COMPUTER SCIENCE 5104
COMPUTABILITY AND FORMAL LANGUAGES
(ADP TITLE: COMP AND FORMAL LANG)

I. CATALOG DESCRIPTION:

5104 COMPUTABILITY AND FORMAL LANGUAGES

Formal theory of computability, the halting problem, models of computation, Church's thesis, and formal languages.

(3H,3C). II.

II. LEARNING OBJECTIVES:

Having successfully completed this course, the student will be able to construct suitable models of computation for particular applications, prove properties about those models, and place those models within the Chomsky hierarchy of formal languages.

III. JUSTIFICATION:

This course explores the mathematical foundations for the science of computing. The basic elements of this course - languages and machines - are the basic tools on which computer science is constructed. This course provides insight into the theoretical nature of these elements and identifies the boundaries of what is achievable via computation. This course, revealing the fundamental basis of computation, is a necessary course in a complete graduate curriculum.

The syllabus has been updated to reflect a slight shift of emphasis on specific materials within the course. The topics in this course partially overlap with 5034, with the more advanced material being covered in this course as indicated by the sections listed below. The prerequisite 5034 is removed since adequate familiarity with formal notation for describing the behavior of computer programs is now provided in 5104 itself, during the first two classes.

IV. PREREQUISITES AND COREQUISITES:

The catalog statement on prerequisites associated with course level is applicable.

V. TEXTS AND SPECIAL TEACHING AIDS:

Required text:

Lewis, Harry R. and Christos H. Papadimitriou. ELEMENTS OF THE THEORY OF COMPUTATION. Englewood Cliffs, New Jersey: Prentice-

Hall, 1981. xiv, 466. [Sections: 2.4-2.6; 3.2; 3.4-3.6; 4.2-4.6; 5.2-5.7; 6.2-6.5; Chapter 7; 8.6-8.7; Chapter 9]

VI. SYLLABUS:

	Percent of Course
1. Models of programs, machines, and computation	15%
2. Correspondences between machines and languages	20%
3. Register and turing machines	15%
4. Lambda calculus and recursive functions	15%
5. The halting problem, reducibility, generability, and undecidable problems	15%
6. Selected additional topics in computability theory	20%
	100%

VII. OLD (CURRENT) SYLLABUS:

Same as above.

VIII. CORE CURRICULUM GUIDELINES:

NA