Proposed Undergraduate Certificate Modules in Artificial Intelligence

Illinois Tech seeks to develop two undergraduate certificates in artificial intelligence. Goals in creating these certificates include:

- Sets of courses (referred to as Modules) that students can earn in addition to their major using available free electives, courses that count toward general education requirements, etc.
- Module completion earns transcripted certification – one for *AI fluency* and one for *AI management*; students can take any number of courses and/or certificates.
- Ensure the courses in the certificates minimize prerequisites (striving for *zero* prerequisites through progressive catalog revisions.
- Ensure courses in the certificates do not need to be taken in sequence.
- Provide as many course options as possible within each topic area within the certificate, to maximize double-counting across major/minor requirements, general education requirements, and certificate requirements; this additionally maximizes student schedule flexibility and allows them to obtain AI fluency and AI management knowledge and skills in educational contexts of most interest to them.
- Develop AI Modules that can be leveraged for new X+AI degrees – new cataloged combined majors (e.g., Physics+AI), where the primary major credit hours out number of AI credit hours (e.g., 2/3 Physics + 1/3 AI, though this may vary across majors) and AI is included in the major both through AI specific courses, but also through AI integration IN major courses and via Major+AI capstone experiences.
- Develop AI Modules that may be integrated into the general education core curriculum in the future.

The *AI Fluency* certificate consists of three knowledge domains:

1. Understanding AI
2. Collaboration with AI for communication
3. Collaboration with AI for computational math & coding

The *AI Management* certificate consists of three knowledge domains:

1. Data literacy
2. Organizational transformation through AI
3. Ethics and the responsible use of AI (bias, privacy, security, and human values)

The following table indicates the courses students will *initially* be able to select from in each knowledge domain, where options are permitted:

Knowledge Domain	Select one course from:	Comments
Understanding AI	CS 180 Artificial Intelligence Foundations	Needs to be developed
Collaboration with AI for Communications	COM 200 AI, Data & Communications	Course being piloted now COM 200 prereq: COM 100-199
Collaboration with AI for computational math and coding	MATH 123 AI for Computational Mathematics & Coding	Needs to be developed
Data literacy	DS 151 Intro to Data Science BUS 102 Intro to Business Analytics	All courses in list exist DS 451 prereq: DS 251 or MATH 484 or CS 484 or CS 422
Organizational transformation through AI	BUS 432 Artificial Intelligence in Business	
Ethics & responsible use of AI	PHIL 381 AI, Philosophy & Ethics DS 261 Data Privacy and Responsible AI PHIL 372 Ethics for Technology and Communications PHIL 380 Philosophy of Data Science	Security & privacy must be added to any of the classes in this list to remain options PHIL 372 prereq: HUM 102 or HUM 104 or HUM 106 or HUM 200-299

The above knowledge domains are expected to cover the following learning objectives:

- Understanding AI
  - Hands-on introduction to AI, learning how to use it as a creative partner
  - AI Foundations and Tool Selection
  - Introduction to Machine Learning
  - The Human's Value Proposition in an AI-Augmented World
- Collaboration with AI for communication
  - AI-Assisted Technical & Non-Technical Communication
  - Iterative human-AI collaboration techniques
  - Large Language Model Competencies (prompt/context engineering, persona development, critical evaluation of output)
  - Output verification & validation techniques
- Collaboration with AI for computational math & coding
  - Large Language Model Competencies
  - Using AI as a native learning tool for computational math
  - Using AI to code without fully understanding programmatic language syntax
  - Developing both mathematical understanding and critical AI literacy
- Data literacy

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    - Data types & fundamentals
    - Data quality dimensions (accuracy, completeness, consistency, timeliness)
    - Common data issues (missing values, bias, outliers, sampling problems)
    - Basic AI/ML evaluation concepts (accuracy, error rates, confidence levels, false positives/negatives)
    - Data assumptions and parameter settings for pre-built AI tools
    - Common AI tool failures, including outputs that reflect biased data, overfitting to specific contexts, or inappropriate model selection
    - Data classification, sharing & sanitization practices
- Organizational transformation through AI
    - Organizational Context for AI-Enabled Transformation (structures, cultures, stakeholders, infrastructure readiness, strategic alignment, etc.)
    - Stakeholder engagement, process mapping/understanding and prototyping
    - Design Thinking for AI-Enabled Solutions
    - Low/no-code AI Agent Development for Workflow Automation
    - Configuring agents with appropriate boundaries, checks & balances
    - Measuring AI Impact in Organizations – metrics for evaluating AI time savings, quality improvements, error reduction, cost reduction, etc.; including both quantitative and qualitative measures
    - Organizational integration & adoption best practices, challenges & strategies
- Ethics and the responsible use of AI (bias, privacy, security, and human values)
    - Ethical frameworks to evaluate AI use
    - Environmental & social impacts of AI systems
    - Bias and discriminatory impacts
    - Professional and organizational responsibility
    - Proper attribution & disclosure practices
    - Professional and organizational codes of ethics
    - Security & privacy risks and mitigation strategies
    - AI security vulnerability awareness
    - Regulatory frameworks and requirements awareness

Governance: Certificates would be hosted out of the College of Computing, with an interdisciplinary steering committee assigned to approve course additions/deletions from the certificate and assess student learning outcomes.