B.Tech – Electrical Engineering (EE) Curriculum

Institute Core Courses
Semester I

Course code	L-T-P-C	Course Name
MTH 101	3-1-0-4	Calculus
PH 101	3-0-0-3	Quantum Physics and Application
CS 101	3-0-2-4	Introduction to Computing
CH 101	1-1-0-2	Physical Chemistry
CH 102	1-1-0-2	Inorganic and Organic Chemistry
CH 104	0-0-3-2	Chemistry Lab II
HS 101	3-0-0-3	Foundation Programme in Humanities and Social Sciences
XX 100	1-0-0-1	Introduction to Profession
NO 101	0-0-0-P/NP	National Sports Organization

Total Credits 21

Semester II

Course code	L-T-P-C	Course Name
MTH 1021	3-1-0-2	Basic Linear Algebra
MTH 1022	3-1-0-2	Ordinary Differential Equations
PH 102	3-0-0-3	Electricity and Magnetism
PH 103	0-0-3-2	Physics Lab
EE 101	3-1-0-4	Introduction to Electrical and Electronics Engineering
BIO 101	3-0-0-3	Introductory Biology
ME 101	0-0-3-2	Introduction to Manufacturing
ME 102	1-0-3-2	Engineering Graphics and Introduction to Computer-Aided-Drawing
NO 102	0-0-0-0-P/NP	National Sports Organization
XX XXX	3-0-0-3	Department Introductory Core Course

Total Credits 23

Course Description

MTH 101 Calculus 3-1-0-4

Objective:
This is a first course in calculus for Science and Engineering students. This course aims to provide a good understanding of the basic concepts of functions, limit, convergence, continuity, differentiation, and integration in one and several variables. It would provide a sufficient background of calculus to support their concurrent and subsequent Engineering studies.

Contents:
Univariate Calculus:

- Real number system: Completeness axiom, density of rationals (irrationals) in real number field.
- Sequences: Limits and convergence of sequences, Sandwich theorem, Monotone sequences, Subsequence, Bolzano-Weierstrass Theorem, Cauchy Convergence Criterion.
- Limits, continuity, and differentiability of functions: Intermediate value theorem, extreme value theorem, chain rule, Rolle's theorem, mean value theorem, Taylor's theorem, maxima and minima.
- Integrability of functions: Riemann integrals, Fundamental theorem of calculus, improper integrals, applications to area and volume. Series: Convergence of a series, power series.

Multivariate Calculus:

- Review of vector algebra: Euclidean space .
- Limits, continuity, partial derivatives, gradient and directional derivatives, (total) derivative, chain rule, maxima and minima, Lagrange multipliers.
- Integrability: Double and triple integrals, Fubini's theorem, 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.

Reference Textbooks:

1. Hughes-Hallett et al. - Calculus - Single and Multivariable, John-Wiley and Sons.
2. James Stewart - Calculus, Thomson.
3. T. M. Apostol - Calculus, Volumes 1 and 2, Wiley Eastern.
4. G. B. Thomas and R. L. Finney - Calculus and Analytic Geometry, Addison-Wesley.

PH 101 Quantum Physics and Application 3-0-0-3

Objective: Exposure towards "Quantum Mechanics and Quantum Statistics" to understand the behavior and dynamics of the subatomic level particles…

Contents:
Part A

- Frame of Reference and limitation of classical physics.
- Galilean and Lorentz transformation, Consequences of Lorentz Transformation.
- Minkowski space time viewpoints and four vectors.
- Energy momentum conservation in four vector notation.

Part B:

- Review of quantum concepts, Bohr model, Black body radiation. 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, Application of Uncertainty principles in physical problems.
- Failures of classical wave and Newtonian dynamics.
- An elementary introduction to the classical Lagrangian and Hamiltonian dynamics formulation, and connection to the quantum version.
- Introduction of Schrödinger Equation. Physical interpretation of wave function, Born interpretation, Elementary idea of operators (Hermitian), expectation value, eigen-value problem and commutators. Solution of Schrödinger equations for simple boundary value problems.
- Reflection and transmission coefficients, quantum tunneling problem with examples, Particle in a three dimensional box, and concept of degenerate states. Concept of stationary states.
- An introduction to the identical quantum particles, boson and fermion. Exposure to Harmonic Oscillator and Hydrogen Atom problem (without deriving the general solution).
- Quantum Statistics: Concept of micro, macro states and phase space. Ergodic hypothesis and postulates of equal priori probability.
- Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics by detailed balance arguments and particles distribution probability.
- Density of states. applications of B-E statistics: Lasers. Bose-Einstein Condensation.
- Applications of F-D statistics: free electron model of metals.
- Concept of Fermi energy.
- Application of potential well problem in solid state physics: elementary ideas of band theory of solids, band gap.
- Exposure to semiconductors, Superconductors.

Reference Textbooks:

1. Introduction to the Special Theory of Relativity: R. Resnick, John Wiley 2003.
2. Basic Concepts in Relativity and Early Quantum Theory: R. Resnick and D. Halliday, John Wiley 1985.
3. Special Relativity: A. P. French, W. W Norton & Co. Inc. MIT Introductory Physics Series, 1968.

4. Classical Mechanics: H. Goldstein, Pearson, 2014, 3rd Edition.
5. Quantum Physics: R Eisberg and R. Resnick, John Wiley 2002, 2nd Edition.
6. Modern Physics: K. S. Krane, John Wiley 1998, 2nd Edition.
7. Concept of Modern Physics: A. Baiser, Tata McGraw Hill, 2009.
8. Lectures on Physics: R. P. Feynman Lecture Series, vol. III, Pearson Education, 2006.
9. Quantum Mechanics: B. H. Bransden and C. J. Joachain, Prentice Hall India, 2000, 2nd Edition.
10. Introduction to Quantum Mechanics: D. J Griffith, Prentice Hall India, 2011, 2nd Edition.
11. Quantum Mechanics Theory and Application: A. K. Ghatak and S. Loanathan, Macmillan India, 2005, 5th Edition.
12. Quantum Mechanics concept and application: N. Zettili, Wiley, 2009, 2nd Edition.
13. Quantum Physics: S. Gasiorowicz, John Wiley 2003, 3rd Edition.
14. Introduction to the Statistical Mechanics: B. B Laud, Macmillan India, 1981.
15. Statistical Mechanics: R. K. Pathria, Butterworth-Heinemann, 1996, 2nd Edition.
16. Introduction to Solid State Physics: C. Kittel, Wiley India, 2007, 7th Edition.
17. Lasers, Fundamentals and Applications: K. Thyagarajan and A. K. Ghatak, Springer, 2010, 2nd Edition.

CS 101 Introduction to Computing 3-0-2-4

Objective: The student should be able to write reasonably complex programs involving sorting, searching, file operations, etc. in a procedural and object oriented way.

Contents:

- Problem solving step-by-step, notion of algorithm
- Introduction to Python language
- Variables and types, arithmetic and Boolean expressions, comparison operators
- Control structures – if, if else, if elif else, while, while else
- Functions, passing arguments, recursion, default arguments
- Turtle graphics
- Lists, tuples, operations on lists and tuples
- Strings, string operations, split and join on strings
- Sorting, bubble sort, selection sort, binary search
- Higher order list operations – map, filter, reduce, zip
- Files, file operations – read, write, seek, tell
- Dictionaries, dictionary operations
- Classes and objects, object constructors, object and class variables, dunder functions
- Classes case study – matrices, polynomials, complex numbers, linked lists, trees
- Number systems, decimal, octal, hexadecimal, binary, conversions between number systems, adding, subtracting, multiplying, one's complement, two's complement, bit operations
- GUI using tkinter, buttons, labels, entry widgets, layout using place, grid and pack

Suggested Textbook:

1. How to Think like a Computer Scientist, Allen B. Downey, 2002

Reference Textbook:

1. Think Python: An Introduction to Software Design, A. B. Downey, 2012

HS 101 Foundation Programme in Humanities and Social Sciences 3-0-0-3

Objective: This programme would cover a variety of activities and expose students to various fields in Humanities and Social Sciences as well as interdisciplinary areas of study. These would range from Literature Appreciation, Painting, Cinema Study, and Music to Architecture, Aesthetics, History of Culture, Cognition, Language and Culture, Environment, Ethics, Psychology, Leadership, communication, community service and many more. The Programme aims to instil in students Leadership, creativity, Value judgement and Ethics, Respect for diversity-social, environmental, political etc. Along with a better understanding of national and international issues and responsibility towards welfare of our people and environment

Contents:

- Leadership, Communication, and Teamwork- To help students develop effective communication, learn team building and teamwork, so that they can take up the leadership roles in future.
- Values and Ethics- To instil the sense of ethics in work and life.
- Art and creativity- To help students recognise and channelize the inner creativity they possess. To appreciate and understand art and evolution of human civilisation.
- Understanding culture and diversity- To help students recognise and understand diversity in culture, societies, environment, ability etc. in the process making them sensitive and appreciative of these differences.
- Humanities and Social Sciences-Perspectives - Special lectures and workshops by eminent scholars in the field of Humanities, Social Sciences, and Arts to familiarise students with these fields and expand their understanding of the world around.

CH 101 Physical Chemistry 1-1-0-2

Objective: The course introduces modern aspects of Chemistry to the undergraduate students of IIT Goa. The aim of the course is to inculcate scientific aptitude in the learners. The course introduces them on how to approach a given problem by different means, e.g. solving ab initio, taking tools from an already solved but unrelated problem. Then it teaches the students to apply them to get a better insight. In order to achieve this, the course uses principles and applications of Quantum Chemistry.

Contents:

- Dawn of quantum chemistry, Schrodinger equation, Origin of quantization, Born interpretation of wave function.
- Particle in a box, Hydrogen atom: solution to f-part, Atomic orbitals, many electron atoms and spin orbitals.
- Chemical bonding: MO theory: LCAO molecular orbitals, Structure, bonding and energy levels of diatomic molecules. Concepts of sp, sp2 and sp3 hybridization; Bonding and shape of many atom molecules. Origin of electronic transitions and its application to explain spectra of atoms, molecules and nanoparticles.

Suggested Textbooks:

1. P. Atkins and J. de Paula, Atkins. Physical Chemistry, Oxford University Press, 8th edition, 2006.
2. I. N. Levine, Physical Chemistry, 5th edition, Tata McGraw-Hill, New Delhi, 2002.
3. D. A. McQuarrie and J.D. Simon, Physical Chemistry - a molecular approach, Viva Books Pvt. Ltd. (1998)

CH 102 Inorganic and Organic Chemistry 1-1-0-2

Objective: Inorganic and Organic Chemistry: This course is designed in such a way that it brings out the essence of inorganic and organic chemistry. While the inorganic chemistry gives a molecular-level understanding of our surroundings by laying emphasis on elemental properties and gives a snapshot of inorganic chemistry in our daily life, the organic chemistry contents introduce the student to universal concepts associated with chemistry like stability and reactivity of molecules with an emphasis on implications at higher levels of molecular arrangements. These concepts are extremely useful for different fields of engineering.

Contents:

Inorganic Chemistry:

- Periodic trends and general concepts of coordination chemistry
- Structure and bonding: Valence bond theory, crystal field theory, ligand field theory. Application on magnetism and color of the complexes.
- Catalysis: 18 electron rule, general concept of catalysis, hydrogenation, hydroformylation and alkene metathesis reaction.
- Bioinorganic chemistry: Transport and storage protein, Inorganic medicinal chemistry

Organic Chemistry

- Qualitative Hückel MOs of conjugated polyenes: Acyclic and Cyclic, MO basis of Aromaticity.
- Configuration, molecular chirality and isomerism, Conformations of alkanes and cycloalkanes and its effect on reactivity and selectivity.
- Reactivity of carbonyl group: Nucleophilic Addition, Enolate Chemistry.
- Introduction to Asymmetric Synthesis, Small Organic Molecules as Bioactive Molecules.

Suggested Textbooks:

1. T. W. G. Solomons, C. B. Fryhle, Organic Chemistry, 9th Edition, WilelyIndia Pvt. Ltd., 2009
2. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th edition, Pearson Com., 1992
3. M. J. Sienko and R. A. Plane, Chemical Principles and Applications, McGraw Hill, 1980.
4. J. D. Lee, Concise Inorganic Chemistry, 4th Edition, ELBS, 1991.
5. D. D. Ebbing, General Chemistry, Houghton Miffin Co., 1984.

CH 104 Chemistry Lab II 0-0-3-2

Objective: This is an experimental chemistry lab course which will be conducted using our daily life utensils/substances at home. It will offer the students an alternate option of experiencing the experiments in the chemistry lab while staying at home. In addition, the students will feel the presence of chemistry and its action in our daily life.

Contents:

Experiment 1: Acid and Bases; Experiment 2: Paper Chromatography; Experiment 3: Absorption and reflection of light, Experiment 4: Emission of light; Experiment 5: Electrochemistry; Experiment 6: Understanding periodic properties; Experiment 7: Visualising atomic orbitals: The atomic orbitals of hydrogenic atom; Experiment 8: The molecular orbitals of diatomic molecules; Experiment 9: Ionic Reactions; Experiment 10: Crystallization.

Text book(s):
1. Vogel's Textbook of Practical Organic Chemistry, A. I. Vogel, A. R. Tatchell, B. S. Furnis, A. J. Hannaford and P. W. G. Smith, Prentice Hall; 5th edition (1989).
2. Concise Inorganic Chemistry, J. D. Lee, Oxford University Press; 5th edition (2008).
3. Physical Chemistry, P. Atkins and J. de Paula, Oxford University Press; 10th edition (2014).

Reference(s):
1. https://www.webmo.net/demo/
2. http://csi.chemie.tu-darmstadt.de/ak/immel/script/redirect.cgi?filename=http://csi.chemie.tu-darmstadt.de/ak/immel/tutorials/orbitals/
3. Additional references will be provided in the manual.

ME 101 Introduction to Manufacturing Technology 0-0-3-2

Objective: To help students acquire skills in basic engineering practice and to introduce them to basic machining techniques.

Contents:

- Fundamentals of Safety in Manufacturing
- Introduction to marking and measurement devices
- Basic workshop practice: filing, saw cutting, bending, fitting
- Introduction to machine tools and its operations: lathe machine; turning, taper turning of Aluminum, Drilling, Milling
- End milling of Al plates
- Welding and Joining Techniques
- Soldering of electrical circuit, Shielded Metal Arc Welding of Steel Plates.

Suggested Textbooks:

1. W. A. J. Chapman, Workshop Technology- Part 1, Edward Arnold Ltd, (2001).
2. W. A. J. Chapman, Workshop Technology- Part 2, Edward Arnold Ltd, (2007).

Reference Textbooks:

1. Serope Kalpakjian , Steven R. Schmid., Manufacturing Engineering and Technology, Pearson Publication, (2016)

NO 101 National Sports organization (P/NP)

Objective: To instil the importance of a fit and healthy lifestyle.
Contents:

- All students get the opportunity to choose and signup for a sport and undergo training.
- There will be training 5 days a week for 45 minutes each.

MTH 1021 Basic Linear Algebra 3-1-0-2

Objective: This is a basic course on linear algebra which is useful in mathematics, statistics, natural sciences and various branches of engineering.
In the course, matrix will be introduced through the study of a system of linear equations. The students will be introduced to the concept of vector space and linear transformations and a fundamental result (called rank nullity theorem), relating the image and zero set of a linear transformation will be proven. Eigenvalues and eigenvectors will be studied and practical applications of eigenvalue and eigenvectors will be highlighted. Triangularization, diagonalization of a matrix and spectral theorem will be discussed.

Contents:

- System of Linear Equations
- Matrix and Determinant, Determinant and its Properties, Row operations and Column operations
- Vector Space, Row vectors and Column vectors
- Basis
- Linear combinations, Linear mappings, Rank of a matrix and its computation
- Row rank=Column rank of a matrix and the rank nullity theorem
- Solve a system of linear equations by using inverse matrix method
- Eigen vector, Eigen value
- Characteristic equation
- Cayley-Hamilton theorem, Orthogonal Matrix, Projection matrix, Orthogonal basis, Gram-Schmidt orthogonalization technique, Upper and Lower Triangulation, The spectral theorem.

Suggested Textbook:

1. S.K Mapa. Higher Algebra- Abstract and Linear Algebra.

Suggested Reference Textbooks:

1. Linear Algebra- A geometric approach- S Kumareasn
2. Linear Analysis- An introductory course - Bela Bollobas
3. Introduction to Linear Algebra- Gilbert Strang
4. Linear Algebra and its application- Gilbert Strang

MTH 1022 Ordinary Differential Equations 3-1-0-2

Objective:
This is a traditional course for the students pursuing careers in engineering and sciences. The main objective of this course is to expose the students with the basic concepts of Ordinary Differential Equations (ODEs) using their existing knowledge of Calculus and Linear Algebra and equip them with the tools to construct the solution of ordinary differential equations.

Contents:

- First order differential equations, Separable equations, Exact equations, Picard's existence and uniqueness theorem, solution set of linear first order ODE, second order ODE, linear independence and dependence of function and its relation with Wronskian, solution set of a linear ordinary differential equation.
- Methods of solving second order linear equations:-Method of reduction of order, Variation of Parameters, linear ODE with constant coefficients, Annihilator methods, Laplace transform and its applications.

Suggested Textbooks:

1. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
2. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005).
3. T. M. Apostol, Calculus, Volume 2 (2nd Edition), Wiley Eastern, 1980.
4. G. F. Simmons: Ordinary Differential Equations, Differential equations with applications and historical notes, 2nd Edition.
5. Earl A Coddington: An introduction to ordinary differential equations, (1990).

PH 102 Electricity and Magnetism 2-1-0-3

Objective: This course is designed to give a basic understanding of electromagnetic fields and their interactions with matter at both microscopic and macroscopic levels.

Content:

- Review of vector calculus, gradient, divergence, curl and Laplacian.
- Spherical polar and cylindrical coordinates, Stokes and divergence theorems.
- Coulomb's law and principle of superposition. Gauss law and its applications.
- Electric potential and electrostatic energy, Poisson's and Laplace's equations with examples, uniqueness theorem, boundary value problems, properties of conductors, method of images.
- Dielectrics- Polarization and bound charges, displacement vector, Gauss law in presence of dielectrics, boundary value problems with linear dielectrics, energy in dielectric systems.
- Lorentz force law, Magnetostatics- Biot & Savart's law, Ampere's law. Divergence and curl of magnetic field, vector potential and concept of gauge invariance.
- Magnetism in matter, bound volume and bound surface currents, Field H, classification of magnetic materials. Faraday's law in integral and differential form, motional emf, displacement current, Maxwell's equations, electromagnetic waves, wave equation, electromagnetic waves in vacuum and media, refractive index, energy and momentum of electromagnetic waves.
- Poynting vector, radiation pressure. Polarization of electromagnetic waves, Reflection and refraction, skin depth, standing electromagnetic waves, resonating cavity.
- Waveguides with rectangular metallic boundaries, TE, TM and TEM mode Electric dipole radiation, Larmor's formula.
- Qualitative ideas on radiation pattern, relativistic invariance of Maxwell's equation

Suggested Textbooks:

1. Introduction to Electrodynamics by D.J. Griffiths
2. Electricity and Magnetism by Mahajan and Rangwala
3. Electricity and Magnetism by Purcell (Berkeley Series)

PH 103 Physics Lab 0-0-3-2

Objective: This laboratory course is designed to give a hands-on experience to visualize/measure the physical phenomena/properties associated with light and matter.

Content/Experiments:

- Laser diffraction
- Thermal conductivity
- LCR bridge
- Determination of e/m of electron
- Grating Spectrometer
- Fresnel's Bi-prism
- Torque on a current loop
- Young's Modulus

Suggested References:

1. Lab Manual
2. Advanced Practical Physics, Worsnop and Flint

BIO 101 Introductory Biology 2-1-0-3

Objective: Nature gives us a glimpse of the most complicated engineering system ever designed. All engineers must be trained to appreciate the aspects of biology where concepts of various phenomena from different fields of engineering like mechanical, chemical, electrical engineering has played a role in understanding the underlying beauty of nature. It is also imperative to understand and address the question of where do we come from and where we are going. This is among the most crucial question which artificial intelligence thrives upon finds clues from concepts of evolution. The course encourages students to take inspiration from biology to address engineering problems.

Content:

- Need for biology
- Biomimicry
- Engineering solutions inspired from biology
- Origin of Life on Earth
- Evolution
- Mutations
- Kingdoms of life
- Cell Structure, Cell Communication
- Enzyme kinetics
- Biomolecules of Life (Lipids, Carbohydrates, Proteins and Nucleic Acids)
- Genetic Basis of Development (Central Dogma, Gene Expression), Genetics, Metabolism
- Quantitative view of modern biology, and other allied topics.

Suggested Textbook:

1. Biology: A global approach, Neil A Campbell et al., 10th Edition, 2015, Pearson Education Ltd, England.

ME 102 Engineering Graphics and Introduction to Computer-Aided-Drawing 1-0-3-2

Objective: The course is aimed at familiarizing the first-year engineering students with the principles of descriptive geometry and visual communication techniques that are utilized by engineers across various disciplines.
The initial part of the course focuses on the basics of traditional technical drawing methods and corresponding theory. This involves free-hand sketching, drafting with traditional drafting tools, and studying the projections of simple solids. The usage of the traditional hand-drafting techniques over the computer-based techniques is a deliberate choice for the first section where the focus is on developing the skill of visualization of the object in spatial coordinates from different locations. Having emphasized and practiced in the important basics of technical drawings and visual communication, computer-aided drafting will be introduced through 3D modelling software and their usage to create 2D drawings will be practiced subsequently.

Contents:

- Introduction : Introduction to the subject, history of visual communication, history and evolution of technical drawing, significance of engineering graphics, introduction to the tools/ techniques used and how to use them.
- Theory of projections : Introduction to projection, classification of projection techniques, first and third angle projections, applications of various of projection methods and practices
- Spatial geometry I : Projections of points, projection of lines, true lengths, inclinations, shortest distance between lines, skew lines, trace of a line
- Spatial geometry II : Projections of simple planar shapes, traces of a planar shape, projection of simple solids, section of solids
- Auxiliary projection : auxiliary projection technique and its application to lines, planes and solids
- Intersections and development : Intersection of solids, development of surfaces
- Orthographic projections : Multi view drawing from pictorial views of complex solids, missing lines and views, sectional views
- Pictorial projections : Theory of isometric projection, isometric projections vs. drawing, construction of isometric drawing from orthographic views, oblique and perspective drawing techniques.
- Introduction to CAD : Advent and evolution of CAD, introduction to the software GUI, basic commands and practices
- 3D modelling : Creating 3D primitives, Introduction to various tools and commands
- Creating and assembly : Assembly of 3D objects/ parts, constraints, animation
- 2D drafting : Creating 2D drawings from the 3D models for production purposes, introduction to standards and codes involved

Suggested Textbooks:

1. Engineering drawing: Plane and Solid Geometry, 9/e - N.D. Bhatt, Charotar Publication, 2006
2. Engineering Drawing with AutoCAD – A.K. Sarkar, A.P. RASTOGI, & D.M. Kulkarni

Reference Textbooks:

1. French T. E., Vierck, C. J., Foster, R. J., Engineering Drawing and Graphic Design. Tata McGraw-Hill Edition, Fourteenth Edition, 2012
2. Luzadder, W. J., Duff, J. M., Fundamentals of Engineering Drawing, Prentice-Hall India, New Delhi, Eleventh Edition, 1983.

EE 101 Introduction to Electrical and Electronics Engineering 3-1-0-4

Objective: This is the first course offered to the student in the area of Electrical and Electronics Engineering. The course aims to:

- Familiarise the students with circuits in the electrical and electronics engineering domain.
- Expose them to various analytical techniques and theorems to understand and analyse the circuits in hand.
- Introduce some of the applications of these circuits in real-life.

Prerequisites:

- MTH 101 (Can be relaxed with instructor's consent)

Contents:

- Basic Physical laws, Circuit elements, active element conventions, Kirchoff's laws
- Analysis of circuits by Node voltage Method and Mesh current method
- Analysis of circuits using source transformation, Thevenin and Norton equivalent models
- Notion of linearity, Superposition theorem, Maximum power transfer theorem, Milman's Theorem
- Transient analysis of electrical circuits, cylco-stationary analysis of RLC circuits
- Notion of power in DC and AC circuits and concepts of real and reactive power in AC circuits, power factor, Polyphase circuits, star- delta conversion.
- Introduction to S-domain analysis
- Diode: basic structure and operating principle, current-voltage characteristic.
- Diode Applications: rectifier circuits (half-wave and full-wave rectifiers), voltage regulator (using Zener diode), clipper (limiter) circuits, clamper circuits.
- Operational Amplifier (Op Amp): Ideal Op Amp characteristics, inverting and non-inverting configurations.
- Op Amp applications: amplifiers, oscillators, current-to-voltage converter, voltage-to-current converter, integrator and differentiator
- Bipolar Junction Transistors (BJT): structure and modes of operation; n-p-n and p-n-p transistors in active mode.
- BJT Applications: amplifier, switch
- Metal Oxide Semiconductor Field-Effect Transistors: structure and physical operation of n-type and p-type MOSFET.
- MOSFET Applications: amplifier, switch
- Basic logic gates and flip-flop.
- Basics of Data converters.

Suggested Textbook:

1. Giorgio Rizzoni, "Principles and applications of Electrical Engineering", McGraw-Hill Higher Education, 2007.

Suggested References:

1. Vincent Del Toro, "Electrical Engineering Fundamental," Prentice Hall, 1989.

2. Sedra and Smith, “Microelectronic Circuits: Theory and Applications”,
3. William H. Hayt Jr., J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, McGraw Hill Education, 2013
4. Robert Boylestad, Louis Nashelsky, Electronic Devices And Circuit Theory,9th Edition, Pearson Education.

NO 102 National Sports organization (P/NP)

Objective: To instil the importance of a fit and healthy lifestyle. This course is a extension to NO 101.

Contents:

- All students get the opportunity to choose and signup for a sport and undergo training.
- There will be training 5 days a week for 45 minutes each.

Programme Core Curriculum

Semester I

Course code	L-T-P-C	Course Name
EE100	1-0-0-1	Introduction to Profession

Semester II

Course code	L-T-P-C	Course Name
EE102	3-0-0-3	Circuit Analysis

EE 100 Introduction to Profession 1-0-0-1

Objective: This course aims to acquaint the fresher students with the broad areas of electrical engineering and career opportunities.

Contents: Introduction to electrical engineering and it's various areas such as machines, power electronics and power systems.
Introduction to electronics and communication engineering, semiconductor technology and fabrication details.
Future prospects of career in electrical, electronics and communication engineering.
Introduction to technical report writing, LaTex and plagiarism.
Introduction to professional bodies of electrical engineering such as IEEE, IET and INAE.
Acquaintance with various BEE standards and grid codes.

EE 102 Circuit Analysis 3–0–0–3

Objective: This course intends to train the students to analyse of circuits in Electrical and Electronics Engineering applications using various analytical tools and methods. By the end of the course, the student is expected to:
Acquire proficiency in using various techniques and theorems for the analysis of circuits in DC and AC steady states as well as in transient conditions.
Learn Graph Theoretical approach to solving networks and circuits.
Model and analyse two-port network models.
Acquire proficiency in computer aided analysis and simulation of electrical circuits.

Prerequisites: None

Contents:
Conventions for Describing Networks. Active Element Conventions, The Dot Convention for Coupled Circuits, Reference directions for Current and Voltage.
Differential Equation approach to Circuit Analysis.
Initial Conditions in Networks, Geometrical Interpretation of Derivatives, Procedure for evaluating Initial Conditions, Higher-Order Equations; Internal Excitation.
Laplace Transform Method of Analysis of Circuits: Basic Theorems for the Laplace Transformation,
Partial Fraction Expansion.
Frequency response plots, Fourier series and Fourier transform approach to Circuit Analysis
Graphs: Basic Notions, Graphs and Subgraphs, Connectedness, Circuits and Cutsets.
Trees and Forests, Strongly Directedness, Fundamental Circuits and Cutsets.
Orientation, Isomorphism and Cyclically Connectedness.
Graphs and Vector Spaces: The Circuit and Crossing Edge Vectors, Voltage and Current Vectors.
Dimension of Voltage and Current Vector Spaces, Fundamental Cutset Matrix of a forest f.
Multi-Port Networks with particular emphasis on 2-Port Networks – Z-parameters, Y-parameters, h-parameters, t-parameters and inverse transmission parameters of 2-Port networks, network functions, complex frequency.

Suggested Textbooks:

1. M. E. Van Valkenburg, Network Analysis, PHI Publishers, Third Edition, 2004

Reference Textbooks:

1. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Higher Education, 2007.
2. William H. Hayt Jr., J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, McGraw Hill Education, 2013.
3. N. Balabanian and T. A. Bickart, Linear Network Theory: Analysis, Properties, Design and Synthesis, Matrix Publishers Inc. 1981.
4. L. O. Chua, C. A. Desoer, E. S. Kuh, Linear and Nonlinear Circuits, McGraw-Hill International Edition 1987.