Course Outline and Syllabus for B. Tech. (First Year)
Batch-2018 Onwards

Semester-I

S. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	PHY101C	Physics	**4**	**0**	**0**	**4**	**4**
2.	CHM101C	Chemistry	**4**	**0**	**0**	**4**	**4**
3.	MTH103C	Mathematics-I	**3**	**0**	**0**	**3**	**3**
4.	BIO101F	Environmental Science	**3**	**0**	**0**	**3**	**3**
5.	MEC101C	Engineering Graphics and Design	**1**	**0**	**4**	**5**	**3**
6.	ENG101F	Communication Skills	**2**	**0**	**2**	**4**	**3**
7.	-	Induction Programme	**-**	**-**	**-**	**-**	**-**
						Total Credits	**20**

Semester-II

S. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV150C	Engineering Mechanics	**3**	**0**	**0**	**3**	**3**
2.	MTH153C	Mathematics –II	**4**	**0**	**0**	**4**	**4**
3.	CSE150F	Programming for Problem Solving	**3**	**0**	**0**	**3**	**3**
4.	MEC150C	Workshop Practices	**1**	**0**	**4**	**5**	**3**
5.	ELE150C	Basic Electrical Engineering	**3**	**0**	**0**	**3**	**3**
6.	CSE151F	Programming Lab	**0**	**0**	**2**	**2**	**1**
7.	PHY150C	Physics Lab	**0**	**0**	**2**	**2**	**1**
8.	CHM150C	Chemistry Lab	**0**	**0**	**2**	**2**	**1**
						Total Credits	**19**

PHY101C **Physics** **4-0-0**

Vectors: Vector Analysis, Rotation of coordinate axis and Transformation of vectors, Gradient of scalar field, divergence and curl of vector field in Cartesians, Spherical polar and Cylindrical Coordinate systems, line , surface & volume integrals, Gauss's divergence theorem, Stokes's theorem.

Mechanics: Newton's laws of motion**,** rigid body, centre of mass, conservation of linear momentum, moment of inertia, conservation of angular momentum, Central forces, Keplers laws for planetary motion.
SHM, Damped, undamped and forced Oscillations (no derivation): Equation of motion, solution, amplitude resonance, velocity resonance, quality factor.

Special theory of Relativity: Frame of reference, Michelson-Morley experiment, Galilian transformations, basic postulates of special relativity, Lorentz transformations, length contraction and time dilation, mass energy relation.

Optics: Electromagnetic theory of light, Interference**:** Conditions for Interference of light, Young's double slit experiment, Newton's rings, diffraction**:** Single Slit diffraction pattern, Diffraction grating, Grating spectra, Polarization: Malus Law, Phenomena of double refraction.

Lasers: Properties of laser light**,** Main components of laser, absorption, spontaneous and stimulated emission, CW and pulsed lasers, Examples and applications: He-Ne laser, Ruby laser.

Quantum Theory: Need of Quantum theory, Photoelectric effect, Compton Effect, Heisenberg's uncertainty principle, de Broglie's hypothesis. Basic postulates of quantum mechanics, Wave function and its properties, Schrodinger's equation and its application to particle in 1-D box.

Nuclear physics: Structure of nucleus. Basic properties of nucleus (size, charge, and density), Binding energy, nuclear fission & fusion, Radioactivity, Gas detectors: GM counter.

Elementary Solid State Physics: Crystal lattice, Crystal structure, Unit cells, Miller Indices, Bravais lattice, Bragg's Law, Photographic crystal X-ray diffraction techniques, Laue's method. Free electron theory of metals, Classification of solids, formation of energy bands in metals, semiconductors and insulators, intrinsic and extrinsic semiconductors.

Text Books/Reference Books:

1. Griffiths D. J., Introduction to electrodynamics, *Pearson Education (India).*
2. Murray R. Speigel, Schaum's Outline on Vector Analysis, *McGraw Hill Education India.*
3. Upadhaya J. C., Classical Mechanics, *Himalaya Publishing House.*
4. Ghatak A., Optics, *McGraw Hill Education India.*
5. Besier A., Mahajan S., Choudhary S. R., Concepts of Modern Physics, *McGraw Hill Education India.*
6. Omar M. A., Elementary Solid State Physics, *Prentice Hall of India.*

CHM101C Chemistry 4-0-0

Chemical Thermodynamics: Introduction and Importance, First Law of Thermodynamics, Work done in Isothermal and Adiabatic Conditions, Heat capacities, Relation between C_p and C_v relations, Second Law of Thermodynamics, Concept of Entropy, Carnot engine, Gibbs free energy. Free Energy Changes as Criteria of Reversible and Irreversible process, Gibbs-Helmholtz's equation, Clausius–Clapeyron equation

Electro-Chemistry and Corrosion: Introduction, Conductivity of Electrolytes, Kohlrausch's Law of Independent Migration of Ions and its Application, Debye Huckel Theory of Strong Electrolytes. Electrochemical cells, Electrode-Potential, Standard Electrode Potential, Fuel Cells, Batteries, Introduction, Effects of Corrosion, Dry Corrosion and Wet Corrosion, mechanisms, Types of Corrosion (Pitting Corrosion, Crevice Corrosion, Galvanic Corrosion and Stress corrosion), Factors Effecting Corrosion (Nature of the Metal and Nature of the Environment), Corrosion Protection and Inhibition (Cathodic Protection, Anodic Protection, Protective Coatings)

Nano-Technology and Polymers: Nanoscale and Its Significance, Properties at Nanoscale: Optical, Electrical, and Magnetic. General Methods of Preparation of Nanomaterials viz Top Down (Ball Milling, Lithography) and Bottom up Methods (Sol-Gel, Solution Based Method), Advantages of Polymers over other Engineering Materials, Functionality, Degree of Polymerization, Concept of Molecular Weight, Polymerization (Addition, Condensation and Copolymerization), Polymerization Techniques (Bulk, Solution, Suspension and Emulsion polymerizations), Preparation, Properties and Engineering application of some Important Polymers, Polythene (LDPE and HDPE), Polyvinyl Chloride, Polystyrene, Teflon, Phenol Formaldehyde, urea-formaldehyde resin

Lubricants: Introduction, Function of Lubricants, Mechanism of Lubrication, Classification of Lubricants (Liquid, Semisolid, Solid), Properties of Lubricants (Flash Point and Fire Point, Viscosity, Aniline Point Acid value)

Instrumental Techniques: Introduction, Advantages and Disadvantages of Instrumental and Non-Instrumental Methods, Electromagnetic Radiation, Electromagnetic Spectrum, Light Absorption (Beers-Lambert Law) UV-Vis spectroscopy (Types of Transition, Chromophors, Auxo-chromes and Applications), Infrared Spectroscopy (Modes of vibration, IR bands corresponding to different functional groups and Applications), Nuclear Magnetic Resonance: Principle, shielding mechanism, chemical shift, number of Signals, Application of Nuclear Magnetic Resonance to Simple Organic Molecules.

Text Books/Reference Books:

1. Chemistry in Engineering and Technology Volumes I & II, J. Kuriacose, R. Rajaram, 2001, *TMH publishing company Limited, New Delhi.*
2. Engineering Chemistry, P.C. Jain, 16th Edition, *Dhanpat Rai & Sons, Nai Sarak; New Delhi.*
3. Chemistry of Engineering Materials, C.V. Agarwal, 9th Edition.
4. Chemistry in Engineering, L. A. Munro, 1964, *Prentice Hall, New York.*
5. Applied Chemistry for Engineers, R. M. E. Diamant, 3rd Revised Edition, *Pitman Publishing.*

6. Principles of Physical Chemistry – Puri, Sharma and Pathania, 2017, 4th Edition, *Vishal Publishing Co.*
7. Physical Chemistry by Peter Atkins, Julio de Paula, 8th Edition, 2006, *WH Freeman.*
8. Concise Inorganic Chemistry by J.D. Lee, 5th Edition, 2008, *Oxford University Press.*
9. Electrochemistry and Corrosion Science by N. Perez, 2nd Edition, 2016, *Springer.*
10. Polymer Science, V.R. Goowriker, N.V Viswanathan and Jayadev Sreedhar, 2nd Edition, 2015, N*ew Age International Publishers.*
11. Nanotechnology Fundamentals and Applications, Manasi Karkare, Rajni Bahuguna, 2013, *I K international.*
12. Nanotechnology Importance And Application, Fulekar, 2010, K *International Publishing House.*

MTH103C Mathematics-I 3-0-0

Brief Review of Differential Calculus: Limit, continuity and differentiability of functions of several variables, Chain rule, Jacobi theorem. Taylor's theorem of one and two variables, extrema of functions, two or more variables using method of Lagrange's multipliers.

Ordinary Differential Equations: Exact ordinary differential equations and Ordinary differential equations reducible to exact differential equations. Linear differential equations and equations reducible to linear form. Linear Differential equations of second and higher order with constant and variable coefficients. Applications of ordinary differential equations. Series solution of differential equations.

Vector Spaces: Linear dependence of vectors, Basis and Dimensions; Linear Transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity Theorem, Composition of Linear maps, Matrix associated with a linear map.

Algebraic Equations, Elements of the theory of polynomial equations. Fundamental theorem of Algebra, Relation between the roots and the coefficients of an equation, Solution of cubic & bi-quadratic equations.

Text Books:

1. Shanti Narayan, Differential calculus, *S. Chand & Sons*.
2. J. W. Brown, R. V. Churchill, Complex variables and Applications, *McGraw Hill Education India.*
3. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons*.
4. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*

Reference Books:

1. James Stewart, Calculus, *Early Transcedentals*.
2. Bali N. P., A text Book on Engineering Mathematics, *Luxmi Publications.*
3. Jain R. K., Iyengar S. R. K., Advanced Engineering Mathematics, *Narosa Publications.*
4. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
5. Piaggio H. T., Differential equations and its applications, *Prentice Hall of India*.
6. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India*.

BIO101F Environmental Science 3-0-0

Introduction to Environmental Science: Scope and importance, Public Environmental awareness and methods of its propagation, Consumerism and Green Consumerism. Environmental issues, Environmental Ethics-Anthropocentricism and Ecocentricism.

I**ntroduction to Ecosystem and Ecology**: Types of Ecosystems, Structure of an Eco system-biotic and abiotic components, Food chain and Food Web, Ecological Pyramids; Ecological Succession, Energy flow in an ecosystem, Major World Ecosystems and their characteristics.

Natural resources: Classification and their conservation; Biodiversity-Definition, values and threats to biodiversity; Classification of species as per IUCN; Hot Spots of Biodiversity. Conservation approaches – *In-Situ* and *Ex-Situ* conservation; Alternatives to conventional developmental approaches – Sustainable Development.

Introduction to global climate change: Greenhouse effect, global warming, acid rain, ozone layer depletion. Definition, Cause, effects and control measures of Air pollution, water pollution, soil pollution, noise pollution, thermal pollution and Solid waste pollution.

Field work (Field work equal to 5 lecture hours), Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

Text Books/Reference Books:

1. Ecology and Environment, P. D. Sharma, *Rastogi Publications*.
2. Environmental Science Towards a Sustainable Future, Nebel and Wright, *Prentice Hall of India.*
3. Environmental Studies, Erach Barucha, *Oxford Publications.*
4. Environmental Studies From Crises to Cure authored, R. Rajagopalan, *Oxford University Press.*
5. Environmental Management by Oberoi, *Excel Books.*
6. Principles of Environmental Science: Inquiry & Applications, William Cunningham & Mary Cunningham, *Tata McGraw Hill.*
7. Perspectives of environmental studies, A. P. Kaushik and C.P. Kaushik, *New Age International Publications.*

MEC101C Engineering Graphics and Design 1-0-4

Introduction: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance, Drawing instruments, lettering, Conic sections; Cycloid, Epicycloid, Hypocycloid and Involute; Scales.

Orthographic Projections: Principles of Orthographic Projections, Conventions, Projections of Points and lines inclined to both planes; Projections of planes inclined Planes, Auxiliary Planes;

Projections of Solids: Auxiliary Views; Draw simple annotation, dimensioning and scaling. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Sections of Solids: Prism, Cylinder, Pyramid, Cone, Auxiliary Views; Development of surfaces; sectional orthographic views, objects from industry and dwellings.

Isometric Projections: Principles of Isometric projection, Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics: Computer technologies, CAD software, the Menu System, Toolbars, Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus, Different commands used in CAD, Isometric Views of lines, Planes, Simple and compound Solids.

Customisation & CAD Drawing: Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints.

Text Books:

1. Gill P. S., Engineering Drawing, *S. K. Kataria and sons.*
2. Bhatt N. D., Engineering Drawing, *Charotar Book Stall.*
3. James D. Bethune, Engineering Graphics with Auto CADD, *Pearson Education.*

Reference Books:

1. Shah M. B., Rana B. C., Engineering Drawing and Computer Graphics, *Pearson Education.*
2. Agrawal B., Agrawal C. M., Engineering Graphics, *TMH Publication.*

ENG101F Communication Skills 2-0-2

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

Basic Writing Skills, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

Nature and Style of sensible Writing: Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

Writing Practices: Comprehension, Précis Writing, Essay Writing.

Oral Communication: (This unit involves interactive practice sessions in Language Lab): Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Text Books/Reference Books:

1. Michael Swan, Practical English Usage, *OUP, 1995.*
2. Wood F. T., Remedial English Grammar, *Macmillan, 2007.*
3. William Zinsser, On Writing Well, *Harper Resource Book, 2001.*
4. Liz Hamp-Lyons and Ben Heasly, Study Writing, *Cambridge University Press, 2006*.
5. Sanjay Kumar and Pushp Lata, Communication Skills, *Oxford University Press, 2011.*
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad, *Oxford University Press.*