

 FLORIDA ATLANTIC UNIVERSITY	NEW/CHANGE PROGRAM REQUEST Graduate Programs		UGPC Approval _____ UFS Approval _____ Banner _____ Catalog _____
	Department _____ College _____		
Program Name _____		New Program* Change Program*	Effective Date (TERM & YEAR)
Please explain the requested change(s) and offer rationale below or on an attachment.			
*All new programs and changes to existing programs must be accompanied by a catalog entry showing the new or proposed changes.			
Faculty Contact/Email/Phone _____		Consult and list departments that may be affected by the change(s) and attach documentation	
Approved by Department Chair <u>Haik Kalva</u> College Curriculum Chair <u>Francisco Presuel-Moreno</u> College Dean <u>Raquel Assis</u> UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____		Date <u>9/17/2025</u> <u>9/23/2025</u> <u>9/23/2025</u> _____ _____ _____ _____ _____	

Email this form and attachments to UGPC@fau.edu 10 days before the UGPC meeting.

Graduate Certificate in Artificial Intelligence in Medicine

This proposed certificate will provide opportunities for current graduate students in Biomedical Science, Engineering and Computer Science, and other disciplines to enhance their skills in the emerging field of Artificial intelligence (AI) in medicine.

Background

The use of AI in medicine is poised to explode over the coming decades. AI has the potential to transform both the practice of medicine and the delivery of healthcare in the United States. AI applications in diagnostic assistance, personalized medicine, drug discovery, and prognostic and predictive analysis will increase efficiency, improve accuracy, enhance patient care, and reduce future medical costs. Driving the need for investment in AI in medicine is the growing amount of medical data generated by whole-genome and other types of next-generation sequencing technologies. Finding meaning and patterns from trillions of gigabytes of data will require AI. In addition, the combinations of global threats, such as an aging population and shortage in medical workers, mean that we need innovative solutions to address these problems, solutions that can be delivered with the aid of AI.

By exposing students with biomedical backgrounds to AI approaches and exposing engineering and computing science students to genetics, multi-omics, pharmacology, genomics, and predictive medicine concepts, we can train the next generation of specialists in AI in medicine. This certificate will ensure we have a population of graduates with the requisite skills to contribute to technologies that enhance healthcare delivery through integration of AI in all aspects of the medical industry.

Strengths at FAU

The College of Medicine and College of Engineering and Computer Science currently have more than 40 faculty engaged in various areas of genetics, genomics, predictive health, AI, and machine learning. Faculty from both colleges have extensive experience teaching graduate students, and all courses that make up this certificate are already being taught to graduate students at present.

This program offering dual specialization is timely and will strengthen existing collaborations between the College of Medicine and College of Engineering and Computer Science, as well as create new opportunities for interaction and development of graduate education programs.

Market/Need

Job demand for individuals with skills in AI in medicine is rapidly growing. According to the towardshealthcare.com website, the AI in medicine market is projected to reach \$674.19 billion by 2034, growing from \$37.98 billion in 2025. There is already a demand for machine learning engineers and data scientists among other specialties.

Resources

All the required resources, including staff, faculty, courses, and infrastructure are currently in place in both colleges, and no new resources are needed to implement this certificate program.

Admission requirements

Admission to and completion of this program will be overseen by the College of Medicine and College of Engineering and Computer Science. For admission, the applicant must satisfy the following criteria:

1. Enrollment in a master's or Ph.D. program in any FAU graduate program.
2. Approval of their graduate program to enroll.

Program Requirements

The certificate program is designed to be tailored to the individual student, with previous coursework and future goals in mind. To complete the certificate, students must complete 12 credits in coursework, with six credits from the Department of Biomedical Sciences and six credits from the Department of Electrical Engineering and Computer Science (see below).

Complete 2 of the following courses in Biomedical Sciences (6 credits):

Human Genetics (PCB 6665) 3 credits

Prerequisite: Permission of instructor

Designed to provide students with a functional understanding of the field of human genetics as it applies to progressive research and medicine. Emphasizes the integrated understanding and application of Genetic Analysis, Diagnosis and Mechanisms in human disease.

Advanced Molecular and Cellular Biology (PCB 5532) 3 credits

Prerequisites: CHM 2210, PCB 4023, BCH 3033 and permission of instructor

Course is designed to provide students with a basic background and advanced topics in cell and molecular biology. Emphasis is placed on human physiology and disease.

Data Interpretation and Analysis in the Age of Precision Medicine – GMS 6860 - 3 credits

Biomedical Science is a broad field comprising many applied sciences geared toward the development of new approaches in healthcare or public health. This unique College of Medicine course is designed for graduate students headed toward a broad array of postgraduate vocational opportunities in areas ranging from professional education, health care and scientific fields through business. Students are introduced to data interpretation, analysis and presentation approaches. Further, students are exposed to novel precision medicine concepts and database research.

Integrating Genomics into Predictive Health (PCB 6667) 3 credits

Prerequisite: Permission of instructor

The aim of this course is to introduce students to the emerging field of genomics, precision

medicine, and predictive health. Upon completion of the course students will gain a better understanding of the contribution of human genetic variation to pathogenic mechanisms and how technology helps us link the two.

Multi-omics in health and disease (PCB 6818) 3 credits

Prerequisite: Permission of instructor

In the rapidly evolving fields of fundamental biology research and biomedicine, multi-omics studies combining genomics, transcriptomics, proteomics, and other modalities—are becoming increasingly prevalent. These integrative approaches, applied at both bulk and single-cell resolutions, have the power to identify novel biomarkers in disease and uncover the complex biological mechanisms within the context of health and disease.

Advanced Molecular and Cellular Biology (PCB 5532) 3 credits

Prerequisites: CHM 2210, PCB 4023, BCH 3033 and permission of instructor

Course is designed to provide students with a basic background and advanced topics in cell and molecular biology. Emphasis is placed on human physiology and disease.

Pharmacology (GMS 6513) 3 credits

Prerequisite: Permission of instructor

This course introduces the study of the properties, effects and therapeutic value of the primary agents in major drug categories. Topics include cholinergic drugs, adrenergic drugs, hormones, diuretics, cardiovascular agents, respiratory drugs and gastrointestinal agents.

Advanced Cell Physiology (PCB 6207) 3 credits

Prerequisite: Permission of instructor

Course describes in-depth membrane physiology, intracellular signaling pathways and cellular function, with an emphasis on neurons and human muscle cells (skeletal, smooth and cardiac muscle cells).

Molecular Basis of Human Cancer (PCB 6235) 3 credits

Prerequisites: Graduate standing and PCB 4023 or BCH 3033 or PCB 6207 with minimum grade of "B-"

Course covers current concepts and knowledge of cancer, exploring the molecular and cellular mechanisms underlying cancer progression with an aim to understand the processes of tumorigenesis.

Complete 2 of the following courses in Electrical Engineering and Computer Science (6 credits):

Computational Foundations of Artificial Intelligence (CAP 5625) 3 credits

Prerequisites: Graduate standing or senior standing

This course covers the mathematical and programming foundations of artificial intelligence (AI) and machine learning (ML) using contemporary programming languages and tools. As a result, students develop familiarity with mathematical methods (and associated notation, software

packages and libraries) that are widely used in AI and ML projects and literature. It is expected that students are proficient in a high level programming language.

Introduction to Data Science (CAP 5768) 3 credits

Prerequisite: Programming competency at the level of an online short course (e.g., Code Academy)

This course surveys foundational topics in data science and reinforces practical programming skills in the context of data analytics. Students learn fundamentals of computational data analysis using statistics and machine learning and gain experience working with data sets from a variety of domains. Students may not enroll in CAP 5768 if they have already taken CAP 4773.

Computer Vision (CAP 6415) 3 credits

Prerequisite: Graduate standing

Course covers fundamentals of computer vision and their applications in various areas such as medicine, homeland security, entertainment, and manufacturing.

Applied Machine Learning (CAP 6610) 3 credits

Prerequisite: STA 2023

This course covers theoretical foundations and tools for machine learning and data analytics. The class introduces major machine learning topics, such as supervised learning, unsupervised learning and numeric predictive models. Case studies include application of machine learning to different domains. Credit will not be given for both CAP 4612 and CAP 6610.

Machine Learning for Computer Vision (CAP 6618) 3 credits

Prerequisite: CAP 5625

Introduction to machine learning techniques and their application in computer vision problems. Discusses image processing principles, techniques and algorithms. Use of MATLAB for lab assignments and projects.

Deep Learning (CAP 6619) 3 credits

Prerequisite: CAP 5625

This course teaches students basic concepts of deep learning with applications in computer science, engineering, business and other areas. The class covers major topics including math preliminaries, machine learning basics, deep forward networks, convolution networks, autoencoders, representation learning networks and their implementations and applications.

Reinforcement Learning (CAP 6629) 3 credits

Prerequisite: CAP 5625

Students in this course study theoretical properties and practical applications of reinforcement learning. Course topics include Markov decision process, dynamic programming, temporal-difference learning, planning and learning with tabular methods, and deep reinforcement learning.

Artificial Intelligence (CAP 6635) 3 credits

The basic concepts, techniques, and applications of artificial intelligence: representations, search strategies, control, communication, deduction, agents, evolutionary computation and machine learning.

Natural Language Processing (CAP 6640) 3 credits

This course provides students with both theory and applications of natural language processing. It includes relevant background material in linguistics, mathematics, probability and computer science. Some of the topics covered in the class are text similarity, part-of-speech tagging, parsing, semantics, question answering, sentiment analysis and text summarization.

Artificial Intelligence in Medicine and Healthcare (CAP 6683) 3 credits

Prerequisite: Graduate standing or permission of instructor

This course introduces the underlying concepts, methods and potential of intelligent systems in medicine. It explores the application of artificial intelligence (AI) and machine learning methods, techniques and tools to specific areas in medicine and healthcare. As a research-and-project-based course, students have opportunities to identify and specialize in particular AI methods, clinical/healthcare applications and relevant tools.