

FIRST YEAR B.Tech. CURRICULUM 2026 (Common to all core branches) PHYSICS CYCLE/GROUP

Year	FIRST SEMESTER						SECOND SEMESTER					
	Course Code	CourseName	L	T	P	C	Course Code	Course Name	L	T	P	C
I	SMS 1101	Engineering Mathematics - I	3	1	0	4	SMS 1201	Engineering Mathematics - II	3	1	0	4
	SMS 1001	Engineering Physics	3	0	0	3	SMS 1003	Engineering Chemistry	3	0	0	3
	CCS 1001	Mechanics of Solids	2	1	0	3	CCS 1004	Biology for Engineers	3	0	0	3
	EES 1003	Basic Electronics	3	0	0	3	EES 1001	Basic Electrical Technology	2	1	0	3
	MES 1001	Basic Mechanical Engineering	3	0	0	3	CES 1001	Problem Solving using Computers	2	1	0	3
	SMS 1005	Communication Skills in English	1	0	2	2	CCS 1003	Environmental Studies	1	0	2	2
	SMS 1006	Universal Human Values and Professional Ethics	1	0	0	1	SMS 1007	Human Rights and Constitution	1	0	0	1
	SMS 1011	Engineering Physics Lab	0	0	3	1	SMS 1013	Engineering Chemistry Lab	0	0	3	1
	MES 1011	Workshop Practice	0	0	3	1	CES 1011	Problem Solving using Computers Lab	0	0	3	1
	MES 1111	Engineering Graphics -I	0	0	3	1	MES 1211	Engineering Graphics - II	0	0	3	1
			16	2	11	22			15	3	11	22
Total Contact Hours (L + T + P)			29			Total Contact Hours (L + T + P)			29			

FIRST YEAR B.Tech. CURRICULUM 2026 (Common to all core branches) CHEMISTRY CYCLE/GROUP

Year	FIRST SEMESTER						SECOND SEMESTER						
	Course Code	Course Name	L	T	P	C	Course Code	Course Name	L	T	P	C	
I	SMS 1101	Engineering Mathematics - I	3	1	0	4	SMS 1201	Engineering Mathematics - II	3	1	0	4	
	SMS 1003	Engineering Chemistry	3	0	0	3	SMS 1001	Engineering Physics	3	0	0	3	
	CCS 1004	Biology for Engineers	3	0	0	3	CCS 1001	Mechanics of Solids	2	1	0	3	
	EES 1001	Basic Electrical Technology	2	1	0	3	EES 1003	Basic Electronics	3	0	0	3	
	CES 1001	Problem Solving using Computers	2	1	0	3	MES 1001	Basic Mechanical Engineering	3	0	0	3	
	CCS 1003	Environmental Studies	1	0	2	2	SMS 1005	Communication Skills in English	1	0	2	2	
	SMS1007	Human Rights and Constitution	1	0	0	1	SMS1006	Universal Human Values and Professional Ethics	1	0	0	1	
	SMS 1013	Engineering Chemistry Lab	0	0	3	1	SMS 1011	Engineering Physics Lab	0	0	3	1	
	CES 1011	Problem Solving using Computers Lab	0	0	3	1	MES 1011	Workshop Practice	0	0	3	1	
	MES 1111	Engineering Graphics - I	0	0	3	1	MES 1211	Engineering Graphics - II	0	0	3	1	
			15	3	11	22			16	2	11	22	
Total Contact Hours (L + T + P)			29			Total Contact Hours (L + T + P)						29	

SMS 1101 ENGINEERING MATHEMATICS I 3104

Computing Inverse of a matrix using row transformations; Rank of a matrix using Echelon form; System of linear equations - consistency, solution by Gauss elimination, Gauss-Seidel method (Iterative); Eigenvalues and eigenvectors-elementary properties; Computation of the largest eigenvalue- Rayleigh power method. Generalization of vector concept to higher dimensions; Vector spaces and subspaces with related properties; Linear combinations and linear span of vectors; Linear independence and dependence of vectors; Basis of a vector space; Orthogonal and orthonormal vectors; Norm and inner product of vectors in R^n ; Gram-Schmidt process of orthogonalization. Taylor's theorem for one variable. Definition of partial derivative, geometric meaning; Euler's theorem on homogeneous functions; Total derivative; Derivatives of composite and implicit functions; Applications - Computing Errors and approximations. Taylor's theorem for functions of two variables; Maxima and minima; Lagrange's method of undetermined multipliers. Bernoulli's differential equation - Exact differential equations. Higher order differential equations: Solution of nonhomogeneous linear equations. Method of variation of parameters; Legendre's differential equations. Interpolation: Finite differences and divided differences. Newton interpolation formula and Lagrange's interpolation formulae. Newton's divided difference interpolation formula. Numerical differentiation. Numerical integration: Simpson's one third rule, Weedle's method

References:

1. Kreyzig E, Advanced Engineering Mathematics, 9th edition, 2011, Wiley Eastern, Delhi.
2. David C. Lay, Linear Algebra and applications, 3rd edition, 2009, Pearson Education.
3. Sastry S.S - Introductory methods of Numerical analysis, 5th edn., PHI learning Pvt. Ltd, 2012.
3. Rainville E.D. and Bedient P.E., A short course in differential equations, 8th edition, 2011, Prentice Hall, New York.
4. B.S.Grewal, Higher Engineering Mathematics, 45th edition, 2023, Khanna Publishers.

SMS 1001 ENGINEERING PHYSICS 3 0 0 3

Lasers and fibre optics: characteristics of lasers, spontaneous and stimulated emission, Einstein's coefficients, population inversion, Ruby, He-Ne and semiconductor lasers, and applications of lasers. Optical fibre principles, acceptance angle, numerical aperture, step-index and graded-index fibres, attenuation, distortion, and applications in fibre optic communication are discussed. Introduction to Quantum physics: Black body radiation, Planck's hypothesis, photoelectric effect, Compton effect, wave-particle duality, Davisson-Germer experiment, and uncertainty principle. Quantum Mechanics: Wave functions, Schrödinger equations, particle in a box, potential well, tunnelling, and harmonic oscillator. Solid State Physics: Bonding, free electron and band theories, semiconductors, conductivity, Hall effect, solar cells, LEDs, MOSFETs, superconductivity, and dielectrics. Materials characterization techniques: XRD, AFM, SEM, TEM, and STM.

References:

1. J. W. Jewett and R. A. Serway, Physics for Scientists and Engineers with Modern Physics, 7th ed. Boston, MA, USA: Cengage Learning, 2008.

2. A. Ghatak, Optoelectronics: An Introduction. Cambridge, U.K.: Cambridge University Press, 2017
3. A. Ghatak and S. Lokanathan, Quantum Mechanics, 5th ed. New Delhi, India: Macmillan, 2007.
4. P. K. Mitra, Characterization of Materials. New Delhi, India: PHI Learning, 2013.
5. T. Verma and M. L. Verma, "Fundamentals of Engineering Physics," SWAYAM Online Course, Chhattisgarh Swami Vivekanand Technical University, Bhilai. [Online]. Available: https://onlinecourses.swayam2.ac.in/nou25_ph01/preview [Accessed: Oct. 17, 2025]

CCS 1001 MECHANICS OF SOLIDS 2 1 0 3

Mechanics of Rigid body : Resultant of coplanar concurrent and non-concurrent force systems, rigid body mechanics, Basic principles and concepts, Resolution, composition, moment of force, Varignon's theorem, couple, Equilibrium of Coplanar concurrent and noncurrent force systems, Conditions of Equilibrium, Space and free body diagram, Lami's theorem, application problems, types of supports, types of beams, support reactions, types of loading, friction, Centroid and Moment of Inertia, Mechanics of Deformable body : Normal stress and strains, mechanical properties of materials, Hooke's law, modulus of elasticity, Stress - Strain behaviour of ductile and brittle materials, factor of safety, allowable stress, stresses and deformations in tapered bars, stepped bars, Poisson's ratio, shear stress and shear strain, modulus of rigidity, relation between modulus of elasticity, modulus of rigidity and bulk modulus, Compound bars and temperature stresses- Introduction, Compound bars, stresses due to temperature, stresses in thin cylinders.

References:

1. Singer F.L. engineering mechanics, tata mcgraw hill publishing (2007),
2. Bhavikatti & rajasekharappa, engineering mechanics, new age international(2006)
3. Bhavikatti s.s., , strength of materials, vikas publishers(2005)
4. eriam & Craige , Engineering Mechanics, John Wiley & Sons.
5. Irwing Shames, Engineering Mechanics, Prentice Hall of India.
6. Beer and Johnston, Mechanics for Engineers, McGraw Hills Edition

EES 1003 BASIC ELECTRONICS 21 0 3

Electronic Systems: Classification based on Signal Type - Analog Systems, Digital Systems, Mixed Signal Systems - Characteristics and examples. Mixed Signal Systems -Analog Front-End (AFE), Signal Conversion Blocks - ADCs, DACs; Digital Processing Unit - Microcontroller; Communication Interfaces - wired, wireless, Output Interface - Actuators, Displays, Speakers; Power unit. Sensors and Transducers: Types of sensors, types of Transducers. Analog Signal Conditioners: Amplifiers, Instrumentation Amplifiers, Differential Amplifiers, Filters, Attenuators; Level Shifters; Sample and Hold Circuits; Voltage References, Signal Conversion Blocks Sampling and quantisation, Analog to Digital Converters, Digital to Analog Converters. Number Systems & Arithmetic: Analog vs Digital logic, Binary, Decimal, Octal, Hexadecimal conversions; 2's Complement Arithmetic: Addition, Subtraction. Boolean Algebra & Logic Gates: Boolean variables and expressions, Basic gates, Boolean laws and simplification, Min-terms, Max-terms & K-Maps. Combinational Circuits using MSI Chips: Multiplexers, decoders, adders. Sequential circuits - Memory, Latch and

Flip flop, Ripple counter. Communication Systems: Basic elements, Block diagram, Analog and Digital communication; Sampling, Types of Communication Systems: Wired Communication, Wireless Communication. Analog Communication Principles and Digital Communication Principles Transmission Media, Bandwidth and noise in transmission channels.

References:

1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th ed. Pearson, 2015
2. David A. Bell, Electronic Instrumentation and Measurements, 2nd ed., PHI, 2003
3. M. M. Mano, Digital Logic and Computer Design, Pearson, 2017
4. George Kennedy, Bernad Davis, Electronic Communication Systems, 5 ed., 2011.
5. <https://nptel.ac.in/courses/108101091>: Basic Electronics by Prof. M.B. Patil, IIT Bombay

MES 1001 BASIC MECHANICAL ENGINEERING 3 0 0 3

Energy Sources: Energy Landscape (India and World), Major energy sectors, power and energy sources, sustainable energy and energy conservation, challenges and future outlook. Properties of Steam and Boilers: Steam properties at constant pressure, Enthalpy equations, Working principle of Babcock & Wilcox Boiler, mountings and accessories of boiler. I.C. Engines and EV Technology: Classification, Working of 2-stroke, 4 - stroke C.I and S.I Engines, determination of basic engine performance parameters, EV Configuration and Components. PowerTransmission: Belt drives, Pulley systems, Rope and Chain drives, Gear Drives, Gear Trains, power transmission in automobiles - manual automatic, CVT. Machine Tools: Introduction to Lathe, Drilling Machine, machining operations on Lathe and Drilling machines. Casting: Two box moulding procedure, moulding sand and its desirable properties, Pattern allowances. Welding: Principle of Resistance spot welding, Electric arc welding, TIG, MIG Welding and Oxy-acetylene gas welding, Introduction to soldering and brazing. Automation: Introduction to CNC machines, Introduction to robotics, robot configuration, application of robotics, Introduction to Additive Manufacturing, Stages in Additive Manufacturing.

References:

1. Gopalakrishna K.R., Text book of elements of Mechanical Engineering, Subash Publications; 2005.
2. Singh S. N., Renewable energy: Sources and Emerging Technologies, PHI learning; 2017.
3. Groover Mikell P., Automation, Production systems, and Computer-Integrated Manufacturing. Pearson Education India; 2016.
4. HMT Limited, Mechatronics, Tata McGraw Hill Publishing Company Limited; 2008
5. Kranz M., Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry, Wiley; 2016

SMS 1005 COMMUNICATION SKILLS IN ENGLISH 1 0 2 2

Introduction-Fundamentals of communication skills- language, expressions, critical thinking, sensitivity; Reading- Features-Types of reading, techniques of reading; Critical response to reading; Select texts on different themes, genres and styles - discussion on universal human

values; Writing- Fundamentals of writing- structures, style and form; Mechanics of writing-punctuation, functional grammar, and error identification; Writing on themes related to human value, Academic writing - essays and responses; Listening - Features- types of listening, barriers to listening, relevance of listening; Listening skills - communication- in a group and interpersonal communication; Response - video clips and speeches; Speaking-Oral communication -speech, presentation/Impromptu speeches; Communication for specific purpose, soft skills in communication- language, expressions, proficiency in digital communication; Professional ethics- ethics in writing, ethics in teamwork and decision making, ethics in use digital content, empathy in communication, engineers and society, sensitivity in communication.

References:

1. Bailey, S. (2018). Academic writing: A handbook for international students (5th ed.). Routledge.
2. Green, D. (2022). Contemporary English Grammar Structure and Composition (2nd ed.). Laxmi Publications.
3. Harris, C. E., Pritchard, M. S., Rabins, M. J., James, R., & Englehardt, E. (2019). Engineering ethics: Concepts and cases (6th ed.). Cengage Learning.
4. Markel, M., & Selber, S. A. (2020). Technical Communication. Edford/St. Martin's.
- 5 NPTEL Courses: Communication Skills offered by IIT Khanpur. <https://nptel.ac.in/courses/109104031>

SMS 1006 UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS 1 0 0 1

Introduction to Value Education: Significance and Basic Guidelines of Value Education, Types of Human Values, Process of Self Exploration and Natural Acceptance, Basic Human Aspirations, Continuous Happiness and Prosperity, Right Understanding, the Basic Requirements for Fulfilment of Aspirations with their Correct Priorities, Understanding Values in Human Relationships Understanding and Living in Harmony at Various Levels, Understanding the Needs of Self and Body, Meditation and Health, Ensuring Mutual Happiness, Intention, Competence, Trust, Respect, Inclusivity, Co-existence as a Comprehensive Human Goal, Promotion of Universal Harmonious Order in Society, Living Peacefully through Caring - Sharing - Honesty. Visualisation of Comprehensive Human Goal, Interconnectedness and Mutual Fulfilment among the Four Orders of Nature, Values in Different Dimensions of Human Living.

Professionalism and Professional Ethics: Relevance and Scope of Professional Ethics, Definition of a Professional, Professionalism, Professional Code of Conduct, Professional Attributes, Civic Virtues, Professionals as Social Experimenters, Building Character in Workplace, Responsible Professionalism, Role of Professionals in the Construction of Safe and Progressive Society, Dealing with Challenges in the Workplace, Moral Dilemmas, Confidentiality, Conflicts of Interest, Managing Consensus and Conflicts in Professional Contexts. Types of Ethics: Ethics, Moral Leadership, Environmental Ethics-Sustainable Development, Waste Disposals, Sensitivity and Sensibility towards Environment/Nature, Conservation of Water, Soil, Wildlife, Computer Ethics, Dealing with Common Ethical Issues related to the Computer and Internet, Corporate Social Responsibility (CSR), Ethics of Technology, Business Ethics, its Core Principles.

References:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
2. Professional Ethics by R. Subramaniam - Oxford Publications, New Delhi.
3. Engineering Ethics by Harris, Pritchard, and Rabins, Cengage Learning, New Delhi.
4. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
5. Engineering Ethics & Human Values by M. Govindarajan, S. Natarajan, and V. S. Senthil Kumar PHI Learning Pvt. Ltd - 2009.

SMS 1011 ENGINEERING PHYSICS LAB 0 0 3 1

Error Analysis, Energy Band Gap, Fermi Energy of Metal, Photoelectric Effect, Black Body Radiation, Resistivity of Semiconductor by Four Probe Method, Hall Effect, Determination of Boltzmann Constant, Numerical Aperture of OFC, Wavelength of Laser using Diffraction Grating, Refractive Indices of Uniaxial Crystals, Michelson's Interferometer.

References:

1. J. R. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, 2nd ed. Sausalito, CA: University Science Books, 1997.
2. R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers with Modern Physics, vol. 2, 6th ed. Belmont, CA: Thomson-Brooks/Cole, 1982.
3. B. L. Worsnop and H. T. Flint, Advanced Practical Physics. Bombay: Asia Publishing House, 1961.
4. W. R. Runyan, Semiconductor Measurements and Instrumentation. New York: McGraw-Hill Book Co., 1975.
5. F. A. Jenkins and H. E. White, Fundamentals of Optics. New York: McGraw-Hill Education, 2001.

MES 1011 WORKSHOP PRACTICE 0 0 3 1

Mechanical Engineering Stream: Fitting practice, Study of automotive systems, Additive manufacturing system. Computer Science Engineering Stream: Introduction to computer hardware and assembly, Operating systems installation and configuration, Basic networking setup and troubleshooting. Electrical Engineering Stream: Electrical wiring Practices, Electronic circuit assembly. Civil Engineering Stream: Material Testing, Surveying, Principles of building planning.

References:

1. Laboratory manual
2. Hajra Choudhury S. K. and Bose S. K., Elements of Workshop Technology, Vol I, Media Promoters & Publishing Pvt. Ltd., Mumbai, 2012.
3. Raghuvanshi S.S, Workshop Technology, Dhanpat Rai and Sons, Delhi, 2002.
4. Uppal S.L. and Garg G.C., Electrical Wiring, Estimating and Costing, Khanna Publishers, 2014.
5. Bishop Owen, Electronics - A First Course, 2nd Edition, NEWNES - An Imprint of Elsevier, 2006.
6. Punmia B.C, Ashok K. Jain, Arun K. Jain, "Surveying", Vol.1, Laxmi Publications (P) Ltd, Bangalore, 2012.

7. Bhavikatti S. S, "Strength of materials", Third edition, Vikas publishing house Pvt. Ltd., 2012.
8. Patterson, David A., and Hennessy, John L. Computer Organization and Design: The Hardware/Software Interface. Germany, Elsevier Science, 2012.
9. Mueller, Scott. Upgrading and Repairing PCs. United Kingdom, Pearson Education, 2015.
10. Kurose, James F., and Ross, Keith W. Computer Networking: A Top-down Approach. United Kingdom, Pearson, 2017.

MES 1111 ENGINEERING GRAPHICS I 0 0 3 1

Introduction - Geometrical constructions, Dimensioning and conventions of lines. Projection of points - Theory of Orthographic projections, Reference planes, Quadrants, Types of quadrants, Conventional representation of first angle projection system, Projection of points in first Quadrant only. Projection of straight lines -Line parallel to both reference planes, Line perpendicular to either horizontal or vertical or profile plane, Line inclined to horizontal plane, Line inclined to vertical plane, Line inclined to both horizontal and vertical planes, Finding true length and true inclinations, Locating the horizontal and vertical traces of lines. Projection of plane surfaces -projections of regular planes (Triangle, Square, Rhombus, Rectangle, Pentagon, Hexagon and Circle), Plane resting on edge and corner conditions, Surface inclined to HP and perpendicular to VP, Surface inclined to VP and perpendicular to HP, Plane surface inclined to both HP and VP (Change of position method only). Projection of solids- Projection regular solids like prisms & pyramids (Triangle, Square, Rectangle, Pentagon and Hexagon), Cone and cylinder, Solids resting on edge and corner conditions, Axis inclined to HP and parallel to VP, Axis inclined to VP and parallel to HP. Axis inclined to both HP and VP (Change of position method only). AUTO CAD - AUTOCAD software instructions, Projection of lines, Planes and Solids.

References:

1. Gopalkrishna K. R. and Sudhir Gopalkrishna "A textbook of Computer Aided Engineering Drawing", 37th Edition, Subhas Stores, Bangalore, 2012.
2. Venugopal K. "Engineering Drawing and Graphics + Auto CAD" Newage International Publishers, Delhi, 2002.
3. Bhat N. D. and V.M. Panchal "Engineering Drawing", 50th Edition, Charotar Publishing House, Anand, India, 2010.
4. Basant Agarwal and C M Agarwa, "Engineering Drawing", 2e, McGraw Hill Education, 2015
5. SWAYAM NPTEL MOOC course: Engineering drawing and computer graphics, By Prof. Rajaram Lakkaraju | IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc20_me79/preview

SMS 1201 ENGINEERING MATHEMATICS -II 3 1 0 4

Solution of Algebraic and Transcendental Equations: Newton-Raphson method. Solution of systems of non-linear equations using the Newton-Raphson method. Numerical Solution of Ordinary Differential Equations: Modified Euler's method; Runge-Kutta methods. Definition of a sequence and series, Convergence and divergence of an infinite series; Comparison test, Ratio test, Cauchy's root test, Raabe's test, Integral test; Alternating series - Leibniz's theorem; Absolute and conditional

convergence; Power series.Periodic function, Dirichlet's conditions, Finite discontinuities - Convergence, even and odd functions, Fourier Series expansion of functions with arbitrary periods, Half range expansions: Simple functions and harmonic analysis.Tracing Standard Curves: Cartesian Curves and Polar Curves.Double integrals, geometrical meaning, change of order of integration, change of variables, Jacobians and Jacobian transformations. Triple Integrals, Triple integrals using spherical and cylindrical polar coordinates, Applications to areas and volumes. Beta and Gamma functions and related problems. Transforms of elementary functions; Shifting properties; Transforms of periodic functions; Unit step function; Transforms of derivatives; Inverse transforms; Convolution; Solution of differential equations using Laplace transforms. Applications to LRC circuits, Vibrating Strings.

References:

1. Sastry S.S - Introductory methods of Numerical analysis, 5th edn., PHI learning Pvt. Ltd, 2012.
2. Kreyzig E, Advanced Engineering Mathematics, 8th edition, 2006, Wiley Eastern, Delhi.
3. Shanti Narayan - Differential Calculus, 6th edition, 2014, Shyam Lal Charitable Trust, Delhi
4. B.S.Grewal, Higher Engineering Mathematics, 45th edition, 2023, Khanna Publishers.

SMS 1003 ENGINEERING CHEMISTRY 3 0 0 3

Electrochemical cells, Energetics of cell reaction, EMF of cell, Calomel electrode, Glass electrode, Battery Technology: Li-ion batteries, Fuel Cells - PEMFC, Metal finishing: Electroplating of Cu & Cr & electroless plating of Cu, Corrosion classification, galvanic, pitting, intergranular and stress corrosion, Corrosion control, Hardness of water, Boiler troubles, Internal treatment, Softening of water, Twelve principles of green chemistry, use of alternative feedstock, minimizing energy consumption, Polymers: Molecular weight, Correlation of polymer properties with structure Glass transition temperature, Liquid crystals: Thermotropic and lyotropic, Liquid crystal Displays, Composites: Classification and properties, Polymer-Matrix Composite, Thin films: Formation, PVD and CVD techniques, Nanomaterials: Classification, bottom up and top down approach.

References:

1. Jain P C, Jain M. Engineering Chemistry, 16th Edn, Dhanpat Rai and Sons, New Delhi, 2015.
2. Kuriacose J C, Rajaram J. Chemistry in Engineering and Technology, Volume I/II, Tata McGraw-Hill, Delhi, 2001.
3. Fischer T. Materials Science for Engineering Students, Academic Press, London, 2009.

CCS 1004 BIOLOGY FOR ENGINEERS 3 0 0 3

Fundamentals of biological systems including elements of life, molecular interactions, macromolecules, and enzymes. Principles of genetic inheritance based on Mendelian and chromosomal models, including test crosses and pedigree analysis. Molecular basis of heredity covering DNA discovery, structure, replication, transcription, and translation. Evolutionary concepts such as modularity, adaptation, and cooperation

in living systems. Integration of biology with engineering through bioinspired designs in motion, robotics, and sustainable technologies. Case studies on biological control, viral replication, cloning, recombinant DNA technology, and synthetic life.

References:

1. Johnson, A. T. (2018). Biology for Engineers (2nd ed.). CRC Press Inc., USA. ISBN: 9781351165648.
2. Hillis, D. M., Heller, C. H., Hacker, S. D., Hall, D. W., Laskowski, M. J., O'Connell, L. A., & Sadava, D. E. (2023). Life: The Science of Biology (12th ed.). Macmillan Learning, USA. ISBN: 9781319498535.
3. Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Reece, J. B. (2024). Campbell Biology (12th ed.). Pearson. ISBN: 9780135988046.
4. Mallick, B. (2021). Biology for Engineers (1st ed.). McGraw-Hill Education India, New Delhi. ISBN: 9354600328.
5. NPTEL Course: Cell and Molecular Biology, IIT Guwahati. https://onlinecourses.nptel.ac.in/noc25_bt57/preview

EES 1001 BASIC ELECTRICAL TECHNOLOGY 21 0 3

DC Circuits: Electric circuit elements, source transformation, Network reduction techniques - Star-Delta transformation; Mesh current analysis, Node voltage analysis, Network Theorems - Superposition, Thevenin's, and Maximum Power Transfer. RL, RC, and RLC transient. Single-phase AC Circuits: Average value and RMS value of sinusoidal and non-sinusoidal waveforms, Sinusoidal AC voltage generation, Phasor representation, Steady-state analysis of RL, RC and RLC series, and parallel circuits with AC source, impedance, admittance. Power in AC circuits, active power, reactive power, and apparent power, power factor. Resonance: Series and parallel resonance. Three-phase AC Circuits: Generation of 3-phase sinusoidal voltages, phase sequence, star, and delta connections, line and phase voltage, analysis of three-phase circuit with star/delta connected balanced and unbalanced loads, power measurement, two-wattmeter method. Magnetic Circuits: MMF, flux, reluctance, analysis of series, parallel magnetic circuits, Electromagnetism, Faraday's laws of electromagnetic induction, self and mutual inductance, coupled circuits. Electrical Power System: Overview of Electrical Power System, Power system components, Generation, Transmission, Distribution, Utilization of Electric Power. Electrical Machines: Transformers, DC and AC motors - Principle of Operation, Types, Construction, & Applications; Energy measurements, Digital Energy Meter.

References:

1. Kothari D. P. & Nagarath I. J, Basic Electrical Engineering (3rd ed), MGH; 2017.
2. Nagasarkar T. K. & Sukhija M. S., Basic Electrical Engineering (3rd ed), OUP; 2017.
3. Hughes E., Electrical and Electronic Technology (12th ed), Pearson Education; 2016.
4. Mahmood Nahvi, Joseph Edminister, Schaum's Outline of Electric Circuits, 6th Edition. MGH 2013
5. NPTEL Courses: A Basic Course on Electric and Magnetic Circuits offered by IIT Kharagpur.
6. https://onlinecourses.nptel.ac.in/noc25_ee158/preview

CES 1001 PROBLEM SOLVING USING COMPUTERS 2 1 0 3

Digital Computer Systems: CPU, Primary and secondary memory, RAM, ROM, cache, registers; buses; input/output devices and bus standards. System software – OS, compiler, linker and assembler. Computer communication; Computer security. Data Representation - integer, floating point, character. Problem solving using computer: Steps in problem solving, Algorithms, Flowcharts. Introduction to C: Structure of a C program; Compilation and execution process; Keywords, identifiers, constants, variables, and data types; Operators and Expressions: Arithmetic, relational, logical, bitwise, assignment, and conditional operators; Operator precedence and associativity; Type conversion; Control Structures: Conditional statements if, if-else, switch; Loops while, do-while, for; break, continue; Arrays and Strings: One-dimensional and two-dimensional arrays; String handling and operations; Functions: Function declaration, and calling. Introduction to MATLAB: MATLAB interface and workspace; Basic commands and operations; Variables, data types, and arrays; Vectors, matrices, and matrix operations; Scripts and functions. Programming in MATLAB: Control flow if, for, while, switch; Functions and file I/O; Plotting and visualization (2D & 3D). Numerical solution of ODEs: MATLAB ODE solvers, Applications. Introduction to Simulink: Simulink environment and libraries; Building simple block diagrams; Simulation settings and scopes; Applications and Case Studies: Modelling simple dynamic systems (example: R-L-C system; mass-spring-damper system); Signal generation and processing.

References:

1. Noam Nisan and Shimon Schocken, The Elements of Computing Systems (2e), The MIT Press, 2021
2. Dromey.R. G, How to solve it by computers, Pearson Education, 2007.
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming language (2e), Pearson India, 2015.
4. Deitel. P and Deitel. H. M, C: How to program (9e), Pearson, 2022.
5. Balagurusamy.E, Computing fundamentals and C programming (2e), MC GRAW HILL INDIA, 2017.
6. MATLAB & Simulink Resources for Students (<https://www.mathworks.com/academia/students/resources.html>)

CCS 1003 ENVIRONMENTAL STUDIES 1 0 2 2

Introduction to Environment and Sustainability: meaning, objectives, major environmental issues, Environmental Ethics, Environmental Sustainability; Natural Resources and Energy – Resource consumption & conservation methods, Terrestrial and aquatic resources, Blue economy, Energy Policy In India and global, Ecosystem: meaning, structure and functions, Biodiversity, and its conservation – in situ & ex situ, IUCN red list; Environmental Pollution and control – Water, Air and Land Pollution, Solid Waste Management, Waste to Energy, Bioreactor landfills, Life cycle assessment, Circular economy; Environmental laws, policies and legislations- International Environmental treaties, Environmental impact assessment (EIA) in India, Clean Development mechanism; Disaster Management- Meaning, classification of disasters, Climate change impacts and mitigation, Disaster management phases – Disaster management cycle, Emergency response and recovery, Case studies on Environmental crisis and remedies in Indian scenario, Practical activities related Environmental awareness and its conservation.

References:

1. Bharucha, E. (2018). Textbook of Environmental Studies for Undergraduate Courses (2nd ed.). University Grants Commission, India.
2. Kanda, M. (2017). Disaster management in India: Evolution of institutional arrangements and operational strategies. BS Publications. (2017)
3. Dara, S. S., & Mishra, D. D. (2006). A textbook of environmental chemistry and pollution control. S. Chand Publishing.
4. Cullet, P, Bhullar, L., & Koonan, S. (Eds.). (2024). The Oxford handbook of environmental and natural resources law in India. Oxford University Press
5. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd..
5. Mahapatra, R., Jeevan, S. S., & Das, S. (Eds.). (2017). Environment reader for universities. Centre for Science and Environment
6. NPTEL Courses: Environmental Studies offered by Aligarh Muslim University https://onlinecourses.swayam2.ac.in/ini25_es02/preview

SMS 1007 HUMAN RIGHTS AND CONSTITUTION 1 0 0 1

This course offers a comprehensive understanding of the evolution, framework, and contemporary relevance of human rights. It begins by tracing the history and development of human rights and introduces learners to the International Bill of Rights, including the UDHR, ICCPR, and ICESCR. The course examines human rights within the Indian context through an exploration of the Constituent Assembly Debates, Fundamental Rights, and the Directive Principles of State Policy. It further highlights key legislations enacted for the protection of human rights and analyses the role of institutional mechanisms such as courts and human rights commissions. India's international obligations towards safeguarding human rights are discussed alongside the significant contributions of civil society. The course concludes with an in-depth study of current human rights issues, encouraging critical reflection and informed engagement with ongoing challenges through case studies.

References:

1. Halder, D., & Brahmabhatt, S. S. (2021). Advancement of Human Rights in India: Contemporary and Emerging Challenges. SAGE Publications Pvt. Ltd.
2. Ishay, M. R. (2008). The History of Human Rights: From Ancient Times to the Globalization Era. University of California Press.
3. Juss, S. (2021). Human Rights in India (Routledge Research in Human Rights Law). Routledge.
4. Mahoney, J. (2007). The Challenge of Human Rights: Origin, Development and Significance. Wiley-Blackwell.
5. Mishra, K. (2022). Human Rights in India: Historical Social and Political Perspective. Raj Publication.

SMS 1013 ENGINEERING CHEMISTRY LAB 0 0 3 1

Alkalimetric titration, Determination of total hardness of water, Estimation of copper in brass, Estimation of iron in hematite, Estimation of manganese dioxide in pyrolusite, Estimation of ammonia nitrogen in a fertilizer, pKa of weak acid by potentiometric titration, conductometric acid-base titration, Colorimetric estimation of copper, Determination of coefficient of viscosity of liquid, Estimation of sodium by flame photometry, Determination of Chemical Oxygen Demand of water

References:

1. Vogel A.I. Textbook of Quantitative Inorganic Analysis, 5th Edition, ELBS, 1998
2. Laboratory Manual for Engineering Chemistry Laboratory, M.I.T., 2014.

CES 1011 PROBLEM SOLVING USING COMPUTERS LAB 0 0 3 1

Module I: Exercises on C programming involving basic input/output operations, data types, operators, control structures, loops, arrays, strings, and functions to develop structured programming and problem-solving skills. Module II: Exercises on MATLAB involving interface navigation, matrix operations, control flow, plotting in 2D and 3D, file input/output, and numerical solutions of ordinary differential equations for engineering applications. Module III: Exercises on Simulink involving building and simulating block diagrams, modelling dynamic systems, and performing signal generation and processing through case studies such as RLC circuits and mass-spring-damper systems.

References:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming language (2e), Pearson Education, 2015.
2. Deitel.P. J and Deitel.H.M, C: How to program (7e), Pearson Education, 2010.
3. Balagurusamy.E, Computing fundamentals and C programming (1e), MC GRAW HILL INDIA, 2017.
4. Delores Etter, Introduction to MATLAB, Pearson Education India, 2019.
5. Stormy Attaway, Matlab: A practical Introduction to Programming and Problem Solving (4e), Butterworth-Heinemann, Elsevier, 2017.
6. MATLAB & Simulink Resources for Students (<https://www.mathworks.com/academia/students/resources.html>)

MES 1211 ENGINEERING GRAPHICS- II 0 0 3 1

SECTIONS OF SOLIDS - Horizontal vertical and inclined section planes and true shape of sections. Drawing sectional views with true shape of section. Simple cases of solids resting on HP or VP with axis perpendicular to reference planes, inclined to one reference plane, section plane perpendicular to VP, inclined to HP and inclined to VP. DEVELOPMENT OF SURFACES - Parallel line development for prisms (Triangle, Rectangle, Square, Pentagon and Hexagon) and cylinders (Including simple cut solids), Radial line development for pyramids (Triangle, Square, Rectangle, Pentagon and Hexagon) and cones (Including simple cut solids). ORTHOGRAPHIC CONVERSIONS - Simple & cut solids (Prisms, Pyramids, Cones, Cylinders), Combined solids, Simple machine components. Radius and angle measurement. ISOMETRIC PROJECTIONS AND VIEWS - Simple & cut solids (Prisms, Pyramids, Cones, Cylinders), Combined solids, Simple machine components. AUTO CAD: Solving and practicing problems on a Section of solids, Development of surfaces, Orthographic and Isometric projection using AutoCAD.

References:

1. Gopalkrishna K. R. and Sudhir Gopalkrishna "A textbook of Computer Aided Engineering Drawing", 37th Edition, Subhas Stores, Bangalore, 2012.
2. Technical Drawing with Engineering Graphics 15th Edition Giesecke PEARSON 2016
3. Basant Agarwal and C M Agarwa, "Engineering Drawing", 2e, McGraw Hill Education, 2015
4. SWAYAM NPTEL MOOC course: Engineering drawing and computer graphics, By Prof. Rajaram Lakkaraju | IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc20_me79/preview
5. James D. Bethune, "Engineering Graphics with AutoCAD", Pearson Education, 2014