Revised July 2007

NORTH CAROLINA STATE UNIVERSITY
GRADUATE COURSE ACTION FORM

NOTE: Click once on shaded fields to type data. To check boxes, right click at box, click "Properties", and click "Checked" under Default Values.

DEPARTMENT/PROGRAM: Computer Science

COURSE PREFIX/NUMBER: CSC 521

PREVIOUS PREFIX/NUMBER:

COURSE TITLE: Artificial Intelligence Programming

ABBREVIATED TITLE: AI PROGRAMMING

SCHEDULING: Fall ☐ Spring ☒ Summer ☐
Every Year ☒ Alt. Year Odd ☐ Alt. Year Even ☐ Other ☐

COURSE OFFERED: BY DISTANCE EDUCATION ONLY ☐ ON CAMPUS ONLY ☒
BOTH ON CAMPUS AND BY DISTANCE EDUCATION ☐

CREDIT HOURS 3 GRADING: ABCDF ☒ S/U ☐

CONTACT HOURS: Lecture/Seminar 3 Laboratory/Studio 0 Research/Independent Study 0

REPEAT FOR CREDIT: YES ____ No X

INSTRUCTOR NAME: Robert St. Amant
TITLE: Associate Professor
GRADUATE FACULTY STATUS: Associate ☐ Full ☒

TYPE OF PROPOSAL

New Course	☒
Drop Course	☐
Course Revision	☐
Dual-Level Course	☐
REVISION	
Content	☐
Prefix/Number	☐
Title	☐
Abbreviated Title	☐
Credit Hours	☐
Contact Hours	☐
Grading Method	☐
Pre-Corequisites	☐
Restrictive Statement	☐
Description	☐
Scheduling	☐

ANTICIPATED ENROLLMENT: Per semester 25 Multiple sections Yes ☐ No ☒ Max. per Section 40

PREREQUISITE(S): CSC520: Artificial Intelligence I

COREQUISITE(S):

PRE/COREQUISITE FOR:

RESTRICTIVE STATEMENT:

REQUIRED CURRICULA/MINOR:

PROPOSED EFFECTIVE DATE: 1 January 2010 APPROVED EFFECTIVE DATE: _____

CATALOG DESCRIPTION IN CONCISE FORM MEANINGFUL TO STUDENT (**INCLUDING RESTRICTIVE STATEMENT**; LIMIT TO TOTAL OF **80 WORDS**): Introduction to techniques for developing AI systems and programming in an language for AI, Common Lisp. Implementation and extension of systems for problem solving, pattern matching, rule-based processing, machine learning, planning, and related areas.

DOCUMENTATION REQUIRED
Please number all document pages

Course Justification	☒
Proposed Revision(s) with Justification	☐
Enrollment for Last 5 Years	☒
Consultation with other Departments	☐
Student Learning Outcomes	☒
Evaluation Methods and Weighting	☒
Explanation of Differences for Dual-level Courses	☐
Resource Statement	☒
Topical Outline and Time Devoted	☒

VERIFICATION/REQUEST BY: *The course syllabus has been developed and is in conformance with the requirements of the Provost's website*.

_____
Instructor or Preparer Date

_____
Department Head/Director of Graduate Programs Date

ENDORSED BY:

_____
Chair, College Graduate Studies Committee Date

_____
College Dean(s) Date

APPROVED:

_____
Dean of the Graduate School Date

INSTRUCTIONS

Provide the following information. If additional table rows are needed place cursor at location, select *Table*, *Insert*, *Rows Above* or *Rows Below*. Please limit your submission to 4 pages using 10-point font.

I. Course Justification (Explain the need for the course and its place in the curriculum in terms of the educational needs and interests of the students for whom the course is intended):

Artificial intelligence is a large and growing field. The introductory CSC graduate AI course, CSC520, relies on a standard textbook over 1100 pages long, and must cover too much conceptual material to allow for exposure to AI development techniques. This course meets the need for AI students to gain practical, hands-on experience building, modifying, and testing AI systems, complementing the theoretical background provided by CSC520.

II. Proposed Revisions with Justification (Briefly list the changes and the justification for each):

Revision	Justification
N/A	

III. Enrollment for Last Five Years (Enter data – look up at R&R website for either existing course number or special topics number as applicable. If not offered, indicate n/a. If previously offered as special topic, indicate designation after number enrolled [e.g. 17 - XX 592B]):

Academic Year	Fall	Spring	Summer
2006-7	N/A	30 – csc 591a	N/A
2007-8	N/A	13 – csc 591a	N/A
2008-9	N/A	5 – csc 591a	N/A

IV. Consultation with Other Departments (List all departments and individuals contacted, and any statements of objection, non-objection, or support. Inclusion of the entire document/communication is not necessary. Consultation is needed whenever there is a possibility of content duplication or when establishment or dropping would affect other programs.

Department	Contact Name	Statement
N/A		

V. Student Learning Outcomes. By the end of the course, the students will be able to:

Understand, explain, and modify software for solving traditional AI problems.
Understand and explain the computational requirements (time and space) for common AI algorithms.
Implement programs containing AI functionality in specific areas of

- knowledge representation (e.g. in production systems)
- search (e.g. A* graph search)
- machine learning (e.g. decision trees)
- planning (e.g. partial order planning and graphplan)

Design and code AI software for research purposes.
Apply AI techniques to successfully solve practical problems.

VI. Student Evaluation Methods (List types of evaluation [tests, exam, papers, homework, etc.] and % weighting normally anticipated):

Evaluation Method	Weighting for Graduate Course (%)	Weighting for Undergraduate Version – if Dual Level (%)
Six to eight programming assignments	40%	
One project	40%	
One final exam	20%	

VII. Explanation of Differences for Dual-Level Course (Explain differences in content, expectations, and outcomes for graduate level version of dual-level course and indicate evaluation above):

N/A.

VIII. Resource Statement (New courses only. Indicate the resource requirements of this course and the source(s) of those resources.)

This course requires a Common Lisp implementation; this will entail the installation of a free, open source development environment, such as CMU Common Lisp, on departmental machines. No other resource requirements are foreseen.

IX. Topical Outline of Course and Time Devoted to Each Topic (Definition should be adequate to allow understanding of the course content. Indicate time measure used, e.g. weeks, 50 min. lectures, 75 min. lectures, etc.):

The course involves two weekly 75-minute lectures on the following topics:

Week 1: Lisp: Syntax, data structures, control structures, and an interpreter.
Week 2: Lisp: Functions, including closures, and variables, including scoping rules.
Week 3: AI: Grammar processing for simple English sentence generation.
Week 4: Lisp: Macros for defining new language forms; loop and format.
Week 5: AI: General Problem Solver: Means-ends analysis and problem representation.
Week 6: AI: ELIZA: Pattern matching.
Week 7: AI: Student: Solving word problems.
Week 8: AI: Knowledge representation and logic.
Week 9: AI: Rule-based systems.
Week 10: AI applications in cognitive science: A rule-based cognitive architecture (ACT-R).
Week 11: AI: Machine learning: Version spaces; ID3.
Week 12: AI: Machine learning: Genetic algorithms, naive Bayes.
Week 13: AI: Planning: Partial-order planning.
Week 14: AI: Planning: GraphPlan.
Week 15: Student presentations.

Course Syllabus
CSC 521 – Artificial Intelligence Programming
Section 001
3 Credit Hours

Course Description
Introduction to techniques for developing AI systems and programming in Common Lisp. Implementation and extension of systems for problem solving, pattern matching, rule-based processing, machine learning, and planning.

Learning Outcomes
After completion of this course, students should be able to
- Explain, develop, and modify software for solving traditional AI problems.
- Derive and explain the computational requirements (time and space) for common AI algorithms.
- Implement programs containing AI functionality in the specific areas of knowledge representation, such as frame or production systems; search; machine learning; and planning.
- Design and code AI software for research purposes.
- Apply AI techniques to practical problems.

Course Structure
This will be a lecture course, with programming and written problem-solving assignments.

Instructor
Robert St. Amant (stamant) - Instructor
Email: stamant@csc.ncsu.edu
Web Page: http://www4.ncsu.edu/~stamant/
Phone: 919-515-7938
Fax: 919-515-7896
Office Location: EB II, Room 2268
Office Hours: Tuesdays, 3:30 - 5:30

Course Meetings
The class will meet twice a week for lectures.

Course Materials
Required Textbook: *Artificial Intelligence: A Modern Approach* - Stuart J. Russell and Peter Norvig. Edition: 2nd. ISBN: 0-13-790395-2. http://aima.cs.berkeley.edu/
Cost: $88.70 (Amazon.com)

Prerequisites
csc520: Artificial Intelligence I

Co-requisites
None.

Restrictions
None.

Grading

Grade Components

Component	Weight	Details
Programming assignments	40%	Six to eight programming assignments will be required; students will submit source code and accompanying documentation, along with a high-level description of their approach.
Project	40%	One individual project will be required. Students will identify a problem to be solved with the application of AI techniques, under the supervision and with the guidance of the instructor; students will develop an AI system of significantly greater scope and complexity than the programming assignments and perform a detailed analysis of the system and its performance, reported in written form.
Final Exam	20%	One final exam will cover the abstract concepts on which the AI techniques covered in the course depend on.

Letter Grades
This Course uses Standard NCSU Letter Grading:

97	≤	A+	≤	100
93	≤	A	<	97
90	≤	A-	<	93
87	≤	B+	<	90
83	≤	B	<	87
80	≤	B-	<	83
77	≤	C+	<	80
73	≤	C	<	77
70	≤	C-	<	73
67	≤	D+	<	70
63	≤	D	<	67
60	≤	D-	<	63
0	≤	F	<	60

Requirements for Credit-Only (S/U) Grading
This course may not be taken for credit-only grading.

Requirements for Auditors (AU)
Information about and requirements for auditing a course can be found at http://www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.5.php.

Policies on Incomplete Grades
If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at http://www.ncsu.edu/policies/academic_affairs/grades_undergrad/REG02.50.3.php. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/

Late Assignments
No late assignments will be accepted, unless there is a university-approved excuse. Partial credit is given for incomplete submissions.

Attendance Policy

Attendance
Full participation is expected in the class, including attendance of all lectures.

Absences
Absences may be excused following the university attendance regulation at http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php, which provides the university definition of excused absences.

Makeup Work
All work missed must be made up, with deadlines being set at the discretion of the instructor.

Academic Integrity

Academic Integrity
Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php
Academic Honesty
See http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php for a detailed explanation of academic honesty.

Honor Pledge
Your signature on any test or assignment indicates, "I have neither given nor received unauthorized aid on this test or assignment."

Electronically-Hosted Course Components
Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Accommodations for Disabilities
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso) located at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.1.php.

Policy on Discrimination
NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or

sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://www.ncsu.edu/policies/campus_environ or http://www.ncsu.edu/equal_op. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 515-3148.

Course Schedule

Lecture - — Programming: Data structures and control — 01/11/2010 - 01/15/2010
Syntax, data structures, control structures, and an interpreter.
Lecture - — Programming: Abstraction I — 01/18/2010 - 01/22/2010
Functions, including closures, and variables, including scoping rules.
Lecture - — A simple AI program — 01/25/2010 - 01/29/2010
Grammar processing for simple English sentence generation.
Lecture - — Programming: Abstraction II — 02/01/2010 - 02/05/2010
Macros for defining new language forms; loop and format.
Lecture - — Problem solving — 02/08/2010 - 02/12/2010
General Problem Solver: Means-ends analysis and problem representation.
Lecture - — Pattern matching — 02/15/2010 - 02/19/2010
ELIZA: Pattern matching, chatbots.
Lecture - — Simple NLP — 02/22/2010 - 02/26/2010
STUDENT: Restricted natural language processing; representation and solution of word problems.
Lecture - — Logic — 03/01/2010 - 03/05/2010
Knowledge representation and logic.
Lecture - — Procedural reasoning — 03/08/2010 - 03/12/2010
Rule-based production systems for inference.
Lecture - — Machine learning I — 03/22/2010 - 03/26/2010
Version spaces and candidate elimination; decision trees and ID3.
Lecture - — Machine learning II — 03/30/2010 - 04/02/2010
Genetic algorithms, naive Bayes.
Lecture - — Planning I — 04/05/2010 - 04/09/2010
Propositional partial-order planning; partial-order planning with variable bindings.
Lecture - — Planning II — 04/12/2010 - 04/16/2010
Graphplan; search-based planning approaches.
Lecture - — Cognition — 04/19/2010 - 04/23/2010
AI applications in cognitive science: A rule-based cognitive architecture (ACT-R).
Lecture - — Presentations — 04/28/2010 - 04/30/2010
Student project presentations.