

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

NEW COURSE PROPOSAL

PROGRAM AREAS _____ COMPUTER SCIENCE

1. Catalog Description of the Course. *[Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]*

COMP 454. AUTOMATA, LANGUAGES, AND COMPUTATION (3)

Three hours of lecture in the lab per week.

Prerequisites: Math. 300, 230.

Study of the relation of languages (i.e. sets of strings) and machines for processing these languages, with emphasis on classes of languages and corresponding classes of machines. Phrase structure languages and grammar. Types of grammars and classes of languages. Regular languages and finite state automata. Context-free languages and pushdown automata. Unrestricted languages and Turing Machines. Computability models of Turing, Church, Markov, and McCarthy. Applications to programming languages, compiler design, and program design and testing.

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment
Lecture	___3___	___1___	___24___
Seminar	_____	_____	_____
Laboratory	_____	_____	_____
Activity	_____	_____	_____

3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

The course is a required course for Computer Science majors according to accreditation guidelines.

Through this course, students will be able to

- Understand influences of culture and common language on abstract language development.
- Understand linguistics and various grammar schemata.
- Understand history of development of unrestricted languages (such as computer languages)
- Analyze changes in common language, communication patterns and society caused by computer use
- Analyze structure of computer languages and their grammar
- Understand and apply finite state automata to problem solving
- Design compilers, programs and test them.
- Organize and express ideas clearly and convincingly in oral and written forms.

This course is not designed to satisfy the University Writing or Language requirements.

4. Is this a General Education Course **NO**
If Yes, indicate GE category:

A (English Language, Communication, Critical Thinking)	
B (Mathematics & Sciences)	

C (Fine Arts, Literature, Languages & Cultures)	
D (Social Perspectives)	
E (Human Psychological and Physiological Perspectives)	

5. Course Content in Outline Form. *[Be as brief as possible, but use as much space as necessary]*

Development of unrestricted languages, grammar schemata
 Communication patterns and computer use in society

Linguistics

DFAs vs. NFAs, RLs, REs, REs->NFAs, DFAs->REs, RGs
 RL closure properties , RL pumping lemma, FSTs
 FA minimization, CFGs
 CFGs, CFG simplification
 CFG normal forms, inherently ambiguous CFLs, PDAs, PDA acceptance
 CFGs->PDAs, PDAs->CFGs, CFL closure properties
 CFL pumping lemma, Ogden's lemma
 CYK algorithm
 Programming with TMs
 Decidable vs. recognizable, TMs as functions and enumerators, Church's hypothesis
 Undecidable problems, Rice's Theorems
 Griebach's Theorem
 Post's Correspondence Problem
 PCP examples, logic theories
 Logical incompleteness

6. References. *[Provide 3 - 5 references on which this course is based and/or support it.]*

Introduction to the Theory of Computation by Michael Sipser, Brooks/Cole Pub Co; ISBN: 053494728X ; (1996)
 Automata and Computability by Dexter C. Kozen, Springer Verlag; ISBN: 0387949070 ; (1997)
 Introduction to Automata Theory, Languages, and Computation by J. E. Hopcroft, R. Motwani, J. D. Ullman, Addison Wesley; ISBN: 0201441241 ; (2000)

7. List Faculty Qualified to Teach This Course.

All Computer Science faculty.

8. Frequency.

a. Projected semesters to be offered: Fall Spring Summer

9. New Resources Required.

a. Computer (data processing), audio visual, broadcasting needs, other equipment
 Use of existing computer lab.

b. Library needs

none

c. Facility/space needs

none

10. Consultation.

Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

Proposer of Course

Date