

# Cell & Gene Therapy Sciences

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## Cell & Gene Therapy Sciences Certificate

Bioprocessing and biotechnology are a specialized forms of chemical and biological science and engineering that encompasses agriculture, food, pharmaceuticals, chemicals, paper, and other materials. It also covers large scale industry production for yield optimization and end product quality. From the NJIT Department of Chemistry and Environmental Science, the Graduate Certificate in Cell and Gene Therapy Sciences will cover these topics in depth, with a particular focus on the rapidly growing applications and processing aspects of cell therapy and gene therapy.

### Who would be suited to take this program?

Typical students in this program could be from the pharmaceutical/biopharmaceutical world or strictly come from a biological or chemical science background, but could also come from an environmental science or engineering background as well. Such occupations may be pharmaceutical biologics scientists, food/drug development specialists, agricultural scientists, biomedical scientists, bacteriologists, and others.

### What will I learn?

- **Principles in Bioscience Processing** - The main concepts of cell physiology, molecular biology, and cell biology. The fundamental aspects of biochemistry that relate directly to pharmaceutical developments are discussed and include basic organic chemistry, blood and buffers, protein based enzymes, complex carbohydrates, nucleic acids, and fats.
- **Applied Bioprocessing and Immunological Based Therapies** - The foundational knowledge of immunology and immunological applications relevant to bioprocessing science including immunoglobulin genetics, leukocyte activation and migration, transplant immunology, and immunotherapy and vaccines.
- **Biochemistry** - Fundamentals of biochemistry related to physical organic chemistry for students who have an interest in biomedical engineering, chemistry, chemical engineering, or environmental science.
- **Toxicology** - The general principles of toxicology are presented and applied to the assessment of acute, subacute and chronic effects of hazardous and toxic chemicals. Qualitative and quantitative measures of toxicity and testing protocols are addressed. The role of toxicology in risk assessment and risk management.
- **Pharmaceutical Analysis** - Instrumental techniques used in the analysis of different pharmaceutical products. Many different types of analysis are carried out in the pharmaceutical industry pertaining to active ingredients, formulations as well as impurities and degradants. The focus will be on instrumentation such as chromatography, mass spectroscopy, different types of spectroscopy, quality assurance and GMP.
- **Principles of Pharmaceutical Chemistry** - Drug design and the molecular mechanisms by which drugs act in the body. Pharmacodynamics, pharmacokinetics, molecular targets used by drugs, the interaction of a drug with a target, and the consequences of this interaction. Strategies used in discovering and designing new drugs, and surveys the "tools of the trade" involved, e.g., QSAR, combichem and computer aided design. Special topics like chlorinergics, analgesics, opiates, antibacterials, antivirals, and anti-ulcer agents.
- **Practicum in Cell & Gene Therapy Sciences** - The practicum is designed to give students supervised practical experience that will apply the skills and knowledge gained as part of the masters program in Pharmaceutical Chemistry/PSM Cell and Gene Therapy Sciences.

### Why Study Cell & Gene Therapy Sciences at NJIT?

NJIT is uniquely situated among the greatest concentration of biotechnology and pharmaceutical activities in the world, with over 400 private and public biopharmaceutical companies thriving around the NJ Area. Opportunity is right outside our door. The mission of NJIT's Cell and Gene Therapy Sciences Graduate Certificate program is to prepare scientists and engineers for dynamic careers in biopharmaceutical industry. The program will focus on providing integrated coursework and training in current biotechnology industry practices. Our approach, relying on the input of our industrial advisory board, will ensure that our program will keep students up-to-date on the latest biopharmaceutical industry changes and challenges and prepare them to work in this growing and exciting industry. NJIT's Graduate Certificate in Cell and Gene Therapy Sciences will provide a solid grounding in science and engineering, with an industry focus, facilitating the tailoring of coursework to meet individual career goals.

"This program complements NJIT's programs in pharmaceutical chemistry and pharmaceutical engineering and was deliberately developed in partnership with biopharmaceutical companies to address unmet workforce needs," said Kevin Belfield, dean of NJIT's Jordan Hu College of Science and Liberal Arts. "We anticipate our graduates will be in high demand in the state's biopharmaceutical industry."

### Into what industries might holders of this program find employment?

Bioprocessing and Biopharmaceutical companies, such as Celgene, Amicus Therapeutics, Chromocell, Soligenix, GE Life Sciences, Vicus, Genzyme, Pall Corp., Roka Biosciences and PTC Therapeutics.

### Prerequisites

Applicants should have a bachelor's degree in the chemical or biological sciences or engineering preferred.

### Related Degree Programs

All courses in this program related entirely to the NJIT MS in Pharmaceutical Chemistry and the Professional Science Masters (PSM) option in Cell and Gene Therapy Sciences.

### Take Note

Check the course descriptions for more information. Some courses have prerequisites and must be taken in order.

Code	Title	Credits
Core Courses		
Take these three (3) courses:		9
BIOL 605	Prin of Bioscience Processing	
BIOL 606	App Bioproc & Immun Based Ther	
CHEM 673	Biochemistry	
Electives – Choose one (1) course:		3
CHEM 595	Practicum in Cell & Gene Therapy Sciences	
CHEM 601	Special Topics in Chemistry I	
CHEM 702	Special Topics in Chemistry II	
CHEM 714	Pharmaceutical Analysis	
CHEM 777	Principles Pharm Chemistry	
EVSC 616	Toxicology	