University of Computer Studies, Yangon

B.C.Sc. / B.C.Tech (Fourth Year)

CST-402 Second Semester

COURSE DESCRIPTION

Course code number	CST-402	**Course Title**	Mathematics of Computing IV
Semester hours	4 hours	**No. of Credit Units**	3
		Course Coordinator	

Course Description

This course covers Applications of Recurrence Relations, Solving Linear Recurrence Relations, Generating Functions, Modeling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition and Turing Machines.

Course Outcomes

After completing the course, the student will be able to:

1. Model, compare and analyse different computational models using combinatorial methods.
2. Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
3. Construct algorithms for different problems and argue formally about correctness on different restricted machine models of computation.
4. Identify limitations of some computational models and possible methods of proving them.

Major Topics Covered in the Course

1. Modeling With Recurrence Relations, Solving Linear Homogeneous and Nonhomogeneous Recurrence Relations, Counting Problems and Generating Functions
2. Phrase Structure Grammars, Derivation Trees, Backus-Naur Form, Finite State Machines with output and no output.
3. Deterministic and Nondeterministic Finite State
4. Using Turing Machines to Recognize Sets

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Assessment Plan for the Course

Class Attendance and Participation	-	10%
Quizzes	-	10%
Assignment	-	10 %
Test	-	10%
Final Exam	-	60%

Class Attendance and Participation Policy:

- **Attendance**

Class attendance is **mandatory**. Most of the material you will learn will be covered in the lectures, so it is important that you not miss any of them. You are expected to show up on time for class, and stay for the whole lecture. Students are expected to attend each class, to complete any required preparatory work (including assigned reading) and to participate actively in lectures, discussions and exercises.

• Mobile phones **must** be silenced and put away for the entire lecture unless use is specified by the instructor. You may not make or receive calls on your cell phone, or send or receive text messages during lectures.

• You are responsible for all material sent as email. Ignorance of such material is no excuse. You are responsible for all materials presented in the lectures.

• Your conduct in class should be conducive towards a positive learning environment for your class mates as well as yourself.

- **Quizzes, assignments, tests and Exam**

Your performance in this class will be evaluated using your scores for attendance, quizzes, homework assignments, two tests and one final examination. There are no planned extra credit projects or assignments to improve your grade.

We will take a short quiz for every lecture.

There will be 11 homework assignments, roughly one per week. Please show all your work and write or type your assignments neatly. Credit cannot be given for answers without work (except on true-false, always-sometimes-never, or other multiple choice questions).

Test will start after two or three chapters finished and the coordinator will announce the date for the test.

Any assignment or quiz or test is simply missed, regardless of the reason why (e.g. illness, work, traffic, car trouble, computer problems, death, etc.), and **earns a grade of zero**. You are strongly encouraged to complete all assignments and attend all

quizzes so that you can check that you understand the material and can throw out bad grades, or grades for which you had to miss an assignment or quiz for a valid reason. **Late submissions will not be accepted for any graded activity for any reason.**

- **There are no extra credit opportunities.**

  Students may not do additional work nor resubmit any graded activity to raise a final grade.

- **Exam**

  The exam will be conducted on-campus, in a classroom. The dates/times/locations will be posted on Board as soon as possible.

For this course, the following additional requirements are specified:

All work submitted for a grade must have been prepared by the individual student. Students are expressly prohibited from sharing any work that has been or will be submitted for a grade, in progress or completed, for this course in any manner with a person other than the instructor and teaching assistant(s) assigned to this course). Specifically, students may not do the following, including but not limited to:

- Discuss questions, example problems, or example work with another person that leads to a similar solution to work submitted for a grade.
- Give to, show, or receive from another person (intentionally, or accidentally because the work was not protected) a partial, completed, or graded solution.
- Ask another person about the completion or correctness of an assignment.
- Post questions or a partial, completed, or graded solution electronically (e.g. a Web site).
- All work must be newly created by the individual student for this course. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.
- Posting or sharing course content (e.g. instructor provided lecture notes, assignment directions, assignment questions, or anything not created solely by the student), using any non-electronic or electronic medium (e.g. web site, FTP site, any location where it is accessible to someone other than the individual student, instructor and/or teaching assistant(s)) constitutes copyright infringement and is strictly prohibited without prior approval from the instructor.

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Tentative Lesson

No	Topics	Week	Remark
I	**Chapter 8 Advanced Counting Techniques**		
1	8.1 Applications of Recurrence Relations	Week 1+2	
2	Introduction; Modeling With Recurrence Relations		Assignment 1
3	8.2 Solving Linear Recurrence Relations	Week 3+4	
4	Introduction; Solving Linear Homogeneous Recurrence Relations with Constant Coefficients		Assignment 2 Assignment 3
5	Linear Nonhomogeneous Recurrence Relations with Constant Coefficients	Week 5	Assignment 4
6	8.4 Generating Functions	Week 6+7	
7	Introduction; Useful Facts About Power Series		Assignment 5
8	Counting Problems and Generating Functions		
9	Using Generating Functions to Solve Recurrence Relations		Assignment 6
10	Proving Identities via Generating Functions		
11	**Test I**		**Test I**
12	**Chapter 13 Modeling Computation**		
II	13.1 Languages and Grammars	Week 8	
13	Introduction; Phrase-Structure Grammars		
14	Types of Phrase-Structure Grammars		Assignment 7
15	Derivation Trees	Week 9	
16	Backus–Naur Form		Assignment 8
17	13.2 Finite-State Machines with Output	Week 10+11	
18	Introduction; Finite-State Machines with Outputs		Assignment 9
19	13.3 Finite-State Machines with No Output Introduction; Set of Strings	Week 12+13	
20	Finite-State Automata		
21	Language Recognition by Finite-State Machines		
22	Nondeterministic Finite-State Automata		Assignment 10

No	Topics	Week	Remark
23	13.4 Language Recognition	Week 14	
24	Introduction; Kleene's Theorem		
25	Regular Sets and Regular Grammars		
26	A Set Not Recognized by a Finite-State Automaton		
27	More Powerful Types of Machines		Assignment 11
28	13.5 Turing Machines	Week 15	
29	Introduction; Definition of Turing Machines		
30	Using Turing Machines to Recognize Sets		
31	Computing Functions with Turing Machines		
32	Different Types of Turing Machines		
33	The Church–Turing Thesis		
34	Computational Complexity, Computability, and Decidability		
35	**Test II**		**Test II**
36	**Revision**		