



UCF, College of Medicine
BS Biotechnology
MS Biotechnology/MBA
Professional Science Masters
Program in Biotechnology/MBA



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UCF, College of Medicine
Biotechnology Programs

Bachelor of Science
Master of Science/MBA
Professional Science MS/MBA

Biotechnology programs will prepare students to function in the industrial biotechnology environment, and is designed to focus on scientific and practical aspects of biotechnology.

It involves innovative, hands-on, and multidisciplinary learning approaches to educate and train students in the science behind biotechnology, its business and legal aspects.

UCF Biotechnology Degree Programs

- Provide students with training, and education in the core aspects of biotechnology through hands on and multidisciplinary approach.
- Scientific principles and knowledge underlying biotechnological advances
- Laboratory techniques in research and development
- Legal and intellectual property issues
- Business and entrepreneurship skills and attributes
- Students are admitted each Fall.
- Student can choose to follow one these tracks:
 - MS Biotechnology: thesis (2 years)
 - PSM MS Biotechnology: non-thesis (1 year)
 - MBA – (one year)

Goals of Biotechnology Program

- **To build a world-class academic program to produce highly trained workers essential to meeting the workforce needs.**
- **To provide a foundation in the life sciences critical to biotechnology.**
- **To educate students on how fundamental science is applied to solve problems through biotechnology.**
- **To provide students with the technical, laboratory and management skills needed in the biotechnology industry.**
- **To provide an emphasis on applications and product development critical to the biotechnology industry.**
- **To provide students with an industrial perspective and an understanding of product development.**
- **Opportunities to participate in biotechnology graduate research in College of medicine laboratories or internships with industrial partners.**
- **To develop team working, communicative, and information fluency skills.**
- **To familiarize students with societal concerns, ethical issues and government regulations regarding the biotechnology industry**

BIOTECHNOLOGY INDUSTRY FACTS

- **Biotechnology is a > \$50 billion a year industry that has produced >150 drugs and vaccines.**
- **There are more than 400 biotech drug products and vaccines currently in clinical trials targeting over 200 diseases, including various cancers, Alzheimer's, heart disease, AIDS, & diabetes,**
- **Biotechnology is responsible for hundreds of medical diagnostic tests that keep the blood supply safe.**
- **Genetic engineering is sweeping the world's farms. Genetically Modified crops are grown by millions of farmers in >50 countries**
- **Consumers already are enjoying biotechnology foods such as soybeans (>90% grown in the US) and corn.**
- **Hundreds of biopesticides and other agricultural products also are being used to improve our food supply and to reduce our dependence on conventional chemical pesticides.**

ADMISSION

- Admission into the Biotechnology MS program will require a BS degree in life sciences with a minimum grade point average of 3.0 and total GRE score of 1000 (combined verbal and quantitative scores).
- Students entering MS Biotechnology program have the option to enroll in the MBA program with no GMAT score. For admission criteria, visit www.ucfmba.ucf.edu. The MBA program begins each Fall semester.

Biotech Degree Goals

- The students will be provided an industrial perspective & an understanding of product development and the molecular techniques.
- Completion of MBA degree in addition to Biotechnology MS will provide great opportunity to perform jobs that require scientific talent and management skills.

Bachelors of Science in Biotechnology

- Upper Division Restricted Electives (Minimum 6-8 hrs)
 - Choose between 2 to 3 courses from 19 courses relevant to the biotechnology industry.
 - MCB 4912 – Directed Research
 - Students must take at least 3 hours of Directed Research, which is applied towards their restricted electives hours.

MS Biotechnology

- **Required Courses--16 Credit Hours**

- BSC 6407C Laboratory Methods in Molecular Biology (3 credit hours)
- BSC 6432 Structure-Function-Relationships of Biomolecular Science I (5 credit hours)
- BSC 6432 Structure-Function-Relationships of Biomolecular Science II (5 credit hours)
- MCB 5527 Genetic Engineering and Biotechnology (3 credit hours)

- **Graduate Seminars--2 Credit Hours**

- Students will participate in at least two graduate seminar courses (MCB 6938, 1 credit).
- Seminar course will prepare students for making professional presentations with emphasis in biotechnology.
- Seminar will involve participation of speakers from the biotechnology industry with emphasis on an industrial perspective on biotechnology applications and product development.

Restricted Electives - 6 Credit Hours

- **MCB 5205 Infectious Processes (3 credit hours)**
- **MCB 5225 Molecular Biology of Disease (3 credit hours)**
- **MCB 5505 Molecular Virology (3 credit hours)**
- **MCB 5654 Applied Microbiology (3 credit hours)**
- **MCB 5932 Current Topics in Molecular Biology (3 credit hours)**
- **MCB 6226 Molecular Diagnostics (3 credit hours)**
- **MCB 6417C Microbial Metabolism (3 credit hours)**
- **MCB 6938 Seminar (1-2 credit hours)**
- **PCB 5238 Immunobiology (3 credit hours)**
- **PCB 5239 Tumor Biology (3 credit hours)**
- **PCB 5275 Signal Transduction Mechanisms (3 credit hours)**
- **PCB 5937 Special Topics: Human Endocrinology (3 credit hours)**
- **PCB 6528 Plant Molecular Biology (3 credit hours)**
- **PCB 6596 Bioinformation and Genomics (3 credit hours)**
- **ZOO 5745C Essentials of Neuroanatomy (4 credit hours)**

Thesis- 6 Credit Hours

- Students will take a minimum of six credits of thesis research (MCB 6971) to complete their research and submit their thesis specializing in biotechnology research.
- During the first few weeks students are expected to familiarize themselves with the research programs by direct interaction with faculty members, through attending seminars or by visiting faculty websites, before choosing a laboratory for thesis research.
- There will be no laboratory rotation. Students will start their research on September 1 the first fall semester. The student and the Thesis Adviser/ Major Professor will jointly recommend an advisory committee comprised of at least three members.
- The committee composition must reflect expertise relevant to the student's thesis research and be approved by the Graduate Committee.
- An oral thesis defense is required. Completion of publication quality research is expected for graduation.

PSM MS Biotechnology

- No thesis research required
- Students will take a minimum of six credits of internship in companies or research institutions
- Internship is performed during the summer
- For PSM certification, MBA foundation courses (4) are required
- For MBA, profession core is required
- Both degrees are completed within two years

PSM MS - Biotechnology

- **Chemistry**
 - CHM 2045, 2046, 2046L Chemistry I & II plus Lab
 - CHM 2210, 2211, 2211L Organic Chemistry I & II plus Lab
 - BCH 4053 Biochemistry I
- **Math and Statistics**
 - MAC 2253 or 2311 Calculus I
 - STA 2023 Statistics I
- **Physics**
 - PHY 2053C, 2054C or PHY 2048, 2049 Physics I & II
- **Upper Division Restricted Electives (Minimum 6-8 hrs)**
 - Choose between 2 to 3 courses from 19 courses relevant to the biotechnology industry.
 - MCB 4912 – Directed Research
 - Students must take at least 3 hours of Directed Research, which is applied towards their restricted electives hours.

Biotech Company Genesis/Timeline Staffing Needs

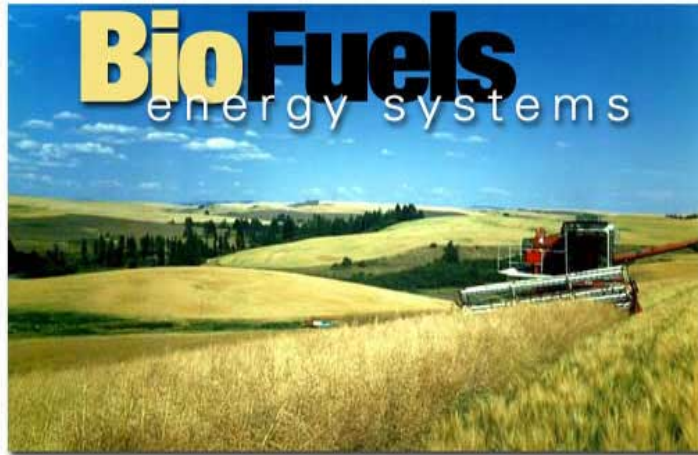
Typical Company Evolution



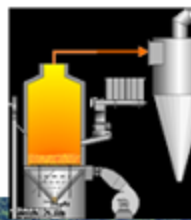
Steps to Success



Biotech & Biofuels – Way of the Future



Gasification



Synthetic
Biorefinery



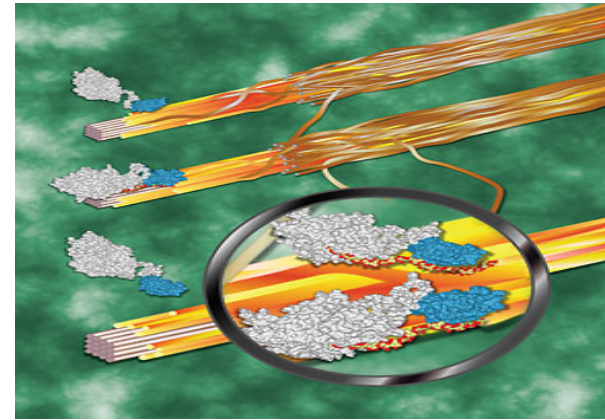
Direct
Synthesis

Algae



Cellulosic Bioethanol







U.S. Job Opportunities in Biotech

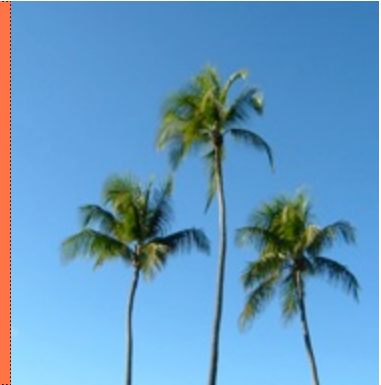


- The biotechnology industry has grown over the past few years, increasing in size between 1993 (\$8 billion in revenues) to 2003 (\$39 billion in revenues).
- **U.S. Department of Labor Statistics: the biotechnology industry employed 815,000 individuals in 2007.**
- **Biotechnology industry in the United States could employ five times the current number of workers by 2015. (BLS)**



UNION-TRIBUNE

Job Opportunities in Florida



- Currently, Florida's biotechnology industry employs 29,000 people.
- FL has more than 600 medical, pharmaceutical & biotech. companies
- State has attracted new biotechnology companies – Scripps, Max Planck, Burnham Institutes, Oregon Health. etc
- **This clustering effect is expected to add 40,000 jobs to Florida.**
- A report in Florida Trends Business Journal – 2007- “Florida has cracked Ernst & Young's top 10 list for number of biotech companies.
- WorkForce Florida states non Ph.D jobs are generally filled by in state candidates. (<http://www.pbcalliance.com/docs/BiotechLMISummary.pdf>)
- Central Florida: Burhnam Insititue, the new V.A. Hospital, the UCF Medical School, and the ensuing spinoffs and convergence of biotech companies.



Biotech Industry Facts

- **Environmental biotechnology** products make it possible to clean up hazardous waste efficiently by harnessing pollution-eating microbes without the use of caustic chemicals.
- **Industrial biotechnology applications** have led to cleaner processes in industrial sectors as chemicals, pulp and paper, textiles, food, energy, and metals and minerals. **For example, most laundry detergents produced in the United States contain biotechnology-based enzymes.**
- **DNA fingerprinting**, a biotech process, has dramatically improved criminal investigation and forensic medicine, as well as afforded significant advances in anthropology and wildlife management.
- There are **1,473 biotechnology companies in the U.S.**



Biotech Industry Facts:

- U.S. revenues increased from \$8 billion in 1992 to \$79.2 billion in 2007.
- The U.S. biotechnology industry employed **258,700 people as of Dec. 31, 2007.**
- Biotechnology is one of the most **research-intensive** industries in the world.
- The top eight biotech companies spent an average of \$108,000 per employee on R&D in 2005.
- The biotech industry is regulated by the U.S. Food and Drug Administration, the Environmental Protection Agency, and the Department of Agriculture (USDA).



Thank you
for your attendance

For more information regarding
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