
PHARM/TOX MINOR GOVERNANCE  
VOTING RECORD  
SUPPORTING LETTERS  
BMS 439X SYLLABUS**

**Pharmacology and Toxicology Undergraduate Minor  
Governance Document**

This document contains the general rules for governance of the Pharmacology and Toxicology Undergraduate Minor referred to hereafter as simply PHARMTOX. This document has been approved by the faculty membership of PHARMTOX on

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**MISSION STATEMENT:** The interdisciplinary pharmacology and toxicology minor is intended to significantly increase the number of ISU graduates who can:

- 1) Understand, use and define key terms and concepts related to pharmacology and toxicology;
- 2) Apply concepts and standard practices in pharmacology and toxicology to solving practical problems relevant to these fields;
- 3) Analyze scientific data in pharmacology and toxicology;
- 4) Synthesize detailed and accurate descriptions of current knowledge on key topics in pharmacology and toxicology;
- 5) Make informed decisions about current controversies in pharmacology and toxicology, using appropriate scientific methods and ethical reasoning.

### **Faculty**

Any faculty in the Biomedical Sciences Department (**BMS**) and any faculty in the Interdepartmental Toxicology Graduate Program (**TOX**) may participate in the administration of this program.

Faculty outside of TOX and BMS may participate. The ISU faculty member will submit a request to join the PHARMTOX program as faculty to the PHARMTOX supervisory committee. This request will include a statement indicating a desire to participate and a short c.v. The PHARMTOX supervisory committee will review the statement and make a decision regarding participation.

### **Administration**

Program Coordinator of the Minor (PCM) and Associate Coordinator of the Minor

All activities of the PHARMTOX program will be coordinated by a Program Coordinator of the Minor (PCM). This PCM will be elected by the PHARMTOX faculty. The term of office for the PCM will normally be two years.

- A deadline will be set by which time faculty must vote
- At least 50% of the faculty of PHARMTOX must vote (yes, no, abstain).

- The deadline maybe extended if 50% of the faculty have not yet voted
- After the deadline the individual with the most total votes will be considered elected to the position.

The Program Coordinator of the Minor (PCM)'s responsibilities include carrying out existing program policies, suggesting new policies, administering the budget, serving as a liaison with higher administration, coordinating the efforts of PHARMTOX committees, and supervising office staff. The PCM's responsibilities may be changed at any time at the discretion of the Supervisory Committee. The PCM may also assign responsibilities to other PHARMTOX Committees, the Associate PCM, faculty or staff; in this instance, however, the PCM will assume responsibility for assuring that the tasks are performed satisfactorily.

Before assuming office, the PCM will normally have served two years as Associate PCM. The duties of the Associate PCM is to share in administrative duties, as assigned by the active PCM. This will relieve the PCM of some duties, provide training for the Associate PCM, and provide more administrative continuity to the program.

Terms of office shall begin with fiscal years (July 1).

### **Supervisory Committee**

A Supervisory Committee will be responsible for review of all aspects of the program, for guiding the establishment of policy, for interpreting and implementing policies that have been established by the PHARMTOX membership, and for advising the PCM.

In all decisions, each member, including the PCM, will have one vote. In case of disagreements between the Supervisory Committee and the PCM, the Supervisory Committee will have final authority. In the case of disagreements between the Supervisory Committee and the faculty, the faculty view, as determined by referenda, shall prevail.

At least one member of the four person Supervisory Committee must be a faculty member in BMS and one member of the Supervisory Committee must be in TOX. If the Supervisory Committee member is both BMS and TOX then this requirement has been met.

### **Membership**

The Supervisory Committee shall consist of five faculty, including the PCM and Associate PCM. At least one member of the four person Supervisory Committee must be a faculty member in BMS and one member of the Supervisory Committee must be in TOX. If the Supervisory Committee member is both BMS and TOX then this requirement has been met.

Supervisory Committee members (excluding the PCM and Associate PCM) will serve for four years. One member of this committee will be replaced every year. Members may be re-elected to consecutive terms.

The Supervisory Committee will be elected by the PHARMTOX faculty. Elections will be held every year before May 15 and will be administered by the Supervisory Committee. Nominations will be solicited from the PHARMTOX membership. Nominees willing to serve will be voted upon by the PHARMTOX membership. Terms will start on July 1. The Supervisory Committee may appoint a PHARMTOX member on a temporary basis (until the next scheduled election) to complete any unfinished term of a Committee member or Associate PCM, or to substitute for a Committee member or Associate PCM on leave.

### **Meetings**

To insure good communication between the PCM and the Supervisory Committee, the Supervisory Committee should meet twice yearly, preferably at a regularly scheduled time. It is the responsibility of the PCM to call the meetings; if the PCM is not available, meetings may be called by the Associate PCM.

### **Committees**

Committees of PHARMTOX Faculty will be established as needed to perform tasks and advise the PCM on matters such as student admissions, curriculum, academic standards and faculty membership. Members will be appointed by the PCM. The number, membership, and responsibilities of the committees may be modified at any time at the discretion of the PCM. In cases of disagreement between a Committee and the PCM, the PCM will have final authority.

### **Faculty Meetings**

Full faculty meetings should be held once per year to update faculty on PHARMTOX activities and to discuss issues of importance to the group. It is the responsibility of the PCM to call the meetings; if the PCM is not available, the meetings may be called by the Associate PCM.

### **Elections and Referenda**

Except as noted below in the sections on 'Establishment of Policies' and 'Changes in the Governance Document', all elections and referenda will be determined by a majority vote of the PHARMTOX membership who respond to the call for votes. At least 50% of the membership must vote for an election or referendum to be valid.

### **Establishment of Policies**



All policies modifying core-course requirements and major changes in PHARMTOX core-course content must be approved by a majority of the total PHARMTOX membership.

All other policies may be established by a vote of the Supervisory Committee. However, the Supervisory Committee should consult with the faculty when making significant policy decisions and should hold referenda for policy changes likely to be controversial. In addition, all policy decisions by the Supervisory Committee must be announced to the faculty; if three or more faculty object to a policy, a referendum must be held to determine its acceptance or rejection. Referenda on such policies will be determined by a majority vote of the PHARMTOX membership who respond to the call for votes; at least 50% of the membership must vote for a referendum to be valid.

### **Changes in the Governance Document**

Policies contained within this Governance Document may be changed by a majority vote of the total PHARMTOX membership.

### **Students that may participate in the program**

All undergraduates at Iowa State University may participate in this undergraduate minor provided they have the prerequisite coursework to take the required coursework. To complete a minor in PHARMTOX students must take 15 credits, including at least 6 credits taken at ISU in courses numbered 300 or above. Nine credits (9) of the courses listed in the minor must not be used to meet any other department, college, or university requirement except the credit requirement for graduation.

### **Faculty involved with the initiation and participation of the program**

**Richard Martin, BMS, interim PCM, (Chair of Interdepartmental Toxicology)**  
**Aileen Keating, Animal Science, interim Associate PCM**  
**Arthi Kanthasamy, BMS**  
**Joel Coats, Entomology**  
**Suzanne Hendrich, FSHN**  
**Wilson Rumbelha, VDPAM**  
**Anumantha Kanthasamy, BMS (Chair of BMS)**

## Pharmacology and Toxicology undergraduate minor Curriculum

### Prerequisites for Prospective undergraduate minors

Coursework required for pre-requisites for Core and Elective Courses to meet the requirements of this undergraduate minor

### Required Common-Core Lecture Courses

#### **TOX 401: Principles of Toxicology, 3 credits (offered fall)**

*Prereq:* [BBMB 404](#) or equivalent

Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

#### **BMS 439: Principles of Pharmacology, 4 credits (offered spring)**

General principles of drug actions; drug disposition; drug acting on, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems; anti-inflammatory and antibiotic drug; anti-cancer drugs; anesthetics CNS stimulants; lifestyle drugs; drug addiction, abuse and dependence; drugs in sport; drugs for obesity; biopharmaceuticals and gene therapy; drug development.

#### **Physiology (select 1)**

##### **BMS 329 Anatomy and Physiology of Domestic Animals, 3 credits (offered spring)**

*Prereq:* [BIOL 212](#), [BIOL 212L](#)

Survey of body systems of domestic animals. Provides a medical science orientation particularly useful to students in a preveterinary medicine curriculum.

##### **BIOL 335: Principles of Human and Other Animal Physiology, 4 credits (offered fall, spring)**

*Prereq:* [BIOL 314](#)

Introduction to systemic functions with emphasis on mammals. Students cannot receive credit for both BIOL 334 and BIOL 335.

##### **BIOL 334: Metabolic Physiology of Mammals, 3 credits**

*Prereq:* [BIOL 211](#), [BIOL 212](#)

Introduction to physiology of metabolic function in mammals and other animals. Metabolic processes and their interactions with various subsystems, approached

form an organismal perspective. Integration of cellular, gastrointestinal, cardiovascular, respiratory, and renal processes, relevant to their control and integration at the nervous and endocrine system levels. Functional aspects of organismal physiology; energy and water balances, physiology of rest exercise, and environmental stress. Students cannot receive credit for both BIOL 334 and BIOL 335.

## Supportive Electives

### **TOX 354: General Pharmacology, 3 credits (offered spring)**

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems. Prerequisites: BBMB 404, BBMB 405

### **TOX 419/FS HN 419: Foodborne Hazards, 3 credits (offered alternative spring)**

*Prereq: [MICRO 201](#) or [MICRO 302](#), a course in biochemistry*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards. Assessed service learning component. Only one of FS HN 419 and FS HN 519 may count toward graduation.

### **TOX 420/FS HN 420: Food Microbiology, 3 credits**

*Prereq: [MICRO 201](#) or [MICRO 302](#)*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

### **TOX 426: Veterinary Toxicology, 3 credits (offered spring)**

*Prereq: Permission of instructor*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

### **BMS 443: Pharmacology and Therapeutics, 3 credits (offered fall)**

*Prereq: [BMS 354](#)*

Pharmacology and therapeutic uses of fluids, antimicrobial and antiparasitic drugs, clinical use of veterinary drugs, and adverse drug reactions.

### **BMS 490: Independent Study, credits 1-3**

### **TOX 499: Undergraduate Research, credits 1-3**

### **BBMB 316: Principles of Biochemistry, credits 3 (offered spring)**

*Prereq: [CHEM 231](#) or [CHEM 331](#); [BIOL 212](#); [BIOL 313](#) and [BIOL 314](#) strongly recommended.*

Understanding biological systems at the molecular level; chemistry of biological macromolecules, enzyme function and regulation, metabolic pathways; integration of

metabolism in diverse living systems. For students in biology and related majors who are not required to take more rigorous treatment of biochemistry found in [BBMB 404/405](#). Not acceptable for credit toward a major in biochemistry, biophysics, or agricultural biochemistry.

**BBMB 404: Biochemistry I, credits 3 (offered fall)**

*Prereq:* [CHEM 332](#).

A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical and nutritional sciences. Chemistry of amino acids, proteins, carbohydrates, and lipids, vitamins; protein structure; enzymology; carbohydrate metabolism.

**BBMB 405: Biochemistry II, credits 3 (offered spring)**

*Prereq:* [BBMB 404](#)

A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical, and nutritional sciences. Metabolism of carbohydrates, amino acids, nucleotides and lipids; formation, turnover, and molecular relationships among DNA, RNA, and proteins; genetic code; regulation of gene expression; selected topics in the molecular physiology of plants and animals. Credit for both BBMB 420 and the BBMB 404 - BBMB 405 sequence may not be applied toward graduation.

**BIOL 381: Environmental Systems I: Introduction to Environmental Systems, 3-4 credits (fall)**

*Prereq:* 12 credits of natural science including biology and chemistry

Introduction to the structure and function of natural environmental systems. Emphasis on the analysis of material and energy flows in natural environmental systems and the primary environmental factors controlling these systems.

**BIOL 382: Environmental Systems II: Analysis of Environmental Systems, 3 credits (spring)**

*Prereq:* [ENSCI 381](#)

Continuation of [ENSCI 381](#). Systems approach to the analysis of material and energy flows in natural environmental systems and the primary environmental factors controlling these systems.

**BIOL 423: Developmental Biology, 3 credits (spring)**

*Prereq:* [BIOL 313](#)

Principles of embryogenesis and animal development. Establishment of body axes, organ and limb development, and specification of cell fates. Emphasis on cell signaling and the control of gene expression within the context of a developing organism. Medically relevant subjects will be discussed, including stem cells, cancer biology, fertilization, and cloning.

**BIOL 434: Endocrinology, 3 credits (spring)**

Prereq: [BIOL 211](#), [BIOL 212](#)

Chemical integration of vertebrate organisms. The structure, development, and evolution of the endocrine glands and the function and structure of their hormones.

**BIOL 436: Neurobiology, 3 credits (fall)**

Prereq: [BIOL 212](#)

Basic principles of brain function and development. Signaling of nerve cells, synaptic transmission, structure/function of ion channels and receptors, memory and synaptic plasticity, movement and central control, sensation and sensory processing, construction of neural circuits, early brain development, complex brain functions in health and disease.

**BIOL 439: Environmental Physiology**

Prereq: [BIOL 335](#); physics recommended

Physiological adaptations to the environment with an emphasis on vertebrates.

**A B E 424A: Air Pollution: Air quality and effects of pollutants, 1 credit**

Prereq: Either [PHYS 221](#) or [CHEM 178](#) and either [MATH 166](#) or 3 credits in statistics.

Senior classification or above

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 451: Food and Bioprocess Engineering, 3 credits (fall)**

Prereq: [A B E 216](#) and [M E 436](#) or [C H E 357](#), or [F S H N 351](#) and [MATH 266](#) or [MATH 267](#)

Application of engineering principles and mathematical modeling to the quantitative analysis of food and bioprocessing systems. Physical/chemical characteristics of foods and biological systems, flow processes, thermal processes and separation processes. Term paper required for graduate credit.

**ENT 450: Pesticides in the Environment, 2 credits (spring)**

Prereq: 9 credits of biological sciences

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENSCI 486: Aquatic Ecology, 3 credits (fall)**

Prereq: [BIOL 312](#) or [ENSCI 381](#) or [ENSCI 402](#) or [NREM 301](#)

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**B M E 440: Biomedical Applications of Chemical Engineering, 3 credits**

Prereq: [C H E 210](#), [MATH 266](#), [PHYS 222](#)

Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

**GEN 409: Molecular Genetics, 3 credits (fall)**

Prereq: [BIOL 313](#).

The principles of molecular genetics: gene structure and function at the molecular level, including regulation of gene expression, genetic rearrangement, and the organization of genetic information in prokaryotes and eukaryotes.

**GEN 410: Analytic Genetics, 3 credits (spring)**

Prereq: [GEN 409](#).

The principles and practice of genetic analysis. Mendelian genetic analysis, mutational, transgenic, and genomic analysis of gene function, linkage and gene mapping, chromosomal aberrations, aneuploidy and polyploidy, extrachromosomal inheritance, analysis of genetic pathways.

**FS HN 264: Fundamentals of Nutritional Biochemistry and Metabolism, 3 credits (Fall)**

Prereq: [FS HN 167](#); [CHEM 163](#), [CHEM 163L](#); [BIOL 211](#)

Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

**FS HN 442: Issues in Food and Society, 2 credits (Fall)**

Prereq: [FS HN 242](#), [FS HN 342](#)

In-depth discussion, synthesis, and analysis of domestic and international food issues including: food systems from farm to fork, poverty and world hunger, over nutrition, population, agriculture and the environment, ethics, biotechnology, and policy.

**FS HN 461: Medical Nutrition and Disease I, 4 credits (fall)**

Prereq: [FS HN 360](#), [FS HN 361](#), [FS HN 367](#); plus [BIOL 256](#) and 256L or [BIOL 306](#) or [BIOL 335](#)

(Dual-listed with [NUTRS 561](#)) Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

**FS HN 464: Medical Nutrition and Disease II, 3 credits (spring)**

Prereq: [FS HN 360](#), [FS HN 461](#); plus [BIOL 256](#) and [BIOL 256L](#) or [BIOL 306](#) or [BIOL 335](#)

(Dual-listed with [NUTRS 564](#)) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

**FS HN 467: Molecular Basis of Nutrition in Disease Prevention, 3 credits (spring)**

Prereq: [FS HN 360](#) or equivalent

Understanding the molecular basis for the role of diet in the development and prevention of common diseases such as diabetes, cancer, and vascular diseases. Translating this understanding into practical approaches for improving the health of individuals and populations.

**FS HN 489: Issues in Food Safety, 1 credit (spring)**

*Prereq: Credit or enrollment in [FS HN 101](#) or FS HN 272 or [HSP M 233](#); [FS HN 419](#) or [FS HN 420](#); [FS HN 403](#)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**CHEM 211: Quantitative and Environmental Analysis, 2 credits (fall, spring)**

*Prereq: [CHEM 163](#) and [CHEM 163L](#), [CHEM 201](#) and [CHEM 201L](#); or credit or enrollment in [CHEM 178](#); and concurrent enrollment in [CHEM 211L](#)*

Theory and practice of elementary volumetric, chromatographic, electrochemical and spectrometric methods of analysis. Chemical equilibrium, sampling, and data evaluation. Emphasis on environmental analytical chemistry; the same methods are widely used in biological and materials sciences as well.

**CHEM 331: Organic Chemistry I, 3 credits, (fall, spring, summer)**

*Prereq: [CHEM 178](#) or [CHEM 201](#), enrollment in [CHEM 331L](#) highly recommended.*

The first half of a two semester sequence. Modern organic chemistry including nomenclature, synthesis, structure and bonding, reaction mechanisms. For students majoring in physical and biological sciences, premedical and pre-veterinary curricula, chemistry and biochemistry.

## Academic Program Approval Voting Record

This document is to be appended as the last page of the proposal for any new or revised academic program to record the successive votes of approval as the proposal moves through its required review and approval steps. Consult Faculty Handbook Section 10.8 or the Faculty Senate Curriculum Committee website for information regarding Committee review and voting requirements for each action.

Curricular Action: (check appropriate boxes below)

1.  New Program     Name Change         Discontinuation     Concurrent Degree for:
2.  Undergraduate Major    Graduate Major     Undergraduate Minor    Graduate Minor  
 Undergraduate Certificate     Graduate Certificate         Other: \_\_\_\_\_
3. Name of Proposed Change: \_\_\_\_\_New **Pharm/Tox undergrad. minor**\_\_\_\_\_
4. Name of Contact Person: Richard J. Martin e-mail address: rjmartin@iastate.edu
5. Primary College: CVM Secondary College: \_\_\_\_\_
6. Involved Department(s): BMS Inter. Dept. Toxicology

**Voting record for this curricular action:**

Voting Body	Votes			Date of Vote
	For	Against	Abstain	
Dept. or Program Committee, BMS	3	0	0	August 15 <sup>th</sup> , 2016
Interdepartmental Toxicology	6	0	0	August 15 <sup>th</sup> , 2016
College Curriculum Committee	9	0	0	August 25 <sup>th</sup> , 2016
College Approval Vote	82	7	6	October 6-14 <sup>th</sup> 2016
Graduate Council				
Faculty Senate Curriculum Committee				Jan 24 <sup>th</sup> 2017
Faculty Senate Academic Affairs Council				
Faculty Senate				



[FSCC – November 2013]

Dear Richard,

Steve Bradbury has been shepherding a request for an undergraduate minor in Pharmacology and Toxicology through our Curriculum Committee chaired by Tim Stewart. The Department of Natural Resource Ecology and Management supports the proposed Pharmacology and Toxicology undergraduate minor. The minor would be relevant for students majoring in Animal Ecology including, but limited to, those students that have chosen the pre-veterinary and wildlife care option. In this regard, training on how veterinary drugs and environmental toxicants can effect wildlife, aquatic life and environmental systems will support students majoring in Animal Ecology who are interested in continuing their education in veterinary or graduate school. The minor could also increase our undergraduates' competitiveness in the job market.

Thank you very much.

Sue Blodgett, Chair  
Department of Entomology  
Department of Natural Resource Ecology and Management  
339 Science II

**Iowa State University**

Ames, IA 50010

(515) 294-1739

[sblodg@iastate.edu](mailto:sblodg@iastate.edu)

*Sep 26; ISU Awards Ceremony, 3:30pm, Campanile Room, MU*

*Sep 22 Paul Errington lecture, Polar Bears, Sea ice and Conservation, Andrew Derocher 7pm Great Hall, MU*

*Sep 25-30; XXV International Congress of Entomology, Orlando, FL*

*Oct 14-16; Cyclone Family Weekend*

Date: September 14, 2016

To: Richard Martin, BMS ([rjmartin@iastate.edu](mailto:rjmartin@iastate.edu))

From: Biology Program Committee, Chair, Jeff Essner

Re: Letter of Support for proposed undergraduate minor in Pharmacology and Toxicology

The Biology major supports the proposed Pharmacology and Toxicology undergraduate minor. The intent of the minor is to train undergraduate students, including those in the biological sciences, in exploring and understanding how drug actions and toxicants can effect animal and environmental systems. We have noted that these students have the option to enroll in Biology 335 or Biology 336 to complete the physiology aspect of their training, and we welcome their participation in these classes. This training will aid in career development.

Jeffrey J. Essner, Ph.D.

Associate Professor

Iowa State University

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**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

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Date: September 14, 2016

To: Richard Martin, BMS ([rjmartin@iastate.edu](mailto:rjmartin@iastate.edu))

From: Don H. Beermann, Professor and Chair

Re: Letter of Support for proposed undergraduate minor in Pharmacology and Toxicology

The Department of Animal Science supports the proposed Pharmacology and Toxicology undergraduate minor. The intent of the minor is to train undergraduate students, including those in the animal sciences, in exploring and understanding how drug actions and toxicants can effect animal and environmental systems. This training will aid in career development.

Sincerely,



Don H. Beermann  
Professor and Chair

cc: Aileen Keating

Date: 15 Sept 2016

To: Graduate Senate

From: Interdepartmental Toxicology Supervisory Committee

Richard Martin, Distinguished Professor, BMS; Suzanne Hendrich, University Professor, FSHN; Wilson Rumbelha, Professor, VDPAM; Aileen Keating, Associate Professor, Animal Science; Joel Coats, Distinguished Professor, Entomology

Re: Letter of support for Pharm and Tox undergraduate minor

This is a letter of support for the Pharmacology and Toxicology undergraduate minor. We have reviewed and contributed to the program proposal, the governance document, and revised and created appropriate coursework in support of this undergraduate minor. Students enrolled in this undergraduate minor will be able to incorporate what they learned about pharmaceuticals and toxicants in the environment into their present majors and also into their careers and further education. Many jobs in industry, government, and academia need an understanding of toxicological and pharmacological concepts.

Hi Richard,

Just a quick note our CVM Curriculum Committee has voted to approve your course BMS 439X which will be part of the Phar/Tox minor.

We wish you the best with this new course.

~ Alex

Alex Ramirez

CVM Curriculum Committee Chair

## BMS 439X

Iowa State University College of Veterinary Medicine  
CVM Graduate Student Syllabus Contents  
ISUCVM Graduate Curriculum Committee

### 1. Basic Information

- a. Course name and number: **Principles of Pharmacology, BMS 439X**
- b. Number of credit hours: 4
- c. Time and location: Spring Semester, Annually; Room #1316 College of Veterinary Medicine

### 2. Instructors

- a. Name of the instructor- in-charge other instructors, course coordinators, teaching assistants, and other facilitators. Instructor in charge: **RJM** Dr Richard Martin ([rjmartin@iastate.edu](mailto:rjmartin@iastate.edu)) Instructors: **WH** Drs Hsu ([whsu@iastate.edu](mailto:whsu@iastate.edu)), **AR** Robertson ([AlanR@iastate.edu](mailto:AlanR@iastate.edu)) and **AK** Kanthasamy ([arthik@iastate.edu](mailto:arthik@iastate.edu))
- b.

#### **BMS 439X: PRINCIPLES OF PHARMACOLOGY**

**SPRING 2016**

**Room # 1316**

**Class Hours: 9-10 am: Monday, Tuesday, Wednesday, Thursday**

<b>Course Instructors</b>	<b>Room #</b>	<b>Phone #</b>	<b>E-mail</b>
Dr. Richard J. Martin (Instructor-in-Charge)	2018	4-2470	<a href="mailto:rjmartin@iastate.edu">rjmartin@iastate.edu</a>
Dr. Alan Robertson	2058	4-1212	<a href="mailto:AlanR@iastate.edu">AlanR@iastate.edu</a>
Dr Walter Hsu	2030	4-6864	<a href="mailto:Hsu@iastate.edu">Hsu@iastate.edu</a>
Dr Arthi Kanthasamy	2016	4-7238	<a href="mailto:arthik@iastate.edu">arthik@iastate.edu</a>

**Class Times (9-10 am Monday, Tuesday, Wednesday and Thursday)  
BUT TESTS START AT 8:00 ON THURSDAYS**

Four 1-hour lectures/week

Shivani Choudhary

[shivani@iastate.edu](mailto:shivani@iastate.edu)

- c. Office hours: 9 am to 5:30 pm

### 3. Prerequisites

Permission of the Instructor in Charge who will help students to realistically assess their readiness for the course by having them list knowledge, skills, and experience as an incoming student. Appropriate for students majoring in a biological science, and command of English who have an interest in and capacity for advanced pharmacology.

### 4. Goals and Objectives

- a. Overview of the course's purpose: To give students a knowledge, understanding and ability to recall the concepts and vocabulary of modern pharmacology at a graduate level.
- b. Subject matter and how the course fits into the curriculum. Pharmacology is one of the core disciplines of Toxicology and Biomedical Sciences.
- c. General Learning Goals/Competencies. Students will be expected to answer questions presented in a multiple choice format that they know and understand the different receptors that are present in the human and mammalian animals, the drugs that act as agonists and antagonists, the concepts of

chemotherapy, drug resistance, drug development, misuse of drugs and main classes of drugs. The course is suitable for those students intending to follow a professional medical training, a PhD or to enter industry that is focused on Biomedical Sciences. The BMS 539 graduate student will have essay questions in addition.

- d. Conceptual structure used to organize the course. Why topics are arranged in a given order and the logic of the themes and concepts as they relate to the course structure. The structure follows that of the textbook (Pharmacology, Rang), starting with the definitions of pharmacology, then receptor theory, a systems based structure and followed by chemotherapy and drug development. Lectures on use and misuse of drugs in society are also given.
- e. The broad goals of this course are to give students a knowledge base of the main properties, mechanisms of actions and logical uses of the therapeutic compounds that are for treating diseases and conditions of humans and animals. Students should be able to answer written questions demonstrating a knowledge and understanding of the properties, effects, mechanisms of action and uses of:
  - 1. The Principles of Pharmacology
  - 2. Chemical Mediators
  - 3. Properties of drugs affecting Major Organ Systems
  - 4. Drugs affecting the Nervous system
  - 5. Drugs used for treatment of infections, Cancer and Immunological Disorders
  - 6. Individual Variation, Harmful drugs, Drugs Used for in Sports and Lifestyle drugs

#### 5. Course teaching philosophy/ learning activities

The format of the course follows a classic lecture pattern using PowerPoint presentations, class discussions, and in class testing of previous lectures. Tests are given after each set of lectures (2 or 3 week intervals). Class test also support the instruction.

#### 6. Textbooks

##### A. Required Texts/Readings Books Required

- 1. Rang and Dale's Pharmacology 2012. Elsevier, Churchill Livingstone. Edinburgh, London, New York, Oxford, Philadelphia, St Louis, Sydney, Toronto

B Additional equipment or materials needed and sources (e.g., glossary of terms and jargon, etc.): Laptop or tablet computer are necessary.

#### 7. Available Resources

- a. Instructor recommendations on how to study or take notes; All notes available on Blackboard.
- b. Information about resources such as tutoring, study skills help, or relevant labs; More in-depth readings, advanced topics, or remedial refreshers. Text: Pharmacology, Rang and Dale.
- c. Use or non-use of prior examinations or sample questions. Not used.

#### 8. Unforeseen Circumstances and Adaptation of the Syllabus

Information in the syllabus is subject to change. Changes will be announced in class and posted on the course site on Blackboard Learn or the appropriate Learning Management System if this format is applicable.

#### 9. Tests and Grading

##### Content Delivery:

Four didactic lectures will be given per week. Students will be expected to complete in class quizzes for each lecture. The lecture content to be based on the Rang and Dale Chapter.

**Assessment/Grading:**

Attainment of the course objectives will be assessed through four avenues:

1: **Six tests** will be given (total = **600 points**) by the section faculty instructor.

2. **Lecture quiz 2 points/LECTURE** (total = **100 points**)

**Total points graded: 700**

The instructors reserve the right to curve (adjust upwards) results of exam test to award the final grades.

No makeup quizzes or exams. Attendance advised but not required. Late work not accepted without medical or prior arrangement.

**TENTATIVE GRADING SCALE**

A:700-666; A-:665-630;

B+:629-606; B:605-582;B-:581-560;

C+:559-536; C:=535-512; C-=511-490;

D+:489-466; D:=465-443; D-=442-420

F : 419 and below

**15. Course Calendar**

**Course content for BMS 439X (Principles of Pharmacology; 50 lectures)**

**LECTURES 9-10 AM MON, TUES, WED AND THUR IN #1316**

**Week 1 Jan 11<sup>th</sup> -15<sup>th</sup> 2016**

**Hours**

**General Principles**

**4**

**M:** What is pharmacology? And How drugs act: general principles **RJM**

**Tu:** How drugs act: molecular aspects **RJM**

**W:** How drugs act: cellular aspects **RJM**

**Th:** Receptor theory **RJM**

**Week 2 Jan 19 – 22<sup>th</sup>**

**4**

**Tu:** Cellular proliferation, apoptosis and repair **RJM**

**W: 9-10 AM** Cellular mechanisms: host defense **RJM**

**W: 11-12 AM** Methods and Measurement in Pharmacology **RJM**

**Th:** Drug Absorption and distribution **RJM**

**Week 3 Jan 25<sup>th</sup> -29<sup>st</sup>**

**4**

**Chemical Mediators**

**M:** Drug Metabolism **RJM**

**Tu:** Pharmacokinetics **RJM**

**W:** Basic Autonomic Anatomy and Physiology and Chemical mediators **WH**

**Th:** TEST 1

**Week 4 Feb 1<sup>rd</sup>-5<sup>th</sup>**

**4**

**M:** Cholinergic Transmission **WH**

**Tu:** Noradrenergic Transmission **WH**

**W:** 5-HT and pharmacology of migraine and purines **WH**

**TH:** Local hormones: cytokines, biologically active lipids and peptide **WH**

**Week 5 Feb 8<sup>th</sup>-12<sup>th</sup>**

**4**

**Drugs affecting the major organs**

**M:** Peptides and Nitric Oxide **SC/AR**

**Tu:** Control of blood glucose and diabetes mellitus **WH**

**W:** Obesity **WH**



**TH: TEST 2**

**Week 6 Feb 15<sup>th</sup>-19<sup>st</sup> 4**  
**M:** Anti-inflammatory and immunosuppressant drugs **APR**  
**Tu:** Respiratory system **APR**  
**W:** The kidney **APR**  
**TH:** Pituitary and Adrenal Cortex **WH**

**Week 7 Feb 22<sup>th</sup>-26<sup>th</sup> 4**  
**M:** Thyroid **WH**  
**Tu:** Bone **WH**  
**W:** The GI tract **APR**  
**TH:** TEST 3

**Week 8 Feb 29<sup>th</sup>-March 4<sup>th</sup> 4**  
**M:** The heart **APR**  
**Tu:** Cannabinoids **APR**  
**The Nervous System**  
**W:** Central transmitters and amino acid transmitters **AK**  
**TH:** Other transmitters and modulators **AK**

**Week 9 March 7<sup>th</sup>-11<sup>th</sup> 4**  
**M:** Drug addiction, dependence and abuse **AK**  
**Tu:** CNS stimulants and psychotomimetic drugs **APR**  
**W:** Antidepressant drugs **APR**  
**TH:** TEST 4

**Spring Break**

**Week 10 March 14<sup>th</sup>-18<sup>st</sup>**

**Week 11 March 21<sup>th</sup>-25<sup>th</sup> 4**  
**M:** Anxiolytic and hypnotic drugs **APR**  
**Tu:** Antipsychotic drugs **APR**  
**W:** Analgesic Drugs **APR**  
**TH:** General Anesthetics and Local Anesthetics **APR**

**Week 12 March 28<sup>th</sup>-April 1<sup>th</sup> 4**  
**Drugs used for treatment of infections, cancer and immunological disorders**  
**M:** Reproduction I **WH**  
**Tu:** Reproduction II **WH**  
**W:** Anticancer drugs **WH**  
**TH:** TEST 5

**Week 13 April 4<sup>th</sup>-8<sup>th</sup> 4**  
**Special Topics**  
**M:** Antimicrobial Drugs I **RJM**  
**Tu:** Antimicrobial Drugs II **RJM**  
**W:** Antiviral drugs **WH**  
**TH:** Antifungal Drugs **WH**

**Week 14 April 11<sup>th</sup>-15<sup>th</sup> 4**  
**M:** Antiprotozoal drugs **WH**  
**Tu:** Anthelmintic drugs **APR**  
**W:** Individual variation drug variation **APR**  
**TH:** Harmful effects of drugs **APR**



## 12. Disability Accommodation

Individuals with physical or mental impairments who are otherwise qualified to pursue their studies may request reasonable accommodations to enable them to continue their studies. For more information, see: <http://www.eoc.iastate.edu/discrimination/disability>.

## 13. Harassment and Discrimination

Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment. For more information, or if you believe you are a victim of discrimination or harassment, please visit the following URL for additional guidance: <http://policy.iastate.edu/policy/discrimination/>.

## 14. Religious Accommodation

There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request reasonable accommodation of their religious practices. <http://www.eoc.iastate.edu/discrimination/religious>.

## 15. Unforeseen Circumstances and Adaptation of the Syllabus

Information in the syllabus is subject to change. Changes will be announced in class and posted on the course site on Blackboard Learn or the appropriate Learning Management System if this format is applicable.