

FIRST YEAR B.Tech. CURRICULUM 2026 (Common to all CS 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 1102	Computational Mathematics - I	3	1	0	4	SMS 1202	Computational Mathematics - II	3	1	0	4
	SMS 1002	Applied Physics for Engineers	3	0	0	3	SMS 1004	Applied Chemistry for Engineers	3	0	0	3
	EES 1004	Fundamentals of Electronics	2	1	0	3	EES 1002	Fundamentals of Electrical Engineering	3	0	0	3
	CES 1102	Programming for Problem Solving	2	1	0	3	CCS 1002	Engineering Mechanics and Smart Buildings	2	1	0	3
	MES 1002	Fundamentals of Mechanical Engineering	3	0	0	3	CES 1201	Introduction to Object Oriented Programming	3	0	0	3
	SMS 1005	Communication Skills in English	1	0	2	2	CCS 1003	Environmental Studies	1	0	2	2
	SMS1006	Universal Human Values and Professional Ethics	1	0	0	1	CES 1211	Introduction to Object Oriented Programming Lab	0	0	3	1
	SMS 1007	Human Rights and Constitution	0	0	0	1	CES 1212	Data Visualisation	0	1	3	2
	MES 1011	Workshop Practice	0	0	3	1	MES 1013	Computer Aided Engineering Graphics	0	0	3	1
	CES 1111	Programming for Problem Solving Lab	0	0	3	1						
			16	3	8	22			15	3	11	22
	Total Contact Hours (L + T + P)						Total Contact Hours (L + T + P)					
							27					
							29					

FIRST YEAR B.Tech. CURRICULUM 2026 (Common to all CS 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 1102	Computational Mathematics - I	3	1	0	4	SMS 1202	Computational Mathematics - II	3	1	0	4
	SMS 1004	Applied Chemistry for Engineers	3	0	0	3	SMS 1002	Applied Physics for Engineers	3	0	0	3
	EES 1002	Fundamentals of Electrical Engineering	2	1	0	3	EES 1004	Fundamentals of Electronics	3	0	0	3
	CES 1102	Programming for Problem Solving	2	1	0	3	MES 1002	Fundamentals of Mechanical Engineering	2	1	0	3
	CCS 1003	Environmental Studies	3	0	0	3	CES 1201	Introduction to Object Oriented Programming	3	0	0	3
	CCS 1002	Engineering Mechanics & Smart Building	1	0	2	2	SMS 1005	Communication Skills in English	1	0	2	2
	SMS 1006	Universal Human Values and Professional Ethics	1	0	0	1	CES 1211	Introduction to Object Oriented Programming Lab	0	0	3	1
	SMS 1007	Human Rights and Constitution	1	0	0	1	CES 1212	Data Visualisation	0	1	3	2
	MES 1013	Computer aided Engineering Graphics	0	0	3	1	MES 1012	Workshop Practice	0	0	3	1
	CES 1111	Programming for Problem Solving Lab	0	0	3	1						
			16	3	8	22			15	3	11	22
	Total Contact Hours (L + T + P)						Total Contact Hours (L + T + P)					
							27					
							29					

SMS 1102 COMPUTATIONAL MATHEMATICS I 3 1 0 4

Matrix Algebra: Elementary column and row transformations, Inverse of a matrix by elementary row operations, Echelon form and rank of a matrix, System of linear equations: Consistency, Solution by Gauss elimination, Gauss-Jordan, Jacobi and Gauss-Seidel methods, Eigen values and eigen vectors: Elementary properties, Spectral Matrix Decomposition, Diagonalisation, power of a matrix. Vector Spaces: Generalization of vector concept to higher dimensions, Generalised vector operations, Vector spaces and sub spaces, Linear independence and span, basis. Inner product spaces and Gram-Schmidt process of orthogonalization. Linear transformations. Differential Equations and Applications: Linear differential equations of first and higher order. Solution of homogeneous and nonhomogeneous linear equations using inverse differential operators, method of variation of parameters, and method of undetermined coefficients. Solution of Algebraic and Transcendental Equations: Tracing of parametric curves: Cycloid and related curves. Bisection method, Method of false position, Newton-Raphson method. Solution of System of Non-linear equations using Newton-Raphson method. Interpolation: Finite differences and divided differences. Newton-Gregory and Lagrange's interpolation formulae. Newton's divided difference interpolation formula. Discrete Numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule. Numerical solution of ordinary differential equations: Taylor's series method, Modified Euler's method, Runge-Kutta methods.

References:

1. B.S.Grewal, Higher Engineering Mathematics, 43nd edition, 2015, Khanna Publishers.
2. Kreyzig E, Advanced Engineering Mathematics, 9th edition, 2011, Wiley Eastern, Delhi.
3. David C. Lay, Linear Algebra and Applications, 3rd edition, 2009, Pearson Education.
4. Sastry S.S - Introductory methods of Numerical analysis, 5th edn., PHI Learning Pvt. Ltd, 2012.
5. Rainville E.D. and Bedient P.E., A short course in differential equations, 8th edition, 2011, Prentice Hall, New York.
6. Sheldon Axler, Linear Algebra Done Right, Springer 2014.

SMS 1002 APPLIED PHYSICS FOR ENGINEERS 3 0 0 3

Lasers and Fibre Optics: Laser characteristics, stimulated emission, Einstein's coefficients, Ruby, He-Ne and semiconductor lasers, and applications in optical communication. Explains fibre principles, acceptance angle, numerical aperture, modes, attenuation, and distortion. Introduction to Quantum Physics: Blackbody radiation, Planck's hypothesis, photoelectric and Compton effects, wave-particle duality, Davisson-Germer experiment, wave packet, and uncertainty principle. Quantum Mechanics: Schrödinger equations, wave functions, expectation values, particle in a box, finite potential well, tunnelling, and harmonic oscillator. Introduction to Quantum Computing: Explores quantum information, qubits, superposition, Pauli matrices, Dirac notation, Bloch sphere, and various single and multiple qubit gates including Hadamard, CNOT, and Toffoli gates. Demonstration Experiments: Optical fibre, photoelectric effect, uncertainty principle, and quantum circuit simulation.

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. S. P. Basavaraju, Engineering Physics. Bangalore, India: Subhas Stores, 2016.
3. A. Ghatak, Optoelectronics: An Introduction. Cambridge, U.K.: Cambridge University Press, 2017
4. A. Ghatak and S. Lokanathan, Quantum Mechanics, 5th ed. New Delhi, India: Macmillan, 2007.
5. M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, 10th Anniversary ed. Cambridge, U.K.: Cambridge Univ. Press, 2010.
6. P. Ramadevi, "Quantum Mechanics I," NPTEL Online Course, IIT Bombay, accessed Oct. 17, 2025. [Online]. Available: https://onlinecourses.nptel.ac.in/noc25_ph22/preview

EES 1004 FUNDAMENTALS OF ELECTRONICS 3 0 0 3

Analog Electronics: Rectifiers using diode, Rectifier Capacitor Filter, Zener Regulator, MOSFET amplifiers, Block diagram representation of Op-Amp, Op-Amp parameters, Linear and non-linear applications of Op-Amp. Digital Electronics: Number system classification, One's and two's complements, weighted and non-weighted codes, Self-complementing codes, error detecting and correcting codes, Boolean algebraic theorems and simplification of Boolean expressions, Basic and Universal logic gates, Implementation of Boolean expressions using logic gates, Standard form of Boolean expression, Simplification of Boolean expressions using K-map and implementation using logic gates, Multiplexers and Demultiplexers, JK, SR, D and T flip-flops, Binary counters, Shift registers, Finite State Machines, Moore's and Mealy model.

References:

1. Robert L. Boylestad, Louis Nashelsky- Electronic Devices & Circuit Theory, 11th Edition, PHI, 2012
2. Behzad Razavi, "Fundamental of Microelectronics", Wiley, 2013.
3. Morris Mano-Digital design, Prentice Hall of India, Third Edition, 2013.
4. George Kennedy, Bernard Davis- Electronic Communication Systems, Fourth edition, TMH, 2004.
5. Raj Pandya, "Mobile and Personal Communication Services and Systems", Wiley-IEEE Press, 1999.

CES 1102 PROGRAMMING FOR PROBLEM SOLVING 2 1 0 3

Introduction to computing, Importance of Problem solving using computers, Algorithms and Flow charts, From algorithms and flowcharts to programs, Introduction to programming using C language, Simple C programs, Syntax and Logical Errors in compilation, Object and executable code, Data concepts in C, Operators in C, Expressions and Precedence, Input and output statements, Decision Making Statements: IF, IF-ELSE, Nested IF-ELSE, ELSE-IF Ladder, Switch, Looping Statements: WHILE, DO-WHILE and FOR constructs, Control structures, 1-D, Multidimensional arrays: 2-D arrays and strings, Searching and sorting, Modularization, functions, and recursive functions, Pointers, Pointer arithmetic, Structures: Defining structures, Array of Structures, Pointer to structures, Files Concept.

References:

1. Computer fundamentals and programming in C, "Reema Thareja", Oxford University, Second edition, 2017.
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.

MES 1002 FUNDAMENTALS OF 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. Power Transmission: Belt drives, Pulley systems, 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. Refrigeration: Principle and working of vapour compression refrigeration system, Performance of refrigeration system, Air conditioning system, types of Airconditioning system. Internet of Things (IoT) in Mechanical Systems: Basics of IoT, IoT Applications in Mechanical Engineering. Automation: Introduction to CNC machines, Introduction to robotics, robot configuration, application of robotics, Introduction to Additive Manufacturing, Stages in Additive Manufacturing, FDM, SLS technology, Printing parameters.

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

HUM 1071 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. SenthilKumar PHI Learning Pvt. Ltd – 2009.

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.

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.

CCS 1111 PROGRAMMING FOR PROBLEM SOLVING LAB 0 0 3 1

Familiarization with programming environment, Simple computational problems using C programming, Problems involving branching control structures, Iterative Problems, 1D array manipulation, 2D array programming (matrices), String operations, Introduction to Modular programming and solving problems using modularization, Recursive functions programming, Programs with pointers, structures, File operations.

References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming language (2e), Pearson Education, 2015.
3. Deitel.P. J and Deitel.H.M, C: How to program (7e), Pearson Education, 2010.
4. Balagurusamy.E, Computing fundamentals and C programming (1e), MC GRAW HILL INDIA, 2017.

SMS 1202 COMPUTATIONAL MATHEMATICS II 3 1 0 4

Partial Differentiation: Continuity of functions of two variables, Definition of partial derivative, Euler's theorem on homogeneous functions, Total derivative, Derivatives of composite & implicit functions. Errors and approximations. Taylor's theorem for functions of two variables, Maxima and Minima, Lagrange's method of undetermined multipliers, Linear Regression Models. Multiple Integrals: Definitions of Double and Triple integrals, Evaluation by the change of order of integration, change of variables, Jacobians. Applications to areas and volumes. Beta and Gamma functions and simple problems. Sequences and Series: Convergent sequences, computing sequence limits. Convergence and divergence of an infinite series. Tests: comparison test, ratio test, Cauchy's root test, Raabe's test, Integral test. Alternating series: Leibnitz's theorem, absolute and conditional convergence with problems. Power series. Efficient Computing Techniques: Modular Exponentiation by Repeated Squaring, Modular Multiplicative Inverse, Lucas Theorem to compute nCr , Primality Tests, Sieve of Eratosthenes and its implementation on a computer, Recurrent Problems, The Tower of Hanoi, Lines in the Plane, The Josephus Problem. Laplace Transforms: Transforms of elementary functions, shifting theorems, Transforms of periodic functions, Unit step function. Inverse Laplace transforms. Convolution and Applications.

References:

1. B.S.Grewal - Higher Engineering Mathematics, , 43nd edition, 2015, Khanna Publishers.
2. N.Piskunov-Differential Calculus, Vol I and II, 1996, Mir Publications
3. Rainville E.D and Bedient P.E. A short course in differential equations, 8th edition, 2011, Prentice hall, New York.
4. Kreyzig E, Advanced Engineering Mathematics, 8th edition, 2006, Wiley Eastern, Delhi.
5. Ronald L. Graham, Donald E. Knuth and Oren Patashnik, Concrete Mathematics: A Foundation for Computer Science (2nd Ed.) by (1994), Pearson Publ.

SMS 1004 APPLIED CHEMISTRY FOR ENGINEERS 3 0 0 3

Battery Technology : Basics of batteries: redox reactions, electrochemical cells (anode, cathode, electrolyte), Battery performance metrics, Types: Lead-acid, NiMH, Li-ion, emerging batteries, fuel cells, Environmental and safety concerns . Materials Chemistry: Polymers: structure, Tg, molecular weight effects, engineering & biodegradable polymers, Functional polymers: conducting, smart, self-healing, Nanomaterials: synthesis, properties, applications, Display technologies: LCD (TN, IPS, VA), OLED, MicroLED, foldable displays. Chemical and Electrochemical sensors: Chemical sensors: biosensors, gas sensors, electrochemical sensors: amperometric, voltametric. E-waste generation and management : Pollution & health risks from e-waste, Circular economy: reuse, repair, redesign, Hazardous materials: heavy metals, BFRs, PFAS, Recycling methods: hydrometallurgical, pyrometallurgical, electrochemical Virtual Labs :Li ion battery, Viscometry(Polymer sample), GPC, Flame photometry, Colorimetry, pH sensor and Circular Economy approach

References:

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013 – 2nd Edition.
2. P. C. Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai Publication, 2015 – 16th Edition
3. Fischer T. Materials Science for Engineering Students, Academic Press, London, 2009.

EES 1002 FUNDAMENTALS OF ELECTRICAL ENGINEERING 3 0 0 3

DC Circuits: Active & Passive Elements, Ohm's Law, KCL & KVL, Source Transformation, Star-Delta Transformation, Mesh & Nodal Analysis, Superposition, Thevenin's & Maximum Power Transfer Theorem, Transient Behavior of RL, RC and RLC Circuits. Single-Phase and three phase AC Circuits: Single-Phase AC circuits-Generation & Representation, RMS & Average Values, Phasor Algebra, Analysis of R, L, C, R-L, R-C, R-L-C Circuits, Parallel AC Circuits, Active, Reactive & Apparent Power, Power Factor Correction, Series & Parallel Resonance. Three-Phase AC Circuits-Generation & Representation, Phase Sequence, Star & Delta Connections, 3-Phase Power, Star-Delta Balanced & Unbalanced Load Analysis, Power Measurement. Magnetically coupled systems: Definitions & Fundamentals, Coupled Circuits, Coupling Coefficient, Dot Rule, Series-Parallel Aiding & Opposition, Analysis of Series & Parallel Circuits, Electromagnetic Induction. Electrical Machines Basics – Transformers, DC Motors, Induction & Special Machines. Introduction to Electrical Power Systems:

Overview of Generation, Transmission, Distribution & Utilization, Loads, Costing of electricity, Energy Metering, Power connection for critical loads. Introduction to Power Electronics: Power Semiconductor devices, Power Converters and classification. Power stages in Laptop and Desktop. SMPS, UPS and Electric Vehicles.

References:

1. William H. Hayt, Jack E. Kemmerly & Steven M. Durbin, Engineering Circuit Analysis (8th ed.), McGraw-Hill, 2012.
2. Nagrath I.J. and D. P. Kothari; Basic Electrical Engineering (4Th Ed); Tata McGraw Hill (2019).
3. Nagasarkar T. K. & Sukhija M. S., Basic Electrical Engineering (3rd ed.), OUP; 2017.
4. Daniel W. Hart; Power Electronics; McGraw Hill (2011).
5. NPTEL Courses: Fundamentals of Electrical Engineering, IIT Kharagpur <https://nptel.ac.in/courses/108105112>

CCS 1002 ENGINEERING MECHANICS AND SMART BUILDINGS 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. 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 and Poisson's ratio. Shear stress and shear strain, Volumetric stress and strain, Elastic constants and their relationships, application problems. Smart building systems: HVAC, lighting control systems, access control systems, fire alarm notification, video IPTV, audio-visual system, energy and sustainability. Case studies on Building automation. Fundamentals of Virtual Reality, Augmented Reality and Building Information Modelling, Transitioning of BIM to Digital Twins. Fundamentals of instrumentation and measuring systems in civil Engineering. Case studies on the Application of Cloud computing & and IoT in construction safety and security.

References:

1. Beer F. P., Johnston Jr. E. R., Dewolf J. T., Mazurek D. F., Sanghi S., Mechanics of Materials (7e), Tata McGraw-Hill, 2017.
2. Bhavikatti S. S., Strength of Materials (4e), Vikas Publishers, 2013.
3. James Sinopli, Smart building systems for Architects, owners and builders, Elsevier, Butterworth-Heinemann Publications, 2010
4. A. K. Ghosh, "Introduction to Measurements & Instrumentation", Illrd, PHI
5. Eastman, C; Teicholz, P; Sacks, R; Liston, K, BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors: NewYork: Wiley. 2011

CES 1201 INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 3 0 0 3

Introduction to Object-Oriented Programming and Java Basics: Object-Oriented Programming (OOP) concepts including definition, features, comparison with procedural programming, and OOP principles such as encapsulation, inheritance, polymorphism, and abstraction. It introduces Java, its history, characteristics, the first simple program, lexical units including keywords, identifiers, literals, operators, and Java's magic: Bytecode and JVM. It also discusses data types including primitive types and literals, variables with declaration, initialization, and scope, and arrays with declaration, initialization, and basic operations. Type Conversion, Operators, and Control Statements: Type conversion and casting such as automatic (widening) and explicit (narrowing) conversion, and type promotion in expressions. Operators in Java are covered including arithmetic, relational, logical, bitwise, assignment, and unary operators along with operator precedence and associativity. Control statements include selection statements (if, if-else, switch), iteration statements (for, while, do-while), and jump statements (break, continue, return). Classes, Objects, and Methods: Classes and objects including class definition, declaring references, creating instances, and array of objects. Methods are introduced including definition, calling, parameter passing (by value, by reference), returning objects, and recursion. Constructors and overloading, including constructor overloading, method overloading, and the use of the this keyword are explained. Static members and blocks, inner blocks, default access control, and garbage collection are also discussed. Strings, Inheritance, and Polymorphism: Strings with String and StringBuffer classes, creation, manipulation, and methods. Inheritance and polymorphism are covered including extends and super keywords, method overriding, abstract classes and methods, and understanding polymorphism. Interfaces and packages are also included, covering definition, implementation, difference between abstract class and interface, and package creation, usage, and access modifiers. Exception Handling: Exception handling including try, catch, finally blocks, throwing exceptions, and creating custom exceptions. Advanced OOP concepts such as composition vs inheritance, Java memory management, and best practices in OOP design are also covered.

References:

1. Schildt H., Java-The Complete Reference, 12th Edition, Tata McGraw-Hill 2020. [Horstmann](#)
2. C. S. & Cornell G., Core Java Volume I – Fundamentals, 13th Edition, Oracle 2024.
3. Programming in Java By Prof. Debasis Samanta | IIT Kharagpur
4. https://onlinecourses.nptel.ac.in/noc20_cs58/preview

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

CES 1211 INTRODUCTION TO OBJECT ORIENTED PROGRAMMING LAB 0 0 3 1

Java program writing and execution, Illustration of Data types, Variable and arrays, Type conversion and casting, Operators and control statements, Classes and methods, static, static block, inner classes, Use of this, super, final keywords. Method overloading, Parameter passing, Array of objects, Nested classes, Inheritance and method overriding, Strings, Abstract classes, Packages, Interfaces, Exception handling.

References:

1. Schildt H., Java-The Complete Reference, 12th Edition, Tata McGraw-Hill 2020. [Horstmann](#)
2. C. S. & Cornell G., Core Java Volume I – Fundamentals, 13th Edition, Oracle 2024
3. https://onlinecourses.nptel.ac.in/noc20_cs58/preview.

CES 1212 DATA VISUALIZATION 0 1 3 2

Introduction, Data Visualization basics: importance of context, effective visuals and storytelling. Python Language Basics: Python Interpreter, Input-Output, Identifiers and keywords, Conditional Statements and Looping, Strings. Built-in Data Structures, Functions and Files: Tuple, List, Dictionary, Sets, Functions, Modules and packages. NumPy basics: Arrays and vectorised computation. Pandas basics: series, data frame, indexing. Data Loading, storage and file formats: read and write files. Data cleaning: missing values, data transforms, discretization and binning, outliers, permutation and random sampling. String manipulation, regular expressions. Data Wrangling: Join, combine, reshaping and pivoting. Plotting and Visualization: Matplotlib basics, figures and subplots, basic plots-line, bar, histogram, density plots,

scatter, facet grids and categorical data, Data Aggregation and Group operations: group summary statistics, linear regression, rank, or subset selection, pivot tables and cross-tabulations. Case study.

Abstract Syllabus (Integrated lab)

Hands-on Python programming: data analysis and visualization using the Anaconda distribution with Jupyter Notebook. Data manipulation, cleaning, aggregation, and visualization using libraries such as NumPy, Pandas, Matplotlib, and Seaborn and appropriate datasets. A case study includes analytical reports, python code, visuals, and interpretations for the assigned dataset.

References:

1. Wes McKinney, Python for Data Analysis: Data Wrangling with pandas, NumPy & Jupyter. 3rd edition. O'Reilly Media, 2022.
2. Cole Nussbaumer Knaflitz, Storytelling With Data: A Data Visualization Guide for Business Professionals, John Wiley and Sons, 2015.
3. Jake VanderPlas, Python Data Science Handbook. O'Reilly Media, 2016.
4. Alberto Boschetti and Luca Massaron, Python Data Science Essentials, 3rd edition, Packt Publishing Ltd. 2018.
5. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley India, 2019.

MES 1013 COMPUTER AIDED ENGINEERING GRAPHICS 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 the 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. Projection of plane surfaces – Projections of regular planes (Triangle, Square, 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 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. Isometric to orthographic conversion – Orthographic projections of machine components to be drawn. Isometric projection – Isometric scale, Isometric projection of simple machine components.

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