FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Undergraduate Programs

Department Mathematics and Statistics

College Science

*(To obtain a course number, contact **erudolph@fau.edu**)*

UUPC Approval 2-23-26
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix IDS	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)*	**Type of Course**	**Course Title**
Number 3763	**Lab Code**	Lecture	Applications of AI in Science

Credits *(See Definition of a Credit Hour)*: 3

Effective Date *(TERM & YEAR)*: Fall 2026

Grading *(Select One Option)*: Regular ◉ Sat/UnSat ○

Course Description *(Syllabus must be attached: see Template and Guidelines)*

Artificial Intelligence (AI) is transforming the way science is conducted across disciplines. This course provides a broad introduction to the history, principles, and applications of AI in scientific research. Designed for undergraduates in all science majors, the course assumes no prior AI or programming background.

Prerequisites, with minimum grade*	**Corequisites**	**Registration Controls** *(Major, College, Level)*
NA	NA	NA

Default minimum passing grade is D-.** **Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course

WAC/Gordon Rule Course

☐ Yes ☑ No

WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See WAC Guidelines.

Intellectual Foundations Program (General Education) Requirement *(Select One Option)*

None

General Education criteria must be indicated in the syllabus and approval attached to the proposal. See Intellectual Foundations Guidelines.

Minimum qualifications to teach course

PhD in fields related to AI

Faculty Contact/Email/Phone

Yuan Wang / ywang@fau.edu

List/Attach comments from departments affected by new course

Approved by	***Date***
Department Chair	02/11/2026
College Curriculum Chair	02/12/26
College Dean	2/13/26
UUPC Chair Korey Sorge	2-23-26
Undergraduate Studies Dean Dan Mesoff	2-23-26
UFS President	
Provost	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.



Syllabus

IDS 3763- 001 - 3 credits

Applications of AI in Science

Building: General Classroom South Boca Room: 103 / Library AI Sandbox

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Instructor

William E. Hahn, Ph.D.
Office: Wimberly Library, Room 103 (Sandbox)
Office Hours: Tuesday 12:30 p.m. – 2:30 p.m.
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Course Description

Artificial Intelligence (AI) is transforming the way science is conducted across disciplines. This course provides a broad introduction to the **history, principles, and applications of AI** in scientific research. Designed for undergraduates in all science majors, the course assumes no prior AI or programming background.

Course Philosophy and Structure

This course explores **Artificial Intelligence (AI)** as a transformative scientific tool across biology, chemistry, physics, environmental science, and related disciplines. It is designed for **all science majors** with **no prerequisites**.

Students will learn how AI connects **mathematical reasoning**, **computation**, and **discovery**. The emphasis is on **conceptual understanding**, **historical grounding**, **limitations**, and **responsible use** of AI tools.

Hands-on experience occurs through guided Google Colab notebooks and collaborative GitHub submissions. Evaluation is based on the five project deliverables—presentation, website, Colab notebook, scientific poster, and video—along with structured peer review and instructor feedback.

By the end of the course, students will be prepared to integrate AI into multiple aspects of their academic and professional development:

- Students will use AI tools to improve study efficiency, data analysis, and problem-solving in science courses. They will also learn to evaluate how AI is transforming learning environments and research training.
- Students will apply AI methods to collect, organize, analyze, and visualize scientific data. They will design small-scale projects, adapt AI workflows to their scientific field, and critically assess AI-generated results.
- Students will demonstrate AI literacy in personal statements, research proposals, and applications. Students will build a portfolio of projects showcasing hands-on experience with AI methodologies valued in advanced study.
- Students will gain foundational AI competencies relevant to scientific industries, research labs, healthcare, environmental science, and technology-driven fields. Emphasis is placed on communicating results clearly and responsibly

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Project – Five Required Deliverables

Students will complete a full deep-learning project applying **AlexNet** to a scientific or real-world problem of their choice. The project consists of **five required deliverables**, each building on the last.

Deliverable 1 — Google Slides Presentation

Create a presentation introducing your project idea.
Include:

- The real-world problem you chose and why it matters
- Background, examples, and context
- An explanation of AlexNet and how you plan to use it
- Diagram(s) or visual aids to illustrate the model and workflow

Share as: **Google Slides link (viewable)**

Deliverable 2 — GitHub Website

Build a simple GitHub Pages website that presents your project publicly.
Include:

- Problem description and motivation
- Overview of your technical approach with AlexNet
- Visualizations, screenshots, and early results
- Clear project structure and documentation

Share: **GitHub repo URL + live site URL**

Deliverable 3 — Google Colab Notebook

Develop a working Colab notebook implementing and training AlexNet on your dataset.
Requirements:

- Load and preprocess your dataset
- Resize images to AlexNet's input size (e.g., 224×224)
- Train and validate your model

- Run experiments (batch size, learning rate, augmentation, model comparison)
- Log and plot metrics
- Save model weights

Share: **Colab link (viewable)**

Deliverable 4 — Scientific Poster

Create a research-style poster summarizing your project and experimental findings.
Include:

- Problem statement
- Methods and model setup
- Key experiments and results
- Charts, tables, and visuals from your notebook
- Discussion, conclusions, and future work

Share: **Google Slides poster link (viewable)**

Deliverable 5 — Presentation Video

Record a **3–8 minute** screencast presenting your project.
Include:

- Clear explanation of the problem
- Walkthrough of your model, experiments, and results
- Visual references from your slides, notebook, or poster

Share: **YouTube or Google Drive link**

Weekly Course Narrative & Colab Activities

Each week includes a **theme**, **concept focus**, **Colab demo**, **AI exploration prompt**, and **media homework**.

Week 1 – Can Machines Think?

Theme: Turing and the idea of computation.
Concept: Imitation, algorithms, and early automata.
Colab Demo: [Week_01_RuleBasedChatbot.ipynb]
AI Exploration Prompt: "Ask an AI what it means to think — does it understand?"
Media: *The Machine that Changed the World: The Thinking Machine*

Week 2 – The Architecture of the Machine Mind

Theme: Von Neumann architecture and feedback systems.
Concept: Memory, feedback, and self-regulation.
Colab Demo: [Week_02_Automata.ipynb]
AI Exploration Prompt: "Why does feedback make a machine seem alive?"
Media: *Electric Avenue (BBC 1988) 'The Machine'*

Week 3 – Logic and Reasoning Machines

Theme: Symbolic AI and expert systems.
Concept: Rule-based inference and reasoning.
Colab Demo: [Week_03_RuleEngine.ipynb]
AI Exploration Prompt: "Why did early AI believe logic was enough?"
Media: *A 1986 video on software design methods pertaining to specific systems using expert knowledge*

Week 4 – From Rules to Learning

Theme: The learning turn in AI.
Concept: Perceptrons and learning from data.

Colab Demo: [Week_04_PerceptronPlayground.ipynb]
AI Exploration Prompt: “What does it mean for a system to learn from mistakes?”
Media: *Neocognitron - A neural network model for a mechanism of visual pattern recognition (1986)*

Week 5 – Representing the World as Numbers

Theme: Vectors and tensors.
Concept: Representation and geometry of data.
Colab Demo: [Week_05_TensorPlayground.ipynb]
AI Exploration Prompt: “How can numbers contain meaning?”
Media: *How do Graphics Cards Work? Exploring GPU Architecture*

Week 6 – Learning by Optimization

Theme: Loss and gradient descent.
Concept: How models learn by minimizing error.
Colab Demo: [Week_06_GradientDescentVisualizer.ipynb]
AI Exploration Prompt: “Why does finding the lowest point make learning possible?”
Media: *Ray Kurzweil - The Age of Intelligent Machines*

Week 7 – Deep Neural Networks

Theme: Layered learning and representation hierarchies.
Concept: Deep structure and feature extraction.
Colab Demo: [Week_07_DNN_Explorer.ipynb]
AI Exploration Prompt: “What does depth give to intelligence?”
Media: *The moment we stopped understanding AI [AlexNet]*

Week 8 – Transfer Learning & Adaptation

Theme: Reuse and generalization.
Concept: Transfer learning across scientific domains.
Colab Demo: [Week_09_TransferLab.ipynb]
AI Exploration Prompt: “Why is transferable knowledge so powerful for science?”
Media: Hamming, "Artificial Intelligence” I, II, III

Week 9 – Physics and Materials

Theme: AI in the physical sciences.
Concept: Surrogate models and simulation acceleration.
Colab Demo: [Week_10_MaterialsPredictor.ipynb]
AI Exploration Prompt: “Can AI learn physics faster than experiments?”
Media: *The Physics of A.I.*

Week 10 – Biology and Medicine

Theme: AI in life sciences.
Concept: Imaging, diagnostics, and protein prediction.
Colab Demo: [Week_11_BiomedicalClassifier.ipynb]
AI Exploration Prompt: “What responsibilities come with AI diagnosis?”
Media: *AlphaFold - The Most Useful Thing AI Has Ever Done*

Week 11 – Earth and Space Science

Theme: Climate, remote sensing, and astronomy.
Concept: AI as an observational tool.
Colab Demo: [Week_12_EarthSkyModel.ipynb]
AI Exploration Prompt: “What might AI discover before we do?”
Media: *Transforming planetary data into actionable intelligence | Google Earth AI*

Week 12 – Language Models and Reasoning

Theme: Large language models.
Concept: Emergent reasoning and scaling.
Colab Demo: [Week_14_MiniLLMScientist.ipynb]
AI Exploration Prompt: “Can a language model think scientifically?”
Media: *The Mind Machines - Arthur C. Clarke - 1978*

Week 13 – AI Agents and Autonomous Science

Theme: Multi-agent systems and lab automation.
Concept: Planning and self-improvement.
Colab Demo: [Week_15_AgentSimulator.ipynb]
AI Exploration Prompt: “Should AI design and run experiments?”
Media: *The Catastrophic Risks of AI — and a Safer Path*

Week 14 – Limits, Ethics, and the Future

Theme: Responsible and ethical AI.
Concept: Bias, reproducibility, and alignment.
Colab Demo: [Week_16_BiasFairnessExplorer.ipynb]
AI Exploration Prompt: “Where should we set boundaries for AI in science?”
Media: *Hamming, "You and Your Research" (June 6, 1995)*

Historical & Contemporary Media Library

Playlist Link: https://tinyurl.com/AIClass26

- *The Machine that Changed the World: The Thinking Machine*
- *Neocognitron – A neural network model for a mechanism of visual pattern recognition (1986)*
- *A 1986 video on software design methods pertaining to specific systems using expert knowledge*
- *The Lighthill debate on Artificial Intelligence: “The general purpose robot is a mirage”*
- *Ray Kurzweil – The Age of Intelligent Machines*
- *The Mind Machines – Arthur C. Clarke (1978)*
- *Electric Avenue (BBC 1988) ‘The Machine’ (Micro Live follow-on)*
- *Hamming, “Artificial Intelligence – Part I” (April 7, 1995)*
- *AlphaGo – The Movie | Full award-winning documentary*
- *AlphaFold – The Most Useful Thing AI Has Ever Done*
- *AlphaFold: The making of a scientific breakthrough*
- *Powering the Cell: Mitochondria (BioVisions)*
- *The F0/F1 ATPase and ATP Production (BioVisions)*
- *Protein Packing Inside the Cell (BioVisions)*

- *BioVisions: Electron Transport and ATP Production in Cells*
- *Transforming planetary data into actionable intelligence | Google Earth AI*
- *Why AI Creates Better Weather Forecasts*
- *Can AI help weather forecasting save lives?*
- *Transformers, the tech behind LLMs | Deep Learning Chapter 5*
- *The Physics of A.I.*
- *Quantum Echoes: Towards real world applications*
- *True Artificial Intelligence will change everything | Juergen Schmidhuber | TEDxLakeComo*
- *AT&T Archives: Incredible Machine*
- *The Catastrophic Risks of AI — and a Safer Path | Yoshua Bengio | TED*
- *We're Not Ready for Superintelligence*
- *Richard Feynman Computer Science Lecture – Hardware, Software and Heuristics*
- *The moment we stopped understanding AI [AlexNet]*
- *How do Graphics Cards Work? Exploring GPU Architecture*
- *Connection Machine CM-1 (1986) & CM-2 (1987)*
- *History of AI – Connection Machine Applications (1986)*
- *The Thinking Game | Full documentary | Tribeca Film Festival official selection*

Instructional Method

This course is available both online and in person, combining lectures and discussions with weekly hands-on lab work in Google Colab and a sequence of five structured deliverables (slides, website, Colab notebook, scientific poster, and presentation video). Learning and evaluation emphasize practical experimentation, peer review, and clear communication of results.

Textbooks/Readings

Required

- *Weekly Viewings* ***Playlist Link: https://tinyurl.com/AIClass26***
- *No Textbook Required*

Prerequisites

None.

Course Objectives / Student Learning Outcomes

1. Understand the history and foundations of AI in science.
2. Apply AI tools to analyze and visualize real-world scientific data.
3. Develop collaborative projects applying AI to different scientific domains.
4. Present scientific results using AI methods clearly and effectively.
5. Evaluate the ethical and professional implications of AI in science.

Course Evaluation Method

Evaluation is based on the five required project deliverables and ongoing participation:

- **Project Deliverables – 70%**
  - Google Slides project proposal – 10%
  - GitHub Pages project website – 15%
  - Google Colab notebook (code + experiments) – 20%
  - Scientific poster – 15%
  - Final presentation video – 10%
- **Participation & Weekly Engagement – 30%**
  - Active participation in discussions
  - Completion and engagement with weekly Colab activities

- Peer feedback and collaboration

Course Grading Scale

Percentages translate to final grades according to the following table:

Grade	% Range
A	94–100
A-	90–93
B+	87–89
B	84–86
B-	80–83
C+	77–79
C	74–76
C-	70–73
D+	67–69
D	64–66
D-	61–63
F	0–60

Policy on Makeup Work and Incompletes

Late work is not accepted, except in cases of extraordinary circumstances (such as significant health problems or university-approved absences with documentation). Extra credit is not offered.

Students should expect to spend a minimum of two hours per week per credit hour on out-of-classroom assignments.

A student who is passing but cannot complete the course due to exceptional circumstances may, with consent of the instructor, receive a temporary incomplete (“I”).

Special Course Requirements

Students are expected to have **Colab, GitHub, and ChatGPT accounts** set up.

- https://colab.research.google.com/
- https://education.github.com/

Attendance Policy

Students are expected to attend all scheduled classes and satisfy all academic objectives. Absences may reduce participation grades. Students are responsible for making up missed work due to legitimate absences and must notify the instructor in advance whenever possible.

Counseling and Psychological Services (CAPS) Center

FAU students may access counseling, psychiatric, and wellness services through CAPS. More information: http://www.fau.edu/counseling/

Disability Policy

Students requiring reasonable accommodations must register with Student Accessibility Services (SAS) and follow all procedures. SAS provides services on all campuses. More information: www.fau.edu/sas

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Code of Academic Integrity

Students at FAU are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these standards. See University Regulation 4.001 for full policy.

AI Statement for this Course:

AI Encouraged Policy

The use of AI to assist in work assigned in this specific course is encouraged for various purposes. The instructor hereby permits the use of AI to assist in work assigned for this course, unless the instructor expressly indicates AI is not permitted on a particular assignment. Use must be properly documented and cited per instructor guidelines.

General FAU AI Policy

FAU recognizes the value of generative AI in facilitating learning. However, output generated by artificial intelligence (AI), such as written words, computations, code, artwork, images, music, etc., for example, is drawn from previously published materials and is not your own original work. FAU students are not permitted to use AI for any course work unless explicitly allowed to do so by the instructor of the class for a specific assignment.

Class policies related to AI use are decided by the individual faculty. Some faculty may permit the use of AI in some assignments but not others, and some faculty may prohibit the use of AI in their course entirely. In the case that an instructor permits the use of AI for some assignments, the assignment instructions will indicate when and how the use of AI is permitted in that specific assignment. It is the student's responsibility to comply with the instructor's expectations for each assignment in each course. When AI is authorized, the student is also responsible and accountable for the content of the work. AI may generate inaccurate, false, or exaggerated information. Users should approach any generated content with skepticism and review any information generated by AI before using generated content as-is.

If you are unclear about whether or not the use of AI is permitted, ask your instructor before starting the assignment.

Failure to comply with the requirements related to the use of AI may constitute a violation of the Florida Atlantic Code of Academic Integrity, Regulation 4.001.