Bachelor of Science in Pharmaceutical Sciences (BSPS)

Program Overview and Internship Requirements
Pharmaceutical Sciences

• Applied sciences that underlie the practice of pharmacy—the development, manufacture, sales, and use of drugs

• These sciences are derived from the basic sciences
  – Chemistry
  – Life Sciences
  – Economic and Social Sciences
Majors Offered at UT

- Cosmetic Science
- Medicinal & Biological Chemistry
- Pharmacology & Toxicology
- Pharmaceutics
- Pharmacy Administration with a Business minor
Upper Division (Junior & Senior Years)

• Core curriculum—taken by all
  – Med Chem I & II; Pharmacology I & II and Physiological Chemistry I & II
  – Internship in major field is required

• Specific requirements for major
  – As required for individual majors, reflecting the student’s interest
  – Elective courses
Internship Sites

- Pharmaceutical Companies
- University Research Laboratories
- Health Care Company
- Government
- Environmental
- Marketing
- Compounding Pharmacy
Program Destinations

• About half of our students find entry-level jobs after graduation
  – Pharma, biotech, biological testing, contract research

• And half go on to graduate programs leading to masters or doctoral degrees in science, medicine, business, pharmacy, and law
Salary Averages in the Pharmaceutical Sciences

US Base Annual Salary By Experience And Education
Education = BS

base: 148 reporting US full-time employees with BS

AAPS 2011 Salary Survey
Salary Information for the Pharmaceutical Sciences

US Base Annual Salary By Education

AAPS 2011 Salary Survey

Base 4,814 non-student US full-time employees
Medicinal and Biological Chemistry

Training in science research for the development of new drugs and therapeutics
MBC Major: Theme is rational drug design

- **Good choice for someone who likes**
  - Chemistry, biochemistry, molecular life science, or immunology
  - Laboratory work
  - Research

- **Program requirements**
  - Advanced laboratory (3 cr. hrs. with more recommended)
  - Additional elective courses and practical laboratory experiences (22 cr. hrs.) in advanced physical science and life science
  - Year 4: Capstone courses in **Targeted Drug Design** (3 cr. hrs.)
  - 22 semester hours of professional elective

- **Opportunity for undergraduate research**
Program Emphasis

• Overall emphasis on development of laboratory skills:
  – chemical synthesis, characterization and chemical analysis
  – capacity to handle and analyze biological materials (cells and receptor preparations) that are important in drug characterization.

• Emphasis on learning by doing
  – Ideally, you start out under close supervision
  – finish working relatively independently
Our Graduates

• Work in industry or in government or a foundation lab as a technical assistant.
• Function as a junior member of a drug design team, but usually with a supervisor who works alongside.

• Go on for further training and obtain master’s degree (1-2 additional years) or doctorate (4-6 additional years).

• Gain job satisfaction-doing difficult work that is also important
  – Responsibility
  – Professional Advancement
  – Opportunity to contribute
  – Genuinely interesting work that is always new
The MBC major offers an entry to applied research in rational drug design.

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Pharmacy Administration

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Pharmacy Administration

Focuses on the business of healthcare

- Pharmaceutical industry
- Pharmacy operations
- Health care
- Insurance industry
- Government
- Military

- Regulatory industry
- Business management
- Equipment and devices sales
- Healthcare coordination
- Health system operations
- Outcomes analysis
- Social and Behavior Sciences
Sample Courses and Minors

Selection of Courses:
- Pharmacology, Medicinal Chemistry, Biochemistry
- Pharmacy Healthcare Administration
- The Pharmaceutical Environment
- Pharmacoeconomics and Outcomes
- Data Analysis
- Financial Accounting
- Marketing
- Management and Behavior in Organizations
- Business Decision-Making

Minors:
- Business Administration
- Professional Sales
- International Business
- Business Analysis
- Entrepreneurship
- Operations and Supply Chain Management
Opportunities

Graduate School

- MBA Track Option @ UT
  - With one year of additional graduate study

- MS in Pharmacy and Healthcare Administration
  - New track-in programming to facilitate entry into our own program

- PhD and Masters programs
- Medical school
- Veterinary school
- Law school

Employment

- Internship Sites
- Chain Drug Store Industry
- Independent Pharmacies
- Pharmaceutical Industry
- Healthcare Insurance Industry
- Healthcare Device Industry
- Healthcare Sales
- Pharmacy Benefits Management Industry
- Non-governmental Organizations
- Hospitals/Healthcare Systems
Pharmacology and Toxicology

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Pharmacology and Toxicology

- **Pharmacology** focuses on the way drugs interact with various living systems that includes the properties, effects, and mechanisms of drug action.

- **Pharmacology** deals with the study of drugs in all aspects: the properties and reactions of drugs, especially with relation to therapeutic value, as well as the discovery, chemistry, composition, identification, biological/physiological effects, uses and manufacture of drugs.

- **Toxicology** focuses on the interaction of toxic compounds in the body that includes exposure assessment, dose response assessment, and hazard identification.

- **Toxicology** is the study of the adverse effects of chemical, physical or biological agents on living organisms and the ecosystem, including the prevention and amelioration of such adverse effects.
Career Opportunities

Opportunities to work as a pharmacologist and toxicologist in the:

– biomedical industry,
– pharmaceutical industry,
– nutritional industries,
– environmental conservation and pollution control,
– scientific civil service,
– governmental agencies,
– forensic sciences, and
– research institutes.

• Graduates can also work as sales representatives or move on to graduate studies in the field, Medicine, Veterinary Medicine, and in most biomedical fields.
Cosmetic Science

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Cosmetic Industry Jobs

• Types of Companies
  – Contract Manufacturers
  – Multi-level Companies
  – Direct Sales Companies
  – Raw Material Vendors
  – Fragrance Suppliers
  – Distributors

• Science Related Jobs in these Companies
  – Formulation Chemist
  – Analytical Chemist
  – Quality Control Specialist
  – Microbiologist and Life Scientists
  – Perfumers
  – Technical Sales
  – Science Related Intellectual Property and Law
Cosmetic Science Careers

Students are prepared for careers as:

1. Cosmetic chemists
2. Research chemists
3. Technical writers
4. Cosmetic marketing representatives
5. Product developers

Professional cosmetic scientists are in demand in:

1. Industry
2. Research
3. The public sector

These opportunities include:

1. Large and small pharmaceutical companies
2. Cosmetic companies
3. Laboratories
4. The chemical industry
Skills of Our Graduates:

1. Ability to develop new and novel products or improving existing ones as well as assessing the quality, durability, safety and packaging and compatibility of products developed.

2. With their business and economic knowledge they will be better equipped to understand the business model in which they navigate.

3. They will better understand the necessity for team interaction in the development of a commercial product.

4. The 10 week internship experience will provide them a working knowledge of the industry in which they are employed.

5. The broad base on which the major is structured does not limit employment to pharmaceutical or cosmetic options, allowing students to compete for positions requiring a knowledge of chemistry.

6. Graduates are also able to move on to graduate programs in the field, medical school, or other professional schools.
Pharmaceutics

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What is Pharmaceutics?

- The art and **applied** science of dosage form design
  - The interface between drug and body
- A broad field that draws from many disciplines:
  - Physical chemistry (organic and inorganic)
  - Medicinal chemistry
  - Anatomy, physiology
  - Microbiology
  - Atomic physics
  - Engineering (chemical, material)
- Deals with many aspects of interactions both inside and outside the body.
- It’s not trivial to **design and implement** a dosage form that is both safe and effective for the drug’s intended use!
Pharmaceutics is unique to pharmacy

• Physicians and other prescribers don’t learn and apply physical pharmaceutical principles (the science of making a dosage form).

• Chemists and engineers don’t learn a whole lot of biology and do not know how drugs work.

• Anyone can read the latest review article of a disease state and play armchair prescriber, but it takes a pharmaceutical scientist to know how to deliver a drug safely and effectively!
Where are the Jobs and Further Education Possibilities?

- Academia (after a PhD)
- Compounding Pharmacy (as a technician)
- FDA
- USDA
- NIH
- USP
- NSF
- Pharmaceutical, Cosmetic, Dental, Veterinary Product Company
  - Quality Control
  - Production
  - Formulation Development
  - Product Improvement Laboratory

- Further Education Possibilities
  - BS Degree ($36 – 44 K)
  - Masters Degree – 2 yrs. ($48 – 64K)
  - PhD -3-5 yrs. depending on school enrolled ($88-95K)

- Other Options
  - PharmD (3-4 Additional years)
  - Physician Assistant (2-3 yrs.)
  - Organ Donation MS (UT) (18 mos.)
  - Medical School (MD, OD, NP)
  - Dental School
  - Nursing
  - Podiatry

- Why Further Education?
  - Improve salary & social position
  - Job satisfaction
  - Attain your potential
For more information on the BSPS Program, please contact:

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