B. Tech Course Curriculum and Syllabus (First year, 2018-2022 Batch):

Common Course Structure for Computer Science and Engineering (CSE), Electronics and Communication (ECE) and Mechatronics Engineering (MeE) up to second semester:

Course Code	Course name	L	T	P	C	Year	Semester
MA101	Engineering Mathematics I	3	1	0	8	1	1
CS101	Computer Programming	3	0	0	6		
CS110	Computer Programming LAB	0	0	3	3		
HS103	Communication Skills	2	1	0	6		
EC102	Basic Electrical Engineering	3	1	0	8		
EM101	Engineering Mechanics	3	1	0	8		
EM111	Engineering Graphics	1	0	3	5		
	NCC/NSS/NSO						
MA102	Engineering Mathematics II	3	1	0	8	1	2
CS103	Data Structures	3	0	0	6		
EC103	Basic Electronics	3	0	0	6		
CS111	Data Structures LAB	0	0	3	3		
EC111	Basic Electronics LAB	0	0	3	3		
BT101	Engineering Biology	3	1	0	8		
HS102	Applied Economics	3	0	0	6		
CS113	IT Workshop	0	0	3	3		
	NCC/NSS/NSO						

Course Code	Course name	L	T	P	C	Year	Semester
MA101	Engineering Mathematics I	3	1	0	8	1st	1st

Linear Algebra: Systems of linear equations and their solutions; vector space R^n and its subspaces; spanning set and linear independence; matrices, inverse and determinant; range space and rank, null space and nullity, eigenvalues and eigenvectors; diagonalization of matrices; similarity; inner product, Gram-Schmidt process; vector spaces (over the field of real and complex numbers), linear transformations.

Single Variable Calculus: Convergence of sequences and series of real numbers; continuity of functions; differentiability, Rolle's theorem, mean value theorem, Taylor's theorem; power series; Riemann integration, fundamental theorem of calculus, improper integrals; application to length, area, volume and surface area of revolution.

Text	Reference
1) D. Poole, Linear Algebra: A Modern Introduction, 4th Edition, Brooks Cole, 2014. 2) S. R. Ghorpade and B. V. Limaye, A Course in Calculus and Real Analysis, 1st Edition, Springer India, 2006.	1) G. Strang, Linear Algebra and Its Applications, 4th Edition, Brooks Cole, 2006. 2) R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 4th Edition, Wiley India, 2011.

Course Code	Course name	L	T	P	C	Year	Semester
CS101	Computer Programming	3	0	0	6	1st	1st

Procedural programming through Language ‘C’: Basic Syntax and Semantics; Variables; Types; Expressions; Assignment statements; Conditional and Iterative Control Structures; Simple I/O; Functions and parameter passing; Strings and string processing; Pointers and References; Structures; Recursion.

Algorithm development: Techniques of problem solving; Stepwise Refinement; Simple numerical examples; algorithms for searching and sorting; merging order lists. Examples taken from real-world applications involving data manipulation.

Text	Reference
Byron Gottfried, Programming with C, 3rd edition, McGraw Hill, 2010.	1) Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, 2nd edition, Universities Press, 2011. 2) Kernighan and Ritchie, The C Programming Language, 2nd edition, PHI, 2012.

Course Code	Course name	L	T	P	C	Year	Semester
CS110	Computer Programming LAB	0	0	3	3	1st	1st

Programming assignments: Basic Assignment Statement; Conditional and Iterative Control Structures; Some Numerical Examples; Functions and parameter passing; Array and String; Pointer; Structure; Recursion; Dynamic Memory Allocation; File Handling; Linked List; Sorting; Command Line Arguments.

Text	Reference
Byron Gottfried, Programming with C, 3rd edition, McGraw Hill, 2010.	3) Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, 2nd edition, Universities Press, 2011. 4) Kernighan and Ritchie, The C Programming Language, 2nd edition, PHI, 2012.

Course Code	Course name	L	T	P	C	Year	Semester
HS103	Communication Skills	2	1	0	6	1st	1st

Listening – Listening comprehension. Listen to various types of spoken discourses understand, analyse and apply the same. Listen and comprehend lectures and speeches.
Speaking – Organization, articulation and correctness. Speak with confidence and present a point of view. Speak coherently and fluently on a given topic.
Reading – Comprehend and critically read the text. Read a given text at a reasonable speed.
Writing – Memos, letters, reports, reviews and writing fluently and coherently on a given topic. Write various types of tasks; short and long.
Presentation Skills – Oral presentation using Powerpoint.
Study Skills – Dictionary, thesaurus & reference
Structure of English – Remedial grammar/ Grammar for Communication

Text/Reference

1) Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
2) Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi. 2001.
3) Martin Hewings , Advanced English Grammar, Cambridge University Press,2007
4) Leech, Geoffrey & Jan Svartvik, A Communicative Grammar of English, Longman,2003

Course Code	Course name	L	T	P	C	Year	Semester
EC102	Basic Electrical Engineering	3	1	0	8	1st	1st

Basic components of electric circuits: charge, current, voltage and power, voltage and current sources, Ohm's law;

Voltage and current laws: nodes, paths, loops and branches, Kirchhoff's current law, Kirchhoff's voltage law, dependent and independent sources, voltage and current division;

Basic nodal and mesh analysis: nodal analysis, supernode, mesh analysis, supermesh;

Network theorems: linearity and superposition, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer;

RL and RC circuits: source-free RL circuit, source-free RC circuit, unit-step function, driven RL circuits, natural and forced response, driven RC circuits;

RLC circuit: source-free parallel circuit, overdamped parallel RLC circuit, critical damping, underdamped parallel RLC circuit, source-free series RLC circuit, complete response of the RLC circuit;

Sinusoidal steady-state analysis: forced response to sinusoidal functions, complex forcing function, phasor, phasor relationship for R, L and C, impedance, admittance, phasor diagrams, instantaneous power, average power, apparent power and power factor, complex power;

Polyphase circuits: polyphase systems, single-phase three-wire systems, three-phase Y-Y connection, delta connection, power measurement in three-phase systems; Magnetically coupled circuits: mutual inductance, energy considerations, linear transformer, ideal transformer;

Frequency response: parallel and series resonance, Bode plots, Filters;

Two-port networks: one-port networks, admittance parameters, impedance parameters, hybrid parameters, transmission parameters.

Text	Reference
W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, 7th / 8th edition, Tata-McGraw-Hill Publishing Company Limited, 2010/ 2012.	1) Bruce Carlson, Circuits: Engineering Concepts and Analysis of Linear Electric Circuits, 2nd Reprint, Thomson Asia Pvt. Ltd., 2006. 2) R. A. De Carlo and P. M. Lin, Linear Circuit Analysis, 2nd edition, Oxford University Press, 2001. 3) Nagrath I.J. and D. P. Kothari, Basic Electrical Engineering, 3rd edition, Tata McGraw Hill, 2009. 4) Ae Fitzgerald David E Higginbotham Arvin Grabel , Basic Electrical Engineering, 5th edition, Tata McGraw Hill Publishing Co Ltd., 2009.

Course Code	Course name	L	T	P	C	Year	Semester
EM101	Engineering Mechanics	3	1	0	8	1st	1st

Equivalent force systems; free-body diagrams; degrees of freedom; equilibrium equations; analysis of determinate trusses and frames; properties of surfaces – friction. Moment of Inertia; Virtual work principal; Particle Dynamics: equations of motion; work-energy and impulse-momentum principles; Generalized coordinates; Lagrangian mechanics. Rigid body dynamics: plane kinematics and kinetics of rigid bodies including work-energy and impulse-momentum principles; single degree of freedom rigid body systems.

Text	Reference
1) H. Shames, Engineering Mechanics: Statics and Dynamics, 4th Ed., PHI, 2002. 2) F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II - Dynamics, 3rd Ed., Tata McGraw Hill, 2000. 3) J. L. Meriam and L. G. Kraige, Engineering Mechanics, Vol I - Statics, Vol II - Dynamics, 5th Ed., John Wiley, 2002. 4) R. C. Hibbler, Engineering Mechanics, Vols. I and II, Pearson Press, 2002	1) Engineering Mechanics Paperback – 1 Jul 2017; S. Timoshenko, D.H. Young, J.V. Rao, SukumarPati

Course Code	Course name	L	T	P	C	Year	Semester
EM111	Engineering Graphics	1	0	3	5	1st	1st

Conventions and standards: ISO; Scales; Curves; Orthographic projections: points, lines, planes and solids; Sections of solids; Isometric projections; Development of surfaces; Intersection of solids. Computer Aided Drawing.

Text	Reference
1) N D Bhatt and V M Panchal, Engineering Drawing, 43rd Ed., Charator Publishing House,2001 2) M B Shah and B C Rana, Engineering Drawing, 2nd Ed., Pearson Education, 2009	1) T E French, C J Vierck and R J Foster, Graphic Science and Design, 4th Ed., McGraw Hill, 1984. 2) W J Luzadder and J M Duff, Fundamentals of Engineering Drawing, 11th Ed., PHI,1995 3) K Venugopal, Engineering Drawing and Graphics, 3rd Ed., New Age International,1998

Course Code	Course name	L	T	P	C	Year	Semester
MA102	Engineering Mathematics II	3	1	0	8	1st	2nd

Multivariable Calculus: Vector functions of one variable – continuity, differentiation and integration; functions of several variables - continuity, partial derivatives, directional derivatives, gradient, differentiability, chain rule; tangent planes and normals, maxima and minima, Lagrange multiplier method; repeated and multiple integrals with applications to volume, surface area, moments of inertia, change of variables; vector fields, line and surface integrals; Green's, Gauss' and Stokes' theorems and their applications.

Ordinary Differential Equation: First order differential equations - exact differential equations, integrating factors, Bernoulli equations, existence and uniqueness theorem, applications; higher-order linear differential equations - solutions of homogeneous and non-homogeneous equations, method of variation of parameters, series solutions of linear differential equations, Legendre equation and Legendre polynomials, Bessel equation and Bessel functions of first and second kinds.

Text	Reference
1) G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, 12th edition, Pearson Education India, 2010. 2) S. L. Ross, Differential Equations, 3rd edition, Wiley India, 2007.	1) H. Anton, I. C. Bivens and S. Davis, Calculus: Early Transcendentals, 11th edition, Wiley, 2016. 2) T. M. Apostol, Calculus, Volume 2, 2nd edition, Wiley India, 2007. 3) W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 10th edition, Wiley India, 2012.

Course Code	Course name	L	T	P	C	Year	Semester
CS103	Data Structures	3	0	0	6	1st	2nd

Performance of algorithms: space and time complexity, asymptotics; Fundamental Data structures: linked lists, arrays, matrices, stacks, queues, binary trees, tree traversals; Algorithms for sorting and searching: linear search, binary search, insertion-sort, selection sort, bubble-sort, quicksort, mergesort, heapsort; Priority Queues: lists, heaps; Graphs: representations, depth first search, breadth first search; Hashing: separate chaining, linear probing, quadratic probing; Search Trees: binary search trees, B-trees.

Text	Reference
M. A. Weiss, Data Structures and Problem Solving C++, 3rd edition, Pearson, 2014.	1) M. Tannenbaum, Y. Langsam and M. J. Augenstein, Data Structures Using C++, 2nd edition, Prentice Hall India, 2007. 2) H. Aho, J. E. Hopcroft and J. Ullman, Data Structures and Algorithms,1st edition, Addison-Wesley, 2002. 3) Robert Sedgewick, Algorithms in C++ Parts 1-4, 3rd edition, Pearson Education, 1998. 4) Robert Sedgewick, Algorithms in C++ Part 5, 3rd edition, Pearson Education, 2002. 5) Seymour Lipschutz, Data Structures with C, SCHAUM SERIES, 1st edition, Tata McGraw-Hill, 2010.

Course Code	Course name	L	T	P	C	Year	Semester
EC103	Basic Electronics	3	0	0	6	1st	2nd

DC power supply: Diode characteristics, half-wave and full wave rectifiers, shunt capacitor filter, voltage regulator, regulated DC power supply.

Amplifier: Amplifier parameters, controlled source models, classification, the operational amplifier (OP-AMP) as a linear active device, the VCVS model of an op-amp, different amplifier configurations using op-amp, frequency response of op-amp and op-amp based amplifiers.

Filter: Concepts of low-pass, high-pass and band-pass filters, ideal (brick-wall) filter response, frequency response of simple RC filters, active RC filters using Op-amp.

Oscillator: Effects of negative and positive feedback of an amplifier, condition of harmonic oscillation, RC and LC oscillator circuits.

Comparator: Op-amp as a comparator, digital inverters (TTL/CMOS) as comparators, comparator with hysteresis, Schmitt trigger using Op-amp, 555 timer as a two dimensional comparator.

Waveform generators: Concept of bistable, monostable and astable circuits, timer and relaxation oscillator based on comparator and RC timing circuit, square wave generator using 555 timer, crystal clock generator.

Analog-Digital conversion: Digital to Analog Converter (DAC) using binary resistor scheme, R-2R ladder DAC, DAC using switched current resources, Analog to Digital converter (ADC) using capacitor charge/discharge: single-slope and dual-slope ADCs, ADC using counter and DAC, ADC using successive approximation.

Text/Reference

Adel S. Sedra, Kenneth C. Smith & Arun N. Chandorkar, Microelectronic Circuits, International Version 6th Edition, Oxford University Press India, 2013.

Course Code	Course name	L	T	P	C	Year	Semester
CS111	Data Structures LAB	0	0	3	3	1st	2nd

Programming assignments using C Programming Language: Implementation of linked lists, stacks, queues, binary trees, tree traversals.
Implementation of algorithms for sorting: Insertion-sort, selection sort, bubble-sort, quicksort, mergesort, heapsort,; Implementation of algorithms for searching: linear search, binary search.
Assignments on Priority Queues: lists, heaps; Graphs: representations, depth first search, breadth first search; Hashing: separate chaining, linear probing, and quadratic probing.
Assignments on search Trees: binary search trees, B-trees;

Text	Reference
M. A. Weiss, Data Structures and Problem Solving C++, 3rd edition, Pearson, 2014.	6) M. Tannenbaum, Y. Langsam and M. J. Augenstein, Data Structures Using C++, 2nd edition, Prentice Hall India, 2007. 7) H. Aho, J. E. Hopcroft and J. Ullman, Data Structures and Algorithms,1st edition, Addison-Wesley, 2002. 8) Robert Sedgewick, Algorithms in C++ Parts 1-4, 3rd edition, Pearson Education, 1998. 9) Robert Sedgewick, Algorithms in C++ Part 5, 3rd edition, Pearson Education, 2002. 10) Seymour Lipschutz, Data Structures with C, SCHAUM SERIES, 1st edition, Tata McGraw-Hill, 2010.

Course Code	Course name	L	T	P	C	Year	Semester
EC111	Basic Electronics LAB	0	0	3	3	1st	2nd

Experiments using diodes: diode characteristics, design and analysis of half-wave and full-wave rectifier circuits without and with filter, clipping circuits, clamper circuits, experiments using operational amplifier: inverting amplifier, non-inverting amplifier, voltage follower, integrator, differentiator, comparators, Multivibrators, Wien's Bridge Oscillator, first-order filters, D/A and A/D converters.

Text/Reference

Adel S. Sedra, Kenneth C. Smith & Arun N. Chandorkar, Microelectronic Circuits, International Version 6th Edition, Oxford University Press India, 2013.

Course Code	Course name	L	T	P	C	Year	Semester
BT101	Engineering Biology	3	0	0	6	1st	2nd

Introduction to basic biology: Diversity in the biological systems, Cell biology and cell structure, Macromolecular biochemistry and biophysics, Molecular biology and Basic human genetics, Human physiology: levels of organisation and different physiological systems, Computational biology and bioinformatics, Bioprocess engineering, Medical and industrial applications

Text	Reference
1) Nelson, D.L., Lehninger, A.L. and Cox, M.M., 2008. Lehninger principles of biochemistry. Macmillan. 2) Jain, J.L., 2004. Fundamentals of biochemistry. S. Chand. 3) Shuler ML and Kargi F., Bioprocess Engineering: Basic concepts, 2nd Edition, Prentice Hall, Engelwood Cliffs, 2002. 4) Krebs, J.E., Lewin, B., Goldstein, E.S. and Kilpatrick, S.T., 2014. Lewin's genes XI. Jones & Bartlett Publishers. 5) Prem S. Mann, Introductory Statistics, 6th Edition, Wiley, 2006. 6) Campbell and Heyer, Discovering Genomics, Proteomics, & Bioinformatics, 2nd Edition, Benjamin Cummings, 2002.	1) Karp, G., 1979. Cell biology (p. 644). New York. 2) Wilson, Keith, and Walker, John. Principles and techniques of biochemistry and molecular biology (6th Ed.). 3) Wayne W. Daniel, Biostatistics : A foundation for Analysis in the Health Sciences, 8th Edition, Wiley, 2004. 4) Stanbury RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1997.

Course Code	Course name	L	T	P	C	Year	Semester
HS102	Applied Economics	3	0	0	6	1st	2nd

Definition of economics, subject matter, scope and nature of economics; Microeconomic theory: consumer behaviour: preference, utility, indifference curve and its properties, income and prices, budget line; Derivation of demand: effects of price and income, demand elasticities, income and substitution effects, consumer's surplus; Production: output and inputs, short run and long run, law of variable proportions, returns to scale, different costs and revenues, profit maximisation and supply function, supply elasticities, opportunity cost; Markets: perfect competition, monopoly; Macroeconomic theory: national income: different aggregative concepts, methods of estimation of national income, circular flow of income; Money: definition and its function; Banking: role of central and commercial banks, money creation; Public finance: public vs. private finance, public revenue and expenditure, taxes- direct and indirect, progressive and regressive; Policy implications.

Text	Reference
P. A. Samuelson and W. D. Nordhaus, Economics, 19th edition, McGraw Hill Inc., 2010.	1) R. S. Pindyck, D. L. Rubinfeld and P. L. Mehta, Microeconomics, 7th edition, Pearson Education, 2009. 2) N. G. Mankiw, Principles of Macroeconomics, 6th edition, South-Western Cengage Learning, 2011. 3) S. B.Gupta, Monetary Economics: Institutions, theory and policy, 1st edition, S. Chand & Co. Ltd., 2010

Course Code	Course name	L	T	P	C	Year	Semester
CS113	IT Workshop	0	0	3	3	1st	2nd

Linux Operating System: Overview of Linux System and basic commands, Basic Linux Administration, Linux File System; Shell Programming Using Bash; Introduction to Web Development: HTML Basics, Cascading Style Sheet (CSS), JavaScript, Basics of HTML5 elements, Basic introduction to XML, Basic introduction to PHP.

Text

1) Das, Sumitabha. UNIX System V. 4: Concepts and Applications. Tata McGraw-Hill, 4th Edition, 2006.
2) Jennifer Niederst Robbins. Learning Web design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics. " O'Reilly Media, Inc.", 4th Edition, 2012.
3) Kogent Learning Solutions, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book, Dreamtech Press, 1st edition, 2012