# http://www.ric.edu/webcommunications/images/SealWithText_Small_Black.pngUNDERGRADUATE CURRICULUM COMMITTEE (UCC)PROPOSAL FORM

|  |  |  |
| --- | --- | --- |
| A.1. [Course or program](#Proposal) | **CSCI 427 Artificial Intelligence Foundations** |  |
| [Replacing](#Ifapplicable)  | **CSCI 427 introduction to artificial intelligence** |
| A. 1b. Academic unit | **School of Business**  |  |
| A.2. [Proposal type](#type) | **Course: revision**  |  |
| A.3. [Originator](#Originator) | **Timothy Henry** | [Home department](#home_dept) | **Computer Science and Information Systems** |
| A.4. [Context and Rationale](#Rationale) Must include additional information listed in smart tip for all [new programs](#type). If **online** course or program, you need to explain what mode(s) you plan to use and why you need that specific delivery.  | Original version of CSCI 427 was designed as a restricted elective for Computer Science, Computer Information Systems and Cybersecurity Majors. The course is being updated to also serve as a foundational course in the Artificial Intelligence major. **Summary of changes:****Change course title to “Artificial Intelligence Foundations” from “Introduction to Artificial Intelligence”** This change better reflects the expanded purpose of this course for AI Majors. The course still serves as a restricted elective for the CS, CIS and Cybersecurity majors. **Increase credits from 3 to 4.** The credit increase allows the course to cover the breadth of topics needed to prepare students for the advanced courses in the program and to strengthen their mathematical foundation as it applies to AI. A fifteen-week outline is included to show these topics. The increase in credits will increase the credit lower bound of the Computer Science B.S. from 75 to 76 and the B.A. from 49 to 50.**Course description updated to be student-oriented.** As per UCC guidelines, and changing when offered from As Needed to Fall and Spring.**Update pre-requisite to include CSC 212W Data Structures and MATH 240 Statistical Methods I.**Students in the AI Major need experience with data structures and basic algorithms to understand and utilize AI models. Students also need the foundation in regression, correlation and confidence intervals that comes from MATH 240. |
| A.5. [Student impact](#student_impact)Must include to explain why this change is being made? | Students selecting this as a restricted elective will now have an additional credit hour when taking the course. The overall level of mathematics required for this course will be higher, slightly reducing the overall number of students that can take the course. |
| A.6. [Impact on other programs](#impact)  | Students selecting this as a restricted elective will now have an additional credit hour when taking the course.  |
| A.7. [Resource impact](#Resource) | [*Faculty PT & FT*](#faculty):  | Existing CSCI faculty and/or adjunct faculty will teach the courses. Depending on the growth of the new AI Program, additional faculty and adjuncts may be needed. |
| [*Library*:](#library) | None |
| *Technology (for in person delivery)*The VP of Information Services should be consulted prior to submission and their acknowledgement signature included. | None. Courses will use existing classrooms and/or computer labs. |
| *Technology: (for online delivery. Must be RIC supported)*The VP of Information Services should be consulted prior to submission and their approval signature included. | None |
| [*Facilities*](#facilities): | None. Courses will use existing classrooms and/or computer labs. |
| A.8. [Semester effective](#Semester_effective) | **Fall 2024** | A.9. [Rationale if sooner than next Fall](#Semester_effective) | **N/A** |
| A.10. INSTRUCTIONS FOR CATALOG COPY: Use the Word copy versions of the catalog sections found on the UCC Forms and Information page. Cut and paste into a single file **ALL the relevant pages from the college catalog that need to be changed.** Use tracked changes feature to show how the catalog will be revised as you type in the revisions. If totally new copy, indicate where it should go in the catalog. If making related proposals a single catalog copy that includes all changes is preferred. Send catalog copy as a separate single Word file along with this form. |
| A.11. List here (with the relevant URLs), any RIC website pages that will need to be updated (to which your department does not have access) if this proposal is approved, with an explanation as to what needs to be revised: |
| A. 12 **Check to see if your proposal will impact any of our** [**transfer** **agreements,**](file:///Users/SAbbotson/Documents/Curriculum/ManualandWebsite/transfer%20agreements) **and if it does explain in what way. Please indicate clearly what will need to be updated, including any changes in prefix numbers/titles for TES. N/A** |
| A. 13 Check the section that lists “Possible NECHE considerations” on the UCC Forms and Information page and if any apply, indicate what that might be here and contact Institutional Research for further guidance. **N/A** |

**C.** [**NEW OR REVISED COURSES**](#delete_if) **THAT ARE DESIGNATED AS HYBRID**

|  | Old | New |
| --- | --- | --- |
| C.1. [Course prefix and number](#cours_title)  |  |  |
| C.2. Cross listing number if any |  |  |
| C.3. [Course title](#title)  | **Introduction to Artificial Intelligence** | **Artificial Intelligence Foundations** |
| C.4. [Course description](#description)  | **Fundamental artificial intelligence methods are introduced, including search, inference, problem solving, and knowledge representation. AI applications, such as natural language understanding and expert systems, are introduced.** | **Students are introduced to foundational artificial intelligence methods, including search, inference, and knowledge representation. Students gain experience with important AI applications, such as natural language processing, computer vision, and forecasting.** |
| C.5. [Prerequisite(s)](#prereqs) | **CSCI 212 or CSCI 212W or CSCI 315** | **CSCI 212 or CSCI 212W and MATH 240** |
| C.6. [Offered](#Offered) please read the screen tips to do this correctly, alternate years needs to be assigned odd/even, and a specific semester. | **As needed** | **Fall** |
| C.7. [Contact hours](#contacthours)  | **3** | **4** |
| C.8. [Credit hours](#credits) | **3** | **4** |
| C.9. [Justify differences if any](#differences) | Additional depth needed for AI Major |

|  |  |  |
| --- | --- | --- |
| C.10. [Grading system](#grading)  |  |  |
| C.11. a. [Type of cours](#instr_methods)e  |  |  |
| C.11.b Instruction mode with percentage |  |  |
| Reminder: Instructors are responsible for ensuring their course meets accessibility standards and provides accommodations identified by Disability Services (find links).  |
| C.11.c. For online components only: How will students engage with the content  |  |  |
| C.11.d. How will students engage with other students  |  |  |
| C.12. CATEGORIES 12. a. [How](#required) to be used | **Restricted elective for major**  | **Required for AI major/minor** **Restricted elective for CS major/minor** |
|  12 b. Is this an Honors  course? | **NO** |  |
|  12. c. [General Education](#ge) N.B. Connections must include at  least 50% Standard Classroom instruction. | **No** |  |
|  12. d. Writing in the  Discipline (WID) | **NO** |  |
| C.13. [How will student performance be evaluated?](#performance)  |  |  |
| C.14 [Recommended class-size](#class_size) |  |  |
| C.15. [Redundancy statement](#competing) |  |  |
| C. 16. Other changes, if any |  |

| C.17**.** [**Course learning outcomes**](#outcomes)**: List each one in a separate row** | [**Professional Org.Standard(s)**](#standards)**, if relevant** | [**How will each outcome be measured?**](#measured) |
| --- | --- | --- |
| Apply core principles of artificial intelligence and machine learning, such as supervised, unsupervised and reinforcement learning, to solve problems in forecasting, natural language processing or computer vision. |  | Homework, labs, projects, in-class assignments, and exams. |
| Analyze a business problem and then select and train the appropriate artificial intelligence algorithm for the problem. |  | Written homework, labs, projects, in-class assignments, and exams. |
| Implement minimal versions of common machine learning models, such as decision trees, KNN models, and neural networks. |  | Homework, projects, and labs. |
| Evaluate large data sets and perform feature engineering to prepare training data for machine learning. |  | Homework, labs, and projects. |
| Evaluate the results of a machine learning model and tune the model to improve performance based on the evaluation. |  | Written homework, projects, in-class assignments, and exams. |
| Understand the importance of fairness and bias mitigation in machine learning, and how to ensure that the predictions made by the model are fair and unbiased.  |  | Written homework, , projects, in-class assignments, and exams. |

| C.18. [**Topical outline**](#outline)**:** |
| --- |
| **Week 1 Artificial Intelligence Concepts and Tools*** History of AI
* Supervised, unsupervised and reinforcement learning

**Week 2 Path Finding*** Graph Concepts
* Various pathfinding algorithms (A\*, etc.)

**Week 3 Decision Trees*** Decision Trees
* Random Forest
* XGBoost

**Week 4 Linear and Logic Regression*** Linear regression and its use in Machine Learning
* Logic Regression and when to use it

**Week 5 Support Vector Machines (SVM)*** History of SVMs
* Implementing SVMs and the Challenges
* When to Use SVMs

**Week 6 K-Nearest Neighbors (KNN)*** KNN Models
* Selecting Optimum Value for *k*
* K-clustering

**Week 7 Neural Networks*** History of Neural Networks
* Perceptrons
* Multi-layer Neural Networks

**Week 8 The Machine Learning Pipeline*** Formulating business problems for AI
* Identifying and preparing data
* Train, Test, Validate Cycles

**Week 9 Feature Engineering*** Cleaning data
* Engineering Categorical Data for Training
* Data Engineering for Numerical Data
* Identifying potential bias in data

**Week 10 Training and Testing a Model*** Determining initial hyperparameters
* Paradigms for training ML models
* Testing Cycles versus Validation
* Overfitting versus underfitting
* Cross-validation
* Analysis of Variance

**Week 11 Tuning a Model*** Determining the best hyperparameters
* Adjusting learning rate
* Adjusting learning algorithms
* Adjusting network structure

**Week 12 Machine Learning Applications - Forecasting*** Processing time sensitive data
* Special considerations for time sensitive data
* ML Models for Forecasting

**Week 13 Machine Learning Applications – Computer Vision*** Image and video analysis
* Facial recognition
* Bias and fairness in training vison models

**Week 14 Machine Learning Applications – Natural Language Processing*** Document translation
* Article Summaries
* Chatbots
* Word Mapping

**Week 15 Wrapping Up Artificial Intelligence*** Final presentations and projects
 |
|  |

**G. Signatures**

* **Changes that affect General Education in any way MUST be approved by ALL Deans and COGE Chair**.
* Changes that directly impact more than one department/program MUST have the signatures of all relevant department chairs, program directors, and their relevant dean (e.g. when creating/revising a program using courses from other departments/programs). Check UCC manual 4.2 for further guidelines on whether the signatures need to be approval or acknowledgement.
* Proposals that do not have appropriate approval signatures will not be considered.
* Type in name of person signing and their position/affiliation.
* Send electronic files of this proposal and accompanying catalog copy to curriculum@ric.edu to the current Chair of UCC. Check UCC website for due dates. **Do NOT convert to a .pdf.**

##### G.1. Approvals: required from programs/departments/deans who originate the proposal. THESE may include multiple departments, e.g., for joint/interdisciplinary proposals.

| Name | Position/affiliation | [Signature](#_Signature" \o "Insert electronic signature, if available, in this column) | Date |
| --- | --- | --- | --- |
| Suzanne Mello-Stark | Chair of Computer Science and Information Systems | \*approved by email | 2/23/2024 |
| Rebecca Sparks | Chair of Department of Mathematical Sciences | \*approved by email | 2/23/2024 |
| Quenby Hughes | Dean of Arts and Sciences | \*approved by email | 2/23/2024 |
| Marianne Raimondo | Dean of School of Business | \*approved by email | 2/23/2024 |