

# BioInnovation (P.S.M.)

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## About The Program:

Bioinnovation entails identification, commercialization, and dissemination of novel biological technologies, concepts, and models. The primary objective of the Professional Science Master's (P.S.M.) program in Bioinnovation is to develop a portfolio of knowledge and experience that allows individuals with a background in science, business, communication, law, and policy and regulation to pursue careers in such fast-growing fields as bioinformation, the environment, global health, pharmaceuticals and biotechnology, technology transfer, and trade. The program offers:

- Extensive biotechnology and biomedical background to challenge and complement traditional thinking and applications;
- Review of the translational nature of biodiscoveries through classroom instruction and direct interaction with different bioindustry professionals, including scientists, lawyers, journalists, and others; and
- Development of team and matrix work routines and effective communication skills.

**Career Options:** Official job placement is not offered, but prospects are good. The program is designed to help recent graduates obtain relevant employment as well as accelerate career advancement and/or allow career shift of currently employed professionals. Graduates of P.S.M. programs are in high demand, which underscores the P.S.M. as an attractive career path for those who do not wish to become academic researchers or pursue a doctorate.

**Prerequisites for Admission:** Prior coursework in Psychology, Physiology, Chemistry, or Biology with a GPA of 3.0 or above.

## Areas of Specialization:

- Bioinnovation in Environment and Society
- Current Topics in Bioinnovation
- Implementation of Biodiscoveries in Health and Other Industries

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## Requirements of Programs:

- **Total Credit Hours:** 30
- **Culminating Events:**

*Capstone Project*

Constitutes the capstone experience for the Bioinnovation P.S.M. and requires the submission of a written project and oral presentation of the results.

## Year 1

### *Fall*

**Innovative Biomodels and Concepts** – The aim of this course is to familiarize students with current concepts, models, and cutting-edge technologies applicable in different bioindustries. The scope of

topics ranges from the implementation of discoveries stemming from molecular genetics, cell biology and nanotechnology in different industries to integration of omics techniques in personalized medicine, drug discovery and pharmacovigilance. Note: Non-STEM graduates will be required to enroll as non-matriculated in at least two Biology Foundation courses recommended by the PSM in Bioinnovation Steering Committee.

**Biomarkers and Biotargets: Research and Commercialization** – This course focuses on the evolution of biomarker and biotarget research, with emphasis on biomarker validation and biotarget druggability. The students will analyze real-life examples of biomarkers and biotargets in medicine, drug development, and environmental science. The formation of therapeutic target databases and development of multi-target agents will be critically evaluated. Note: Non-STEM graduates will be required to enroll as non-matriculated in at least two Biology Foundation courses recommended by the PSM in Bioinnovation Steering Committee.

**Principles of Strategy and Management** – Whether you are interested in being a high-performing employee, a manager within an organization, an innovator, or a successful entrepreneur, understanding the core business principles of strategy and management is critical to helping you achieve your goals. This course will provide an overview of traditional as well as cutting-edge, innovation-focused perspectives and tools including: industry and stakeholder analysis, competitive advantage, business models, profitability, organizational design, and the evolving roles of managers and leaders. This is an introductory course for anyone without formal business training or education. It is utilized as an introductory course in a number of certificates and masters programs and can help individuals considering whether or not a Fox graduate degree is interesting or appropriate for them. NOTE: Not open to MBA students but available to all other majors / all schools and colleges.

### *Spring*

**Epigenetics, Genetics: Applications in Drug Design and Drug Response** – This course focuses on applications of current epigenetics knowledge in health industries. Special emphasis is on epigenetic and genetic testing in clinical settings, epigenetic and genetic determinants of drug response as well as drug- and environment-induced modulation of epigenetic status. Note: Non-STEM graduates will be required to enroll as non-matriculated in at least two Biology Foundation courses recommended by the PSM in Bioinnovation Steering Committee.

**Systems Biology: Principles and Applications** – This course provides an overview of Systems Biology technologies and the scientific challenges in applicability of system biology paradigms in the analysis of biological processes. Topics covered include the use of genome-scale in silico models and dissecting transcriptional control networks. By successfully completing this course, the students will obtain background on theoretical and modeling techniques, and software platforms for Systems Biology. Note: Non-STEM graduates will be required to enroll as non-matriculated in at least two Biology Foundation courses recommended by the PSM in Bioinnovation Steering Committee.

**Dissemination of Biodiscoveries and Virtual Reality in Medicine** – The students will learn contemporary methods of effective dissemination of research findings and concepts to professional and lay audiences. Current real-life findings will be presented through slide and video development, press releases, and the use of social media. Furthermore, this course will provide the students with a

background on Virtual Reality and its applications in medicine, laboratory research, training and education in bioindustry.

### **Elective (Worth 3 Credits)**

#### **Year 2**

##### *Summer I*

**Capstone Project** – Capstone project for master's students including students in PSM, MA or MS. This class will provide full-time status. Students in PSM programs need to register for at least one credit of this course to fulfill program requirements. Additional credits may be required for specific programs. Students in the MA program may satisfy this course requirement by completing a library thesis. This course will confer full-time status at the minimum credit hour registration limit of one credit.

##### *Fall*

**Ethics Regulation and Policy in Biotechnology** – The Bioethics, Policy and Regulation course is designed for students in the Professional Science Master's Program in Biotechnology. This course will provide an understanding of ethical decisions, governmental regulations and policies in biotechnology. A case study approach will be used to provide a framework for discussions of policy and ethical decision making. Guest speakers will provide insights from legal and governmental perspectives on emerging and current biotechnology applications.

**Capstone Project** – Capstone project for master's students including students in PSM, MA or MS. This class will provide full-time status. Students in PSM programs need to register for at least one credit of this course to fulfill program requirements. Additional credits may be required for specific programs. Students in the MA program may satisfy this course requirement by completing a library thesis. This course will confer full-time status at the minimum credit hour registration limit of one credit.

### **Electives (Worth 3 Credit)**

##### *Spring*

**Capstone Project** - Capstone project for master's students including students in PSM, MA or MS. This class will provide full-time status. Students in PSM programs need to register for at least one credit of this course to fulfill program requirements. Additional credits may be required for specific programs. Students in the MA program may satisfy this course requirement by completing a library thesis. This course will confer full-time status at the minimum credit hour registration limit of one credit.

Approved Electives

**Bioinnovation Seminar** – This course includes lectures and seminars on current topics in bioinnovation presented by experts in different disciplines and it will include seminars at the Fox School of Business and Management. By successfully completing this course, the students will obtain up-to-date knowledge of bioinnovative models.

**Milestones in Clinical Translation of Biodiscoveries** - The goal of this course is to familiarize the students with clinical trial design and principles of pharmacovigilance. Topics will include clinical trial phases and examples of clinical trial design for selected biologic drugs. Case studies of drug safety-driven

FDA decisions will also be evaluated. The comparison between regulatory requirements of the U.S. and international agencies will be discussed.

**Bioadvanced Screening in Health Disparity** – This course focuses on the effects of nutrients, bioactive food components and environment on public health, medical treatments and applications for improving human health.

**Entrepreneurial Thinking and New Venture Creation** – Whether students are aspiring entrepreneurs bent on launching new businesses or managers bent on growing profitable businesses, the module seeks students to "think big" and "think out of the box". The central focus of the module is on two key success factors: the entrepreneur; and his/her ability to create and recognize opportunities. It examines the concepts, skills and know-how, information, attitudes and alternatives that are relevant for entrepreneurs engaged in start-up and early-stage ventures, managers of new ventures within established organizations, and the relevant stakeholders. Key questions raised and answered in the module include: What are the key aspects of new venture creation process? Where can you look for new opportunities? How do you evaluate an opportunity? How do you generate, evaluate, and evolve your ideas? How do new ventures achieve growth? What are the key elements of deal structure? How should you structure a deal? What are the strategies for harvesting new ventures? What are the unique properties of entrepreneurs and their teams?

**Global Innovation Strategy: Creating Agile, Innovative, Globally-Competitive Organizations** – This course discusses innovation-based strategies as a source of competitive advantage as well as how to build and design agile / adaptive organizations that excel at innovation. Major topics include understanding how disruptive innovations impact industries, designing an organization that encourages innovation and embraces change, balancing performance and innovation demands, and organizing to take advantage of various sources of innovation. In addition, students will be exposed to a number of cutting-edge topics relevant to next-generation strategy: global R&D and emerging market innovation, organizational learning and knowledge management, and open innovation approaches that engage both your customer base as well as your value system to innovate and create unparalleled value.

**Lean Entrepreneurship / Innovation: Fast & Frugal Methods to Launch Startups & Test Innovative Ideas** – The Lean Startup or Lean Launchpad methodology has transformed the way that entrepreneurship is taught and practiced and has even changed how the most innovative organizations in the world invent new products and services or reinvent themselves via innovation. In this experiential, hands-on course students will learn the 'customer-development' approach that serves as a counterpoint to traditional 'product development' undertaken in most organizations. Students will be immersed in the iterative (build-measure-learn) process and will learn how to accelerate the process via creative approaches to designing minimum-viable products, prototypes, and experiments. Furthermore, they will learn how to more systematically identify and test assumptions so that they can make decisions to pivot, proceed, or restart based on customer insights and evidence gathered.

**Business Model Innovation** – A business model describes how an organization creates and captures value - a business model is like the DNA of an organization. Business model tools and perspectives have recently advanced at a dramatic pace and business model innovations are one of the most significant sources of industry disruption. This course uses the business model canvas methodology as well as the strategic revolution/blue ocean strategy approaches to generate rule-breaking business models. In addition, building on this business model foundation, we will explore theories of innovation characteristics, adoption, and diffusion to provide practical advice and techniques for finding first

customers, implementing innovative ideas, and driving acceptance by modifying your products, services, and business model.

**Creativity Unleashed: Harnessing Creativity to Solve Real-World Innovation Challenges** – We all face an innovation imperative - innovate or die. Innovation fuels our ability to be competitive - both on a corporate level and on a personal one. However, innovation remains elusive to many organizations and individuals. Students in this course will shift both their perspective and their behaviors as they learn a set of creativity tools that they will apply to real-world innovation challenges during class. This course delves deep into critical creativity topics like problem formulation, divergent thinking techniques, idea evaluation and convergent thinking, evolving ideas to increase impact and feasibility, and championing your ideas to find acceptance. No matter what career or profession you are going into, being familiar with creative approaches and techniques will help you to be more valuable, employable, innovative, and entrepreneurial. Developing your competencies in this area might be one of the most important investments you can make in yourself. Creativity has become one of the most sought after characteristics of employees and managers and is an important predictor of executive success. Creativity is not simply something you have, it is something that you can develop.

**Open Innovation and Managing Strategic Alliances** – It is said that competition is no longer company-vs-company but business ecosystem against business ecosystem. Unbridled advances in technology, connectedness, globalization, and fragmentation of value chains across industries have transformed the relationship between companies, customers, partners, and competitors. Increasingly the knowledge and specialization required by firms to produce new products, gain new resources including strategic intelligence, and to place bets across nascent markets resides outside of firms' boundaries. To be successful in this context, firms - from established industry giants to entrepreneurial new ventures - must build comprehensive open innovation strategies that engage and mobilize external stakeholders to productive and innovative ends. This course addresses the distinct challenges and opportunities posed by the confluence of digital community (i.e. "the crowd"), powerful and expanding data gathering and analytics, and the ambiguous boundaries of successful modern firms.

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## Courses:

Click [HERE](#) for more information on the courses below.

- Evolution
- Genomics in Medicine
- Fundamentals of Genomic Evolutionary Medicine
- Evolutionary Ecology
- Genomics and Infectious Disease Dynamics
- Evolutionary Genetics Genomics
- Innovative Biomodels and Concepts
- Biomarkers and Biotargets: Research and Commercialization
- Epigenetics, Genetics: Applications in Drug Design and Drug Response
- Systems Biology: Principles and Applications
- Behavioral Genetics
- Effective Dissemination of Bio-discoveries through Traditional and New Media
- Bioinnovation Seminar
- Milestones in Clinical Translation of Biodiscoveries
- Bioadvanced Screening in Health Disparity
- Virtual Reality in Bioindustry and Medicine

- Dissemination of Biodiscoveries and Virtual Reality in Medicine
- Genomics and Evolutionary Biology of Parasites and Other Dependent Species
- Animal Behavior
- Ecology of Invasive Species
- Cell Biology
- Conservation Biology
- Herpetology
- Biostatistics
- Plant Community Ecology
- Biology of Plants
- Research Techniques in Molecular Biology
- Polar Biology - Life at the Extremes
- Comparative Biomechanics
- Epigenetics
- Cellular/Molecular Neuroscience
- Stem Cell Biology
- Genomics
- Structural Bioinformatics I
- Tropical Marine Biology: Belize
- Immunology
- Virology
- Developmental Genetics
- Advanced Techniques in Microscopy
- Freshwater Ecology
- Systems Neuroscience
- Neurological Basis of Animal Behavior
- Organization and Development of the Nervous System
- Biochemistry of Embryogenesis
- Mammalian Development
- Contemporary Biology
- Endocrinology
- Molecular Biology
- Cell Proliferation
- Physical Biochemistry
- General Biochemistry I
- General Biochemistry II
- Biotechnology
- Analytical Biotechnology
- Microbial Biotechnology
- Biotechnology Laboratory I
- Biotechnology Laboratory II
- Ethics Regulation and Policy in Biotechnology
- Professional Development Seminar for PSM in Biotechnology
- Computational Genomics
- Ethics in Bioinformatics
- Nucleic Acid Technologies
- Introduction to Scientific and Regulatory Writing
- Introduction to Grant Writing
- Communicating Science to a Broader Audience / Non-Scientists
- Graduate Independent Study
- Teaching of Biology
- Introduction to Graduate Research
- Seminar in Neuroscience
- Research Techniques
- Teaching in Higher Education: Life Sciences
- Directed Readings
- Master's Research Projects
- Preliminary Examination Preparation
- Master's Thesis Research