City University
Department of Computer Science and Engineering
Faculty of Science and Engineering

Course Outline

Course Code and Title, CSE – 307: Discrete Mathematics
Credit Hours: 3
Prerequisites:

Program: B. Sc. in Computer Science & Engineering (CSE),
Semester: Fall 2018

Total Weeks: 13	**Hours/Week:** 3	**Total Hours:** 39^+

Instructor: Supta Richard Philip
Designation: Senior Lecturer
Office: Room 404   **Phone:**   01914818982
Email: supta.philip@gmail.com
Office Hrs: By appointment

Course Details
Rationale:
This course is an introduction to the study of Discrete Mathematics, a branch of contemporary mathematics using discrete methods and combinatorial reasoning underly the areas of data structures, computational complexity and the analysis of algorithms to develops reasoning and problem-solving abilities. Recent advances in technology particularly in applications of computing that have enhanced the importance of discrete (or finite) mathematics as a basis for understanding the foundations of computing and for further studies in computer analysis and applications.

Course Objectives:

1. The main objective of the course is to develops reasoning and problem-solving abilities as well as enhance research and analytical thinking abilities using the mathematical language and techniques.
2. Students will learn some basic mathematical concepts that are common to mathematics and computer science like basic set theory, theory of relations, functions, vectors and matrices ,graph theory, Tree, propositional logic, Mathematical Reasoning and Proof, Combination and proposition calculus.

Intended learning outcomes (ILOs) of the Course:

Knowledge	**LO1:** Will be able to understand and construct mathematical arguments of set theory.
	LO2: Will be able to prove problems in combinatory and probability theory.
	LO3: Will be able to develop recursive algorithms based on mathematical induction.
	LO4: Will be able to understand and analyze various essential concepts in tree, graph theory and related algorithms.
Skills	Will develop skills on understanding the problems
	Will gain skills on analysis the problem and selecting the solutions for the problem.
	Will help in achieving communication, demonstrate and presentation skill.
Attitude	Will develop attitude to group dynamics and team work.
	Will create attitude to tackle challenges related to computer and basic software.
	Will create positive attitude to listen ideas of classmates.

Mapping of Course ILO and PLO:

Learning Outcome (LO)	Program Learning Outcome (PLO)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
LO1	MJ	MJ	MN	MJ						MJ	MN	
LO2	MJ	MJ	MJ	MJ						MJ	MN	
LO3	MJ	MJ	MN	MN						MJ	MN	
LO4	MJ	MJ	MN							MJ	MN	

Course Contents:

Sl. No.	ILO	Topic	Teaching Learning Strategy	Assessment Strategy	No. of Sessions
1	1,4	**Prepositional and Periodic Calculus:** Statements and compound statement, conjunction, negation, proposition and truth-tables, algebra of propositions and proposition calculus.	Lecture, Practice, Assignment	Short questions, Essay type, Observation	4
2	1,4	**Set theory:** Basic concepts of sets and set elements, universal set, subsets, set operations, algebra of sets, power sets, mathematical induction.	Lecture, Practice, Assignment	Short questions, Essay type, Observation	2
3	3,4	**Relational Algebra:** Relations Introduction, Product Sets, Relations, Pictorial Representatives of Relations.	Lecture, Practice, Assignment	Short questions, Essay type, Observation	1
4	2,3	**Functions and Algorithms:** Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions. Exponential and Logarithmic Functions, Sequences, Indexed Classes of Sets. Recursively Defined Functions, Cardinality, Algorithms and Functions.	Lecture, Practice Assignment	Short questions, Essay type. Observation	4
5	3,4	**Vector and Matrices:** Vectors, Matrices, Matrix addition and multiplication, Transpose, Invertible Matrices and Determinants.	Lecture, Practice, Assignment	Essay type questions, Observation	2
6	1,4	**Probability Theory:** Introduction, Sample Space and Events Finite Probability Spaces, Conditional Probability, Random Variables.	Lecture, Practice, Assignment	Short questions, Essay type Observation	2
7	3,4	**Binary Trees:** Introduction, Complete and Extended Binary Trees, Representing Binary, Traversing Binary Trees, Binary Search Tree, Priority Queues, Heaps, Path Lengths, Huffman's Algorithm.	Lecture, Practice, Assignment	Short questions, Essay type, Observation	4
7	3,4	**Graph theory:** Introduction, Data Structures, Graphs and Multigraphs, Subgraphs, Isomorphic and Homeomorphic Graphs, Paths, Tree Graphs, Graph Algorithms (Depth-First and Breadth-First Searches).	Lecture, Practice, Assignment	Short questions, Essay type, Observation	4
				Total	23

Teaching Learning Methods:

Analyze and solve knowledge-based problems for practical situation
Group discussion
Lecture slides, presentations, audio and video
Analytical and critical thinking approach to understand real life system and models

Assessment Schedule:

Assessment 1	Quizzes	Week 4, Week 10
Assessment 2	Assignments	Week 5, Week 11
Assessment 3	Presentation	Week 5, Week 11
Assessment 4	Mid-Term Exam	Week 6
Assessment 5	Final Exam	Week 12

Weights of Assessments:

Assessments	%
Mid-Term Exam	30
Final Exam	40
Quizzes	10
Assignments	10
Presentation	10
Total	**100**

Grading Policy:

Policy	Letter Grade	Grade Point	Assessments
80% and above	A+	4.00	Outstanding
75% to below 80%	A	3.75	Superlative
70% to below 75%	A-	3.50	Excellent
65% to below 70%	B+	3.25	Very Good
60% to below 65%	B	3.00	Good
55% to below 60%	B-	2.75	Average
50% to below 55%	C+	2.50	Below Average
45% to below 50%	C	2.25	Passing
40% to below 45%	D	2.00	Probationary
Below 40%	F	-----	Fail

List of References:

> **Course Notes:**   Follow Lecture notes.
> **Essential Books (Text Books):**
> 1. DISCRETE MATHEMATICS, Schaum's Outline Series, McGRAW-HILL ,Third Edition-Seymour Lipschutz, Ph.D, Marc Lars Lipson, Ph.D.
> 2. Kenneth H Rosen : Discrete Mathematics and its Applications.
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> **Recommended Reference Books:**
> 1. Bernard Kolman, Robert C. Busby, Sharon Ross : Discrete Mathematics**.**
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> **Online Recourses:** Use Internet to get documents on specific topics

Facilities Required for Teaching and Learning:

> Projector, Whiteboard, Internet access from classroom computer, Audio/Visual equipment.

Course Policies and Procedures:

1. **Class attendance:** Regular attendances of classes are mandatory and students will be assigned F automatically if he/she misses 6 consecutive classes.
2. **Late submission of work:** Late submission will be followed by penalty, please maintain deadlines.
3. **Unfair means /plagiarism:** Plagiarism will be dealt with severe penalty. Original work is encouraged as they will carry value marks.

Appendix-1: Program Learning Outcome (PLO)

PLO No.	PLO
1.	**Engineering Knowledge**
2.	**Problem Analysis**
3.	**Design/Development of Solutions**
4.	**Investigation**
5.	**Modern Tool Usage**
6.	**The Engineer and Society**
7.	**Environment and Sustainability**
8.	**Ethics**
9.	**Communication**
10.	**Individual and Team Work**
11.	**Life Long Learning**
12.	**Project Management and Finance**

Professional/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 moral 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.

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Course Coordinator/ Teacher   *Head of the Department*

Date: *Date:*