**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

**Syllabus for B. Tech in Electrical Engineering**

(Applicable from the academic session 2018-2019)

| | |
|---|---|
| **Name of the course** | **ELECTRIC CIRCUIT THEORY** |
| **Course Code: PC-EE 301** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum Marks: 100** |
| | |
| **Teaching Scheme** | **Examination Scheme** |
| **Theory: 3 hrs/week** | **Mid Semester Exam: 15 Marks** |
| **Tutorial: 1 hr/week** | **Assignment & Quiz: 10 Marks** |
| **Practical: 2 hrs/week** | **Attendance: 05 Marks** |
| **Credit Points: 4+1** | **End Semester Exam: 70 Marks** |
| | |

**Objective:**

| | |
|---|---|
| 1. | To understand the structure and properties of different type of electrical circuits, networks and sources. |
| 2. | To apply different mathematical tools & techniques for analyzing electrical networks. |
| 3. | To apply circuit analysis techniques to simplify electrical networks.. |
| 4. | To solve problems of electrical circuits. |

Pre-Requisite

| | |
|---|---|
| 1. | Basic Electrical Engineering (ES-EE-101) |
| 2. | Mathematics ( BS-M-102, Bs-M202) |

| Unit | Content | Hrs | Marks |
|---|---|---|---|
| 1 | **Introduction**: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals | 3 | |
| 2 | **Graph theory and Networks equations:** Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials. Duality, Solution of Problems | 4 | |
| 3 | **Coupled circuits:** Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems. | 3 | |
| 4 | **Laplace transforms:** Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions. Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources. | 8 | |
| 5 | **Fourier method of waveform analysis:** Fourier series and Fourier Transform (in continuous domain only). Application in circuit analysis, Solution of Problems | 6 | |
| 6 | **Network Theorems:** Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources. | 8 | |

| | | | |
|---|---|---|---|
| 7 | **Two port networks analysis:** Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems | 4 | |
| 8 | **Filter Circuits:** Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems | 4 | |

Text books:

1. Networks & Systems, Ashfaq Husain, Khanna Book Publishing, New Delhi
2. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
3. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
4. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli4th edition. Tata Mc Graw Hill Education Pvt. Ltd.
5. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd.

Reference books

1. Network Analysis, M.E. Valkenburg, Pearson Education .
2. Fundamental of Electric circuit theory, D. Chattopadhay & P.C. Rakshit, S. Chand
3. Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly & S.M. Durbin, The Mc Graw Hill Company.
4. Problems and Solutions of Electric Circuit Analysis, R.K. Mehta & A.K. Mal, CBS, New Delhi

Course Outcome: After completion of this course, the learners will be able to

1. describe different type of networks, sources and signals with examples.
2. explain different network theorems, coupled circuit and tools for solution of networks.
3. apply network theorems and different tools to solve network problems.
4. select suitable techniques of network analysis for efficient solution.
5. estimate parameters of two-port networks.
6. design filter circuits.

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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|---|---|
| **Name of the course** | **Electric circuit theory** |
| **Course Code:PC-EE391** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum marks:100** |
| | |
| **Teaching Scheme** | **Examination scheme:** |
| **Theory: Nil** | **Continuous Internal Assessment:40** |
| **Tutorial: Nil** | **External Assessment: 60** |
| **Practical: 2 hrs/week** | |
| **Credit Points:1** | |
| | |

| | **Laboratory Experiments:** |
|---|---|
| 1. | Transient response of R-L and R-C network: simulation with software & hardware |
| 2. | Transient response of R-L-C series and parallel circuit: simulation with software & hardware |
| 3. | Determination of Impedance (Z) and Admittance (Y) parameter of two-port network: simulation & hardware. |
| 4. | Frequency response of LP and HP filters: simulation & hardware. |
| 5. | Frequency response of BP and BR filters: simulation & hardware. |
| 6. | Generation of Periodic, Exponential, Sinusoidal, Damped Sinusoidal, Step, Impulse, Ramp signal using MATLAB in both discrete and analog form. |
| 7. | Determination of Laplace transform and Inverse Laplace transform using MATLAB. |
| 8. | Amplitude and Phase spectrum analysis of different signals using MATLAB. |
| 9. | Verification of Network theorems using software & hardware |

Course Outcome: After completion of this course, the learners will be able to

1. determine
    - transient response of different electrical circuit
    - parameters of two port network
    - frequency response of filters.
    - Laplace transform and inverse Laplace transform
2. generate different signals in both discrete and analog form
3. analyze amplitude and phase spectrum of different signals.
4. verify network theorems.
5. construct circuits with appropriate instruments and safety precautions.
6. Simulate electrical circuit experiments using suitable software.

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Special Remarks: The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

| **Name of the course** | **ANALOG ELECTRONICS** |
|---|---|
| **Course Code: PC-EE 302** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum Marks: 100** |
| | |
| **Teaching Scheme** | **Examination Scheme** |
| Theory: 3 hrs/week | Mid Semester Exam: 15 Marks |
| Tutorial: 0 hr/week | Assignment & Quiz: 10 Marks |
| Practical: 2 hrs/week | Attendance: 05 Marks |
| Credit Points: 3+1 | End Semester Exam: 70 Marks |
| | |

| **Objective:** | |
|---|---|
| 1. | To understand the structure and properties of different components of analog electronics. |
| 2. | To explain principle of operation of analog electronics components and circuits. |
| 3. | To understand the application of operational amplifier |
| 4. | To solve problems of analog electronic components and circuits |
| 5. | To analyze amplifiers, oscillators and other analog electronic circuits. |

| **Pre-Requisite** | |
|---|---|
| 1. | Physics (10+2) |

| Unit | Content | Hrs | Marks |
|---|---|---|---|
| 1 | **Filters & Regulators**: Review of half wave and full wave rectifier**,** Capacitor filters, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation. | 4 | |
| 2 | **BJT circuits:** Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits | 8 | |
| 3 | **MOSFET circuits:** MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit. | 8 | |
| 4 | **Feed back amplifier & Oscillators:** Concept of Feed back, Negative & Positive feedback, Voltage/Current, Series/Shunt feedback, Berkhausen criterion, Colpit , Hartley's, Phase shift, Wien bridge, & Crystal oscillators. | 5 | |
| 5 | **Operational amplifier:** Ideal OPAMP, Differential amplifier, Constant current source (Current mirror etc), Level shifter, CMRR, Open & closed loop circuits, importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, Voltage follower/Buffer circuits. | 5 | |

| | | | |
|---|---|---|---|
| 6 | **Application of Operational amplifiers:** Adder, Integrator & Differentiator, Comparator, Schmitt Trigger, Instrumentation Amplifier, Log & Antilog amplifier, Trans-conductance multiplier, Precision rectifier, Voltage to current &Current to voltage converter. | 5 | |
| 7 | **Power amplifier:** Class A, B, AB, C, Conversion efficiency | 2 | |
| 8 | **Multivibrator:** Monostable, Bistable multivibrator, Monostable & Astable operation using 555 timer. | 2 | |
| 9 | **Special function circuits:** VCO & PLL | 2 | |

Text books:

1. Malvino—Electronic Principles , 6/e ,TMH
2. Nagrath, Electronics: Analog and Digital, PHI, 2004
3. Mottershed, Electronics Devices & Circuits, Wiley Eastern
4. Millman & Halkias – Integrated Electronics, Tata McGraw Hill.
5. Gayakwad R.A -- OpAmps and Linear IC's, 4/e, Pearson-PHI
6. Franco—Design with Operational Amplifiers & Analog Integrated Circuits , 3/e,TMH
7. Coughlin and Drisscol – Operational Amplifier and Linear Integrated Circuits – Pearson Education Asia.
8. A.K. Maini, Analog Electronics, Khanna Publishing House, 2019
9. L.K. Maheswari, Analog Electronics, Laxmi Publications

Reference books

1. Nagchoudhuri , Microelectronic Devices, 1/e, Pearson Education, 2001
2. Natarajan, Microelectronics: Analysis & Design, 1/e 2005, TMH
3. Maheshwari and Anand , Analog Electronics, PHI
4. Boyle'stead , Nashelsky: & Kishore, Electronic Devices & Circuit theory, 1/e, PHI/Pearson.
5. Millman & Halkias: Basic Electronic Principles; TMH.
6. Tobey & Grame – Operational Amplifier: Design and Applications, Mc Graw Hill.

Course Outcome: After completion of this course, the learners will be able to

1. describe analog electronic components and analog electronics circuits
2. explain principle of operation of analog electronic components, filters, regulators and analog electronic circuits.
3. compute parameters and operating points of analog electronic circuits.
4. determine response of analog electronic circuits.
5. distinguish different types amplifier and different types oscillators based on application.
6. construct operational amplifier based circuits for different applications.

Special Remarks:

The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

| | |
|---|---|
| **Name of the course** | **Analog electronic laboratory** |
| **Course Code:PC-EE392** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum marks:100** |
| | |
| **Teaching Scheme** | **Examination scheme:** |
| Theory: Nil | **Continuous Internal Assessment: 40** |
| Tutorial: Nil | **External Assessment: 60** |
| Practical: 2 hrs/week | Credit Points:1 |
| | |

| | **Laboratory Experiments:** |
|---|---|
| 1. | Study of ripple and regulation characteristics of full wave rectifier with and without capacitor filter. |
| 2. | Study of Zener diode as voltage regulator. |
| 3. | Study of characteristics curves of B.J.T & F.E.T . |
| 4. | Construction of a two-stage R-C coupled amplifier & study of it's gain & Bandwidth. |
| 5. | Study of class A, C & Push-Pull amplifiers. |
| 6. | Study of timer circuit using NE555 & configuration for monostable & astable and bistable multivibrator |
| 7. | Study of Switched Mode Power Supply & construction of a linear voltage regulator using regulator IC chip |
| 8. | Construction of a simple function generator using IC. |
| 9. | Realization of a V-to-I & I-to-V converter using Op-Amps. |
| 10. | Realization of a Phase Locked Loop using Voltage Controlled Oscillator (VCO). |
| 11. | Study of D.A.C & A.D.C. |

Course Outcome: After completion of this course, the learners will be able to

1. determine
   - characteristics of full wave rectifier with filter and without filter
   - characteristics of BJT and FET
   - characteristics of Zener diode as voltage regulator
   - characteristics of class A, C and push pull amplifiers
2. verify function of DAC and ADC
3. construct
   - function generator using IC
   - R-C coupled amplifier
   - linear voltage regulator using regulator IC chip.
   - timer circuit using 555 for monostable, astable and multistable multivibrator.
   - V to I and I to V converter with Op amps.

- phase locked loop using Voltage Controlled Oscillator (VCO)

4. work in a team
5. validate theoretical learning with practical

Special Remarks: The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

| | | | |
|---|---|---|---|
| **Name of the course** | | **ELECTRO MAGNETIC FIELD THEORY** | |
| **Course Code: PC-EE 303** | | **Semester: 3rd** | |
| **Duration: 6 months** | | **Maximum Marks: 100** | |
| | | | |
| **Teaching Scheme** | | **Examination Scheme** | |
| **Theory: 3 hrs/week** | | **Mid Semester Exam: 15 Marks** | |
| **Tutorial: 0 hr/week** | | **Assignment & Quiz: 10 Marks** | |
| **Practical: 0 hrs/week** | | **Attendance: 05 Marks** | |
| **Credit Points: 3** | | **End Semester Exam: 70 Marks** | |
| | | | |
| **Objective:** | | | |
| 1. | To understand the basic mathematical tools to deal with Electromagnetic field Problem. | | |
| 2. | To understand properties and application of Electric and magnetic field. | | |
| 3. | To analyze electromagnetic wave propagation | | |
| 4. | To solve problem related to Electromagnetic field. | | |
| Pre-Requisite | | | |
| 1. | Basic Electrical Engineering (ES-EE-101) | | |
| 2. | Mathematics ( BS-M-102, Bs-M202) | | |
| 3. | Physics (BS-PH 101) | | |
| **Unit** | **Content** | **Hrs** | **Marks** |
| 1 | **Introduction:** Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems | 4 | |
| 2 | **Introduction to Vector calculus:** DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Strokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem. Solution of problems | 4 | |
| 3 | **Electrostatic field:** Coulomb's law, field intensity, Gauss's law, Electric potential and Potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field. Boundary conditions: Dielectric-dielectric, Conductor –dielectric, Conductor-free space. Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation. Solution of problems | 8 | |
| 4 | **Magneto static fields:** Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, | 8 | |

| | | | |
|---|---|---|---|
| | Magnetisation in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic material. Solution of problems | | |
| 5 | **Electromagnetic fields:** Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields. Solution of problems | 6 | |
| 6 | **Electromagnetic wave propagation:** Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Polarisation. Solution of problems | 6 | |
| 7 | **Transmission line:** Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation. Solution of problems | 4 | |

Text books:

1. Elements of Electromagnetic, Mathew N.O. Sadiku, 4th edition, Oxford university press.
2. Engineering Electromagnetic, W.H. Hyat & J.A. Buck, 7th Edition, TMH
3. Theory and problems of Electromagnetic, Edminister, 2nd Edition, TMH
4. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University

Reference books

Course Outcome: After completion of this course, the learners will be able to

1. relate different coordinate systems for efficient solution of electromagnetic problems.
2. describe mathematical s tools to solve electromagnetic problems.
3. explain laws applied to electromagnetic field.
4. apply mathematical tools and laws to solve electromagnetic problems.
5. analyze electromagnetic wave propagation
6. estimate transmission line parameters

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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| | | | |
|---|---|---|---|
| **Name of the course** | | **ENGINEERING MECHANICS** | |
| **Course Code: ES-ME 301** | | **Semester: 3rd** | |
| **Duration: 6 months** | | **Maximum Marks: 100** | |
| | | | |
| **Teaching Scheme** | | **Examination Scheme** | |
| Theory: 3 hrs/week | | Mid Semester Exam: 15 Marks | |
| Tutorial: 0 hr/week | | Assignment & Quiz: 10 Marks | |
| Practical: 0 hrs/week | | Attendance: 05 Marks | |
| Credit Points: 3 | | End Semester Exam: 70 Marks | |
| | | | |
| **Objective:** | | | |
| 1. | To understand the basic mathematical tools to deal with the physical bodies. | | |
| 2. | To learn different mathematical techniques to analyze physical bodies. | | |
| 2. | To learn analysis techniques of rigid bodies. | | |
| 2. | To solve problem of general motion. | | |
| **Pre-Requisite** | | | |
| 1. | Physics (BS-PH-101) | | |
| 2. | Mathematics ( BS-M102, BS-M202) | | |
| Unit | Content | Hrs | Marks |
| 1 | **Introduction to vectors and tensors and co-ordinate systems**<br>Introduction to vectors and tensors and coordinate systems; Vector and tensor algebra; Indical notation; Symmetric and anti-symmetric tensors; Eigenvalues and Principal axes. | 5 | |
| 2 | **Three-dimensional Rotation**<br>Three-dimensional rotation: Euler's theorem, Axis-angle formulation and Euler angles; Coordinate transformation of vectors and tensors. | 4 | |
| 3 | **Kinematics of Rigid Body**<br>Kinematics of rigid bodies: Dentition and motion of a rigid body; Rigid bodies as coordinate systems; Angular velocity of a rigid body, and its rate of change; Distinction between two- and three dimensional rotational motion; Integration of angular velocity to find orientation; Motion relative to a rotating rigid body: Five term acceleration formula. | 6 | |
| 4 | **Kinetics of Rigid Bodies**<br>Kinetics of rigid bodies: Angular momentum about a point; Inertia tensor: Dentition and computation, Principal moments and axes of inertia, Parallel and perpendicular axes theorems; | 5 | |

| | | | |
|---|---|---|---|
| | Mass moment of inertia of symmetrical bodies, cylinder, sphere, cone etc., Area moment of inertia and Polar moment of inertia, Forces and moments; Newton-Euler's laws of rigid body motion. | | |
| 5 | **Free Body Diagram (1 hour)**<br>Free body diagrams; Examples on modelling of typical supports and joints and discussion on the kinematic and kinetic constraints that they impose. | 1 | |
| 6 | **General Motion**<br>Examples and problems. General planar motions. General 3-D motions. Free precession, Gyroscopes, Rolling coin. | 9 | |
| 7 | **Bending Moment**<br>Transverse loading on beams, shear force and bending moment in beams, analysis of cantilevers, simply supported beams and overhanging beams, relationships between loading, shear force and<br>bending moment, shear force and bending moment diagrams. | 5 | |
| 8 | **Torsional Motion**<br>Torsion of circular shafts, derivation of torsion equation, stress and deformation in circular and hollow shafts. | 2 | |
| 9 | **Friction**<br>Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction. | 3 | |

Text books:

1. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley, 2011.
2. M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & Business Media, 1986.
3. Manoj K. Harbola, " Engineering Mechanics", Cengage Learning India Pvt. Ltd, 2018
4. D.S. Bedi & M.P. Poonia, "Engineering Mechanics", Khanna Publishing House, 2019
5. R.S. Khurmi, "Engineering Mechanics", S.Chand Publications
6. R.K. Bansal, "Engineering Mechanics", Laxmi Publications

Course Outcome: After completion of this course, the learners will be able to

1. explain the co-ordinate system, principle of three dimensional rotation, kinematics and kinetics of rigid bodies.
2. elaborate the theory of general motion, bending moment, torsional motion and friction.
3. develop free body diagram of different arrangements.

4. solve problems with the application of theories and principle of motion , friction and rigid bodies.
5. analyze torsional motion and bending moment.

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

| | | | |
|---|---|---|---|
| **Name of the course** | | **MATHEMATICS-III** | |
| **Course Code: BS- M 301** | | **Semester: 3rd** | |
| **Duration: 6 months** | | **Maximum Marks: 100** | |
| | | | |
| **Teaching Scheme** | | **Examination Scheme** | |
| Theory: 3 hrs/week | | Mid Semester Exam: 15 Marks | |
| Tutorial: 0 hr/week | | Assignment & Quiz: 10 Marks | |
| Practical: 0 hrs/week | | Attendance: 05 Marks | |
| Credit Points: 3 | | End Semester Exam: 70 Marks | |
| | | | |
| **Objective:** | | | |
| 1. | To understand Probability theory required an Electrical Engineer to apply in profession. | | |
| 2. | To understand numerical methods to solve engineering problem | | |
| 3. | To understand basics of Z transform to solve engineering problems. | | |
| **Pre-Requisite** | | | |
| 1. | Mathematics ( 10+2 ) | | |
| Unit | Content | Hrs | Marks |
| 1 | **Probability:**<br>Basic Probability Theory**:** Classical definition and its limitations. Axiomatic definition. Some elementary deduction: i) P(O)=0, ii) $0 \leq P(A) \leq 1$, iii) P(A')=1-P(A) etc. where the symbols have their usual meanings. Frequency interpretation of probability.<br><br>Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pair wise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems.<br><br>Random Variable & Probability Distributions. Expectation: Definition of random variable. Continuous and discrete random variables. Probability density function & probability | 1<br><br>3<br><br>2 | |

| | | | |
|---|---|---|---|
| | mass function for single variable only. Distribution function and its properties (without proof). Examples. Definitions of Expectation & Variance, properties & examples.<br><br>Some important discrete distributions: Binomial & Poisson distributions and related problems. Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. Determination of Mean & Variance for Binomial, Poisson & Uniform distributions only. | 2 | |
| 2 | **Numerical Methods:**<br>Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.<br><br>Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.<br><br>Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.<br><br>Numerical solution of a system of linear equations:<br>Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.<br><br>Numerical solution of Algebraic equation:<br>Bisection method, Regula-Falsi method, Newton-Raphson method.<br><br>Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. | 4<br><br>5<br><br>3<br><br>6<br><br>4<br><br>6 | |
| 3 | **Z transform:**<br>Sequence, Representation of sequence, Basic operations on sequences, Z-transforms, Properties of Z-transforms, Change of scale, Shifting property, Inverse Z-transform, Solution of difference equation , Region of convergence. | 4 | |

Text books:

1. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.
2. C.Xavier: C Language and Numerical Methods.
3. Dutta & Jana: Introductory Numerical Analysis.
4. J.B.Scarborough: Numerical Mathematical Analysis.
5. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

6. Hwei P Hsu, " Signal and system", (Schaum's Outline Series), Mc Graw Hill education.

Reference books

1. Balagurusamy: Numerical Methods, Scitech.
2. R.S. Salaria: Numerical Methods, Khanna Publishing House.
3. S.S. Sashtry: Numerical Methods, PHI
4. Baburam: Numerical Methods, Pearson Education.
5. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
6. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
7. Srimanta Pal: Numerical Methods, OUP.

Course Outcome: After completion of this course, the learners will be able to

1. explain basics of probability theories, rules, distribution and properties of Z transform
2. describe different methods of numerical analysis.
3. solve numerical problems based on probability theories , numerical analysis and Z transform
4. apply numerical methods to solve engineering problems.
5. solve engineering problems using z transform and probability theory.

Special Remarks:
The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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|---|---|
| **Name of the course** | Numerical Methods laboratory |
| **Course Code: PC-CS 391** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum marks:100** |
| | |
| **Teaching Scheme** | **Examination scheme:** |
| Theory: Nil | **Continuous Internal Assessment:40** |
| Tutorial: Nil | **External Assessment: 60** |
| Practical: 2 hrs/week | |
| Credit Points:1 | |
| | |

| | **Laboratory Experiments:** |
|---|---|
| 1. | Assignments on Newton forward /backward, Lagrange's interpolation. |
| 2. | Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule. |
| 3. | Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations |
| 4. | Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods. |
| 5. | Assignments on ordinary differential equation: Euler's and Runga-Kutta methods. |
| 6. | Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica. |

Course Outcome: After completion of this course, the learners will be able to

1. solve
    - problems with Newton forward /backward, Lagrange's interpolation
    - problems of numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule
    - problems to find numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
    - problems to find numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
    - ordinary differential equation by Euler's and Runga-Kutta methods.
2. find appropriate numerical methods to solve engineering problems.
3. use software package to solve numerical problems.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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| | | | |
|---|---|---|---|
| **Name of the course** | | **BIOLOGY FOR ENGINEERS** | |
| **Course Code:BS- 301** | | **Semester: 3rd** | |
| **Duration: 6 months** | | **Maximum Marks: 100** | |
| | | | |
| **Teaching Scheme** | | **Examination Scheme** | |
| Theory: 3 hrs/week | | Mid Semester Exam: 15 Marks | |
| Tutorial: 0 hr/week | | Assignment & Quiz: 10 Marks | |
| Practical: 0 hrs/week | | Attendance: 05 Marks | |
| Credit Points: 3 | | End Semester Exam: 70 Marks | |
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| **Objective:** | | | |
| 1. | To introduce modern biology with an emphasis on evolution of biology as a multi-disciplinary field. | | |
| 2. | To make students aware of application of engineering principles in biology and engineering robust solution inspired by biological examples. | | |
| **Pre-Requisite** | | | |
| 1. | NIL | | |
| Unit | Content | Hrs | Marks |
| 1 | **Introduction**<br>Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry | 2 | |
| 2 | **Classification:**<br>Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructureprokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs,<br>lithotropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular | 3 | |

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| | taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus. | | |
| 3 | **Biomolecules**<br>Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids. | 4 | |
| 4 | **Macromolecular analysis:**<br>Purpose: To analyze biological processes at the reductionistic level. Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements. | 5 | |
| 5 | **Metabolism**<br>Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge. | 4 | |
| 6 | **Microbiology**<br>Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics. | 3 | |
| 7 | **Immunology**<br>Purpose: How does the immune system work? What are the molecular and cellular components and pathways that protect an organism from infectious agents or cancer? This comprehensive course answers these questions as it explores the cells and molecules of the immune system.<br>Immunology- Self vs Non-self, pathogens, human immune system, antigen-antibody reactions. | 5 | |
| 8 | **Information Transfer**<br>Purpose: The molecular basis of coding and decoding genetic information is universal. Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic | 4 | |

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| | code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. s •on cell proliferation • metastasis • cell proliferation • cell death • cell •D | | |
| 9 | **Cancer biology**<br>Purpose: A basic understanding of cancer biology and treatment. The course is not designed for patients seeking treatment guidance – but it can help to understand how cancer develops and provides a framework for understanding cancer diagnosis and treatment. –cell Identification of the major types of cancer worldwide. Description of how genes contribute to the risk and growth of cancer. List and description of the ten cellular hallmarks of cancer. Definition of metastasis, and identification of the major steps in the metastatic process. Description of the role of imaging in the screening, diagnosis, staging, and treatments of cancer. Explanation of how cancer is treated. | 5 | |
| 10 | **Techniques in bio physics**<br>Purpose: Biophysics is an interdisciplinary science that applies approaches and methods traditionally used in physics to study biological phenomena. The techniques including microscopy, spectroscopy, electrophysiology, single-molecule methods and molecular modeling | 3 | |
| 11 | **Stem cell**<br>Purpose: Stem cells and derived products offer great promise for new medical treatments. Learn about stem cell types, current and possible uses, ethical issues. | 2 | |

**Text / References:**

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
3. D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
4. G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.
5. L. M. Prescott, J. P. Harley and C. A. Klein, "Microbiology", McGraw Hill Higher Education, 2005.
6. Lewis J. Kleinsmith. "Principles of cancer biology", Pearson, 2016

Course Outcome: After completion of this course, the learners will be able to

1. describe with examples the biological observations lead to major discoveries.
2. explain
   - the classification of kingdom of life
   - the building blocks of life
   - different techniques of bio physics used to study biological phenomena.
   - the role of imaging in the screening, diagnosis, staging, and treatments of cancer.
3. identify DNA as a genetic material in the molecular basis of information transfer
4. analyze biological processes at the reductionistic level.
5. apply thermodynamic principles to biological systems.
6. identify microorganisms.

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

**Syllabus for B. Tech in Electrical Engineering**

(Applicable from the academic session 2018-2019)

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| **Name of the course** | **INDIAN CONSTOTUTION** |
| **Course Code: MC-EE 301** | **Semester: 3rd** |
| **Duration: 6 months** | **Maximum Marks: 100** |
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| **Teaching Scheme** | **Examination Scheme** |
| Theory: 3 hrs/week | Mid Semester Exam: 15 Marks |
| Tutorial: 0 hr/week | Assignment & Quiz: 10 Marks |
| Practical: 0 hrs/week | Attendance: 05 Marks |
| Credit Points: 0 | End Semester Exam: 70 Marks |
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| **Objective:** | |
| 1. | To have basic knowledge about Indian Constitution. |
| 2. | To understand the structure and functioning of union, state and local self-government. |
| 3. | To understand the structure, jurisdiction and function of Indian judiciary. |
| **Pre-Requisite** | |
| 1. | NIL |

| Unit | Content | Hrs | Marks |
|---|---|---|---|
| 1 | **Indian Constitution:**<br>Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy | 5 | |
| 2 | **Union government and its administration:**<br>Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.<br>**State government and its administration:**<br>Governor: Role and Position, CM and Council of ministers,<br>State Secretariat: Organisation, Structure and Functions | 10 | |
| 3 | **Supreme court:** Organization of supreme court, procedure of the court, independence of the court, jurisdiction and power of supreme court.<br>**High court:** Organization of high court, procedure of the court, independence of the court, jurisdiction and power of supreme court.<br>**Subordinate courts:** constitutional provision, structure and jurisdiction.<br>National legal services authority, Lok adalats, family courts, gram nyayalays.<br>Public interest litigation (PIL): meaning of PIL, features of PIL, scope of PIL, principle of PIL, guidelines for admitting PIL | 10 | |
| 4 | **Local Administration:** | 10 | |

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| | District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy. | | |

Text books:

1. Indian polity, M, Laxmikanth, MC Graw Hill education, 5th Edition.

Reference books

1. DD Basu, " Introduction to the constitution of India", 21st Edition, Lexis Nexis Books Publication ltd, India

Course Outcome: After completion of this course, the learners will be able to

1. describe
    - different features of Indian constitution..
    - power and functioning of Union, state and local self-government.
    - structure, jurisdiction and function of Indian Judiciary.
    - basics of PIL and guideline for admission of PIL.
    - Functioning of local administration starting from block to Municipal Corporation.
2. identify authority to redress a problem in the profession and in the society.

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.