


COSC 405 Artificial Intelligence-CrsRvs-2015-10-05

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Form Information

 Page Naming Example: CRIM 101 Intro to Criminology-CrsRvs-2015-08-10

Please direct any questions to curriculum-approval@iup.edu

**Indicates a required field*

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Course Level*	undergraduate-level
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Course Revisions	
(Check all that apply;fill out categories below as specified; i.e. if only changing a course title, only complete Category A)	
<p>Category A:</p> <p>catalog_desc_change mod_prereq</p>	<p>Category B:</p> <p>course_revision</p> <p><i>* Teacher Education: Please complete the Teacher Education section of this form (below)</i></p> <p><i>* Liberal Studies: Please complete the Liberal Studies section of this form (below)</i></p> <p><i>* Distance Education: Please complete the Distance Education section of this form (below)</i></p>

Rationale for Proposed Changes (All Categories)	
(A) Why is the course being revised /deleted:	Modifications are being made to the catalog description and student learning outcomes to reflect more up-to-date topics and techniques in artificial intelligence. The modifications also address requirements of the ABET accreditation agency. Additionally, a grade of C or better will be required for the prerequisite COSC 310 to ensure that students are prepared for the rigorous programming tasks required.
(B) University Senate Summary of Rationale	<i>Please enter a single paragraph summary/rationale of changes or proposal for University Senate.</i> Modifications are being made to the catalog description and student learning outcomes to reflect more up-to-date topics and techniques in artificial intelligence. The modifications also address requirements of the ABET accreditation agency. Additionally, a grade of C or better will be required for the prerequisite COSC 310 to ensure that students are prepared for the rigorous programming tasks required.
(C) Implications of the change on the program, other programs and the Students:	

Current Course Information	Proposed Changes
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Category A			
(D) Curr ent Prefix	COSC	Propos ed Prefix	
(E) Curr ent Num ber	405	Propos ed Number	
(F) Curr ent Cour se Title	Artificial Intelligence	Propos ed Course Title	
(G) Prer equi site (s)	COSC 310	Propos ed Prereq uisite (s)	Grade of C or better in COSC 310
(H) Curr ent Catal og Desc ription	An introduction to the field of artificial intelligence, i.e., the study of ideas that enable computers to process data in a more intelligent way than conventional practice allows. Covers many information representation and information processing techniques. Explores the underlying theory including matching, goal reduction, constraint exploration, search, control, problem solving, and logic.	Propos ed Catal og Desc ription	Introduces the field of artificial intelligence. Explores and implements solutions using classical and modern artificial intelligence techniques. Includes state space search, logical inference, expert systems, optimization, knowledge representation, machine learning, handling uncertainty, and soft computing.
<i>If changing Category A, no further action required.</i>			
Category B (if no change, leave blank)			
(I) Num ber of Cred its	Class Hours:3 Lab Hours:0 Credits:3	Propos ed Num ber of Credits	Class Hours: Lab Hours: Credits:
(J) Curr ent Cour se (St uden t Lear ning) Ou tcom es	Upon successful completion of this course, the students will be able to: 1. Discuss AI terminology, progress, and issues 2. Assess strength and weakness of blind search algorithms. 3. Assess strength and weakness of heuristic search algorithms. 4. Solve problems regarding knowledge and reasoning. 5. Formulate and solve simple problems in logic inference. 6. Assess strength and weakness in game searching algorithms. 7. Assess strength and weakness in AI algorithms in planning. 8. Formulate and solve problems in machine learning. 9. Formulate and solve problems in vision or natural language processing. 10. Understand the basics of robotics or expert systems. 11. Write programs in functional or logical paradigms. 12. Implement software solutions to AI problems.	Propos ed Course (Stu dent Learn ing) Outco mes	Upon successful completion of this course, the students will be able to: 1. Assess the strengths and weaknesses of commonly used artificial intelligence techniques and determine which are most suitable for a particular problem. 2. Assess the strengths and weaknesses of and implement various state-space search algorithms. 3. Formulate and use propositional logic for inference problems. 4. Understand knowledge representation including frame-based and semantic nets. 5. Explain expert systems and choose one to implement using an expert system shell. 6. Assess the strengths and weaknesses of and implement various machine learning algorithms. 7. Explain and implement uncertainty representation including Bayesian networks, belief systems, and fuzzy logic. 8. Understand and implement a neural network for classification. 9. Understand and implement genetic algorithms for planning and optimization problems.

<p>(K) Dual Listed Courses Only:</p> <p>List Current Learning Objectives for the Higher-Level Course</p>		<p>Dual Listed Courses Only:</p> <p>List Proposed Learning Objectives for the Higher-Level Course</p>	
<p>(L) Brief Course Outline</p> <p><i>(It is acceptable to copy from old syllabus)</i></p>	<p><i>As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or direct faculty instruction, there should be a minimum of two hours of out of class student work.</i></p> <p>A. Introduction 3 hours</p> <ul style="list-style-type: none"> a. What is AI b. The foundations of AI c. The History of AI d. Intelligent agents e. Agent based system <p>B. Search 6 hours</p> <ul style="list-style-type: none"> a. Searching for solution b. Uninformed/Blind search c. Informed/ Heuristic search d. A* search e. Hill-climbing search f. Genetic algorithms g. Constraint satisfaction problems <p>C. Game 5 hours</p> <ul style="list-style-type: none"> a. Games b. Optimal decision in games c. Minimax algorithm d. Alpha-Beta pruning e. Imperfect real time decision f. Games that include an element of chance <p>D. Logic 6 hours</p>	<p>Brief Course Outline</p> <p><i>(Give sufficient detail to communicate the content to faculty across campuses. It is not necessary to include specific readings, calendar or assignments)</i></p>	<p><i>As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or direct faculty instruction, there should be a minimum of two hours of out of class student work.</i></p> <ul style="list-style-type: none"> A. History of AI B. Predicate Calculus <ul style="list-style-type: none"> a. Propositional Logic b. Predicate Calculus c. Logical Inference d. Unification C. Search <ul style="list-style-type: none"> a. State Space Search b. Heuristic Search c. A* Search d. Constraint satisfaction e. Minimax algorithm f. Alpha-beta pruning E. Expert Systems <ul style="list-style-type: none"> a. Rule-based production systems b. Model-based systems c. Case-based reasoning d. Planning F. Knowledge Representation <ul style="list-style-type: none"> a. Conceptual graphs b. Semantic nets c. Frames G. Machine Learning <ul style="list-style-type: none"> a. Supervised learning b. Unsupervised learning

- a. Knowledge-based agents
- b. Syntax of First Order Logic
- c. Semantics of First Order Logic
- d. Reasoning patterns in propositional logic
- e. First order logic
- f. Inference in first order logic
- g. Unification and lifting
- h. Forward and backward chaining
- i. Resolution

**E. Planning
5 hours**

- a. The planning problem
- b. Planning with state space search
- c. Partial order search
- d. Planning with propositional logic
- e. Planning and acting in the real world

**F. Learning
5 hours**

- a. Learning from observation
- b. Knowledge in learning
- c. Statistical learning methods
- d. Reinforcement learning

Choose any two of the following:

**G. Robotics
5 hours**

- a. Robotics hardware
- b. Perception
- c. Planning to move and moving
- d. Software architecture

**H. Vision
5 hours**

- a. Digitization
- b. Low-level processing
- c. Noise removal
- d. Feature detection
- e. Segmentation and the Hough transformation
- f. Recovering 3D information
- g. The waltz algorithm
- h. Active vision
- i. Object recognition
- j. Scene recognition

**I. Natural
Languages
hours**

- a. Signal processing
- b. Syntax

- c. Reinforcement learning
- d. Knowledge acquisition

H. Uncertainty

- a. Hidden Markov models
- b. Bayesian networks
- c. Dempster-Shafer
- d. Fuzzy Logic

I. Soft Computing Techniques

- a. Neural networks
- b. Genetic algorithms

J. Ethical issues in AI

<ul style="list-style-type: none"> c. Parsing d. Semantics e. Meaning f. Pragmatics g. Natural language generation 			
J. Expert Systems hours	5		
<ul style="list-style-type: none"> a. Examples b. History c. Advantages of expert system d. AI as an experimental discipline 			

Distance Education Section

- Complete this section only if adding Distance Education to a New or Existing Course

Course Prefix/Number	
Course Title	
Type of Proposal	<i>See CBA, Art. 42.D.1 for Definition</i>
Brief Course Outline	<p><i>Give an outline of sufficient detail to communicate the course content to faculty across campus. It is not necessary to include specific readings, calendar or assignments</i></p> <p><i>As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or direct faculty instruction, there should be a minimum of two hours of out of class student work.</i></p>
Rationale for Proposal (Required Questions from CBA)	
How is/are the instructor(s) qualified in the Distance Education delivery method as well as the discipline?	
For each outcome in the course, describe how the outcome will be achieved using Distance Education technologies.	
How will the instructor-student and student-student interaction take place? (if applicable)	

How will student achievement be evaluated?	
How will academic honesty for tests and assignments be addressed?	

Liberal Studies Section

- Complete this section only for a new Liberal Studies course or Liberal Studies course revision

Liberal Studies Course Designations (Check all that apply)	
Learning Skills:	
Knowledge Area:	
Liberal Studies Elective	<i>Please mark the designation(s) that apply - must meet at least one</i>
Expected Undergraduate Student Learning Outcomes (EUSLOs)	<i>Describe how each Student Learning Outcome in the course enables students to become Informed Learners, Empowered Learners and/or Responsible Learners</i> <i>See http://www.iup.edu/WorkArea/DownloadAsset.aspx?id=181694</i>
Description of the Required Content for this Category	<i>Narrative on how the course will address the Selected Category Content</i>
All Liberal Studies courses are required to include perspectives on cultures and have a supplemental reading.	
Please answer the following questions.	
Liberal Studies courses must include the perspectives and contributions of ethnic and racial minorities and of women whenever appropriate to the subject matter. Please explain how this course will meet this criterion.	

<p>Liberal Studies courses require the reading and use by students of at least one non-textbook work of fiction or non-fiction or a collection of related articles. Please describe how your course will meet this criterion.</p>	
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Teacher Education Section

- Complete this section only for a new Teacher Education course or Teacher Education course revision

Course Designations:	
Key Assessments	
	<p>For both new and revised courses, please attach (see the program education coordinator):</p> <ul style="list-style-type: none"> • The Overall Program Assessment Matrix • The Key Assessment Guidelines • The Key Assessment Rubric <p style="text-align: center;">File Modified</p> <hr style="width: 20%; margin: auto;"/>
Narrative Description of the Required Content	<i>How the proposal relates to the Education Major</i>

For Deans Review
Are Resources Available/Sufficient for this Course?
Is the Proposal Congruent with the College Mission?
Has the Proposer Attempted to Resolve Potential Conflicts with Other Academic Units?
Comments:

Please scroll to the top and click the Page Status if you are ready to take action on the workflow. Please submit an ihelp if you have any questions <http://ihelp.iup.edu>