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

## Cover page scroll over blue text to see further important [instructions](#instructions): [if not working select “COMMents on rollover” in your Word preferences under view] please read these.

**N.B. DO NOT USE HIGHLIGHT, where choices are given within categories, please DELETE those THAT DO NOT APPLY TO YOUR PROPOSAL. Do not delete numbered categories.**

**ALL numbers in section (A) to be completed, including the impact ones (#5-7), put “none” if that is the case.**

|  |  |  |
| --- | --- | --- |
| A.1. [Course or program](#Proposal) | **CSCI 428 Machine Learning** |  |
| [Replacing](#Ifapplicable)  |  |
| A.2. [Proposal type](#type) | **Course: creation** **Program: revision** |
| A.3. [Originator](#Originator) | **Raafat Elfouly and Sally Hamouda** | [Home department](#home_dept) | **MATHEMATICS AND COMPUTER SCIENCE** |
| A.4. [Context and Rationale](#Rationale)  | This new course, titled Machine Learning, is being proposed as a required course in the BS of Data Science and as an elective for BA and BS of Computer Science., and potentially also for CISMachine Learning is a key to develop intelligent systems and analyze data.  Students will learn to develop intelligent systems and analyze data. Topics include supervised, unsupervised and deep learning algorithms. Current packages and tools will be used to solve real-world problems The course includes the development of individual projects, with emphasis on the application of machine learning to challenging real-world problems.This course is an important course for students majoring/minoring in CSCI /CIS or data science.The class size is capped at 24 as this course is taught in a computer lab. |
| A.5. [Student impact](#student_impact) | After taking this course, students will have enhanced their competence in building intelligent systems, and data analysis. |
| A.6. [Impact on other programs](#impact)  | **Mathematics and Computer Science****CSCI** – In the restricted electives for the BA and BS in CSCI students can taketwo additional courses in computer information systems or **computer science** at the 300-level or above**CIS**– In the restricted electives for the BS in CIS students can taketwo additional courses in computer information systems or **computer science** at the 300-level or above |
| A.7. [Resource impact](#Resource) | [*Faculty PT & FT*](#faculty):  | **Existing faculty can teach this course** |
| [*Library*:](#library) | **No additional resources needed**  |
| [*Technology*](#technology) | **Will teach in the existing computer labs using existing software** |
| [*Facilities*](#facilities): | **Existing labs** |
| A.8. [Semester effective](#Semester_effective) | **Fall 2020** | A.9. [Rationale if sooner than next Fall](#Semester_effective) |  |
| A.10. INSTRUCTIONS FOR CATALOG COPY: This single file copy must include ALL relevant pages from the college catalog, and show how the catalog will be revised. (1) Go to the “Forms and Information” page on the UCC website. Scroll down until you see the Word files for the current catalog. (2) Download ALL catalog sections relevant for this proposal, including course descriptions and/or other affected programs. (3) Place ALL relevant catalog copy into a single file. Put page breaks between sections and **delete any catalog pages not relevant for this proposal**. (4) Using the track changes function, revise the catalog pages to demonstrate what the information should look like in next year’s catalog. (5) Check the revised catalog pages against the proposal form, especially making sure that program totals are correct if adding/deleting course credits. If new copy, indicate where it should go in the catalog. If making related proposals a single catalog copy that includes all is acceptable. Send as a separate single file along with this form. |

B. [NEW OR REVISED COURSES](#delete_if)  **DO NOT use highlight. Do not delete numbered categories, just leave blank if they do not apply. Delete this whole page if the proposal does not include a new or revised course. Always fill in b. 1 and B. 3 for context.**

|  | Old ([for revisions only](#Revisions))ONLY include information that is being revised, otherwise leave blank.  | NewExamples are provided within some of the boxes for guidance, delete just the examples that do not apply. |
| --- | --- | --- |
| B.1. [Course prefix and number](#cours_title)  |  | **CSCI 428** |
| B.2. Cross listing number if any |  |  |
| B.3. [Course title](#title)  |  | **Machine Learning** |
| B.4. [Course description](#description)  |  | Students will learn to develop intelligent systems and analyze data. Topics include supervised, unsupervised and deep learning algorithms. Current packages and tools will be used to solve real-world problems |
| B.5. [Prerequisite(s)](#prereqs) |  | CSCI 212, or CIS 470 and CSCI 157, or consent of department chair. |
| B.6. [Offered](#Offered) |  | **Spring**  |
| B.7. [Contact hours](#contacthours)  |  | **4** |
| B.8. [Credit hours](#credits) |  | **4** |
| B.9. [Justify differences if any](#differences) |  |
| B.10. [Grading system](#grading)  |  | **Letter grade**  |
| B.11. [Instructional methods](#instr_methods) |  | **Lecture**  |
| B.12.[Categories](#required) |  | **Required for major in DS****Required Elective for CSCI and CIS** |
| B.13. Is this an Honors course? |  | **NO** |
| B.14. [General Education](#ge)N.B. Connections must include at least 50% Standard Classroom instruction. |  | **NO**  |
| B.15. [How will student performance be evaluated?](#performance) |  | **Exams | Class Work | Quizzes | Projects | Team Project** |
| B.16 [Recommended class-size](#class_size" \o "Check appendix XVIII in the UCC Manual for Best Practices) |  | **24** |
| B.17. [Redundancy statement](#competing) |  | **N/A** |
| B. 18. Other changes, if any |  |

| B.18**.** [**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)**?** |
| --- | --- | --- |
| Understand a variety of classical learning algorithms for supervised and unsupervised learning; Along with its applications, such as classifications, clustering, and Recommender Systems. |  | Projects, homework and exam/quiz questions. |
| Implement basic machine learning algorithms in the programming language of their choice. |  | Projects, homework and exam/quiz questions. |
|  Understand and effectively use established machine learning tools and libraries available for practitioners. |  | Projects, homework and exam/quiz questions. |
| Properly apply machine learning methods to solve real-world problems in a variety of domains. |  | Projects, homework and exam/quiz questions. |

| B.19. [**Topical outline**](#outline)**: DO NOT INSERT WHOLE SYLLABUS, JUST A TWO-TIER TOPIC OUTLINE. Proposals that ignore this request will be returned for revision.** |
| --- |
| 1) Introduction to Machine Learning 1.0 Week* What is Machine learning
* Motivation and applications

2) Types of Machine Learning Algorithms 1.0 Week* Supervised, unsupervised learning
* Machine learning lifecycle
* Linear Regression

3) Non-Linear regression 1.0 Week* Polynomial regression
* Model building, and training

4) Supervised Learning 1.0 Week* Classification
* Logistic Regression

5) Other metrics 1.0 Week* Confusion matrix
* In sample and out of sample accuracy

6) K nearest neighbors 1.0 Week* What is K-Nearest Neighbors
* Implementing KNN

7) Model Selection 1.0 Week* Performance Measures

8) Kernel Methods: Support Vector Machines 1.0 Week* What is SVM
* Kernel tricks

 9) Decision Trees 1.0 Week* What is Decision Tree
* Implementing the model

10) Ensemble Algorithms 1.0 Week* Random Forests
* Implementing Random Forests

11) Clustering 1.0 Week* Unsupervised learning using K-Means
* Implementing K means

12) Clustering II 1.0 Week* Hierarchical Clustering
* Implementing Hierarchical Clustering

13) Deep Learning 1.0 Week* Introduction to Deep Learning
* Implementing ANN

14) Review and Testing 1.0 Week Total        14.0 weeks |
|  |

### C. [Program Proposals](#program_proposals) **complete only what is relevant to your proposal. Delete this whole page if the proposal is not revising, creating, deleting or suspending any progam.**

|  | [Old (for revisions only)](#old_program) | New/revised |
| --- | --- | --- |
| C.1. [Enrollments](#enrollments) |  | **BA CSCI: 100****BS CSCI: 71****DATA SCIENCE: c.20** |
| C.2. [Admission requirements](#admissions) |  |  |
| C.3. [Retention requirements](#retention) |  |  |
| C.4. [Course requirements](#course_reqs) for each program option. Show the course requirements for the whole program here. | THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

 | **As well as being used in the new Data Science major, this course will be added as a required elective to both the CSCI BA and BS majors and CIS. This will not affect any total credits.****CIS just has a note that additional courses at the 300-level or above in CSCI or CIS are required so no change to the way that program is listed. The CSCI programs will add it to the list of electives in both the BA and BS programs:**THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 428 | Machine Learning | 4 |  |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

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| C.5. [Credit count](#credit_count) for each program option |  | **Same** |
| C.6. Other changes if any |  |  |
| C.7 [Program goals](file://Users/sabbotson/Documents/Curriculum/Program%20goals)Needed for all new programs |  |  |

## D. 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 and a printed signature copy of this whole form to the current Chair of UCC. Check UCC website for due dates.

##### D.1. Approvals: required from programs/departments/deans who originate the proposal. 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 |
| --- | --- | --- | --- |
| Stephanie Costa | Chair, Mathematics and Computer Science |  |  |
| Lisa Bain | Chair, Accounting and Computer Information Systems |  |  |
| Jeffrey Mello | Dean, School of Business |  |  |
| Earl Simson | Dean, Arts and Sciences |  |  |

##### D.2. [Acknowledgements](#acknowledge): REQUIRED from OTHER PROGRAMS/DEPARTMENTS (and their relevant deans if not already included above) that are IMPACTED BY THE PROPOSAL. SIGNATURE DOES NOT INDICATE APPROVAL, ONLY AWARENESS THAT THE PROPOSAL IS BEING SUBMITTED. CONCERNS SHOULD BE BROUGHT TO THE UCC COMMITTEE MEETING FOR DISCUSSION; all faculty are welcome to attend.

| Name | Position/affiliation | [Signature](#Signature_2) | Date |
| --- | --- | --- | --- |
|  |  |  |  |