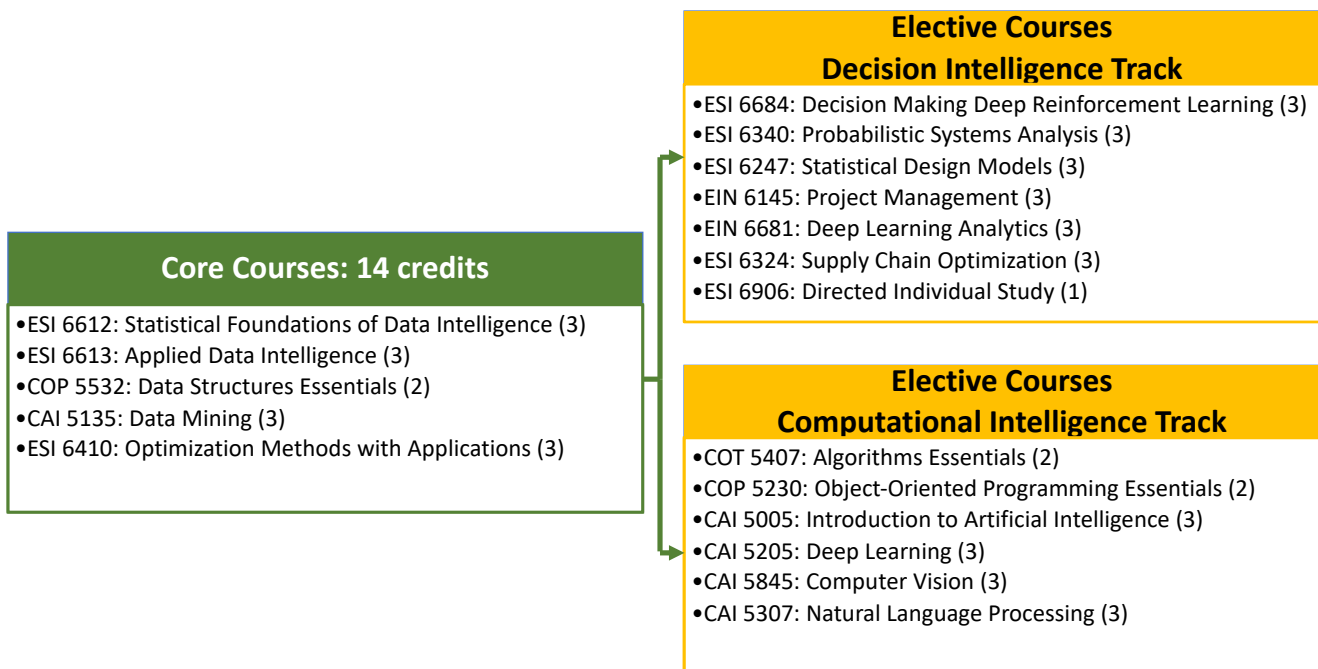# Master of Science in Data Intelligence (MSDI) Program
University of South Florida

In the Master of Science in Data Intelligence (MSDI) Program at the University of South Florida (USF), graduate students are expected to know their program requirements, and register for classes using Oasis. The following class search feature will help you search for courses based on the term, department, level, and status https://usfweb.usf.edu/DSS/StaffScheduleSearch. Make sure that you register only for course sections indicated as "**For MSDI program students only**."

The MSDI Program consists of **30 credit hours**. All students are required to take **14 credit hours of core courses** and **16 credit hours of electives**. The elective courses can be selected and combined from the two program specialization tracks offered, and based on the student's interests and career goals:

- **Decision Intelligence Track**: This track will deal with topics covering statistical and machine learning approaches to data-driven dynamic decision making in areas including system design and optimization, supply chain and logistics, among others. This track is synchronous with primarily distance learning (PD) and in-person classes available.

- **Computational Intelligence Track**: This track is for students interested in computing and learning how to derive information from a large database. This track is asynchronous with online classes and has the same courses as the Graduate Certificate in Artificial Intelligence.

- **General Data Intelligence Track**: Choose a combination of courses from the Decision Intelligence Track and Computational Intelligence Track. This track has a combination of synchronous with primarily distance learning and in-person classes, and asynchronous with online classes.

Elective Courses
Decision Intelligence Track
- ESI 6684: Decision Making Deep Reinforcement Learning (3)
- ESI 6340: Probabilistic Systems Analysis (3)
- ESI 6247: Statistical Design Models (3)
- EIN 6145: Project Management (3)
- EIN 6681: Deep Learning Analytics (3)
- ESI 6324: Supply Chain Optimization (3)
- ESI 6906: Directed Individual Study (1)

Core Courses: 14 credits
- ESI 6612: Statistical Foundations of Data Intelligence (3)
- ESI 6613: Applied Data Intelligence (3)
- COP 5532: Data Structures Essentials (2)
- CAI 5135: Data Mining (3)
- ESI 6410: Optimization Methods with Applications (3)

Elective Courses
Computational Intelligence Track
- COT 5407: Algorithms Essentials (2)
- COP 5230: Object-Oriented Programming Essentials (2)
- CAI 5005: Introduction to Artificial Intelligence (3)
- CAI 5205: Deep Learning (3)
- CAI 5845: Computer Vision (3)
- CAI 5307: Natural Language Processing (3)

The classes offered in primarily distance learning (PD) mode may require students to be on campus for instructor-proctored quizzes/exams and group activities. However, students away from campus may arrange their own proctoring services (upon USF approval) at their location.

International Students: Please note that to meet international student visa requirements, students must be enrolled full-time each semester (Fall and Spring), which is at least 9 credit hours (only up to 3 of these credit hours can be online). Due to these restrictions, international graduate students may only be able to select the Decision Intelligence Track or the General Data Intelligence Track. For questions about student visa requirements, contact USF International Services.

Below is the **tentative** offering of the courses, which is subject to change at any time. The table indicates the semester when the course is tentatively going to be offered (✔), offered in alternate years (✔ (Alt)), and if the course is offered online only.

Track	Type	Course Number	Course Name	Credits	Fall	Spring	Summer	Online Only
	Core	ESI 6612	Statistical Foundations of Data Intelligence	3	✔			
		ESI 6613	Applied Data Intelligence	3		✔		
		COP 5532	Data Structures Essentials	2	✔	✔		✔
		CAI 5135	Data Mining	3		✔		✔
		ESI 6410	Optimization Methods with Applications	3	✔			
Decision Intelligence Track	Electives	ESI 6684	Decision Making with Deep Reinforcement Learning	3	✔ (Alt)			
		ESI 6340	Probabilistic Systems Analysis	3		✔		
		ESI 6247	Statistical Design Models	3	✔			
		EIN 6145	Project Management	3			✔	
		ESI 6681	Deep Learning Analytics	3		✔		
		ESI 6324	Supply Chain Optimization	3		✔ (Alt)		
		ESI 6906	Directed Individual Study	1	✔	✔		
Computational Intelligence Track	Electives	COT 5407	Algorithms Essentials	2		✔	✔	✔
		COP 5230	Object-Oriented Programming Essentials	2		✔	✔	✔
		CAI 5005	Introduction to Artificial Intelligence	3	✔	✔	✔	✔
		CAI 5205	Deep Learning	3	✔		✔	✔
		CAI 5845	Computer Vision	3	✔		✔	✔
		CAI 5307	Natural Language Processing	3	✔		✔	✔

COURSE DESCRIPTIONS

Core Courses
ESI 6612: Statistical Foundations of Data Intelligence (3 credits)
This is an introductory course to statistical learning for data science and analytics. It will present basic methods to analyze and interpret data in order to extract patterns and gain insights for problem-solving and decision-making.
ESI 6613: Applied Data Intelligence (3 credits)
This course focuses on the practice of predictive analytics by developing models using statistical learning tools and quantifying their prediction accuracy on unseen data to improve decision-making. This course will help develop a more intuitive determination of the strengths and weaknesses of the various underlying mathematical techniques.
COP 5532: Data Structures Essentials (2 credits)
Understand and implement fundamentals of concise data structure and organization for program efficiency, clarity, and simplification. Implementation of different data types and structures.
CAI 5135: Data Mining (3 credits)
An introductory course to mining information from data. Scalable supervised and unsupervised machine learning methods are discussed. Methods to visualize and extract heuristic rules from large databases with minimal supervision is discussed. ***Recommended Prerequisite(s):*** CAI 5005 - Introduction to AI.
ESI 6410: Optimization Methods with Applications (3 credits)
This course delivers fundamental knowledge of modeling, solution algorithms, and their implementations needed for solving real-life decision-making problems formulated as mathematical programs. This course will make the students familiar with the use of optimization solvers, they will also learn how to develop heuristic solutions for computationally complex models.

Elective Courses – Decision Intelligence Track
ESI 6684: Decision Making with Deep Reinforcement Learning (3 credits)
This course explores foundations, theory, and algorithms of DRL and applications to sequential decision-making problems. Python programming will be used for algorithm implementation. Students will conduct literature review and periodically present a summary of their findings. Students are expected to write a conference/journal research paper as a part of this course.
ESI 6340: Probabilistic Systems Analysis (3 credits)
Exposes the students to the fundamental principles and techniques of applied probability and stochastic processes. Students will be able to formulate and solve engineering problems surrounding systems operating under uncertain conditions.
ESI 6247: Statistical Design Models (3 credits)
Design of experimental mathematical models. Application of advanced analysis of variance techniques as applied to industrial problems.
EIN 6145: Project Management (3 credits)
Provide principles and techniques for planning, scheduling and managing projects in engineering and related environments. Applies analytical tools and techniques including software to solve project management problems.
EIN 6681: Deep Learning Analytics (3 credits)
Introduction to neural networks and deep learning with a focus on architectures, optimization, and applications.

ESI 6324: Supply Chain Optimization (3 credits)
The course will focus on the discussion of analytical optimization models and tools. To learn how logistical decisions impact the performance of a firm as well as an entire supply chain. To understand supply chain structures and logistical capacities.

Elective Courses – Computational Intelligence Track
COT 5407: Algorithms Essentials (2 credits)
Design principles and analysis techniques applicable to various classes of computer algorithms frequently used in practice. ***Prerequisite(s):*** COP 5532 – Data Structures Essentials.
COP 5230: Object-Oriented Programming Essentials (2 credits)
Design of a computer program using an Object-Oriented programming language. Extension of programming knowledge from a procedural language to an object-oriented language. Analysis of program requirements.
CAI 5005: Introduction to Artificial Intelligence (3 credits)
Basic concepts, tools, and techniques used to produce and study intelligent behavior. Organizing knowledge, exploiting constraints, searching spaces, understanding natural languages, and problem solving strategies. ***Recommended Prerequisite(s):*** COP 5532 – Data Structures Essentials.
CAI 5205: Deep Learning (3 credits)
The study of deep learning is a subset of machine learning that focuses on neural networks. Topics will include math for deep learning, single and multi-layer neural networks, applications of deep learning, as well as ethical concerns of the use of deep learning.
CAI 5845: Computer Vision (3 credits)
Techniques for description and recognition of objects, use of stereo, texture, and motion information for scene segmentation and description, consistent labeling and matching, use of knowledge and planning in computer vision.
CAI 5307: Natural Language Processing (3 credits)
The concepts and principles of computer processing of natural language, including linguistic phenomena, formal methods, and applications.