

# CSE540 Syllabus

## Instructor

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Zoom Link:

<https://stonybrook.zoom.us/j/3555831036?pwd=Y0dTamtNRFA0WTZpOVFyZU9ZVXdZQT09>

Office: B408      Office Hour: TTh 2:00-3:00

## COURSE DESCRIPTION

Topics include:

### **Models of computation:**

Finite-state machines, Stack machines, Turing machines, Church's thesis;

### **Computability theory:**

Halting problem and Unsolvability, Introductory recursion theory;

### **Complexity theory:**

Complexity measures, Time and space hierarchy, NP-complete problems

## LEARNING OBJECTIVES

- An understanding of models of computation
- An understanding of relationship between models of computation
- An understanding of computability theory and its application in computer science
- Complexity theory and its use in Computer Science

## REQUIRED MATERIALS

Course Material will be given in email as ppt or pdf files.

## **References:**

Lewis and Papadimitriou, Elements of the Theory of Computation

Linz, Formal Language and Automata

Moret, The Theory of Computation

## **PREREQUISITE**

CSE 303

## **EVALUATION**

Midterm : 40%

Final: 50%

Home Work: 10%

## **LESSONS**

### **Introduction**

Introduction:

Set Theory

Relation and Function

Building Mathematical Structures

### **Models of Computation**

- Automata

- Pushdown Automata

- Regular Grammar

- Context Free Grammar

• **Finite State Machines and their properties**

- Relation between Machines and Grammars
- Deterministic and Nondeterministic Machines
- Formal Language and Chomski-Hierarchy

### **Turing Machine and its Variations**

- Turing Machine as a model of Computation
- Variations of Turing Machines
- Equivalence of Turing Machines
- Church's Thesis

### **Computability Theory**

- Computability and Turing Machine
- Unsolvability
- Halting Problem
- Recursive Function Theory

### **Complexity Theory**

- Analysis of Program Complexity
- NP Hard
- NP Complete