SEMESTER - I (Common for all B.Tech Courses)						
S.No	**C. Code**	**Course**	**L**	**T**	**P**	**C**
1	MA 101	Calculus	3	1	0	8
2	PH 101	Quantum Physics and Applications	2	1	0	6
3	CH 102	Fundamental Concepts and Applications of Chemistry	3	0	0	6
4	BB 103	Introduction to Modern biology	3	0	0	6
5	PH 113	Hands on Science Laboratory - I	0	0	3	3
6	CS 101	Computer Programming	3	0	2	8
7	HS 103	Introduction to Fine Arts	0	0	1	PP/NP
8	HS 106	Design Thinking and Creativity	1	0	0	PP/NP
9	NO107/NO105	NSO/NSS	0	0	2	2
	First Semester Total Credits					39

1	**Title of the course** (L-T-P-C)	**Fundamental Concepts &Applications of Chemistry** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	**Organic and Inorganic (Inorganic): a. Harness the power of periodic table** Periodic properties: trends in size, electron affinity, ionization potential and electronegativity • Role of chemical elements in water contamination • Hardness of water • Desalination of brackish and sea water • Role of silicon in semiconducting applications • metal atom (Cu, Au, Pt, Pd etc.) based nanoparticles **b. Coordination complexes** Transition metal chemistry: inorganic complexes, bonding theories, magnetism, bonding aspects and structural distortion **(Organic): a. M.O. theory and π-conjugated compounds** Molecular orbitals of common functional groups, Qualitative Huckel MOs of conjugated polyenes and benzene. Aromaticity. Configuration, molecular chirality and isomerism, Conformation of alkanes and cycloalkanes **b. Polymers** Types and classification of polymers • polymerization techniques • Structure-property relationships of polymers • Conducting polymers **Physical Chemistry:** **a. Quantum chemistry** Schrodinger equation, Origin of quantization, Born interpretation of wave function, Hydrogen atom: solution to □-part, Atomic orbitals, many electron atoms and spin orbitals. Chemical bonding: MO theory: LCAO molecular orbitals, Structure, bonding and energy levels of diatomic molecules. Concept of sp, sp^2 and sp^3 hybridization; Bonding and shape of many atom molecules; Intermolecular Forces; Potential energy Surfaces-Rates of reactions; Steady state approximation and its applications; Concept of pre-equilibrium; Equilibrium and related thermodynamic quantities **b. Electrochemistry** Electrochemical cells and Galvanic cells • EMF of a cell Single electrode potential • Nernst equation • Electrochemical series • Types of electrodes • Reference electrodes • Batteries • Modern batteries • Fuel cells • corrosion
4	**Texts/References**	1. J. D. Lee, "Concise Inorganic chemistry" 5th Edition. Wiley India. Ed. 2. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, "Inorganic Chemistry: Principles of structure and reactivity" 4th Edition, Person. 3. P. Atkins, J. de Paula, "physical chemistry" 5th Edition, Oxford. 4. J. Clayden, N. Greeves, S. Warren, "Organic chemistry" 2th Edition, Oxford. 5. George Odian, Principles of polymerization, 4th edition, Wiley student edition, Wiley India Pvt Ltd. 6. F. W. Billmeyer, Text book of Polymer Science, 3rd edition, Wiley student edition, Wiley India Pvt Ltd. 7. A. K. De, Environmental Chemistry, 8th edition, New Age International publishers. 8. B. K. Sharma, Environmental Chemistry, 16th edition, Krishna Prakashan Media Pvt Ltd. 9. A. R. West, Solid State Chemistry and Its Applications, Wiley student edition, Wiley India Pvt Ltd. 10. T. Pradeep, Nano: The essentials, McGraw-Hill Education publishers. 11. Geoffrey A Ozin and André Arsenault, Nanochemistry: A Chemical Approach to Nanomaterials, 2nd edition, RSC publishing.

Name of Academic Unit: Mathematics

Level: B. Tech.

Programme: B.Tech.

i	**Title of the course**	MA 101 Calculus
ii	**Credit Structure (L-T-P-C)**	(3-1-0-8)
iii	**Type of Course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	--
vii	**Course Content**	Review of limits, continuity, differentiability. Mean value theorem, Taylors Theorem, Maxima and Minima. Riemann integrals, Fundamental theorem of Calculus, Improper integrals, applications to area, volume. Convergence of sequences and series, power series. Partial Derivatives, gradient and directional derivatives, chain rule, maxima and minima, Lagrange multipliers. Double and Triple integration, Jacobians and change of variables formula. Parametrization of curves and surfaces, vector fields, line and surface integrals. Divergence and curl, Theorems of Green, Gauss, and Stokes.
viii	**Texts/References**	1. B.V. Limaye and S. Ghorpade, A Course in Calculus and Real Analysis, Springer UTM (2004) 2. B.V. Limaye and S. Ghorpade, A Course in Multivariable Calculus and Analysis, Springer UTM (2010) 3. James Stewart, Calculus (5th Edition), Thomson (2003). 4. T. M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern (1980). 5. Marsden and Tromba, Vector calculus (First Indian Edition), Springer (2012)

ix	**Name(s) of Instructor(s)**	BVL
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	NA
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	This is a fundamental mathematics course which is essential for any branch of engineering

1	**Title of the course** (L-T-P-C)	**Quantum Physics and Applications** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	● Quantum nature of light: Photoelectric Effect and Compton Effect. ● Stability of atoms and Bohr`s rules. ● Wave particle duality: De Broglie wavelength, Group and Phase velocity, Uncertainty Principle, Double Slit Experiment. ● Schrödinger Equation. ● Physical interpretation of Wave Function, Elementary Idea of Operators, Eigen-value Problem. ● Solution of Schrödinger equation for simple boundary value problems. ● Reflection and Transmission Coefficients. Tunneling. ● Particle in a three dimensional box, Degenerate states. ● Exposure to Harmonic Oscillator and Hydrogen Atom without deriving the general solution. ● Quantum Statistics: Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics by detailed balance arguments. ● Density of states. ● Applications of B-E statistics: Lasers. Bose-Einstein Condensation. ● Applications of F-D statistics: Free electron model of electrons in metals. Concept of Fermi Energy. ● Elementary Ideas of Band Theory of Solids. ● Exposure to Semiconductors, Superconductors, Quantum Communication and Quantum Computing.
4	**Texts/References**	1. Quantum Physics: R. Eisberg and R. Resnick, John Wiley 2002, 2nd Edition. 2. Introduction to Modern Physics: F. K. Richtmyer, E. H. Kennard and J.N. Cooper, Tata Mac Graw Hill 1976, 6th Edition. 3. Modern Physics: K. S. Krane, John Wiley 1998, 2nd Edition. 4. Introduction to Modern Physics: Mani and Mehta, East-West Press Pvt. Ltd. New Delhi 2000. 5. Elements of Modern Physics: S. H. Patil, Tata McGraw Hill, 1984. 6. Concepts of Modern Physics, A Beiser, Tata McGraw Hill, 2009.

1	**Title of the course** (L-T-P-C)	**Introduction to Modern Biology** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	Quantitative views of modern biology. Importance of illustrations and building quantitative/qualitative models. Role of estimates. Cell size and shape. Temporal scales. Relative time in Biology. Key model systems – a glimpse. Management and transformation of energy in cells. Mathematical view – binding, gene expression and osmotic pressure as examples. Metabolism. Cell communication. Genetics. Eukaryotic genomes. Genetic basis of development. Evolution and diversity. Systems biology and illustrative examples of applications of Engineering in Biology.
4	**Texts/References**	Campbell Biology 12th edition, Pearson publication by Lisa Urry,Michael Cain,Steven Wassserman

Name of Academic Unit: Computer Science and Engineering

Level: B. Tech.

Programme: B.Tech.

i	**Title of the course**	CS 101 Computer Programming
ii	**Credit Structure (L-T-P-C)**	(3-0-2-8)
iii	**Type of Course**	Core course
iv	**Semester in which normally to be offered**	Spring
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – *specify course number(s)***	Nil

vii	**Course Content**	This course provides an introduction to problem solving with computers using a modern language such as Java or C/C++. Topics covered will include: **Utilization**: Developer fundamentals such as editor, integrated programming environment, Unix shell, modules, libraries. **Programming features**: Machine representation, primitive types, arrays and records, objects, expressions, control statements, iteration, procedures, functions, and basic i/o. **Applications**: Sample problems in engineering, science, text processing, and numerical methods.
viii	**Texts/References**	1. An Introduction to Programming through C++, 1st edition, by Abhiram G. Ranade, McGraw Hill Education, 2014. 2. C++ Program Design: An introduction to Programming and Object-Oriented Design, 3rd Edition, by Cohoon and Davidson, Tata McGraw Hill, 2003. Other references 1. Thinking in C++ 2nd Edition, by Bruce Eckel (available online). 2. How to Solve It by Computer, by G. Dromey, Prentice-Hall, Inc., Upper Saddle River, NJ, 1982. 3. How to Solve _It (2nd ed.), by Polya, G., Doubleday and co, 1957. 4. Let Us C, by Yashwant Kanetkar, Allied Publishers, 1998. 5. The Java Tutorial, Sun Microsystems, Addison- Wesley, 1999.
ix	**Name(s) of Instructor(s)**	--
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	NA
xi	**Is/Are there any course(s) in the same/**	No

	other academic unit(s) which is/ are equivalent to this course? If so, please give details.	
xiii	**Justification/ Need for introducing the course**	Basic course in problem solving using computers.

1	**Title of the course** (L-T-P-C)	**Introduction to Fine Arts: Urban Dance in India: A Brief & Partial Introduction in Theory & Practice**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Body and Movement, Classical Dance in India, Contemporaneity: Modern & Postmodern Forms & Modes of Sustenance for a Dancer, Experimenting, Making Your Own Dance Work (Dance-pieces)
4	**Texts/References**	--

1	**Title of the course** (L-T-P-C)	**Design thinking and Creativity** **(1-0-0-0)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	1.Problem Exploration- Students move around and find problems that need solutions. 2.They analyse the problem (not solution) and evolve a problem space. The problem space is converted into a story boar and presented in a poster session. 3.Feedback at the poster session is used to refine the problem definition(s). 4.Solution Exploration: Creative solutions (solution space) are now explored and presented using story boards. 5.The solutions are converted into "embodiments"
4	**Texts/References**	1."Stuff Matters" Prof. Mark Miodownik, Penguin 2. "Design and Technology" by James Garratt, Cambridge University Press. 3. How it works in the home: Walt Disney :9780894340482- Amazon.com. 4.How it works in the City (Walt Disney available on Amazon.com) 5.Change by design – Tim Brown There are some additional books in this "How it Works" series.

Semester II						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MA 102	Linear Algebra (1st Half)	3	1	0	4
2	MA 103	Differential Equations - I (2nd Half)	3	1	0	4
3	ME 111	Engineering Graphics Laboratory	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 107/ NO 105	National Sports Organization (NSO)/National Service Scheme (NSS)	1	0	0	2
		Total Credits				**39**

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 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) 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., Text Book 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) Modeling 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 Press and 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 creating and 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 Press and 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)**	Nil
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.

Semester III						
S.No	**Course code**	**Course name**	**L**	**T**	**P**	**C**
1	CS 205	Design and analysis of algorithms	3	0	0	6
2	CS 203	Discrete structures	3	0	0	6
3	EE 221	Introduction to Probability (1st Half)	3	0	0	3
4	EE 227	Data Analysis (2nd Half)	3	0	0	3
5	HS 201	Economics	3	0	0	6
6	CS 213	Software Systems Lab	1	3	0	8
Total credits						**32**

1	**Title of the course** (L-T-P-C)	**Design and Analysis of Algorithms** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Computer Programming and Utilization, Discrete Structures, Data Structures and Algorithms , Data Structures and Algorithms Laboratory
3	**Course content**	Syllabus is divided roughly 8 modules; each module roughly takes two weeks. Module 1: Introduction Examples and motivation. Asymptotic complexity: informal concepts, formal notation, examples Module 2: Searching in list: binary search, Sorting: insertion sort, selection sort, merge sort, quicksort, stability and other issues. Module 3: Divide and conquer: binary search, recurrence relations. nearest pair of points, merge sort, integer multiplication, matrix multiplication. Module 4: Graphs: Motivation, BFS, DFS, DFS numbering and applications, directed acyclic graphs, directed acyclic graphs, Shortest paths: unweighted and weighted, Single source shortest paths: Dijkstra, Minimum cost spanning trees: Prim's algorithm, Kruskal's Algorithm Module 5: Union-Find data structure, Priority queues, heaps. Heap sort. Dijstra/Prims revisited using heaps, Search Trees: Introduction Traversals, insertions, deletions Balancing Module 6: Greedy algorithms: Greedy: Interval scheduling, Proof strategies, Huffman coding. Module 7: Dynamic Programming: weighted interval scheduling, memoization, edit distance, longest ascending subsequence. matrix multiplication, shortest paths: Bellman Ford, shortest paths: Floyd Warshall 1. Module 8: Intractability: NP completeness, reductions, examples, Misc topics.
4	**Texts/References**	1. Algorithms, by Sanjoy Dasgupta, Christos Papadimitriou and Umesh Vazirani, McGraw Hill Education, 2006. 2. Introduction to Algorithms, 3rd edition, by Cormen, Leiserson, Rivest and Stein, PHI Learning Pvt. Ltd., 2010. 3. Algorithm Design, 1st edition, by Kleniberg and Tardos, Pearson, 2014.

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, primenumbers, primality theorems.
4	**Texts/References**	1. Discrete Mathematics and its applications with Combinatorics and graph theory, 7th edition, by Kenneth H Rosen. Special Indian Edition published byMcGraw-Hill Education, 2017. 2. Introduction to Graph Theory, 2nd Edition, by Douglas B West. Eastern Economy Edition published by PHI Learning Pvt. Ltd, 2002. 3. Discrete Mathematics, 2nd Edition, by Norman L Biggs. Indian Edition published by Oxford UniversityPress, 2003.

1	**Title of the course** (L-T-P-C)	**Introduction to Probability** **(3-0-0-3)**
2	**Pre-requisite courses(s)**	Basic calculus
3	**Course content**	**Introduction**: Motivation for studying the course, revision of basic math required, connection between probability and length on subsets of the real line, probability-formal definition, events and σ-algebra, independence of events, and conditional probability, sequence of events, and *Borel-Cantell* Lemma. **Random Variables**: Definition of random variables, and types of random variables, CDF, PDF and its properties, random vectors and independence, brief introduction to transformation of random variables, introduction to Gaussian random vectors. **Mathematical Expectations**: Importance of averages through examples, definition of expectation, moments and conditional expectation, use of MGF, PGF and characteristic functions, variance and k-th moment, MMSE estimation. **Inequalities and Notions of convergence**: Markov, Chebychev, Chernoff and Mcdiarmid inequalities, convergence in probability, mean, and almost sure, law of large numbers and central limit theorem. **A short introduction to Random Process:** Example and formal definition, stationarity, autocorrelation, and cross correlation function, definition of ergodicity.
4	**Texts/References**	**1. Robert B. Ash**, ``Basic Probability Theory," Reprint of the John Wiley & Sons, Inc., New York, 1970 edition. 2. **2. Sheldon Ross**, ``A first course in probability," Pearson Education India, 2002. 3. **3. Bruce Hayek**, ``An Exploration of Random Processes for Engineers," Lecture notes, 2012. . 4. D. P. Bertsekas and J. Tsitisklis, "Introduction to Probability" MIT Lecture notes, 2000 (*link*: https://www.vfu.bg/en/e-Learning/Math--Bertsekas_Tsitsiklis_Introduction_to_probability.pdf)

1	**Title of the course** (L-T-P-C)	**Data Analysis** **(3-0-0-3)**
2	**Pre-requisite courses(s)**	Introduction to Probability
3	**Course content**	The role of statistics. Graphical and numerical methods for describing and summarizing data. Sampling variability and sampling distributions, Estimation using a single sample, Hypothesis testing using a single sample, Comparing two populations or treatments, Simple linear regression and correlation, and Case studies.
4	**Texts/References**	Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists," Elsevier, New Delhi, 3rd edition (Indian), 1987. Papoulis and Pillai, "Probability, Random Variables and Stochastic processes," 4th Edition, Tata McGraw Hill, 1991. William Feller , "An Introduction to Probability Theory and Its Applications," Vol. 1, 3rd edition, John Wiley International, 1968.

1	**Title of the course** (L-T-P-C)	**Economics** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Basic economic problems. resource constraints and Welfare maximizations. Nature of Economics: Positive and normative economics; Micro and macroeconomics, Basic concepts in economics. The role of the State in economic activity; market and government failures; New Economic Policy in India. Theory of utility and consumer's choice. Theories of demand, supply and market equilibrium. Theories of firm, production and costs. Market structures. Perfect and imperfect competition, oligopoly, monopoly. An overview of macroeconomics, measurement and determination of national income. Consumption, savings, and investments. Commercial and central banking. Relationship between money, output and prices. Inflation - causes, consequences and remedies. International trade, foreign exchange and balance payments, stabilization policies : Monetary, Fiscal and Exchange rate policies.
4	**Texts/References**	1. 1. P. A. Samuelson & W. D. Nordhaus, Economics, McGraw Hill, NY, 1995. 2. 2. A. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975. R. Pindyck and D. L. Rubinfeld, Microeconomics, Macmillan publishing company, NY, 1989. 3. R. J. Gordon, Macroeconomics 4th edition, Little Brown and Co., Boston, 1987. 4. 4. William F. Shughart II, The Organization of Industry, Richard D. Irwin, Illinois, 1990. 5. 5. R.S. Pindyck and D.L. Rubinfeld. Microeconomics Th (7 Edition), Pearson Prentice Hall, New Jersey, 2009. 6. 6. R. Dornbusch, S. Fischer, and R. Startz. Macroeconomics (9th Edition), McGraw-Hill Inc. New York, 2004.

1	**Title of the course** (L-T-P-C)	**Software Systems Laboratory** **(1-3-0-8)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Vim/emacs HTML, CSS 2. Report and presentation software: latex, beamer,drawingsoftware(e.g. inkscape, xfig, open-office) 3. IDE (e.g. eclipse, netbeans), code reading,debugging Basic Java Java collections, interfaces 4. Java threads Java GUI Introduction todocumentation: e.g. doxygen/javadocs 5. Version management: SVN/Git 6. Unix basics: shell, file system, permissions, processhierarchy, process monitoring, ssh, rsync 7. Unix tools: e.g. awk, sed, grep, find, head, tail, tar,cut, sort 8. Bash scripting: I/O redirection, pipes 9. Python programming 10. Makefile, libraries and linking 11. Graph plotting software (e.g., gnuplot) 12. Profiling tools (e.g., gprof, prof) 13. Optional topics (may be specific to individualstudents302222 projects): intro to sockets, basic SQL for data storage,JDBC/pygresql A project would be included which touches upon manyof the above topics, helping students see the connect across seemingly disparate topics. The project is also expected to be a significant load: 20-30 hours of work.
4	**Texts/References**	1. Online tutorials for HTML/CSS, Inkscape, OODrawUnix Man Pages for all unix tools, AdvancedBash Scripting Guide from the Linux Documentation Project (www.tldp.org). 2. The Python Tutorial Online Book (http://docs.python.org/3/tutorial/index.html). 3. The Java Tutorials (http://docs.oracle.com/javase/tutorial/). 4. Latex - A document preparation system, 2/e, byLeslie Lamport, Addison-Wesley, 1994.

Semester IV						
S.No	**Course code**	**Course name**	**L**	**T**	**P**	**C**
1	CS 202	Automata theory	3	1	0	8
2	CS 209	Artificial intelligence	3	0	0	6
3	CS 301	Computer Architecture	3	0	0	6
4	EE 204	Digital systems	2	1	0	6
5	EE 214	Digital Circuits Lab	3	0	0	3
6	CS 214	Artificial intelligence lab	0	0	3	3
7	CS 311	Computer Architecture lab	0	0	3	3
Total credits						**35**

1	**Title of the course** (L-T-P-C)	**Automata Theory** **(3-1-0-8)**
2	**Pre-requisite courses(s)**	Exposure to Discrete Structures
3	**Course content**	Finite state machines (DFA/NFA/epsilon NFAs), regular expressions. Properties of regular languages. My hill-Nerode Theorem. Non-regularity. Push down automata. Properties of context-free languages. Turing machines:Turing hypothesis, Turing computability, Nondeterministic, multi tape and other versions of Turing machines. Church`s thesis, recursively enumerable sets and Turing computability. Universal Turing machines. Unsolvability, The halting problem, partial solvability, Turing enumerability, acceptability and decidability, unsolvable problems about Turing Machines. Post`s correspondence problem.
4	**Texts/References**	1. Introduction to Automata Theory, Languages and Computation, by John. E. Hopcroft, Rajeev Motwani, J. D. Ullman, 3rd edition. Pearson. 2013. 2. Elements of the Theory of Computation, by H.R. Lewis and C. H. Papadimitrou, 2nd Edition. Prentice Hall Inc, 1998.

1	**Title of the course** (L-T-P-C)	**Artificial Intelligence** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	
3	**Course content**	Search: Problem representation; State Space Search; A* Algorithm and its Properties; AO* search, Minimax and alpha- beta pruning, AI in games. Logic: Formal Systems; Notion of Proof, Decidability, Soundness, Consistency and Completeness; Predicate Calculus (PC), Resolution Refutation, Herbrand Interpretation, Prolog. Knowledge Representation: PC based Knowledge Representation, Intelligent Question Answering, Semantic Net, Frames, Script, Conceptual Dependency, Ontologies, Basics of Semantic Web. Leaning: Learning from Examples, Decision Trees, Neural Nets, Hidden Markov Models, Reinforcement Learning, Learnability Theory. Uncertainty: Formal and Empirical approaches including Bayesian Theory, Fuzzy Logic, Non-monotonic Logic, Default Reasoning. Planning: Blocks World, STRIPS, Constraint Satisfaction, Basics of Probabilistic Planning. Advanced Topics: Introduction to topics like Computer ain
4	**Texts/References**	Text: Stuart J. Russel, Peter Norvig, Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River: Prentice Hall, 2010. Other references: N.J. Nilsson, Principles of Artificial Intelligence, Morgan Kaufmann, 1985. Malik Ghallab, Dana Nau, Paolo Traverso, Automated Planning: Theory & Practice, The Morgan Kaufmann Series in Artificial Intelligence, 2004. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006. Mark Stefik, Introduction to Knowledge Systems, Morgan Kaufmann, 1995. E. Rich and K.Knight, Artificial Intelligence, Tata McGraw Hill, 1992.

1	**Title of the course** (L-T-P-C)	**Computer Architecture** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	The Language of Bits, Assembly Language, Logic Gates, Registers, and Memories, Processor Design, Principles of Pipelining, The Memory System, Multiprocessor Systems, I/O and Storage Devices. Each concept will be first taught on the basis of the fundamental driving principles. Following this, real world examples (e.g., ARM processors) will be used to emphasize the content.
4	**Texts/References**	1. Computer Organization and Architecture, by Smruti Ranjan Sarangi, McGraw Higher Ed, 2017. 2. Computer Architecture A Quantitative Approach, Sixth edition, by David Patterson and John L. Hennesy, Morgan Kaufmann, 2017.

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 Charles H Roth; Digital Systems Design using VHDL, Thomson Learning, 1998.

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 7. Finite State Machines (2 weeks) Experiments with CPLDs 1. Arithmetic and Logic Unit 2. 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 Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009

1	**Title of the course** (L-T-P-C)	**Artificial Intelligence Lab** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	
3	**Course content**	The lab will closely follow and aim to elucidate the lessons covered in the theory course CS344. Implementation and study of A*, Usage of Prolog Inferencing, Expert System Shells, Neural Net Platforms, Prediction and Sequence Labeling using HMMs, Simulation of Robot Navigation and such exercises are strongly recommended.
4	**Texts/References**	Stuart J. Russel, Peter Norvig, Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River: Prentice Hall, 2010. Other references: N.J. Nilsson, Principles of Artificial Intelligence, Morgan Kaufmann, 1985. Malik Ghallab, Dana Nau, Paolo Traverso, Automated Planning: Theory & Practice, The Morgan Kaufmann Series in Artificial Intelligence, 2004. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006. Mark Stefik, Introduction to Knowledge Systems, Morgan Kaufmann, 1995. E. Rich and K.Knight, Artificial Intelligence, Tata McGraw Hill, 1992.

1	**Title of the course** (L-T-P-C)	**Computer Architecture Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	The lab will closely follow the theory course. The idea is to have the students develop a software model of a simple processor, capturing both functionality and timing aspects. Theywill implement modules as the concepts are taught in class.
4	**Texts/References**	Nil

Semester V						
S.No	**Course code**	**Course name**	**L**	**T**	**P**	**C**
1	CS 304	Operating systems	3	0	0	6
2	CS 303	Databases and information systems	3	0	0	6
3		Elective I / R&D I#	3	0	0	6
4		Elective II	3	0	0	6
5		HSS Elective 1*	3	0	0	6
6	CS 314	Operating systems lab	0	0	3	3
7	CS 313	Databases and information systems laboratory	0	0	3	3
Total credits						**36**

1	**Title of the course** (L-T-P-C)	**Operating Systems** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Computer Architecture
3	**Course content**	Process Management, Memory Management, Storage Management, Protection and Security, Virtual Machines, Distributed Systems
4	**Texts/References**	1. Avi Silberschatz, Peter Baer Galvin, Greg Gagne, ``Operating Systems Concepts'' 9th edition. *Wiley.*  *2.* Andrew S. Tanenbaum, Herbert Bos, ``Modern Operating 1. Systems", 4th edition. *Pearson*

1	**Title of the course** (L-T-P-C)	**Data Bases and Information Systems** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Overview of data management systems. Relational model and query languages (relational algebra and calculus, SQL). Database design using the ER Model, ER Diagrams, UML Class Diagrams. Relational database design and normalization. Integrity and Security. Design and development of Web based information systems. Overview of storage structures and indexing, query processing and optimization, and transaction processing. Introduction to Big Data management concepts such as: distributed and scalabledata storage, including distributed file systems, keyvalue stores, column stores and graph databases, replication and consistency, and concurrent data processing using the Map Reduce paradigm. Introduction to decision support and data analysis, datawarehousing and data mining, and Information Retrieval.
4	**Texts/References**	Database System Concepts, 6th edition, by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill, 2010.

1	**Title of the course** (L-T-P-C)	**Operating Systems Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	**Computer Architecture**
3	**Course content**	Laboratory Assignments related to the topics covered in the theory course: Process Management, Memory Management, Storage Management, Protection and Security, Virtual Machines, Distributed Systems
4	**Texts/References**	1. **Avi Silberschatz, Peter Baer Galvin, Greg Gagne**, ``Operating Systems Concepts'' 9th edition. *Wiley.* *2.* **Andrew S. Tanenbaum, Herbert Bos**, ``Modern Operating Systems", 4th edition. *Pearson.*

1	**Title of the course** (L-T-P-C)	**Data Bases and Information Systems Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Use of database systems supporting interactive SQL.Two-tier client-server applications using JDBC or ODBC,Three-tier web applications using Java servlets/JDBC orequivalent. Design of applications and user interfaces using these systems. Data analysis tools. Laboratory project involving building data backed applications withWeb or mobile app frontends.
4	**Texts/References**	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 6th Ed, McGraw Hill, 2010.

Semester VI						
S.No	**Course code**	**Course name**	**L**	**T**	**P**	**C**
1	CS 348	Computer networks	3	0	0	6
2	CS 323	Compilers	3	0	0	6
3	CS 316	Compilers lab	0	0	3	3
4	CS 315	Computer networks lab	0	0	3	3
5		HSS Elective II*	3	0	0	6
6	CE 301	Environmental studies	3	0	0	6
7		Elective III / R&D I/II#	3	0	0	6
Total credits						**36**

1	**Title of the course** (L-T-P-C)	**Computer Networks** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	Design of Computer Networking protocols at all layers: transmission media, data link protocols, media access control, routing and congestion control, admission control, traffic shaping and policing, Internet working (IP) and transport layer protocols (TCP). Performance analysis of networks.
4	**Texts/References**	1. Data and Computer Communications, 6th edition, by W. Stallings, Prentice Hall, 2000. 2. Computer Networks, 4th edition, by A. S. Tannenbaum, Prentice Hall, 2003. 3. Data Communications, Computer Networks and Open Systems, 4th edition, by F. Halsall, Addison-Wesley, 1996. 4. High Performance Communication Networks, by Walrand and Varaiya, Morgan Kaufman, 1996. 5. Internet working with TCP/IP: Principles, Protocols, Architecture, 3rd edition, by D. E. Comer, Prentice Hall, 1996. 6. TCP/IP Illustrated Vol. I, by W. R. Stevens, Addison Wesley, 1994.

1	**Title of the course** (L-T-P-C)	**Compilers** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Exposure to Data Structures and Algorithms, Computer Architecture, Automata Theory
3	**Course content**	The compiled and interpreted execution models. Lexical analysis and parsing using lex and yacc. LR parsers, Scope and visibility analysis. Data layout and lifetime management of data. Runtime environment. Dynamic memory allocation and Garbage collection. Translation of expressions, control structures, and functions. Code generation and introduction to optimizations (local and global). Lattice Theory, Optimizations- dataflow, control flow, reaching definition, liveness analysis, code transformation-tiling, fusion.
4	**Texts/References**	1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D.Ullman: Compilers: Principles, Techniques, and Tools, 2/E, AddisonWesley 2007. 2. Andrew Appel: Modern Compiler Implementation in C/ML/Java, Cambridge University Press, 2004 3. Dick Grune, Henri E. Bal, Cerial J.H. Jacobs and Koen G. Langendoen: Modern Compiler Design, John Wiley & Sons, Inc. 2000. 4. Michael L. Scott: Programming Language Pragmatics, Morgan Kaufman Publishers, 2006. 5. Fisher and LeBlanc: Crafting a Compiler inC.

1	**Title of the course** (L-T-P-C)	**Compilers Lab** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	Exposure to Data Structures and Algorithms, Computer Architecture, Automata Theory, and a programming language such as C/C++/Java.
3	**Course content**	Design and implementation of a scanner using scanner generator. Design and implementation of a parser using parser generator. Symbol table generation, Semantic actions for expressions, control structures, and functions. Implementing liveness analysis and applying it to register allocation.
4	**Texts/References**	1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D.Ullman: Compilers: Principles, Techniques, and Tools, 2/E, AddisonWesley 2007. 2. Andrew Appel: Modern Compiler Implementation in C/ML/Java, Cambridge University Press, 2004 3. Dick Grune, Henri E. Bal, Cerial J.H. Jacobs and Koen G. Langendoen: Modern Compiler Design, John Wiley & Sons, Inc. 2000. 4. Michael L. Scott: Programming Language Pragmatics, Morgan Kaufman Publishers, 2006. 5. Fisher and LeBlanc: Crafting a Compiler in C.

1	**Title of the course** (L-T-P-C)	**Computer Networks Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	Experiments to support study of the Internet protocol stack: (a) Experimental study of application protocols such as HTTP, FTP, SMTP, using network packet sniffers and analyzers such as Ethereal. Small exercises in socket programming in C/C++/Java. (b) Experiments with packet sniffers to study the TCP protocol. Using OS (netstat, etc) tools to understand TCP protocol FSM, retransmission timer behavior, congestion control behaviour. (c) Introduction to ns2 (network simulator) - small simulation exercises to study TCP behavior under different scenarios. (d) Setting up a small IP network - configure interfaces, IP addresses and routing protocols to set up a small IP network. Study dynamic behaviour using packet sniffers (e) Experiments with ns2 to study behaviour (especially performance of) link layer protocols such as Ethernet and 802.11 wireless LAN.
4	**Texts/References**	Nil

1	**Title of the course** (L-T-P-C)	**Environmental studies** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	Module A: Natural Resources, Ecosystems, Biodiversity and its conservation: Natural resources and ecosystems, Forest, grassland, desert and aquatic ecosystems, biodiversity at global, national and local levels, conservation of biodiversity Module B: Air Pollution Introduction to understanding air quality management, fundamental processes of meteorology, Air Pollutants – Gaseous and particulate, Criteria for pollutants, ambient and source standards, Aerosols: Characterisation of aerosols, size distributions, measurement methods; Transport behaviour: diffusion, sedimentation, inertia; Visibility; principles of particulate control systems. Module C: Water Treatment Discussion of water quality constituents and introduction to the design and operation of water and wastewater treatment processes. Module D: Solid Waste Management and Climate Change Different aspects of solid and hazardous waste management. Climate change and greenhouse gas emissions, technologies would reduce the greenhouse gas emissions. Climate change and its possible causes. Module E: Sociology/Environmentalism Description: Environmentalism in sociological tradition, Sustainability, North-South divide, Political economy approaches in environmental studies, Debates over environmental issues Module F: Economics Energy economics and financial markets, Market dynamics, Energy derivatives, Energy Efficiency; Sustainable Development: Concept, Measurement & Strategies, Interaction between Economic Development and the Environment Module G: Philosophy Environmental ethics, Deep ecology, Practical ecology, Religion and attitude towards environmental ethics, Ecofeminism and its evolution. Module H: Field work and project: visit to a local area to document environmental assets, case studies of a simple ecosystem and group discussions on current environmental issues.
4	**Texts/References**	1) Cunningham W.P. and Cunningham M.A. (2002), Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi. 2) Dasgupta, P. and Maler, G. (eds.), (1997), The Environment and Emerging Development Issues, Vol. I, Oxford University Press, New Delhi. 3) Jackson, A.R.W. and Jackson, J.M. (1996), Environmental Sciences: The Environment and Human Impact, Longman Publishers. 4) Nathanson, J.A., (2002), Basic Environmental Technology, Prentice Hall of India, New Delhi. 5) Redclift, M. and Woodgate, G. (eds.), (1997), International Handbook of Environmental Sociology. 6)Srivastava, K.P. (2002), An Introduction to Environmental Study, Kalyani Publishers, Ludhiana. 7) Review articles from literature

Semester VII						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1		Elective IV				6
2		Elective V				6
3		Elective VI				6
		Elective VII / BTP#				6
Total credits						**24**

Semester VIII						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1		Elective VIII				6
2		Elective IX				6
3		Elective X/ BTP#				6
Total credits						**18**