B.Tech. First Year Curriculum 2021 (Common for all branches)

(Applicable to students admitted during 2021 and later)

First Year: Course Structure (Physics Group)

Total: 44 Credits

FIRST SEMESTER

Year	Course Code	Course Name	L	T	P	C
1	MAT_1151	Engineering Mathematics - I	3	1	0	4
	PHY_1051	Engineering Physics	2	1	0	3
	CIE_1051	Mechanics of Solids	2	1	0	3
	ECE_1051	Basic Electronics	3	0	0	3
	MME_1051	Basic Mechanical Engineering	3	0	0	3
	HUM_1053	Communication Skills in English and Human Values	1	0	3	2
	PHY_1061	Engineering Physics Lab	0	0	3	1
	MME_1061	Workshop Practice	0	0	3	1
	MME_1161	Engineering Graphics - I	1	0	2	2
			15	3	11	22
		Total Contact Hours (L + T + P)		29		

SECOND SEMESTER

Course Code	Course Name	L	T	P	C
MAT_1251	Engineering Mathematics - II	3	1	0	4
CHM_1051	Engineering Chemistry	2	1	0	3
BIO_1051	Biology for Engineers	2	1	0	3
ELE_1051	Basic Electrical Technology	2	1	0	3
CSE_1051	Problem Solving Using Computers	2	1	0	3
CIE_1052	Environmental Studies	1	0	3	2
CHM_1061	Engineering Chemistry Lab	0	0	3	1
CSE_1061	PSUC Lab	0	0	3	1
MME_1261	Engineering Graphics - II	1	0	2	2
		13	5	11	22
	Total Contact Hours (L + T + P)		29		

First Year: Course Structure (Chemistry Group)

Total: 44 Credits

FIRST SEMESTER

Year	Course Code	Course Name	L	T	P	C
1	MAT_1151	Engineering Mathematics - I	3	1	0	4
	CHM_1051	Engineering Chemistry	2	1	0	3
	BIO_1051	Biology for Engineers	2	1	0	3
	ELE_1051	Basic Electrical Technology	2	1	0	3
	CSE_1051	Problem Solving Using Computers	2	1	0	3
	CIE_1052	Environmental Studies	1	0	3	2
	CHM_1061	Engineering Chemistry Lab	0	0	3	1
	CSE_1061	PSUC Lab	0	0	3	1
	MME_1161	Engineering Graphics - I	1	0	2	2
			13	5	11	22
		Total Contact Hours (L + T + P)		29		

SECOND SEMESTER

Course Code	Course Name	L	T	P	C
MAT_1251	Engineering Mathematics - II	3	1	0	4
PHY_1051	Engineering Physics	2	1	0	3
CIE_1051	Mechanics of Solids	2	1	0	3
ECE_1051	Basic Electronics	3	0	0	3
MME_1051	Basic Mechanical Engineering	3	0	0	3
HUM_1053	Communication Skills in English and Human Values	1	0	3	2
PHY_1061	Engineering Physics Lab	0	0	3	1
MME_1061	Workshop Practice	0	0	3	1
MME_1261	Engineering Graphics - II	1	0	2	2
		15	3	11	22
	Total Contact Hours (L + T + P)		29		

MAT_1151: ENGINEERING MATHEMATICS – I [3 1 0 4]

Matrices-inverse and rank, solution of linear system of equations, Eigen value problems. Vector spaces, basis, linear transformations, inner product spaces and Orthogonalization. First and higher order differential equations and their solutions, Lagrange's and divided difference interpolation. Numerical differentiation and integration. Solution of algebraic and transcendental equations, solutions of ordinary differential equations.

References:

1. B. S. Grewal, Higher Engineering Mathematics, (42e), Khanna Publishers, 2013
2. Kreyzig E., Advanced Engineering Mathematics, (10e), Wiley Eastern, 2011
3. David C. Lay, Linear Algebra and applications, (3e), Pearson Education, 2009
4. 4. Sastry S. S., Introductory methods of Numerical analysis, (4e), PHI, 2007
5. Rainville E. D. and Bedient P.E., A short course in differential equations, (4e), Macmillan Publishers, 1969

PHY_1051: ENGINEERING PHYSICS [2 1 0 3]

Double-slit interference of light, Interference from thin films (Air-wedge, Newton's rings), Michelson interferometer. Single-slit and Double-slit diffraction of light, Circular apertures, Diffraction gratings and applications, Diffraction of X-rays, Polarization of light, Double refraction, Optical activity.

Black body radiation and Planck's hypothesis, Photoelectric effect, The Compton effect, Wave packet, phase speed, group speed. Uncertainty principle. One-dimensional wave functions and expectation values, Particle in a box, Boundary conditions on particles in general, The schrodinger equation, Particle in a well of finite height, Tunneling through a potential barrier and its applications, The simple harmonic oscillator. Atomic spectra of gases and Bohr's model of the hydrogen atom, The quantum model of the hydrogen atom, The wave functions for hydrogen, Quantum numbers, X-ray spectra, Spontaneous and stimulated transitions, Lasers and applications.

Molecular bonds, Energy states and spectra of molecules, Bonding in solids, Free electron theory of metals, Band theory of solids, Electrical conduction in metals, Insulators and Semiconductors, Superconductivity.

References:

1. Jewett & Serway; PHYSICS for Scientists and Engineers with Modern Physics (7e), Cengage Learning 2008.
2. Halliday, Resnick, Krane, PHYSICS (5e), Volume 2, John Wiley & Sons, Inc 2002.

CIE_1051: MECHANICS OF SOLIDS [2 1 0 3]

Introduction to mechanics of rigid bodies, Resolution of force, Composition of forces, Moment of a force, Varignon's theorem, couple, Conditions of Equilibrium, Space and free body diagrams, Lami's theorem, Types of beams, Support reactions, Types of loading, Friction, Centroid and moment of inertia of simple and composite areas, Introduction to rigid bodies, Normal stress and strain, 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, Relationship between modulus of elasticity, modulus of rigidity and bulk modulus, Compound bars, stresses due to temperature, Stresses in thin cylinders, Concepts of bending moment & shear force diagrams.

References:

1. Meriam J. L., Kraige L. G., Engineering Mechanics: Statistics (5e), John wiley & sons, 2004.
2. Beer F. P., Johnston Jr. E. R., Dewolf J. T., Mazurek D. F., Sanghi S., Mechanics of Materials (7e), Tata McGraw-Hill, 2017.
3. Pytel A., Singer F.L., Strength of Materials (4e), HarperCollins College Div, 1987.
4. Bhavikatti S. S., Strength of Materials (4e), Vikas Publishers, 2013.
5. Basavarajaiah B. S., Mahadevappa P., Strength of Materials (3e), Universities Press, 2010.

ECE_1051: BASIC ELECTRONICS [3 0 0 3]

Diode Characteristics, Breakdown phenomenon in diodes, Zener diode, Diode rectifier, Zener regulator, Regulated Power supplies, Special purpose diodes, BJT characteristics, CB, CE and CC configurations, Transistor biasing, RC coupled Amplifier, Transistor as a Switch, Block diagram and characteristics of Operational Amplifier, Inverting and noninverting amplifier, Difference amplifier, Op-amp based adder, subtractor, integrator, differentiator, comparator and square wave generator, Number systems and codes, Boolean algebraic theorems, simplification of Boolean expressions, Logic gates, concept of Universal Logic, Flip flops, Fundamentals of analog communication, Introduction to digital communication and communication networks, Introduction to mobile communication.

References:

1. Robert L. Boylestad, Louis Nashelsky., Electronic Devices & Circuit Theory (11e), PHI 2012.
2. Malvino and Leach., Digital Principles & applications (7e), TMH 2010.
3. George Kennedy, Bernad Davis., Electronic Communication Systems, (4e), TMH, 2004
4. Garcia, Widjaja., Communication Networks, McGraw Hill 2006.
5. Raj Pandya, Mobile and Personal Communication Services and Systems, Wiley-IEEE Press, 1999.

MME_1051: BASIC MECHANICAL ENGINEERING [3 0 0 3]

Properties of Steam and Boilers: Steam properties Working principle of Babcock & Wilcox Boiler. Prime Movers: Classification, working principle of steam, gas and water turbines Power plants: Working principle of thermal, nuclear, hydel and solar power plants Refrigeration: Principle and working of vapour compression refrigeration system, I.C. Engines: Classification, Working of 2-stroke, 4 - stroke C.I and S.I Engines Power Transmission: Belt drives, Introduction to rope drive and chain drives, Gear Drives. Machine Tools: Introduction to Lathe, Drilling Machine and operations Casting and Forging: Two box moulding procedure, moulding sand and its desirable properties, Pattern allowances, Introduction to forging. Welding: Principle of Resistance spot welding, Electric arc welding and Oxy-acetylene gas welding, Introduction to soldering and brazing.

References:

1. K. R.Gopalakrishna, Text book of elements of Mechanical Engineering, Subhash Publications, Bangalore, 2005.
2. Roy & Choudhury, Elements of Mechanical Engineering, Media Promoters & Publishers Pvt. Ltd, Mumbai, 2000.
3. Mishra B.K., Mechanical Engineering Sciences, Kumar & Kumar Publishers (P) Ltd, Bangalore, 1999
4. Trymbaka Murthy S., A text book of elements of Mechanical Engineering, I. K. International Publishing House Pvt. Ltd, 2010.
5. Rajput R. K., Elements of Mechanical Engineering, Fire Wall Media, 2005.

6. B.S. Raghuvanshi, A course in Workshop Technology, Vol. 1, Dhanpat Rai & sons, New Delhi, 2005.

HUM_1053: COMMUNICATION SKILLS IN ENGLISH & HUMAN VALUES [1 0 3 2]

Reading- selected texts on different themes, genres and styles –discussion on universal human values, professionalism and conflict. Writing- response writing on themes related to human values, academic writing– essay; mechanics of writing–punctuation, functional grammar, and error identification. Oral communication –speech, presentation/Impromptu speeches, Group discussion, Interview techniques, formal/informal communication. Listening-Audio Texts/speeches, listening skills. Communication-group communication and interpersonal communication. Readings on themes: culture and society; science and technology; progress and social changes; gender and identity issues; world around us; nation and development; leadership.

References:
1. Dhanavel, S.P (2010). English and Soft Skills. Orient BlackSwan
2. Swan, Michael (2014). Practical English Usage. Oxford University Press. London.
3. Balasubramanian, P (2013). Phonetics for Indian Students. Mc Milan, Mumbai
4. Lewis, Norman (2011). Word Power Made Easy. Goyal Publications
5. Green, David, (2015).Contemporary English Grammar Structure and Composition. Laxmi Publications.
6. Raman, M & Sharma S (2014). Technical Communication: Principles and Practice. Oxford University Press. New Delhi
7. Nagarazan R S (2007). A text book on Professional Ethics and Human values, New Age International Publishers, New Delhi.
8. Gaur, R. R., Sangal, R., & Bagaria, G. P. (2010). A Foundation Course in Human Values and Professionals Ethics. Excel Books India.

CHM_1051: ENGINEERING CHEMISTRY [2 1 0 3]

Principles and applications of electrochemistry, metal finishing. Chemistry of primary and secondary batteries. Working principles of fuels cells and their applications. Concept of corrosion and its importance, types of corrosion, factors affecting corrosion, Corrosion control methods. General methods of chemical analysis, Instrumental methods. Introduction to spectroscopic methods of analysis: Electromagnetic radiation (EMR), Interaction of EMR with matter, Numerical Problems. Concepts of rotational, vibrational and electronic spectra, Laws of spectrophotometry. Classification of Fuels, Gross Calorific value and Net Calorific value. Solid, Liquid and Gaseous fuels. basic principles and classification of materials, Effect of bonding on properties of materials. Classification of advanced materials-polymers, Liquid crystals, Ceramics, composites, bio materials, nanomaterials, thin films and their properties and applications.

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

BIO_1051: BIOLOGY FOR ENGINEERS [2 1 0 3]

Chemistry of life: Elements of life and their bonding ability, importance of carbon, elemental replacement, different types of bonds and interactions in biological systems, water and phospholipids as well as their importance in the survival of life, Biomolecules such as carbohydrates and proteins, their structures, enzymes, effect of pH and Bioenergetics. Inheritance of life: Mendelian model and its testing, Location of factors and its mode of inheritance, Morgan concept on location of factors, pedigree analysis. Molecular basis of inheritance: Discovery of DNA, Experimental evidence for the existing theories of molecular biology, structure of DNA, DNA copying mechanism and its proof reading as well as editing, RNA synthesis and processing, Protein synthesis and Genetic code. Case studies: Mechanism of viral replications, Lac operon as an example of biological control system, Concepts of cloning, Recombinant DNA technology, vaccination and ascent of sap. Evolution and origin of life: Darwin's theory, Mechanisms of Evolution, Evidence of evolution, Constraints on evolution.

References:
1. Sadava D. E., Hillis D. M., Heller H. C. and Hacker S. D. Life the science of biology, (11e), Macmillan Learning, USA ISBN-10: 1-319-01016-4, 2107
2. Urry L. A., Cain M. L., Wasserman S. A., Minorsky P. V. and Reece J. B., Campbell Biology, (11e), Pearson ISBN-10: 0134093410, 2017
3. Johnson A. T., Biology for Engineers, CRC Press Inc., USA, ISBN 9781420077636, 2010.

ELE_1051: BASIC ELECTRICAL TECHNOLOGY [2 1 0 3]

DC circuits, Independent sources, Resistance, Network reduction techniques, Mesh and Node voltage analysis, Superposition, Thevenin's and Maximum power transfer theorems, Transient behaviour of inductance and capacitance, Series and Parallel magnetic circuits, Self and Mutual inductances, Coupled coils, Dot rule, Average and RMS values of sinusoidal waves, Series and Parallel AC circuits, Power factor improvement, Series and Parallel resonance, Three phase star and delta connected loads, Measurement of power in three phase circuits, Electrical power system, Transformers, DC motors, BLDC, Induction motors, Synchronous motors, Stepper motors, Measurement of energy.

References:
1. Hughes E., Electrical and Electronic Technology (9e), Pearson Education, 2008
2. D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2012.
3. Kothari D. P. & Nagarath I. J., Basic Electrical Engineering, TMH 2013
4. http://www.nptel.ac.in/courses/108108076/
5. http://www.nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Basic%20Electrical%20Technology/New_index1.htm

CSE_1051: PROBLEM SOLVING USING COMPUTERS [2 1 0 3]

Introduction to computing, Importance of Problem solving using computers, Algorithms and Flow charts, Introduction to C language, Simple C programs, Syntax and Logical Errors in compilation, Object and executable code, Variable names and declaration, Data types, Sizes and Constants, Various operators, Type conversion and expressions, Precedence and order of evaluation, Statements and blocks, Control flow, Break and continue, 1-D and 2-D Arrays and Strings, Searching and Sorting, Multidimensional Arrays and Matrices, Modular programming and Recursive functions, Structure and Pointers, Defining Structures and Array of Structures, Pointer arithmetic, Pointer to Structures, File Management and Cyber Security.

References:
1. Dromey. R. G, How to solve it by computers, Pearson, 1982.

3

2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming language (2e), Pearson Education, 1988.
3. Deital. P. J and Deitel. H. M, C: How to program (7e), Pearson Education, 2010.
4. Balagurusamy, E, Computing fundamentals and C programming (1e), McGraw-Hill, 2008.

CIE_1052: ENVIRONMENTAL STUDIES [1 0 3 2]

Meaning, multidisciplinary nature of environmental science, applications in engineering disciplines, environmental ethics, sustainable development, Renewable and non-renewable resources, Resource consumption & conservation methods, different types of energy, Conventional sources & Non-Conventional sources of energy, Types & Structure of Ecosystem, Environmental Pollution and control , Disaster Management meaning, natural disasters especially earthquakes & Manmade disasters, Environmental crisis & legislations , Environmental acts, Laws and Policies, EIA, Case studies of the past related to environmental issues, crisis, disasters, hazard, pollution, climate change & its effects, Practical activity related to environmental problems and its impacts on environment.

References:
1. Mohan kanda, Disaster Management in India evolution of institutional arrangements & operational strategies, 2017.
2. Y.Anjaneyulu, Introduction to Environmental science, 2017.
3. R.K.Trivedy, Handbook of Environmental laws, acts, guidelines, compliances & standards, 3rd edition, 2nd volume, 2017.
4. Benny Joseph, Environmental Studies, Tata McGraw-Hill Publishing Company Ltd., New Delhi , 2008.
5. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.
6. R.J.Ranjit Daniels and Jagadish Krishnaswamy, "Environmental Studies", Wiley India Private Ltd., New Delhi, 2009.
7. G.Swarajya Lakshmi, Environmental science: A Practical Manual, 2010.
8. Student guide: Environment Reader for Universities, based on UGC syllabus published by Centre for Science and Environment, 2017.

PHY_1061: ENGINEERING PHYSICS LAB [0 0 3 1]

Experiments on interference of mechanical waves, Experiments on interference, diffraction and double refraction of light. Experiments on quantum theory of radiation. Experiments on free-electron theory of metals, band theory of solids, semiconductors. Experiments on resonance circuits, Hall-effect.

References:
1. Jewett & Serway, PHYSICS for Scientists and Engineers with Modern Physics (7e), Cengage Learning 2008.
2. Worsnop & Flint, Advanced Practical Physics for Students (9e), Methuen & Co. Ltd, London 1987.

MME_1061: WORKSHOP PRACTICE [0 0 3 1]

Demonstration of working of 4 - stroke C.I and S.I Engines and electrical engines. Introduction to Computer Numerical Control (CNC) machine & to study principle - working of CNC machine. Developing a CNC part programming for basic CNC Lathe operations.
Civil Engineering Practices - Bending moment diagram (BMD) of a beam with various support and loading conditions using software/smart application, shear force diagram (SFD) of a beam with various support and loading conditions using software/smart application, software application in building layout planning, 3D rendering view of RCC structure using software/smart application.

Study of wiring tools, Fuses, Circuit breakers, Lighting sources, two-way switches, fluorescent lamp wiring, Electrical energy measurement in Single-phase and three-phase circuits, Energy tariff calculations, Soldering practices with basic electrical circuits on PCB.
Identification of circuit components – Resistor, capacitors, Diodes, Fundamentals of Cathode Ray Oscilloscope, Function generator, Regulated power supply. Study of PN junction diode Characteristics, Static and Dynamic Resistance.

References:
1. Hajra Choudhury S. K and Bose S. K, "Elements of Workshop Technology, Vol I", Media Promoters & Publishing Pvt. Ltd., Mumbai, 2012.
2. P M Agarwal, V J Patel, "CNC Fundamentals and Programming", 2nd edition, Charotar Publishers.
3. Bhavikatti S. S., Strength of Materials (4e), Vikas Publishers, 2013.
4. Verma B. P., Civil Engineering Drawing and House Planning (12th Edition), Khanna Publishers, 2006.
5. Uppal S.L., Electrical Wiring, Estimating and Costing, Khanna Publishers, 1978.
6. Bishop Owen, Electronics: A First Course, (2e), NEWNES, An Imprint of Elsevier, 2006.
7. Lab Manual, MIT Bengaluru.

MME_1161: ENGINEERING GRAPHICS – I [1 0 2 2]

Introduction – Geometrical constructions, Dimensioning and conventions of lines. Projection of points in first Quadrant only. Projection of straight lines inclined to both horizontal and vertical planes, Traces of lines, Application problems on lines. Projection of regular plane when the surface is inclined to both HP and VP. Projection of regular solids like prisms, pyramids cone and cylinder when the axis is inclined to both HP and VP.

References:
1. Gopalkrishna K. R. and Sudhir Gopalkrishna., A textbook of Computer Aided Engineering Drawing, (37 e), Subhas Stores, Bangalore 2012.
2. Bhat N. D. and Panchal V. M., Engineering Drawing, (50 e), Charotar Publishing House, Anand, India 2010.
3. Venugopal K., Engineering Drawing and Graphics + Auto CAD, Newage International Publishers, Delhi 2002.
4. Narayana K. L. and Kannaiah P., Text book on Engineering Drawing, Scitech Publications, Chennai, 2002.
5. Basant Agrawal and Agrawal C. M., Engineering Drawing, Tata McGraw Hill, New Delhi 2010.

CHM_1061: ENGINEERING CHEMISTRY LABORATORY [0 0 3 1]

Alkalimetric titration; Estimation - Total hardness of water, percentage of copper in brass, weight of iron in haematite, percentage of manganese dioxide in pyrolusite, percentage of ammonia nitrogen in a fer tilizer; pK value of a weak acid by potentiometric titration; Conductometric acidbase titrations; Determination of concentration of copper using colorimeter; Determination of coefficient of viscosity of liquid; Chloride content of water; Analysis of lead pigment.

References:
1. Vogel A.I. Text book of Quantitative Inorganic Analysis, (5e), ELBS, 1998
2. Laboratory Manual for Engineering Chemistry Laboratory, M.I.T., 2014

CSE_1061: PROBLEM SOLVING USING COMPUTERS LAB
[0 0 3 1]

Introduction to Computing, Simple C programming, Branching Control Structures, Looping Control Structures, 1D and 2D Array programming, String programming, Modular and Recursive Function Programming – Programs using Pointers, Structures and File manipulation – MATLAB Programming with Simulink.

References:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming language (2e), Pearson Education, 1988.
2. Deital. P. J and Deitel. H. M, C: How to program (7e), Pearson Education, 2010.
3. Balagurusamy. E, Computing fundamentals and C programming (1e), McGraw-Hill, 2008.
4. Duane Hanselman and Bruce Littlefield, Mastering Matlab 7, Pearson Publication, 2008.
5. Stormy Attaway, Matlab: A practical Introduction to Programming and Problem Solving, Elsevier, ISBN: 978-0-75-068762-1.

MAT_1251: ENGINEERING MATHEMATICS – II [3 1 0 4]

Mean value theorems, Taylor and Maclaurin's series expansions, indeterminate forms. Partial differentiation, total derivatives, errors and expansions, Taylor's theorem, maxima and minima, Lagrange's method. Infinite series, tests for convergence of series with positive terms, alternating series, power series. Analytical solid geometry- spheres. Cones and cylinders. Multiple integrals and their applications, beta and gamma functions. Laplace transforms, periodic functions, step functions, inverse transforms, convolution, solution of differential equations and applications.

Reference:
1. B. S. Grewal - Higher Engineering Mathematics, Khanna Publishers.
2. N. Piskunov-Differential Calculus, Vol I and II, Mir Pub.
3. Rainville E.D and Bedient P. E., A short course in differential equations, Macmillan Pub., Mumbai.
4. Kreyzig E, Advanced Engineering Mathematics, Wiley Eastern, Delhi.
5. Shanti Narayan, Differential Calculus, Shyam Lal Charitable Trust, Delhi.

MME_1261: ENGINEERING GRAPHICS – II [1 0 2 2]

Introduction to Engineering Graphics, Sections of solids – Drawing sectional views and true shape of section, Development of surfaces using parallel line development for prisms and cylinders, Radial line development for pyramids and cones, Isometric projections of simple and sectioned solids, Combined solids, Simple machine components. Orthographic views of Simple and cut solids, combined solids, Simple machine components.

References:
1. Gopalkrishna K. R. and Sudhir Gopalkrishna., A textbook of Computer Aided Engineering Drawing, (37e), Subhas Stores, Bangalore 2012.
2. Bhat N. D. and Panchal V. M., Engineering Drawing, (50e), Charotar Publishing House, Anand, India 2010.
3. Venugopal K., Engineering Drawing and Graphics + Auto CAD, Newage International Publishers, Delhi 2002.
4. Narayana K. L. and Kannaiah P., Text book on Engineering Drawing, Scitech Publications, Chennai, 2002.
5. Basant Agrawal and Agrawal C. M., Engineering Drawing, Tata McGraw Hill, New Delhi 2010.