SULTAN QABOOS UNIVERSITY COLLEGE OF SCIENCE DEPARTMENT OF COMPUTER SCIENCE



FALL 2008 COURSE OUTLINE COMP5521: AUTOMATA AND FORMAL LANGUAGES

Lectures: Sat, Mon & WED15:15 To 16:05, CMT/ C23 Office Hours: Sun & Tue: 11:00am – 1:00 Noon

Instructor:	Dr. N.	S. Kutti	Room: 0003
Extension:	2498	Email: nsk	kutti@squ.edu.om
Credit Hours:	3		

Textbook: "Introduction to Formal Languages and Automata", Peter Linz, Health and Company, 3rd Edition, 1990.

References:

- 1. "Introduction to automata Theory, Languages, and Computation", J. E. Hopcroft, R. Motwani, J. Ullman, Addison-Wesley, 1979.
- 2. "Introduction to languages and theory of computation". John . C. Martin, McGraw-Hill, NY, 1991

Pre-requisite by course:

- 1. MATH3340: Discrete Structures
- 2. COMP3314: Data Structures

Pre-requisites by topic:

- 1. Applied Discrete Structures
- 2. Data Structures

Course Description:

This course introduces finite automata, formal languages regular expressions and context free grammars. The parsing problem is discussed using push down automata. Turing machines and the halting problem are covered.

Course Outcomes:

On successful completion of the course students will be able to:

- 1. Describe concepts and notations of both ordered and unordered sets towards understanding of language theory.
- 2. Describe alphabets, strings, sentences, etc.
- 3. Design tokens of a language using Regular Expression grammar.
- 4. Analyze deterministic as well as non-deterministic finite state automata machines.
- 5. Construct recognizers for the regular languages using Finite State Automata principles.

- 6. Distinguish non-regular languages from regular languages using Pumping Lemma.
- 7. Discuss the need for more powerful grammars than Regular Expression for designing computer languages.
- 8. Design computer languages by applying Context-Free Grammars.
- 9. Describe different normal forms of Context-Free Grammars.
- 10. Construct recognizers for regular as well as context-free languages using PushDown Automata principles.
- 11. Construct recognizers for various types of languages using Turing Machine principles.
- 12. Construct recognizers for various types of transducers using Turing Machine principles.

Major Topics:

Week	Торіс	Chapter/Section
1-2	Introduction: Mathematical Preliminaries, Sets, Languages and their applications in Computer Science	1.1, 1.2 and 1.3
3-5	Regular Languages and Non-Regular Languages: Regular Expressions, Regular and Non-regular languages, Pumping Lemma, Regular grammars.	3.1, 3.2, 3.3 4.1 and 4.3
6-7	Finite State Automata as Language Recognizers: Finite State Automata (FSA), Non-Deterministic and Deterministic Finite State automata (NFA and DFA), Minimization of FSA.	2.1, 2.2, 2.3, 2.4
8-10	Context-Free Languages: Context-Free Grammars (CFG), Parsing and Ambiguity in Grammars and Languages, RightLinear and Left-Linear CFG, Simplified CFG Forms and Normal Forms.	5.1, 5.2, 5.3 6.1 and 6.2
11-12	Pushdown Automata as Language Recognizers: NonDeterministic Pushdown Automata. Pushdown Automata for Context-Free Languages, Deterministic Pushdown Automata.	7.1, 7.2 and 7.3
13-14	Turing Machines: The Standard Turing Machine, Turing Machines as transducers and language recognizers, other models of Turing machines.	9.1, 9.2 10.1 and 10.2

Assessment plan:

Item	Date Out	Due Date	Chapters	Weigh ts
Assignment 1	15/09/2008	24/09/2008	1	4%
Assignment 2	24/09/2008	13/10/2008	3, 4	4%
Quiz 1	08/10/2008	08/10/2008	1, 3, 4	5%
Assignment 3	13/10/2008	22/10/2008	2	4%
Mid-Term 1	22/10/2008	22/10/2008	1,2, 3 and 4	20%
Assignment 4	01/11/2008	22/11/2008	5, 6 and 7	4%
Quiz 2	26/11/2008	26/11/2008	5, 6 and 7	5%
Assignment 5	29/11/2008	24/12/2008	9 and 10	4%
Final Exam	31/12/2008		All chapters covered	50%

Policy on late submission and Code of Ethics

- 1. Late submission of assignments faces a penalty of 20% per day
- 2. Students involved in copying will be severely penalized.

A zero mark will be assigned the first time a student is caught involved in copying and his/her name will be added to a watch list maintained by the Head of Department.
Further repeated involvement in copying will cause the student to get an <u>F grade</u> in that course. This is in line with the university academic regulations

(see pages 36-37 of the 2005 edition of the university academic regulations booklet).