University of Asia Pacific (UAP)
Department of Computer Science and Engineering (CSE)

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Theory of Computation
Course Code:	CSE 307
Semester:	Fall-2020
Level:	5th Semester
Credit Hour:	3.0
Name & Designation of Teacher:	Nadeem Ahmed, Assistant Professor
Office/Room:	**706 (B),** 7th Floor, teacher's compound
Class Hours:	Sunday/Monday: 9:30-10:50 p.m. & Wednesday: 03:30-4:50 a.m. Thursday: 09:30-11:00 a.m.
Consultation Hours:	Tuesday: 07:00-08:30 p.m.
e-mail:	nadeem@uap-bd.edu
Mobile:	+8801921095904
Rationale:	(a set of reasons or a logical basis for a course of action or a particular belief.) Required course in the CSE program. This knowledge is very important to build up the knowledge of compiler design.
Pre-requisite (if any)**:**	CSE 207

Course Synopsis:

Concepts of Automata Theory, Finite Automata (FA), Regular Expressions, Properties of Regular Expressions, Properties of Regular Languages, Grammars, Properties of CFLs, Turing Machines, Undecidability, Intractable Problems.

Course Objectives:
The objectives of this course are to:

1. Provide knowledge about the characteristics of all kinds of Finite Automata.
2. Impart adequate knowledge on Regular Expressions, Regular Languages and their properties.
3. Teach about the various grammars.
4. Explain the mechanism of Turing machine and its applications.
5. To enable effective understanding on Undecidability and Intractable problems.

Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	Describe the concepts of all kinds of basic elements of Finite Automata and Construct according to the specification.	1	1/Understand	Live Lecture in Google Meet using Pen Tablet with recording, Online Group Discussion	Assignment, Quiz, Written Exam, VIVA
CO2	Apply the knowledge of Finite Automata, Regular Language and Turing machine for problem solving.	2	1/Apply	Live Lecture in Google Meet using Pen Tablet with recording, Online Group Discussion	Assignment, Quiz, Written Exam, VIVA
CO3	Analyze the properties of various grammars and languages.	2	1/Analyze	Live Lecture in Google Meet using Pen Tablet with recording, Online Group Discussion	Assignment, Quiz, Written Exam, VIVA

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3
Final Exam	50%	10	80	60
Mid Term	20%	10	50	-
Class performance, Quizzes, Assignment	30%	10	10	10
Total	100%	30	140	70

Course Content Outline and mapping with COs

Weeks	Topics / Content	Course Outcome	Delivery methods and activities	Reading Materials
1	Alphabets, Strings, Languages, Problems, Introduction to formal proof	CO1	Live Lecture in Google Meet using Pen Tablet with recording, Online Group Discussion	Book chapter 1
2-3	Finite automata: Deterministic and Non-Deterministic Finite Automata, Notation, Transition table/diagram, Quiz	CO2		Book chapter 2
4	Conversion of NFA to DFA, Equivalence testing.	CO2		Book chapter 2
5	€-NFA transition, eliminating € transition,	CO2		Book chapter 2
6-7	Regular Expressions and Languages, Quiz	CO2		Book chapter 3, other resources
Mid				
8-9	Properties of Regular Languages, Pumping Lemma, Testing Equivalence of Regular Languages, Minimization of DFA's, Quiz	CO2	Live Lecture in Google Meet using Pen Tablet with recording, Online Group Discussion	Book chapter 4, other resources
10	Context-Free Grammars and Languages, Leftmost and Rightmost Derivations	CO3		Book chapter 5, other resources
11	Ambiguous Grammars, Removing Ambiguity from Grammars, Inherent Ambiguity	CO3		Book chapter 5, other resources
12-13	Pushdown Automata, Graphical notation, Properties of Context-Free Languages, Chomsky Normal Form, Quiz	CO3		Book chapter 6-7, other resources
14	Computation with Turing Machines, Turing Computable Functions, Review	CO2		Book chapter 8, other resources
Final Exam				

Minimum attendance: 70% class attendance is mandatory for a student in order to appear at the final examination.

Textbook: Introduction to Automata Theory, Languages, and Computation (3rd Edition), - John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman

Required References: http://infolab.stanford.edu/~ullman/ialc.html
http://infolab.stanford.edu/~ullman/ialcsols/sols.html

Recommended References: Introduction to the Theory of Computation, Second Edition by Michael Sipser.

Grading System: As per the approved grading scale of University of Asia Pacific (Appendix-3).

Special Instructions:

Late attendance: Students who will enter the class after the attendance call will be marked as absent.

Assignment: Assignment will be given throughout the semester. Copied assignments will be graded as zero. Late submission will result a 50% deduction in score.

Class Test: There will be no make-up quizzes.

Student's responsibilities: Students must come to the class prepared for the course material covered in the previous class (es).

They must submit their assignments on time.

Prepared by (Course Teacher)	**Checked by** (Chairman, PSAC committee)	**Approved by** (Head of the Department)

Appendix-1:

Washington Accord Program Outcomes (PO) for engineering programs:

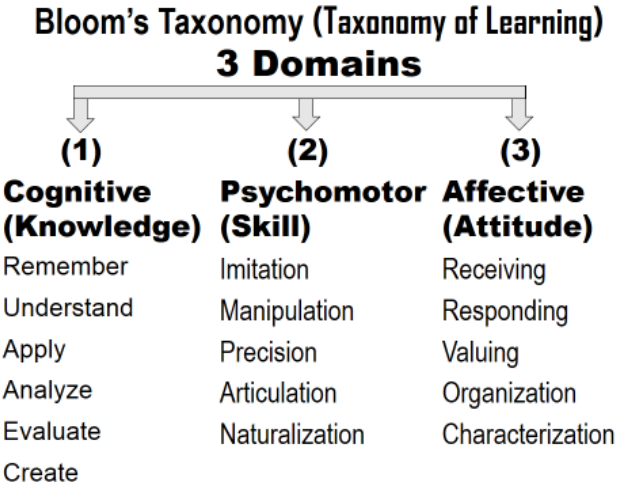
No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed
11	Project Management and Finance	Level of management required for differing types of activity
12	Lifelong learning	Preparation for and depth of Continuing learning.

Generic Skills (Detailed):

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development;
8. **Ethics (ESSE)** –Apply professional ethics with Islamic values and commit to responsibilities and norms of professional engineering code of practices.

9. **Communication (S)** -Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

Appendix-2



Appendix-3
UAP Grading Policy:

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00