AMITY UNIVERSITY
UTTAR PRADESH

Course Name: MATHEMATICAL FOUNDATION TO COMPUTER SCIENCE

Course Level : PG

Course Type : Foundation Course

Course Code: CSIT611

Credit Units:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	1	-	-	5

Course Objective:

The aim of the course is to

- introduce the mathematical underpinnings of theoretical computer science
- give overview of the theory of computation.
- give an insight to fundamental concepts of discreet mathematics with emphasis on their applications to computer science.

Pre-requisites:

Basic knowledge of Mathematics

Student Learning Outcomes:

After completion of the course, The student will be able to:

- Analyze set Theory and relations and the use of Generating Functions.
- Explain the concept of Lattices and Posets.
- Describe Deterministic Finite Automata and Non Deterministic Automata.
- Apply the concepts of Logical Reasoning.
- Apply various algorithmic concepts.

Course Contents/Syllabus:

	Weightage (%)
Module I: Introduction	**25**
Relation: Type and compositions of relations, Pictorial representation of relations, closures of relations, Equivalence relations, Para Ordering relation. *Function*: Types, Composition of function, Recursively defined function, *Mathematical Induction:* Piano's axioms, Mathematical Induction, Discrete Numeric Function and Generating Functions, Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behaviour of functions,	
Module II: Algebraic Structures	**20**
Properties of Algebraic Structures, Semi Group, Monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets Permutation group, Homomorphism, Isomorphism and Automorphism of groups.	
Module III: Propositional Logic	**20**
Preposition, First order logic, Basic Logical operations, Tautologies, Contradictions, Algebra of Proposition. Logical implications, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices and Complemented lattices.	
Module IV: Regular Expression	**20**
Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hiearchy, Regular expressions, Generalization Transition graph, Conversion of regular expression to finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with output Moore machine, Mealy machine, Conversions.	
Module V: Non-regular language	**15**
Pumping Lemma, Myhill Nerode Theorem, Pushdown Automata and Introduction to Turing Machine and elementary applications to recognition of a language and computation of functions.	

Pedagogy for Course Delivery:

The course will be taught in theory based mode. The instructor will discuss numerical computation problems to the students for better understanding of the concept.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	TOTAL (%)
100	**-**	**100**

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	**Mid-Term Exam**	**Assignments**	**Project/Viva**	**Attendance**	
Weightage (%)	10	10	5	5	70

Text & References:

Text Books:
Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill, 3rd Edition, 2009

References Books:
- Tremblay, J.P & R. Manohar, "Discrete Mathematical Structures with Application to Computer Science", TMH, Edition-1997, 35th Reprint 2008.
- Kenneth H. Rosen, "Discrete Mathematics and its applications", TMH, 7th Edition, 2011.
- Doerr Alan & Levasseur Kenneth, "Applied Discrete Structure for Computer Science". Galgotia Publication Pvt Ltd., 2nd Edition, 1989 .
- Gersting, "Mathematical Structure for Computer Science:A modern treatment to Discrete Mathematics",W. H. Freeman and Macmillan (India), 6th Edition.
- Kumar Rajendra, "Theory of Automata : Language and Computation", PPM, 3rd Edition, 2010
- Hopcroft J.E. Ullman J.D., "Introduction to Automata theory, Language and Computation", Narosa Publishing House, New Delhi, 3rd Edition, 2006 .
- C.L. Liu, "Elements of Discrete Mathematics", McGraw Hill, 3rd Edition, 2000.
- Peter Grossman, "Discrete Mathematics for Computer ", Palgrave Macmillian., 3rd Edition, 2009.

Any Other Study Material:
- http://calculus.nipissingu.ca/tutorials/induction.html
- http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut11_simp.htm
- http://www.cs.odu.edu/~ygongjun/nerzic/level-a/logic/prop_logic/proposition/proposition.html
- http://www.proftpd.org/docs/howto/Regex.html