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**

CIV150C Engineering Mechanics 3-0-0

Force Systems: Basic concepts, equilibrium of rigid bodies, system of forces, coplanar concurrent forces, components in space, resultants, moment of forces and its application, couples and resultant of force system, equilibrium of system of forces, free body diagrams, equations of equilibrium of coplanar systems and spatial systems, static indeterminacy.

Centroid and Second Moment of Area: Centroid of simple figures from first principle, centroid of composite sections; Area moment of Inertia**,** Moment of Inertia of plane sections from first principles, theorems of moment of inertia, moment of inertia of standard sections and composite sections.

Basic Structural Analysis: Equilibrium of deformable bodies, external and internal forces, stresses and strains in bars, basic introduction to beams, shear force and bending moment in simple beams, basic introduction to torsion, and analysis of trusses using method of joints.

Friction: Types of friction, limiting friction, dry friction, laws of friction, static and dynamic friction; motion of bodies, wedge friction, screw jack, friction clutches and brakes.

Centre of Gravity and Moment of Inertia: Centre of gravity and its implications; Mass moment of inertia, Moment of inertia of Cylinder, Cone, Sphere, etc.

Fundamentals of Dynamics: Kinematics and Kinetics of particles in rectilinear and curvilinear motion; Kinematics and Kinetics of Rigid bodies, types of motion, instantaneous centre of rotation in plane motion, D'Alembert's principle and its applications in plane motion and connected bodies, Work Energy principle, Impulse-Momentum principle, Impact.

Text Books:

1. Irving H. Shames, Engineering Mechanics, *Prentice Hall India, New Delhi.*
2. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, *Pearson Education.*

Reference Books:

1. F. P. Beer, E. R. Johnston, Vector Mechanics for Engineers, Vol I & Vol II, *McGraw Hill Education (India).*
2. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, *Oxford University Press.*
3. Shanes and Rao, Engineering Mechanics, *Pearson Education.*
4. Hibler and Gupta, Engineering Mechanics (Statics, Dynamics), *Pearson Education.*
5. Bansal R. K., A Text Book of Engineering Mechanics, *Laxmi Publications.*

MTH153C Mathematics-II 4-0-0

Integral Calculus: Definite Integrals and their properties, Differential under the sign of integration. Double and triple integrals, Change of variables, Beta and Gamma functions, Fourier series.

Non-linear differential equation of first order, Simultaneous differential equation, Simultaneous differential equation of the form $dx/P = dy/Q = dz/R$. Partial differential equations of first order, langrage linear equation, Standard form, Charpit`s Method to solve non- linear partial differential equation, Partial differential equations of second and higher order, Homogeneous Partial Differential equations with constant coefficients, Solutions by the method of separation of variables, heat flow equation, Wave equation.

Matrices: Eigen values and Eigen vectors of a matrix, Cayley-Hamilton Theorem, Symmetric, Skew-symmetric, Hermitian, skew- Hermitian, Orthogonal and unitary matrices and their properties, Diagonalization; Inner product spaces, Gram-Schmidt Orthogonalization.

Complex Variables: Differentiation, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, elementary analytic functions(exponential, logarithmic and trigonometric) and their properties, Taylor's series and Laurent's series.

Text Books:

1. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*
2. Piaggio H. T., Differential equations and its applications, H *Prentice Hall of India.*
3. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons.*

Reference Books:

1. James Stewart, Calculus, *Early Transcedentals.*
2. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
3. Shanti Narayan, Integral Calculus by Shanty Narayan, *S. Chand & Sons.*
4. Greenberg, Advanced Engineering Mathematics, *Pearson education.*
5. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India.*

CSE150F Programming for Problem Solving 3-0-0

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc. Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Branching, Loops, and Arrays: Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops. Arrays, Arrays (1-D, 2-D), Character arrays and Strings.

Algorithms, Order complexity and Functions: Basic Algorithms, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required), Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing
arrays to functions: idea of call by reference.

Recursion: Recursion as a different way of solving problems. Example programs, such as Finding Factorial,
Fibonacci series, Ackerman function etc. Quick sort or Merge sort, Structure, Structures, Defining structures and Array of Structures.

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, *McGraw Hill Education India.*
2. Yashavant Kanetkar, Let Us C, *BPB Publications*

Reference Books:

1. Gottfried, Schaum's Outline of Programming with C, *McGraw Hill Education India.*
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, *Prentice Hall of India.*

MEC150C Workshop Practices 1-0-4

(i) Lectures and Videos

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

(ii) Workshop Practice

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding, gas welding)
6. Casting
7. Smithy Shop

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010, *Media promoters and publishers private limited, Mumbai.*
2. Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, *Pearson Education India Edition, 2002.*

Reference Books:

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, *Pearson Education, 2008.*
2. Roy A. Lindberg, Processes and Materials of Manufacture, 4th edition, *Prentice Hall India, 1998.*
3. Rao P.N., Manufacturing Technology, Vol. I and Vol. II, *Tata McGraw Hill House, 2017.*

ELE150C Basic Electrical Engineering 3-0-0

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits, resonance in series and parallel RLC circuits. Three phase balanced circuits, voltage and current relations in star and delta connections.

Transformers: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Three-phase transformer connections.

Electrical Machines: Generation of rotating magnetic fields. Construction and working of a three-phase induction Motor. Significance of torque-slip characteristic. Starting of induction motor. Construction, working, torque-speed characteristic of separately excited dc motor. Construction and working of synchronous generators.

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.

Text Books:

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, *Tata McGraw Hill, 2010*.
2. D. C. Kulshreshtha, Basic Electrical Engineering, *McGraw Hill, 2009*.
3. V. D. Toro, Electrical Engineering Fundamentals, *Prentice Hall India, 1989*.

Reference Books:

1. E. Hughes, Electrical and Electronics Technology, *Pearson, 2010*.
2. Charles K. Alexender, Mathew N. O. Sadiku, Fundamentals of Electric circuits, *McGraw Hill,*
3. Jack E. Kemmerly William H. Hayt, Engineering Circuit Analysis, *McGraw Hill, 2012*.
4. L. S. Bobrow, Fundamentals of Electrical Engineering, *Oxford University Press, 2011*.

CSE151F **Programming Lab** **0-0-2**

List of Experiments

1. Familiarization with the programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems e.g., sum of series
5. 1D Array manipulation
6. Matrix problems, String operations
7. Simple functions
8. Programming for solving Numerical methods problems
9. Recursive functions
10. Pointers and structures
11. File operations

PHY150C **Physics Lab** **0-0-2**

List of Experiments

1. To determine the value of e/m of an Electron by Thompson Method
2. To determine the value of Acceleration due to gravity(g) by using Bar Pendulum
3. To determine the value of Acceleration due to gravity(g) by using Kater's Reversible Pendulum
4. To determine the Young's Modulus of rigidity of rectangular Steel Bar by Bending of Beam Method.
5. To determine the Wavelength of Sodium Light by Newton's Rings.
6. To determine the Wavelength of Laser Source by Fresnel Biprism
7. To determine the frequency of AC by Melde's Method
8. To determine The Resolving Power of Telescope.
9. To study the moment of Inertia of a Fly Wheel
10. To determine the refractive index of Crown Glass Prism.
11. To determine the wavelength of Sodium Light by Plane diffraction Grating.
12. To study the characteristics of Zener Diode.
13. To determine the Wavelength of Prominent lines of Mercury Light by Plane Diffraction Grating.
14. To study the characteristics of PN Junction Diode (Forward Bias)
15. To verify Biot-Savart's Law by showing that magnetic field produced is directly proportional to the current passed in a coil.
16. To study the characteristics of G.M. Tube.
17. To determine Planck's constant by LED Method.
18. To verify Stefan's Law by Electrical method.
19. Determination of Modulus of rigidity by Maxwell's Needle
20. Determination of velocity of Sound by Standing Wave Method.
21. To study the Hall Effect:
    (i) Determination of Hall Voltage and RH.
    (ii) Determination of mobility of charge carriers and carrier concentration

CHM150C **Chemistry Lab** **0-0-2**

List of Experiments

1. Basic Introduction on Solution Preparation, Concentration terms, Handling of Glass ware, Chemicals, Instruments: Precautions.
2. Determination of strength of NaOH solution by standardization of sodium hydroxide using Oxalic acid
3. To determine the acid value of a given mineral oil or vegetable oil.
4. To determine the moisture content of a given sample of coal.
5. To determine the Degree of dissociation of a weak acid by Conductometry.
6. Determination of the strength and pK_a value of the weak acid by titration with an alkali.
7. To determine the Aniline point of the given sample of a Lubricating oil.
8. Synthesis of the phenol formaldehyde resin.
9. To determine the temporary and permanent hardness of a sample of water by complexometric titration.
10. To determine the Alkalinity of the given sample of water.
11. Determination of the ion exchange capacity of cation exchange resin.

Demonstration Experiments

1. Determination of pH of different concentration of acid and bases by pH meter.
2. Spectrophotometer (concentration determination, wavelength maximum)

Text Books/Reference Books:

1. Laboratory Manual On Engineering Chemistry by S. K. Bhasin, S. Rani, 2009, *D R Publications.*
2. J. B. Yadav, Advanced Practical Physical Chemistry.