Semester II						
Sr No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MA 102	Linear Algebra	3	1	0	4
2	MA 103	Differential Equations -I	3	1	0	4
3	ME 111	Engineering Graphics Lab	1	0	3	5
4	EE 101	Introduction to Electrical Systems and Electronics	3	0	0	6
5	CS 201	Data Structures and Algorithms	3	0	0	6
6	CS 211	Data Structures and Algorithms Laboratory	0	0	3	3
7	ME 113	Hands on Engineering Laboratory	0	0	3	3
8	PH 102	Electricity and Magnetism	2	1	0	6
9	NO 102/ NO 104	National Sports Organization (NSO)/ National Service Scheme (NSS)				PP/ NP
		Total Credits				37

1	**Title of the course (L-T-P-C)**	**Linear Algebra (3-1-0-4)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	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.
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)

1	**Title of the course (L-T-P-C)**	**Differential Equations -I (3-1-0-4)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	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 ODEs 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.** E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999) **2.** W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005)

1	**Title of the course (L-T-P-C)**	**Engineering Graphics Lab (1-0-3-5)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Engineering Graphics with mini drafter: Around half a semester and bit more with following topics to be covered. • Introduction to Engineering Graphics • Curves • Projections of Points • Projection of Lines • Projection of Planes • Projections on Auxiliary Planes • Projections of Solids • Sections of Solids • Intersections of Solids Engineering Graphics with 2D Drafting Software: 5 weekly computer laboratory sessions covering above using AutoCAD® as a drafting software, 5th session on Isometric Projections.
4	**Texts/References**	**1.** N. D. Bhatt, revised and enlarged by V. M. Panchal and P. R. Ingle, Engineering Drawing, 53rd Edition, 2014, Charotar Publishers, Anand. **2.** Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, Prentice-Hall of India. **3.** Gopalakrishna K. R., Engineering Drawing Vol. I & II Combined., Subhas Stores, 25th Edition, 2017. **4.** Narayana. K. L., and Kannaiah, P. E., Textbook on Engineering Drawing, 2nd Edition, 2013, Scitech Publications, Chennai. **5.** Venugopal K. and Prabhu Raja V., Engineering Drawing + AutoCAD, New Age International Publishers, 5th Edition, 2011.

1	**Title of the course (L-T-P-C)**	**Introduction to Electrical Systems and Electronics (3-0-1-7)**
2	**Pre-requisite courses(s)**	**Exposure to Calculus**
3	**Course content**	**From Physics to Electrical Engineering** a) Lumped matter discipline b) Batteries, resistors, current sources and basic laws c) I-V characteristics and modeling physical systems. **Basic Circuit Analysis Methods** a) KCL and KVL, voltage and current dividers b) Parallel and serial resistive circuits c) More complicated circuits d) Dependent sources, and the node method e) Superposition principle f) Thevenin and Norton method of solving linear circuits. g) Circuits involving diode. **Analysis of Non-linear Circuits** a) Toy example of non-linear circuit and its analysis b) Incremental analysis c) Introduction to MOSFET Amplifiers d) Large and small signal analysis of MOSFETs e) MOSFET as a switch **Introduction to the Digital World** a) Voltage level and static discipline b) Boolean logic and combinational gates c) MOSFET devices and the S Model d) MOSFET as a switch; revisited e) The SR model of MOSFETs f) Non-linearities: A snapshot **Capacitors and Inductors** a) Behavior of capacitors, inductors, and its linearity b) Basic RC and RLC circuits c) Modelling MOSFET anomalies using capacitors. d) RLC circuit and its analysis e) Sinusoidal steady state analysis f) Introduction to passive filters **Operational Amplifier Abstraction** a) Introduction to Operational Amplifier b) Analysis of Operational amplifier circuits c) Op-Amp as active filters d) Introduction to active filter design **Transformers and Motors** a) AC Power circuit analysis b) Polyphase circuits c) Introduction to transformers d) Introduction to motors

4	**Texts/References**	**1.** Anant Agarwal and Jefferey H. Lang, "Foundations of Analog and Digital Electronics Circuits," Morgan Kaufmann publishers, 2005 **2.** Wlilliam H. Hayt, Jr., Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis," Tata McGraw-Hill **3.** Theodore Wildi, "Electrical Machines, Drives and Power Systems," Pearson, 6-th edition. **4.** V. Del. Toro, "Electrical Engineering Fundamentals," Pearson publications, 2nd edition.

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 MichaelT. 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)**	**Electricity and Magnetism (2-1-0-6)**
2	**Pre-requisite courses(s)**	Nill
3	**Course content**	• Review of vector calculus: Spherical polar and cylindrical coordinates; gradient, divergence and curl. • Divergence and Stokes` theorems. • Divergence and curl of electric field, Electric potential, properties of conductors. • Poisson's and Laplace's equations, uniqueness theorems, boundary value problems, separation of variables, method of images, multipoles. • Polarization and bound charges, Gauss` law in the presence of dielectrics, Electric displacement D and boundary conditions, linear dielectrics. • Divergence and curl of magnetic field, Vector potential and its applications. • Magnetization, bound currents, Ampere`s law in magnetic materials, Magnetic field H, boundary conditions, classification of magnetic materials. • Faraday's law in integral and differential forms, Motional emf, Energy in magnetic fields, Displacement current, Maxwell's equations, • Electromagnetic (EM) waves in vacuum and media, Energy and momentum of EM waves, Poynting`s theorem. Reflection and transmission of EM waves across linear media.
4	**Texts/References**	**1.** Introduction to Electrodynamics (4th ed.), David J. Griffiths, Prentice Hall, 2015. **2.** Classical Electromagnetism, J. Franklin, Pearson Education, 2005.