ORION TECHNICAL COLLEGE

October 15, 2024

ADDENDUM

to

2024/2025

Academic Catalog

Replaces the following pages:
- **28, 30, 31, 120, 121, & 123**

SCHOOL OF GRADUATE STUDIES

Artificial Intelligence, Master of Science

School of Graduate Studies

Program Overview
- 30 semester credits required
- 20 months to complete with continuous enrollment and no interruption to studies.
- Graduates will be awarded a Master of Science in Artificial Intelligence

Program Description
The Master of Science in Artificial Intelligence program is an interdisciplinary that prepares students to drive the design, development, and deployment of AI and machine learning (ML) products and services across a broad array of applications and industries to meet contemporary social and technical challenges.

Student Learning Outcomes
Upon completion of this program, graduates will be able to:
- Uses machine learning to solve complex problems
- Creates searchable knowledge stores in unstructured data via data mining
- Contributes to the sustainable development of businesses, organizations, and automated projects
- Design and prototype AI systems utilizing data mining, deep learning, neural networks, and collective intelligence
- Use appropriate tools and platforms to leverage AI to optimize the technology that impacts every day life
- Exhibit effective collaboration and leadership skills.

In addition, graduates will gain proficiency in the following:
- Machine Learning Algorithms
- Deep Learning
- Natural Language Processing
- Computer Vision
- Reinforcement Learning
- Data Preprocessing
- Algorithm Evaluation
- Ethics and Bias Mitigation
- Critical Thinking
- Research and Innovation
- Version Control Programming Python, and familiarity with libraries like TensorFlow, PyTorch and Keras.

Program Outline
The following courses are required for program completion.

Course Code	Course Name	Semester Credits
AI 500	Concepts in Intelligent Systems and Business Analytics	3 credits
AI 510	Database Management Systems	3 credits
AI 520	Artificial Intelligence for Human-Computer Interaction	3 credits
AI 530	Advanced Machine Learning	3 credits
AI 540	Algorithm Design and Analysis	3 credits
AI 550	Deep Learning and its Applications	3 credits
AI 560	Integrated Business Process	3 credits
AI 570	Data Analytics and Mining for Business	3 credits
AI 580	Research Methodologies	2 credits
AI 585	ELITE Leadership Training	1 credit
AI 590	Masters Project in Artificial Intelligence	3 credits
	Total	30 credits

Graduate Opportunities
Graduates of this program will be prepared for positions such as Machine Learning Engineer. Data Scientist, Natural Language Processing (NLP) Engineer, Computer Vision Engineer, Deep Learning Engineer, AI Research

Program Outline

The following courses are required for program completion.

Course Code	Course Name	Semester Credits
BA 500	Concepts in Intelligent Systems and Business Analytics	3 credits
BA 510	Database Management Systems	3 credits
BA 520	Business Analytics Methods	3 credits
BA 530	Data Engineering	3 credits
BA 540	Business Analytics with Data Engineering for Business Applications	3 credits
BA 550	Data Analytics and Mining for Business	3 credits
BA 560	Integrated Business Process	3 credits
BA 570	Machine Learning for Business Analytics	3 credits
BA 580	Research Methodologies	2 credits
BA 585	ELITE Leadership Training	1 credit
BA 590	Masters Project in Business Analytics	3 credits
	Total	30 credits

Graduate Employment Opportunities

Graduates of this program will be prepared for positions such as Data Analyst, Business Intelligence Analyst, Data Scientist, Marketing Analyst, Financial Analyst, Supply Chain Analyst, Operations Analyst, Healthcare Analyst, Market Research Analyst, Risk Analyst, E-Commerce Analyst, Customer Insights Analyst, Retail Analyst, Fraud Analyst, and Government Analyst. Graduates may also seek professional advancement. Organizations employing graduates include business, medical, government and IT companies in the local, national, and global workforce.

Optional Certifications

Graduates of this program will be prepared to test for the following optional certifications:

- Certified Business Analytics Professional (CBAP)
- Certified Data Analyst (CDA)
- Snowflake Certified Data Engineer Certification
- Microsoft Azure Data Engineer Certification
- Certified Machine Learning Specialist (CMLS)

Please note that certain certification exams may require additional studies and/or may require work experience in the field in addition to the graduate degree to apply to sit for the exam. The cost of the exams is the responsibility of the student.

Computer Science, Master of Science

School of Graduate Studies

Program Overview

- 30 semester credits required
- 20 months to complete with continuous enrollment and no interruption to studies.
- Graduates will be awarded a Master of Science in Artificial Intelligence.

Program Description

The Master of Science in Computer Science program provides students with a comprehensive understanding of computer systems, programming languages, algorithms, software development, and various aspects of computing technology. It equips students with the skills and knowledge necessary to design, develop, analyze, and implement software applications, systems, and solutions.

Student Learning Outcomes

Upon completion of this program, graduates will be able to:

- Demonstrate technical skills in Python, Java, C++. Java Script, and Ruby
- Develop computer or information systems.
- Coordinate operational activities with external stakeholders.
- Develop organizational goals or objectives.
- Analyze data to inform operational decisions or activities.
- Confer with organizational members to accomplish work activities.
- Direct organizational operations, projects, or services.
- Resolve employee or contractor problems.
- Manage operations, research, or logistics projects.
- Advise customers on technical or procedural issues.
- Develop operating strategies, plans, or procedures.
- Analyze data to determine project feasibility.
- Manage organizational or project budgets.
- Purchase materials, equipment, or other resources.
- Exhibit effective collaboration and leadership skills.

Program Outline

The following courses are required for program completion.

Course Code	Course Name	Semester Credits
CS 500	Concepts in Intelligent Systems and Business Analytics	3 credits
CS 510	Database Management Systems	3 credits
CS 520	Algorithm Design and Analysis	3 credits
CS 530	Developing Object-Oriented Systems with Java	3 credits
CS 540	Information Security Planning and Policy	3 credits
CS 550	Software Testing and Quality Assurance	3 credits
CS 560	Integrated Business Process	3 credits
CS 570	PEGA Systems	3 credits
CS 580	Research Methodologies	2 credits
CS 585	ELITE Leadership Training	1 credit
CS 590	Masters Project in Computer Science	3 credits
	Total	30 credits

Graduate Employment Opportunities

Graduates of this program will be prepared for positions such as Software Developer, Web Developer, Data Scientist, Data Analyst, CyberSecurity Analyst/Engineer, Network Engineer, QA Engineer, System Analyst, Game Developer, Devops Engineer, UI/UX Designer, IT Consultant, or Cloud Engineer. Graduates may also seek professional advancement. organizations such as business, medical, and IT companies in the local, national, and global workforce.

Optional Certifications

Graduates of this program will be prepared to test for the following optional certifications:

1. Certified Pega Systems Architect
2. Certified Pega Senior Systems Architect
3. Oracle Certified Professional (OCP) Java Enterprise Edition
4. Oracle Certified Professional (OCP) Java Standard Edition
5. Certified Software Quality Analyst Certification

Please note that certain certification exams may require additional studies and/or may require work experience in the field in addition to the graduate degree to apply to sit for the exam. The cost of the exams is the responsibility of the student.

SS104 Psychology *Three (3) semester credits*

This course provides an overview of the scientific study of human behavior and instills the ability to better understand yourself and others. Topics include history, methodology, perception, motivation, cognition, abnormal behavior, personality theory, social psychology, and other relevant topics.

SS303 Human Relations *Three (3) semester credits*

This course studies interpersonal development as it relates to social and behavioral sciences. A focus is made on creativity, innovation, and change in professional environments.

School of Graduate Studies

Artificial Intelligence

AI 500 Concepts in Intelligent Systems and Business Analytics *Three (3) semester credits*

This course provides a comprehensive introduction to the foundational principles of intelligent systems, artificial intelligence (AI), and business analytics. By integrating concepts from AI, computer science, and business analytics, this course prepares students to design, develop, and implement intelligent systems that solve complex business problems. Students will explore key ideas and techniques underlying the design of intelligent computer systems, focusing on modern AI applications such as machine learning, knowledge representation, decision-making, and optimization. The course also covers the study and application of business analytics, offering students the opportunity to learn how data can be used effectively within organizations to enhance decision-making, optimize operations, and maintain a competitive edge. Topics include descriptive analytics, predictive analytics, software engineering principles, and the ethical considerations of deploying AI and analytics in real-world environments. Through a combination of theoretical study and practical application, students will gain the skills necessary to leverage AI and business analytics in various professional settings.

AI 510 Database Management Systems *Three (3) semester credits*

This course explores the technologies used to develop and implement database systems including Python, SQL, R, and other specialized data analysis toolkits. The course examines the relational model and the structure query language (SQL) and post-relational models as found in object-oriented and semantic databases. Students learn to use data modeling concepts and principles of good database design to illustrate the construction of integrated databases. Concepts of the cloud, big data, and cybersecurity as they relate to the management of database systems. Requires students to complete a project that incorporates good database design concepts.

AI 520 Artificial Intelligence for Human-Computer Interaction *Three (3) semester credits*

Human intelligence and artificial intelligence (AI) are intertwined, co-evolving and complementary. This course explores how to combine the complementary strengths of humans and AI to design intelligent interactive systems that are ethical, usable, and useful.

AI 530 Advanced Machine Learning *Three (3) semester credits*

Mathematical foundations of classification, regression, and decision making. Supervised algorithms covered include perceptrons, logistic regression, support vector machines, and neural networks. Directed and undirected graphical models. Numerical parameter optimization, including gradient descent, expectation maximization, and other methods. Introduction to reinforcement learning.

AI 540 Algorithm Design and Analysis *Three (3) semester credits*

This course provides efficient algorithm design and analysis tools and processes. Topics include asymptotic analysis, average-case and worst-case analysis, recurrence analysis, amortized analysis, classical algorithms, computational complexity analysis, NP-completeness, and approximation algorithms. In addition, the course investigates approaches to algorithm design including greedy algorithms, divide and conquer, dynamic programming, randomization, and branch and bound.

AI 550 Deep Learning and its Applications *Three (3) semester credits*

This course focuses on the algorithms, implementation, and application of neural networks for learning about data. It will present how neural networks represent data and learn in supervised and unsupervised contexts with applications to language processing, classification, and regression problems. Topics include learning algorithms, and optimization methods, deep learning methods for deriving deep representations from surface features, recursive networks, Boltzmann machines and convolutional networks.

AI 560 Integrated Business Process *Three (3) semester credits*

This course is focused on Systems, Applications and Products (SAP) functional and technical modules. Students learn how to use SAP software to manage multiple aspects of a business, including finances,

operations, facilities and human resources. Students will learn how to use the SAP functional modules to provide standard functionality to simulate actual business activity.   SAP technical modules enable professionals to troubleshoot performance issues, schedule tasks, develop applications, download and install updates and manage and execute migrations.

AI 570 Data Analytics and Mining for Business   *Three (3) semester credits*

This course introduces students to the field of data mining and data analytics, which has been defined as the extensive use of data, statistical and quantitative analysis, and exploratory and predictive models to drive decisions and actions. With an emphasis on hands-on problem solving capabilities, this course further develops students' analytics mindset and data-driven decision skills.

AI 580 Research Methodologies   *Three (3) semester credits*

In this course, we understand an in-depth study of the current state-of-the-art and master the research methodology used in Software Engineering. Selected topics will be from areas such as Software Engineering Methodologies, evidence-based best practice strategies, software maintenance, software testing, model-driven engineering, human factors in software engineering, emerging technology, and applications, applying optimization techniques in software engineering, and empirical software engineering.

AI 585 ELITE Leadership Training   *Three (3) semester credits*

The ELITE Leadership course is designed to develop the soft skills necessary to manage staff and lead projects in today's complex work environment. Students will construct a Personalized Activity Calendar that emphasizes ELITE's Guiding Principles of Focus, Design and Assessment. Leadership principles associated with Team Building, Management Styles, Listening Effectiveness, Training & Coaching Techniques, Managing Motivations, Goal Setting, and Performance Reviews will be discussed in detail and introduced into an amended Personal Activity Calendar as a final course project.

AI 590 Masters Project in Artificial Intelligence   *Three (3) semester credits*

This course requires a report, analysis, or project designed to demonstrate the attainment of the knowledge, skills, and abilities commensurate with study in a graduate level program. The course requires students to identify a problem related to their field of study, summarize the problem into a project statement, identify data requirements, apply research and analytic tools and personal judgment learned from the coursework and real world experience, use modeling and analysis techniques to draw conclusions form the data, evaluate the multiple solutions and complete the project by creating a written document that presents the research conclusions and recommendations. Students must present and demonstrate their findings in a written report and class presentation. Prerequisite: AI 580.

Business Analytics, Master of Science

BA 500 Concepts in Intelligent Systems and Business Analytics   *Three (3) semester credits*

This course provides a comprehensive introduction to the foundational principles of intelligent systems, artificial intelligence (AI), and business analytics. By integrating concepts from AI, computer science, and business analytics, this course prepares students to design, develop, and implement intelligent systems that solve complex business problems. Students will explore key ideas and techniques underlying the design of intelligent computer systems, focusing on modern AI applications such as machine learning, knowledge representation, decision-making, and optimization. The course also covers the study and application of business analytics, offering students the opportunity to learn how data can be used effectively within organizations to enhance decision-making, optimize operations, and maintain a competitive edge. Topics include descriptive analytics, predictive analytics, software engineering principles, and the ethical considerations of deploying AI and analytics in real-world environments. Through a combination of theoretical study and practical application, students will gain the skills necessary to leverage AI and business analytics in various professional settings.

BA 510 Database Management Systems   *Three (3) semester credits*

This course explores the technologies used to develop and implement database systems including Python, SQL, R, and other specialized data analysis toolkits. The course examines the relational model and the structure query language (SQL) and post-relational models as found in object-oriented and semantic databases. Students learn to use data modeling concepts and principles of good database design to illustrate the construction of integrated databases. Concepts of the cloud, big data, and cybersecurity as they relate to the management of database systems.   Requires students to complete a project that incorporates good database design concepts.

BA 520 Business Analytics Methods   *Three (3) semester credits*

This course reviews the key analytics methods for using data through the perspectives of applied statistics and operations analysis. The course covers application of these methods to business areas including marketing, supply chain management, and finance. Topics include business-analytic thinking; application of business analytics solutions to business problems; data mining, supervised and unsupervised machine learning; methods for detecting co-occurrences and associations; and achieving and sustaining competitive advantage by using business analytics methods.

Computer Science, Master of Science

CS 500 Concepts in Intelligent Systems and Business Analytics   *Three (3) semester credits*

This course provides a comprehensive introduction to the foundational principles of intelligent systems, artificial intelligence (AI), and business analytics. By integrating concepts from AI, computer science, and business analytics, this course prepares students to design, develop, and implement intelligent systems that solve complex business problems. Students will explore key ideas and techniques underlying the design of intelligent computer systems, focusing on modern AI applications such as machine learning, knowledge representation, decision-making, and optimization. The course also covers the study and application of business analytics, offering students the opportunity to learn how data can be used effectively within organizations to enhance decision-making, optimize operations, and maintain a competitive edge. Topics include descriptive analytics, predictive analytics, software engineering principles, and the ethical considerations of deploying AI and analytics in real-world environments. Through a combination of theoretical study and practical application, students will gain the skills necessary to leverage AI and business analytics in various professional settings.

CS 510 Database Management Systems   *Three (3) semester credits*

This course explores the technologies used to develop and implement database systems including Python, SQL, R, and other specialized data analysis toolkits. The course examines the relational model and the structure query language (SQL) and post-relational models as found in object-oriented and semantic databases. Students learn to use data modeling concepts and principles of good database design to illustrate the construction of integrated databases. Concepts of the cloud, big data, and cybersecurity as they relate to the management of database systems.   Requires students to complete a project that incorporates good database design concepts.

CS 520 Algorithm Design and Analysis   *Three (3) semester credits*

This course provides efficient algorithm design and analysis tools and processes. Topics include asymptotic analysis, average-case and worst-case analysis, recurrence analysis, amortized analysis, classical algorithms, computational complexity analysis, NP-completeness, and approximation algorithms. In addition, the course investigates approaches to algorithm design including greedy algorithms, divide and conquer, dynamic programming, randomization, and branch and bound.

CS 530 Developing Object-Oriented Systems with Java   *Three (3) semester credits*

Object oriented programming is an essential skill for those students wishing to work with application development and maintenance. This course focuses on the use of Java as the most popular object based languages in use today. Students are presented with the fundamental design principles of modularity and abstraction as applied to current programming practices in computer science. Students will work with object oriented components and characteristics as they write, debug, execute and test Java applets and applications. Topics include data types, classes, inheritance, arrays, overloading and exception processing. A variety of Java development environments will be considered.

CS 540 Information Security Planning and Policy   *Three (3) semester credits*

This course examines the fundamental issues and first principles of security and information assurance. Security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems. Cryptography (key management and digital signatures), network security (PKI, IPsec), intrusion detection and prevention, risk management, security assurance and secure design principles are topics addressed in this course. Additional topics include organizational security policy, legal and ethical issues in security, standards and methodologies for security evaluation and certification.

CS 550 Software Testing and Quality Assurance   *Three (3) semester credits*

This course provides a hands-on approach to various types of functional testing including unit, integration and user acceptance testing as well as non-functional testing including load, performance, and security testing.

CS 560 Integrated Business Process   *Three (3) semester credits*

This course is focused on Systems, Applications and Products (SAP) functional and technical modules. Students learn how to use SAP software to manage multiple aspects of a business, including finances, operations, facilities and human resources. Students will learn how to use the SAP functional modules to provide standard functionality to simulate actual business activity.   SAP technical modules enable professionals to troubleshoot performance issues, schedule tasks, develop applications, download and install updates and manage and execute migrations.