# Computer Science Engineering

| Semester - II | | | | | | |
|---|---|---|---|---|---|---|
| **S.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 Lab | 0 | 0 | 3 | 3 |
| 8 | PH 102 | Electricity and Magnetism | 2 | 1 | 0 | 6 |
| 9 | NO 105/ NO 107 | National Sports Organization (NSO)/National Service Scheme (NSS) | 1 | 0 | 0 | 2 |
| | | Total Credits | | | | 37 |

Computer Science Engineering

| | | |
|---|---|---|
| **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).<br>**2.** G. Strang, Linear algebra and its applications (4th Edition), Thomson (2006)<br>**3.** S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India (2000)<br>**4.** E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999) |

| | | |
|---|---|---|
| **1** | **Title of the course (L-T-P-C)** | **Differential Equations -I**<br>**(3-1-0-4)** |
| **2** | **Pre-requisite courses(s)** | Nill |
| **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 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.** E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999)<br>**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**<br>**(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.<br>• Introduction to Engineering Graphics<br>• Curves<br>• Projections of Points<br>• Projection of Lines<br>• Projection of Planes<br>• Projections on Auxiliary Planes<br>• Projections of Solids<br>• Sections of Solids<br>• Intersections of Solids<br>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.<br>**2.** Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, Prentice-Hall of India.<br>**3.** Gopalakrishna K. R., Engineering Drawing Vol. I & II Combined., Subhas Stores, 25th Edition, 2017.<br>**4.** Narayana. K. L., and Kannaiah, P. E., Textbook on Engineering Drawing, 2nd Edition, 2013, Scitech Publications, Chennai.<br>**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 (3-0-1-6)** |
| 2 | **Pre-requisite courses(s)** | Exposure to Calculus |
| 3 | **Course content** | **From Physics to Electrical Engineering**<br>(a) Lumped matter discipline<br>(b) Batteries, resistors, current sources and basic laws<br>(c) I-V characteristics and modeling physical systems<br>**Basic Circuit Analysis Methods**<br>(a) KCL and KVL, voltage and current dividers<br>(b) Parallel and serial resistive circuits<br>(c) More complicated circuits<br>(d) Dependent sources, and the node method<br>(e) Superposition principle<br>(f) Thevenin and Norton method of solving linear circuits<br>(g) Circuits involving diode.<br>**Analysis of Non-linear Circuits**<br>(a) Toy example of non-linear circuit and its analysis<br>(b) Incremental analysis<br>(c) Introduction to MOSFET Amplifiers<br>(d) Large and small signal analysis of MOSFETs<br>(e) MOSFET as a switch<br>**Introduction to the Digital World**<br>(a) Voltage level and static discipline<br>(b) Boolean logic and combinational gates<br>(c) MOSFET devices and the S Model<br>(d) MOSFET as a switch; revisited<br>(e) The SR model of MOSFETs<br>(f) Non-linearities: A snapshot<br>**Capacitors and Inductors**<br>(a) Behavior of capacitors, inductors and its linearity<br>(b) Basic RC and RLC circuits<br>(c) Modeling MOSFET anomalies using capacitors<br>(d) RLC circuit and its analysis<br>(e) Sinusoidal steady state analysis<br>(f) Introduction to passive filters<br>**Operational Amplifier Abstraction**<br>(a) Introduction to Operational Amplifier<br>(b) Analysis of Operational amplifier circuits<br>(c) Op-Amp as active filters<br>(d) Introduction to active filter design<br>**Transformers and Motors**<br>(a) AC Power circuit analysis<br>(b) Polyphase circuits<br>(c) Introduction to transformers<br>(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<br>**2.** Wlilliam H. Hayt, Jr., Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis," Tata McGraw-Hill<br>**3.** Theodore Wildi, "Electrical Machines, Drives and Power Systems," Pearson, 6-th edition.<br>**4.** V. Del. Toro, "Electrical Engineering Fundamentals," Pearson publications, 2nd edition. |

| | | |
|---|---|---|
| **1** | **Title of the course (L-T-P-C)** | **Data Structures and Algorithms**<br>**(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.<br>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.<br>**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.<br>**2.** Data structures and algorithms in C++, by Michael T.Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004. |

| | | |
|---|---|---|
| 1 | **Title of the course**<br>(L-T-P-C) | **Hands on Engineering Lab**<br>**(0-0-3-3)** |
| 2 | **Pre-requisite courses(s)** | -- |
| 3 | **Course content** | **List of Experiments (Mechanical Workshop)**<br>• To make a Square-fit from the given mid steel pieces (Fitting)<br>• To make a V-fit from the given mid steel pieces (Fitting)<br>• To make a rectangular tray as per required dimensions (Sheet Metal)<br>• To build a transition piece (Sheet Metal)<br>• To make a Butt joint using the given two M.S pieces (Arc welding)<br>• To make a lap joint using the given two M.S pieces (Arc welding)<br>• To build a pipeline using fittings for given flow circuit (Plumbing)<br>**List of Experiments (Electrical Workshop)**<br>• To control one lamp by a one switch with provision for plug socket with switch control (Electrical wiring)<br>• To do stair case wiring (i.e. control of one lamp by two switches fixed at two different places) (Electrical wiring)<br>• Measurement of hot and cold resistance of filament<br>• Improvement of Power Factor<br>• Calibration of Energy meter<br>• Measurement of Power using three ammeter/voltmeter method<br>**List of Experiments (Electronics)**<br>• Understanding breadboard, One-way traffic<br>• Introduction to Arduino and Buzzer<br>• Using Arduino speed measurement of motor/ glowing of LED<br>• Control of water level using Arduino<br>• Line follower using Arduino |
| 4 | **Texts/References** | 1. Elements of Workshop Technology Vol. 1 (2015), S. K. Hajra Choudhary, A. K. Hajra Choudhary and Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd.<br>2. W. A. J. Chapman, Workshop Technology, Vol. 1 (2006), Vol 2 (2007), and (1995), CBS Publishers. |

| | | |
|---|---|---|
| **1** | **Title of the course (L-T-P-C)** | **Electricity and Magnetism**<br>**(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.<br>• Divergence and Stokes` theorems.<br>• Divergence and curl of electric field, Electric potential, properties of conductors.<br>• Poisson's and Laplace's equations, uniqueness theorems, boundary value problems, separation of variables, method of images, multipoles.<br>• Polarization and bound charges, Gauss` law in the presence of dielectrics, Electric displacement D and boundary conditions, linear dielectrics.<br>• Divergence and curl of magnetic field, Vector potential and its applications.<br>• Magnetization, bound currents, Ampere`s law in magnetic materials, Magnetic field H, boundary conditions, classification of magnetic materials.<br>• Faraday's law in integral and differential forms, Motional emf, Energy in magnetic fields, Displacement current, Maxwell's equations,<br>• Electromagnetic (EM) waves in vacuum and media, Energy and momentum of EM waves, Poynting`s theorem.<br>• Reflection and transmission of EM waves across linear media. |
| **4** | **Texts/References** | **1.** Introduction to Electrodynamics (4th ed.), David J. Griffiths, Prentice Hall, 2015.<br>**2.** Classical Electromagnetism, J. Franklin, Pearson Education, 2005. |