Semester - II						
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MA109T	Linear Algebra and Differential Equations	3	1.5	0	9
2	EE103T	Digital Systems	3	0	0	6
3	EE101L	Digital Circuits Laboratory	0	0	3	3
4	CS101T	Data Structures and Algorithms	3	0	0	6
5	CS202T	Discrete Structures	3	0	0	6
6	CS101L	Data Structures and Algorithms Laboratory	0	0	3	3
7	CC	NSO/NSS/NCC/NCA	1	0	0	2
		Total Credits				**35**

1	**Title of the course (L-T-P-C)**	**Linear Algebra and Differential Equations (3-1.5-0-9)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	**Linear Algebra:** Vectors in R^n, notion of linear independence and dependence, linear span of a set of vectors, vector subspaces of R^n, basis of a vector subspace. Systems of linear equations, matrices and Gauss elimination, row space, null space, and column space, rank of a matrix. Determinants and rank of a matrix in terms of determinants. Abstract vector spaces, linear transformations, matrix of a linear transformation, change of basis and similarity, rank-nullity theorem. Inner product spaces, Gram-Schmidt process, orthonormal bases, projections and least squares approximation. Eigenvalues and eigenvectors, characteristic polynomials, eigenvalues of special matrices (orthogonal, unitary, Hermitian, symmetric, skew-symmetric, normal). Algebraic and geometric multiplicity, diagonalization by similarity transformations, spectral theorem for real symmetric matrices, application to quadratic-forms. **Differential Equations:** Exact equations, integrating factors and Bernoulli equations. Orthogonal trajectories. Lipschitz condition, Picard's theorem, examples on non-uniqueness. Linear differential equations generalities. Linear dependence and Wronskians. Dimensionality of space of solutions, Abel-Liouville formula. Linear ODE's with constant coefficients, the characteristic equations. Cauchy-Euler equations. Method of undetermined coefficients. Method of variation of parameters. Laplace transform generalities. Shifting theorems. Convolution theorem.
4	**Texts/References**	1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley (1995). 2. G. Strang, Linear algebra and its applications (4th Edition), Thomson (2006) 3. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India (2000) 4. E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999) 5. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005)

1	**Title of the course** (L-T-P-C)	**Digital Systems** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	None
3	**Course content**	• Introduction to Digital Systems • Number systems and Logic: Number Systems, Different Codes, Boolean logic, basic gates, truth tables • Introduction to Logic families: TTL, CMOS etc. • Boolean Algebra: Laws of Boolean Algebra, logic minimization using K maps • Combinational Logic Circuits: Adders, Subtractors, Multipliers, MSI components like Comparators, Decoders, Encoders, MUXs, DEMUXs • Sequential circuits: Latches, Flipflops, Analysis of clocked sequential circuits, Registers and Counters (Synchronous and Asynchronous), State Machines • Introduction to Hardware Description Languages • Array based logic elements: Memory, PLA, PLD, FPGA • Special Topics: Asynchronous State machines, Testing and Verification of Digital Systems
4	**Texts/References**	1. J. F. Wakerly: Digital Design, Principles and Practices,4th Edition,Pearson Education, 2005 2. M. Moris Mano; Digital Design, 4th Edition, Pearson,2009 3. Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009 4. H.Taub and D. Schilling; Digital Integrated Electronics, McGraw Hill, 1977 5. Charles H Roth; Digital Systems Design using VHDL, Thomson Learning, 1998.

1	**Title of the course (L-T-P-C)**	**Data Structures and Algorithms (3-0-0-6)**
2	**Pre-requisite courses(s)**	Exposure to Computer Programming
3	**Course content**	Introduction: data structures, abstract data types,analysis of algorithms. Creation and manipulation of data structures: arrays,lists, stacks, queues, trees, heaps, hash tables, balanced trees, tries, graphs. Algorithms for sorting and searching, order statistics, depth-first and breadth-first search, shortest paths and minimum spanning tree.
4	**Texts/References**	**1.** Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Pressand McGraw-Hill, 2009. **2.** Data structures and algorithms in C++, by Michael T. Goodrich, Roberto Tamassia, and David M. Mount,Wiley, 2004.

1	**Title of the course (L-T-P-C)**	**Data Structures and Algorithms Laboratory (0-0-3-3)**
2	**Pre-requisite courses(s)**	Exposure to Computer Programming (CS 102)
3	**Course content**	Laboratory course for CS 211 is based on creatingand manipulating various data structures and implementation of algorithms.
4	**Texts/References**	**1.** Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Pressand McGraw-Hill, 2009. **2.** Data structures and algorithms in C++, by Michael T.Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004.

1	**Title of the course** (L-T-P-C)	**Digital Circuits Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	Digital Systems Theory (EE224)
3	**Course content**	This purpose of this lab is to complement the Digital Systems Theory Course. The following is the tentative list of experiments for this lab: Experiments with discrete ICs **1.** Introduction of digital ICs **2.** Realizing Boolean expressions **3.** Adder/Subtractor **4.** Shift registers **5.** Synchronous Counters **6.** Asynchronous Counters + **7.** segment display **8.** Finite State Machines (2 weeks) Experiments with CPLDs **9.** Arithmetic and Logic Unit **10.** LCD, Buzzer Interfacing Pipelining
4	**Texts/References**	**1.** M. Moris Mano; Digital Design, 5th Edition, Pearson, 2009 **2.** J.F.Wakerly: Digital Design, Principles and Practices,4th Edition,Pearson Education, 2005 **3.** Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009

1	**Title of the course** (L-T-P-C)	**Discrete Structures** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	There are four modules in the course: **1. Proofs and structures** Introduction, propositions, predicates, examples oftheorems and proofs, types of proof techniques, Axioms, Mathematical Induction, Well-ordering principle, Strong Induction, Sets, Russell's paradox, infinite sets, functions, Countable and uncountable sets, Cantor's diagonalization technique, Relations, Equivalence relations, partitions of a set. **2. Counting and Combinatorics** Permutations, combinations, binomial theorem, pigeon hole principle, principles of inclusion and exclusion, double counting. Recurrence relations, solvingrecurrence relations. **3. Elements of graph theory** Graph models, representations, connectivity, Euler andHamiltonian paths, planar graphs, Trees and tree traversals. **4. Introduction to abstract algebra and numbertheory** Semigroups, monoids, groups, homomorphisms,normal subgroups, congruence relations. Ceiling, floor functions, divisibility. Modular arithmetic, prime numbers, primality theorems.
4	**Texts/References**	**5.** Discrete Mathematics and its applications with Combinatorics and graph theory, 7th edition, by Kenneth H Rosen. Special Indian Edition published by McGraw-Hill Education, 2017. **6.** Introduction to Graph Theory, 2nd Edition, by Douglas B West. Eastern Economy Edition published by PHI Learning Pvt. Ltd, 2002. **7.** Discrete Mathematics, 2nd Edition, by Norman L Biggs. Indian Edition published by Oxford UniversityPress, 2003.