DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	Mathematical Foundations for Computer Science		
Course Code	CS602	No. of Credits	03
Course Code of Pre-requisite subject(s)	None		
Session	Jan 2018	Section (if, applicable)	
Name of Faculty	Dr. Kunwar Singh	Department	CSE
Email	kunwar@nitt.edu	Telephone No.	0431 – 2503212
Course Type	☑ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Unit I
Functional Logic: Proposition Logic, Resolution Proof system, Predicate logic. Congruences, Fermat's theorem, Euler function, Chinese remainder theorem.

Unit II
Groups, homomorphism theorems, cosets and normal subgroups, Lagrange's theorem, Ring. Field. Linear algebra: Vector Space, Basis, Matrices and Linear Transformations, Eigen values, Orthogonality.

Unit III
Counting, Probability, Discrete random variable, Continuous random variable, Moment generating function, Markov's inequality, Chebyshev's inequality, The geometric and binomial distributions, The tail of the binomial distribution.

Unit IV
Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula, applications of Kuratowski's theorem, graph colouring, chromatic polynomials, trees, weighted trees, the max-flow min-cut theorem.

Unit V
Turing Machines, Recursive and Recursively Enumerable languages. Cantor's Diagonalization theorem. Complexity classes - NP-Hard and NP-complete Problems - Cook's theorem NP completeness reductions. Approximation algorithms.

Text Books

1. Donald F. Stanat and David F. McAllister, Discrete mathematics in Computer Science.
2. Thomas Koshy, Elementary number theory with Applications, Elsevier
3. I.N.Herstein, Topics in Algebra.JOHN Wiley & SONS. 1990.
4. Sheldon M. Ross, Introduction to Probability Models, Elsevier.

5. H. Cormen, C. E. Leiserson, R. L. Rivest, C Stein, Introduction to Algorithms, Prentice Hall India.
6. Douglas B. West, Introduction to Graph Theory, Prentice Hall of India.
7. Linear Algebra 2nd Edition (Paperback) by Kenneth Hoffman, Ray Kunze, PHI Learning, 2009.

COURSE OBJECTIVES

1. To gain the ability to use some of the fundamental methods of logic, number theory, algebra, combinatorics, probability and graph theory in Computer Science.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Be able to comprehend the fundamental methods of logic, number theory and algebra.	PO1, PO4
2. Be able to comprehend the fundamental methods of combinatorics, probability and graph theory. Use basic combinatorics in graph theory and to obtain probabilities.	PO1, PO4
3. Be conversant with the Mathematical Rigor that is necessary for computer science and be able to come up with rigorous arguments.	PO1, PO4

COURSE PLAN – PART II

COURSE OVERVIEW

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1/3	Functional Logic: Proposition Logic, Resolution Proof system	Chalk & Talk
2	2/3	Predicate logic. Congruences, Fermat's theorem, Euler function,	Chalk & Talk
3	3/3	Chinese remainder theorem, Groups, homomorphism theorems, cosets and normal subgroups,	Chalk & Talk
4	4/3	Lagrange's theorem, Ring. Field. Linear algebra	Chalk & Talk
5	5/3	Vector Space, Basis, Matrices and Linear Transformations	Chalk & Talk

6	**6/3**	Eigen values, Orthogonality	Chalk & Talk
7	**7/3**	Counting, Probability, Discrete random variable	Chalk & Talk
8	**8/3**	Continuous random variable, Moment generating function, Markov's inequality, Chebyshev's inequality	Chalk & Talk
9	**9/3**	The geometric and binomial distributions, The tail of the binomial distribution.	Chalk & Talk
10	**10/3**	Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula, applications of Kuratowski's theorem,	Chalk & Talk
11	**11/3**	graph colouring, chromatic polynomials, trees, weighted trees,	Chalk & Talk
12	**12/3**	The max-flow min-cut theorem, Turing Machines, Recursive and Recursively Enumerable languages. Cantor's Diagonalization theorem	Chalk & Talk
13	**13/3**	Complexity classes - NP-Hard and NP-complete Problems Cook's theorem NP completeness reductions. Approximation algorithms	Chalk & Talk

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test I	5th week	1 hour	20
2	Cycle Test II	10th week	1 hour	20
3	Assignement 1 Assignement 2 Assignement 3 Assignement 4	4th week of January 4th week of February 4th week of March 4th week of April		10
CPA	Compensation Assessment*	12th week		20
4	Final Assessment *	1st week of May		50

Course Exit Survey

- Feedbacks are collected before every Cycle Test and after the End semester exam in the feedback forms*.
- Suggestions from the students are incorporated for making the course more understanding and interesting.
- Students, through their Class Representatives, may give their feedback at any time to the course faculty which will be duly addresses.

ATTENDANCE

Minimum 75% is mandatory to write the end semester examination. Students having attendance 65% to 74% are eligible for the end semester exam only after attending the extra classes and submitting assignments. Students have to redo the course, if they have less than 65% of attendance.

Medical Certificate/ On Duty Certificate should be submitted immediately after rejoining.

COMPENSATION ASSESSMENT

The Students those have missed the cycle test 1 or cycle test 2 on medical or OD can appear for COMPENSATION ASSESSMENT (Retest) after showing the medical certificate or OD letter signed by competent authority.

ACADEMIC HONESTY & PLAGIARISM

In cycle tests or semester exam, students who are caught copying from cell phone, paper chit or from neighboring students will be directly given zero marks. In addition, a letter to their parents may be sent reporting the incident. Again if students are caught copying will result in failure in the course.

ADDITIONAL INFORMATION

The students can get their doubts clarified at any time with prior appointment.

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** S. Selvakumar 31/01/18 **HOD** _____ 31/1/2018