COURSE DESCRIPTION FORM

INSTITUTION FAST School of Computing, National University of Computer and Emerging Sciences, Islamabad

PROGRAM(S) TO BE EVALUATED BS-AI, **SPRING 2020**

Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

<table>
<tr><td>Course Code</td><td>CS-211</td></tr>
<tr><td>Course Title</td><td>DISCRETE STRUCTURES</td></tr>
<tr><td>Credit Hours</td><td>3</td></tr>
<tr><td>Prerequisites by Course(s) and Topics</td><td>Nil</td></tr>
<tr><td>Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)</td><td>100% Theory

Assessment items of Theory Part
<table>
<tr><th>Assessment Item</th><th>Number</th><th>Weight (%)</th></tr>
<tr><td>Assignments</td><td>3</td><td>10</td></tr>
<tr><td>Quizzes</td><td>5</td><td>10</td></tr>
<tr><td>Midterm Exam</td><td>1</td><td>30</td></tr>
<tr><td>Final Exam</td><td>1</td><td>50</td></tr>
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<tr><td>Course Instructors</td><td>Amna Irum, Amina Asif</td></tr>
<tr><td>Lab Instructors (if any)</td><td>-</td></tr>
<tr><td>Course Coordinator</td><td>Amina Asif</td></tr>
<tr><td>URL (if any)</td><td></td></tr>
<tr><td>Current Catalog Description</td><td></td></tr>
<tr><td>Textbook (or Laboratory Manual for Laboratory Courses)</td><td>Discrete Mathematics with applications (4th edition)by Susanna S. Epp</td></tr>
<tr><td>Reference Material</td><td>Discrete Mathematics and its applications by Kenneth H. Rosen</td></tr>
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Course Learning Outcomes

A. Course Learning Outcomes (CLOs)

After completion of the course, the students shall be able to:

1. Express a logic sentence in terms of predicates, quantifiers and logical connectives.
2. Apply rules of logic in computational problems.
3. Apply rules of inference and methods of proof to prove or disprove a mathematical statement.
4. Use mathematical induction to prove properties of sequences.
5. Define and solve recursive relations.
6. Determine correctness of algorithms.
7. Use graph theory to solve computational problems.

B. Program Learning Outcomes

For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent.

1. Computing Knowledge	Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems.	✔
2. Problem Analysis	Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences.	✔
3. Design/ Develop Solutions:	Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	✔
4. Investigation and Experimentation	Conduct investigation of complex computing problems using research based knowledge and research based methods.	
5. Modern Tool Usage:	Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modelling for complex computing problems.	
6. Society Responsibility	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems.	
7. Environment and Sustainability	Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems.	

8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice.	
9. Individual and Team Work:	Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.	
10. Communication:	Communicate effectively on complex computing activities with the computing community and with society at large.	
11. Project Management and Finance	Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member of a team.	
12. Lifelong Learning:	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	

C. Mapping of CLOs on PLOs
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CLOs	1	✔	✔	✔							
	2	✔	✔	✔							
	3	✔	✔	✔							
	4	✔	✔	✔							
	5	✔	✔	✔							
	6	✔	✔	✔							
	7	✔	✔	✔							

Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-

Topics to be covered:

List of Topics	No. of Weeks	Contact Hours	CLO(s)
Basics of Discrete mathematics, speaking mathematically.	**1**	**3**	**1**

<table>
<tr><td>hour lectures)</td><td colspan="4"><table>
<tr><td>Logic of compound and quantified statements.</td><td>2</td><td>6</td><td>1</td></tr>
<tr><td>Valid/ invalid arguments, logic puzzles, applications of logic</td><td>2</td><td>9</td><td>1,2</td></tr>
<tr><td>Methods of Proofs</td><td>3</td><td>9</td><td>3</td></tr>
<tr><td>Elementary Number theory and proofs</td><td>2</td><td>6</td><td>3,4,6</td></tr>
<tr><td>Sequences, Mathematical induction, correctness of algorithms, sets, relations</td><td>3</td><td>12</td><td>3,4,6</td></tr>
<tr><td>Graphs and Trees</td><td>2</td><td>3</td><td>7</td></tr>
<tr><td>Total</td><td>15</td><td>45</td><td></td></tr>
</table></td></tr>
<tr><td>Laboratory Projects/Experiments Done in the Course</td><td colspan="4">None</td></tr>
<tr><td>Programming Assignments Done in the Course</td><td colspan="4">None</td></tr>
<tr><td>Class Time Spent (in credit hours)</td><td>Theory</td><td>Problem Analysis</td><td>Solution Design</td><td>Social and Ethical Issues</td></tr>
<tr><td></td><td>1.0</td><td>0.8</td><td>0.8</td><td>0.4</td></tr>
<tr><td>Oral and Written Communications</td><td colspan="4">Every student is required to submit at least _3_ written reports of typically _5_ pages.</td></tr>
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Theoretical Component of the course

Weeks	Contents/Topics	Assessment Items (Case Study/ Exercise Assignment/ Quiz etc.)
Week-01	Introduction to the course, Revision of basic concepts, Introduction to logic, statements and compound statements, Logical connectives	
Week-02	Logical equivalence, Conditional statements	
Week-03	Valid/invalid arguments, Application of logic in computing	Quiz-1, Assignment 1
Week-04	Logic of quantified statements, PROLOG	
Week-05	Introduction to direct proofs, Proving existential statements, Disproving by counterexample, Proving universal statements	
Week-06	Determining whether numbers are rational or irrational, Proving divisibility, quotient-remainder theorem, representation of integers	Quiz-2, Assignment 2
Week-07	Indirect proof: Contradiction and contraposition, proving irrationality, the halting problem	
Week-08	Sequences, Summation notation, Product notation, Factorial notation	
Week-09	Mathematical induction	Quiz-3, Assignment 3
Week-10	Correctness of Algorithms	
Week-11	Defining sequences recursively, Solving recurrences by iteration	

Week -12	Sets, set properties, Functions, Relations on sets	Quiz-4
Week 13	Modular Arithmetic and applications in cryptography: Caeser cipher	Assignment 4
Week-14	Graphs and Trees	Quiz-5
Week-15	Graphs and Trees	