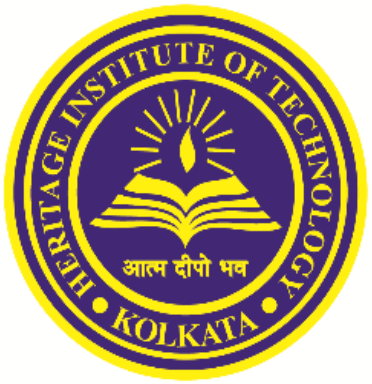

Mechanical Engineering Department

B.TECH. PROGRAMME

CURRICULUM STRUCTURE

RELEASE DATE:

July, 2023

(Applicable from 2023-24 admitted batch)

1st Year 1st Semester Syllabus:

3 week Orientation Programme								
A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Basic Science course	**MTH 1101**	Mathematics I	3	1	0	4	4
2	Basic Science course	**CHM 1001**	Chemistry I	3	0	0	3	3
3	Engg. Science course	**CSE 1001**	Programming for Problem Solving	4	0	0	4	4
4	Engg. Science course	**ELE 1001**	Basic Electrical Engineering	3	1	0	4	4
5	Humanities	**HUM 1001**	English for Technical Writing	2	0	0	2	2
			TOTAL	15	2	0	**17**	**17**

B. Practical								
1	Basic Science Course	**CHM 1051**	Chemistry I Laboratory	0	0	2	2	1
2	Engg. Science Course	**CSE 1051**	Programming for Problem Solving Laboratory	0	0	3	3	1.5
3	Engg. Science Course	**ELE 1051**	Basic Electrical Engineering Laboratory	0	0	2	2	1
4	Humanities	**HUM 1051**	English for Technical Writing Laboratory	0	0	2	2	1
Total Practical				0	0	9	**9**	**4.5**
Total of Semester				15	2	9	**26**	**21.5**

1st Year 2nd Semester Syllabus:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Basic Science course	**PHY 1001**	Physics I	3	0	0	3	3
2	Basic Science course	**MTH 1201**	Mathematics II	3	1	0	4	4
3	Engg. Science Course	**ECE 1001**	Introduction to Electronic Devices and Circuits	3	0	0	3	3
4	Humanities	**HUM 1002**	Universal Human Values and Professional Ethics	2	1	0	3	3
5	Mandatory Course	**MEC 1216**	Sports and Yoga	2	0	0	2	0
Total Theory				11	2	0	13	**13**

B. Practical								
1	Basic Science course	**PHY 1051**	Physics I Laboratory	0	0	2	2	1
2	Engg.Science Course	**ECE 1051**	Introduction to Electronic Devices and Circuits Laboratory	0	0	2	2	1
3	Engg.Science Course	**MEC 1051**	Workshop/ Manufacturing Practices	1	0	3	4	2.5
4	Engg. Science Course	**MEC 1052**	Engineering Graphics & Design	1	0	3	4	2.5
Total Practical				2	0	10	**12**	**7**
Total of Semester				13	2	10	**25**	**20**

2nd Year 1st Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Basic Science Courses	**PHY 2101**	Physics – II	3	0	0	3	3
2	Basic Science Courses	**MTH 2001**	Mathematical Methods	3	1	0	4	4
3	Engineering Science Courses	**MEC 2101**	Engineering Mechanics	3	1	0	4	4
4	Professional Core Courses	**MEC 2102**	Fluid Mechanics & Hydraulics	3	0	0	3	3
5	Engineering Science Courses	**MEC 2103**	Engineering Thermodynamics	3	1	0	4	4
6	Mandatory Course	**EVS 2016**	Environmental Science	2	0	0	2	0
Total Theory				**17**	**3**	**0**	**20**	**18**

B. Practical								
1	Professional Core Courses	**MEC 2151**	Machine Drawing-I	0	0	3	3	1.5
2	Professional Core Courses	**MEC 2152**	Workshop Practice-II	0	0	3	3	1.5
3	Engineering Science Courses	**MEC 2153**	Design Thinking and Idea Lab	0	0	2	2	1
4	Professional Core Courses	**MEC 2151**	Machine Drawing-I	0	0	3	3	1.5
Total Practical				0	0	8	**8**	**4**
Total Semester				**17**	**3**	**8**	**28**	**22**

<u>List of Paper offered by ME Department for other departments (EE & CHE):</u>

1. MEC 2106 : Mechanics for Engineers

2nd Year 2nd Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Professional Core Course	**MEC 2201**	Mechanics of Deformable Bodies	3	1	0	4	4
2	Professional Core Course	**MEC 2202**	Fluid Machinery	3	0	0	3	3
3	Professional Core Course	**MEC 2203**	Engineering Materials	3	0	0	3	3
4	Professional Core Course	**MEC 2204**	Manufacturing Processes	3	0	0	3	3
5	Professional Core Course	**MEC 2205**	Kinematics & Dynamics of Machines	3	1	0	4	4
6	Professional Core Course	**MEC 2206**	Measurement and Metrology	3	0	0	3	3
Total Theory				**18**	**2**	**0**	**20**	**20**

B. Practical								
1	Professional Core Course	**MEC 2251**	Material Testing Lab	0	0	3	3	1.5
2	Professional Core Course	**MEC 2252**	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	3	1.5
3	Professional Core Course	**MEC 2253**	Measurement and Metrology Lab	0	0	2	2	1
Total Practical				**0**	**0**	**8**	**8**	**4**
Total of Semester				**18**	**2**	**8**	**28**	**24.0**

3rd Year, 1st. Semester

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Professional Core Course	**MEC 3101**	Machine Elements & System Design	3	0	0	3	3
2	Professional Core Course	**MEC 3102**	Heat Transfer	4	0	0	4	4
3	Professional Core Course	**MEC 3103**	Mechatronics, Robotics & Control	3	0	0	3	3
4	Professional Elective Courses	**MEC 3131-3135**	Professional Elective - I	3	0	0	3	3
5	Professional Elective Courses	**MEC 3141-3145**	Professional Elective - II	3	0	0	3	3
6	Open Elective Courses		Open Elective-I	3	0	0	3	3
7	Mandatory Courses	**INC 3016**	Indian Constitution and Civil Society	2	-	-	2	0
Total Theory				**21**	**0**	**0**	**21**	**19**

B. Practical								
1	Professional Core Course	**MEC 3152**	Heat Transfer Lab	0	0	2	2	1
2	Professional Core Course	**MEC 3153**	Mechatronics, Robotics & Control Lab	0	0	2	2	1
3	Professional Core Course	**MEC 3155**	Dynamics of Machines Lab	0	0	2	2	1
4	Professional Elective Courses	**MEC 3181-3184**	Professional Elective - I Lab	0	0	2	2	1
Total Practical				**0**	**0**	**8**	**8**	**4**
Total of Semester				**21**	**0**	**8**	**29**	**23**

List of Professional Elective I	**List of Professional Elective I Lab**
1. MEC 3131 : Refrigeration & Air Conditioning	1. MEC 3161 : Refrigeration & Air Conditioning Lab
2. MEC 3132 : Electrical Machines	2. MEC 3162: Electrical Machines Lab
3. MEC 3133 : Data Structure & RDBMS	3. MEC 3163: RDBMS Lab
4. MEC 3134 : Matlab for Engineers	4. MEC 3164 : Matlab for Engineers Lab
5. MEC 3135 :	5. MEC 3165 :
List of Professional Elective – II	**List of Open Elective I (**Emerging Field**)**
1. MEC 3141 : Vibration	1. MEC 3121: Additive Manufacturing
2. MEC 3142 : Turbo Machinery	2. MEC 3122: Total Quality Management (TQM)
3. MEC 3143 : Aerodynamics	3. MEC 3123: Industrial Engineering
4. MEC 3144 : Power Plant Engineering	4. :
5. MEC 3145 : Design for Manufacturing & Assembly	5. :

3rd Year 2nd Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Humanities	**HUM 3201**	Economics for Engineers	3	0	0	3	3
2	Professional Core Courses	**MEC 3201**	Computer Aided Design & Analysis	3	0	0	3	3
	Professional Core Courses	**MEC 3202**	Manufacturing & Automation	3	0	0	3	3
	Professional Core Courses	**MEC 3203**	Product Innovation and Entrepreneurship	3	0	0	3	3
	Professional Elective Courses	**MEC 3231-3233**	Professional Elective - III	3	0	0	3	3
	Open Elective Courses		Open Elective-II	3	0	0	3	3
Total Theory				18	0	0	**18**	**18**

B. Practical								
1	Professional Core Courses	**MEC 3257**	Computer Aided Design & Analysis Lab	0	0	3	3	1.5
2	Professional Elective Courses	**MEC 3281-3283**	Professional Elective–III Lab	0	0	2	2	1
3	Seminar	**MEC 3293**	Seminar	0	0	4	4	2
4	Project	**MEC 3295**	Project I	0	0	4	4	2
Total Practical				**0**	**0**	**13**	**13**	**6.5**
Total of Semester				**18**	**0**	**13**	**31**	**24.5**

List of Professional Elective – III

1. MEC 3231 : Finite Element Method
2. MEC 3232 : Computational Fluid Dynamics
3. MEC 3233 : Renewable Energy Technology

List of Open Elective II

1. MEC 3221 : Optimization Techniques
2. MEC 3222 : Computational Methods in Engineering
3. CIV 3221 : Project Planning and Management
4. HUM 3221 : Elementary Spanish for Beginners
5.

List of Professional Elective Lab – III

1. MEC 3261 : Finite Element Method Lab
2. MEC 3262: Computational Fluid Dynamics Lab
3. MEC 3263: Energy Laboratory

4th Year 1st Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Humanities	**HUM 4101**	Principles of Management	3	0	0	3	3
2	Professional Elective Courses	**MEC 4131-4135**	Professional Elective – IV	3	0	0	3	3
3	Open Elective Courses	**4121-4125**	Open Elective-III (Emerging Field)	3	0	0	3	3
4	Open Elective Courses	**4126-4130**	Open Elective-IV (Emerging Field)	3	0	0	3	3
Total Theory				12	0	0	**12**	**12**

B. Sessional								
1	Professional Core Courses	**MEC 3256**	Manufacturing & Automation Lab	0	0	2	2	1
2	Project/ Summer internship	**MEC 4191**	Industrial Training /Summer internship	-	-	-	-	2
3	Project	**MEC 4195**	Project – II	0	0	6	6	3
Total Sessional				**0**	**0**	**8**	**8**	**6**
Total of Semester				**12**	**0**	**8**	**20**	**18**

List of Professional Elective – IV
1. MEC 4131 : Maintenance Engineering
2. MEC 4132 : Materials Handling
3. MEC 4133 : Operations Research
4. MEC 4134 : Automobile Engineering
5. MEC 4135 : IC Engine

List of Open Elective- III :Emerging Field (Mech) or other departmental subjects	**List of Open Elective- IV :Emerging Field (Mech) or other departmental subjects**
1. MEC 4121 : Micro and Nano Manufacturing 2. MEC 4122 : Advanced Welding Technology 3. CIV 4121 : An introduction to Concrete Technology 4. CIV 4222 : Construction Materials	BTC 4126: Biology for Engineers BTC 4127: Biosensor BTC 4128: Bioenergy and other Non-conventional Energy

5. HUM 4221 : Introduction to Industrial Sociology	

List of Open Electives offered by ME Department for other departments:

For Open Elective III	For Open Elective IV
1. MEC 4123 : Mechanical Handling of Materials 2. MEC 4124 : Engineering Computational Techniques 3. MEC 4125 : Quantitative Decision Making	1. MEC 4128 : Quality Control & Management 2. MEC 4129 : Ecology and Environmental Engineering 3. MEC 4130 : Modern Manufacturing Technology

4th Year 2nd Semester:

A. Sessional								
1	Professional Core Courses	**MECH 4256**	Design of an Industrial Product	0	0	4	4	2
2	Project	**MECH 4295**	Project – III	0	0	14	14	7
3	Comprehensive Viva	**MECH 4297**	Comprehensive Viva-voce	-	-	-	-	1
Total Sessional				**0**	**0**	**18**	**18**	**10**
Total of Semester				**0**	**0**	**18**	**18**	**10**

Heritage Institute of Technology, Kolkata (HIT-K) – Credit Summary for B Tech Programmes with effect from 2023-2024

Sl. No.	Categories	Semesters								Total	Total as per AICTE
		1st	2nd	3rd	4th	5th	6th	7th	8th		
1.	Basic Science Courses	8	8	7						**23**	**29**
2.	Engineering Science Courses	10.5	9	9						**28.5**	**27**
3.	Humanities	3	3				3	3		**12**	**12**
4.	Mandatory Courses			0		0				**0**	**0**
5.	Professional Core Courses			6	24	13	10.5	1	2	**56.5**	**58**
6.	Open Elective Courses					3	3	6		**12**	**09**
7.	Professional Elective Courses					7	4	3		**14**	**9**
8.	Internship/Seminar/Projects/Grand Viva						4	5	8	**17**	**16**
	Total	**21.5**	**20**	**22**	**24**	**23**	**24.5**	**18**	**10**	**163**	**160**

Definition of Credit (as per AICTE):

- 1 Hour Lecture (L) per Week = 1 Credit
- 1 Hour Tutorial (T) per Week = 1 Credit
- 1 Hour Practical (P) per Week = 0.5 Credits
- 2 Hours Practical (Lab) per Week = 1 Credit

Range of Credits (as per AICTE):

- A total of 160-163 credits will be necessary for a student to be eligible to get B. Tech. degree.
- A part or all of the above additional credits may also be acquired through MOOCs. Any student completing any course through MOOC will have to submit an appropriate certificate to earn the corresponding credit.
- For any additional information, the student may contact the concerned HODs.

1ST YEAR 1ST SEMESTER

Course Title : Mathematics-I					
Course Code: MTH 1101					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**1**	**0**	**4**	**4**

Course Outcomes

1. MTH 1101.1 Apply the concept of rank of matrices to find the solution of a system of linear simultaneous equations.
2. MTH 1101.2 Develop the concept of eigen values and eigen vectors.
3. MTH 1101.3 Combine the concepts of gradient, curl, divergence, directional derivatives, line integrals, surface integrals and volume integrals.
4. MTH 1101.4 Analyze the nature of sequence and infinite series
5. MTH 1101.5 Choose proper method for finding solution of a specific differential equation.
6. MTH 1101.6 Describe the concept of differentiation and integration for functions of several variables with their applications in vector calculus.

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Module I [10L]

Matrix:

Inverse and rank of a matrix; Elementary row and column operations over a matrix; System of linear equations and its consistency; Symmetric, skew symmetric and orthogonal matrices; Determinants; Eigen values and eigen vectors; Diagonalization of matrices; Cayley Hamilton theorem; Orthogonal transformation.

Module II [10 L]

Vector Calculus:

Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative, Related problems onthese topics,

Infinite Series:

Convergence of sequence and series; Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test; Alternating series; Leibnitz's Test (statement, definition); Absolute convergence and Conditional convergence.

Module III [10 L]

First order ordinary differential equations:

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders:

General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods, Method of variation of parameters, Cauchy-Euler equations.

Module IV [10L]

Calculus of functions of several variables

Introduction to functions of several variables with examples, Knowledge of limit and continuity, Determination of partial derivatives of higher orders with examples, Homogeneous functions and Euler's theorem and related problems up to three variables,

Multiple Integration

Concept of line integrals, Double and triple integrals. Green's Theorem, Stokes Theorem and Gauss Divergence Theorem.

Suggested Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2000.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. K. F. Riley, M. P. Hobson, S. J. Bence. Mathematical Methods for Physics and Engineering, Cambridge University Press, 23-Mar-2006.
6. S. L. Ross, Differential Equations", Wiley India, 1984.
7. G.F. Simmons and S.G. Krantz, Differential Equations, McGraw Hill, 2007.
8. Vector Analysis(Schaum's outline series): M.R. Spiegel, Seymour Lipschutz, Dennis Spellman (McGraw Hill Education)
9. Engineering Mathematics: S. S. Sastry (PHI)
10. Advanced Engineering Mathematics: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP),Indian Edition.
11. Linear Algebra (Schaum's outline series): Seymour Lipschutz, Marc Lipson (McGraw Hill Education)

Course Title : Chemistry I					
Course Code : CHM 1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Course outcomes:

The subject code CHM 1001 corresponds to chemistry theory classes for the first year B. Tech students, which is offered as Engineering Chemistry and is common for all branches of engineering subjects. The course provides basic knowledge of theory based subjects like quantum mechanics, thermodynamics, reaction dynamics, electrochemistry, structure and reactivity of molecules. The course outcomes of the subject are

1. Knowledge of understanding the operating principles and reaction involved in batteries and fuel cells and their application in automobiles as well as other sectors to reduce environmental pollution.
2. An ability to design and conduct experiments, as well as to organize, analyzes, and interprets data.
3. An ability to analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces for engineering applications.
4. Have knowledge of synthesizing nano materials and their applications in industry, carbon nano tube technology is used in every industry now-a-days.
5. Understanding of bulk properties and processes using thermodynamic considerations.
6. Elementary knowledge of IR, UV, NMR and X-ray spectroscopy is usable in structure elucidation and characterisation of various molecules. Knowledge of electronic effect and stereochemistry for understanding mechanism of the major chemical reactions involved in synthesis of various drug molecules.

MODULE 1[10 L]

Atomic structure and Wave Mechanics:

Brief outline of the atomic structure, Duel character of electron, De Broglies's equation, the Heisenberg uncertainty principle, brief introduction of quantum mechanics, the Schrodinger wave equation, Hermitian operator, solution of the Schrodinger equation for particle in a one dimensional box, interpretation of the wave function Ψ, concept of atomicorbital.3L

Thermodynamics:

Carnot cycle, 2nd law of thermodynamics, entropy, Clausius inequality, free energy and work function, Clausius Clapeyron Equation, Chemical Potential, Activity and Activity coefficient. Gibbs Duhem Relation.4L

Spectroscopic Techniques & Application

Electromagnetic spectrum: EMR interaction with matter - absorption and emission of radiation. Principle and application of UV- visible and IR spectroscopy

Principles of NMR Spectroscopy and X-ray diffraction technique. 3L

MODULE 2 [10 L]

Chemical Bonding

Covalent bond, VSEPR Theory, hybridization, molecular geometries, Dipole moment, Intermolecular forces, V.B. and M.O. theory and its application in Homo and Heteronuclear diatomic molecules, Band theory of solids, Pi- molecular orbital of ethylene and butadiene.5L

Periodicity

Effective nuclear charge, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro-negativity, inert pair effect.3L

Ionic Equilibria

Acid Base Equilibria, Salt Hydrolysis and Henderson Equation, Buffer solutions, pH indicator, Common ion Effect, Solubility product, Fractional Precipitation .2L

MODULE 3 [10 L]

Conductance

Conductance of electrolytic solutions, Strong and Weak electrolytes, effect of temperature and concentration. Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Application of conductance Acid-base and precipitation titration. 3L

Electrochemical Cell

Thermodynamic derivation of Nernst equation, Electrode potential and its application to predict redox reaction; Standard Hydrogen Electrode, Reference electrode, cell configuration, half-cell reactions, evaluation of thermodynamic functions; Reversible and Irreversible cells; Electrochemical corrosion.

Electrochemical Energy Conversion: Primary & Secondary batteries, Fuel Cells. 4L

Reaction dynamics

Rate Laws, Order & Molecularity; zero, first and second order kinetics. Pseudo-unimolecular reaction, Arrhenius equation.

Mechanism and theories of reaction rates (Transition state theory, Collison theory). Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). 3L

MODULE 4 [10]

Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.4L

Structure and reactivity of Organic molecule

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion, free radicals, aromaticity.3L

Organic reactions and synthesis of drug molecule

Introduction to reaction mechanisms involving substitution, addition, elimination and oxidation-reduction reactions. Synthesis of commonly used drug molecules.3L

TEXT BOOKS

1. Atkins' Physical Chemistry, P.W. Atkins (10th Edition)
2. Organic Chemistry, I. L. Finar, Vol-1 (6th Edition)
3. Engineering Chemistry, Jain & Jain,(16th Edition)
4. Fundamental Concepts of Inorganic Chemistry, A. K. Das, (2nd Edition)
5. Engineering Chemistry -I, Gourkrishna Dasmohapatra, (3rd Edition)

REFERENCE BOOKS

1. General & Inorganic Chemistry, R. P. Sarkar
2. Physical Chemistry, P. C. Rakshit, (7th Edition)
3. Organic Chemistry, Morrison & Boyd , (7th Edition)
4. Fundamentals of Molecular Spectroscopy, C.N. Banwell, (4th Edition)
5. Physical Chemistry , G. W. Castellan, (3rd Edition)
6. Basic Stereo chemistry of Organic Molecules, Subrata Sen Gupta, (1st Edition)

Course Title: Programming for Problem Solving					
Course Code: CSE 1001					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	4	0	0	4	4

Course outcome:

1. CO 1: Understand and remember functions of the different parts of a computer.
2. CO 2: Understand and remember how a high-level language (C programming language, in this course) works, different stages a program goes through.
3. CO 3: Understand and remember syntax and semantics of a high-level language (C programming language, in this course).
4. CO 4: Understand how code can be optimized in high-level languages.
5. CO 5: Apply high-level language to automate the solution to a problem.
6. CO 6: Apply high-level language to implement different solutions for the same problem and analyze why one solution is better than the other.

Learning Objectives: Introduction to the concept of computer and computation and solving of problems using C as a programming language. Coverage of C will include basic concepts, arithmetic and logic, flow control, and data handling using arrays, structures, pointers and files.

Total load – 40 hours

Module I: [10L] Fundamentals of Computer

History of Computers, Generations of Computers, Classification of Computers.

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Basic Concepts of Assembly language, High level language, Compiler and Assembler.

Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations. Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half- 16 bit, full- 32 bit, double- 64 bit).

Basic concepts of operating systems like MS WINDOWS, LINUX How to write algorithms & draw flow charts.

Module II: [10L] Basic Concepts of C

C Fundamentals:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements. Operators & Expressions:

Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Standard input and output, formatted output -- printf, formatted input scanf.

Flow of Control:

Statement and blocks, if-else, switch-case, loops (while, for, do-while), break and continue, go to and labels.

Module III: [10L]

Program Structures in C

Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes -

auto, external, static and register variables – comparison between them. Scope, longevity and visibility of variables. C preprocessor (macro, header files), command line arguments.

Arrays and Pointers:

One dimensional arrays, pointers and functions – call by value and call by reference, array of arrays. Dynamic memory usage– using malloc(), calloc(), free(), realloc(). Array pointer duality.

String and character arrays; C library string functions and their use.

Module IV: [10L]

Data Handling in C

User defined data types and files:

Basic of structures; structures and functions; arrays of structures.

Files – text files only, modes of operation. File related functions – fopen(), fclose(), fscanf(), fprintf(), fgets(), fputs(), fseek(), ftell();

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C – E Balagurusamy

Reference Books

1. C: The Complete Reference – Herbert Schildt
2. The C Programming Language- D.M.Ritchie, B.W. Kernighan

Course Title: Basic Electrical Engg.					
Course Code : ELE 1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes

After attending the course, the students will be able to

1. Analyse DC electrical circuits using KCL, KVL and network theorems like Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.
2. Analyse DC Machines; Starters and speed control of DC motors.
3. Analyse magnetic circuits.
4. Analyse single and three phase AC circuits.
5. Analyse the operation of single phase transformers.
6. Analyse the operation of three phase induction motors.

Module-I: [11 L]

DC Network Theorem: Kirchhoff's laws, Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-Delta conversion. [6L]

Electromagnetism: Review of magnetic flux, Force on current carrying conductors, Magnetic circuit analysis, Self and Mutual inductance, B-H loop, Hysteresis and Eddy current loss, Lifting power of magnet. [5L]

Module-II[10L]

AC single phase system: Generation of alternating emf, Average value, RMS value, Form factor, Peak factor, representation of an alternating quantity by a phasor, phasor diagram, AC series, parallel and series-parallel circuits, Active power, Reactive power, Apparent power, power factor, Resonance in RLC series and parallel circuit.

Module-III [11 L]

Three phase system: Generation of three-phase AC power, Balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams, power measurement by two wattmeter method. [4L]

DC Machines: Construction, EMF equation, Principle of operation of DC generator, Open circuit characteristics, External characteristics, Principle of operation of DC motor, speed-torque characteristics of shunt and series machine, starting of DC motor, speed control of DC motor.[7L]

Module-IV [10L]

Transformer: Construction, EMF equation, no load and on load operation and their phasor diagrams, Equivalent circuit, Regulation, losses of a transformer, Open and Short circuit tests, Efficiency, Introduction to three phase transformer.[6L]

Three-phase induction motor: Concept of rotating magnetic field, Principle of operation, Construction, Equivalent circuit and phasor diagram, torque-speed/slip characteristics, Starting of Induction Motor.[4L]

Text Books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
3. Basic Electrical Engineering, Hughes
4. Electrical Technology, Vol-I,Vol-II,Surinder Pal Bali, Pearson Publication
5. A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company

Reference Books:

1. Electrical Engineering Fundamentals, Vincent Del Toro, Prentice-Hall
2. Advance Electrical Technology, H.Cotton, Reem Publication
3. Basic Electrical Engineering, R.A. Natarajan, P.R. Babu, Sictech Publishers
4. Basic Electrical Engineering, N.K. Mondal, Dhanpat Rai
5. Basic Electrical Engineering, Nath & Chakraborti
6. Fundamental of Electrical Engineering, Rajendra Prasad, PHI, Edition 2005

Course Title : English for Technical Writing
Course Code : HUM 1001

Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	2	0	0	2	2

Course Outcome:

Students will be able to

1. Communicate effectively in an official and formal environment

2. Use language as a tool to build bridges and develop interpersonal relations in multi-cultural environment

3. Use various techniques of communication for multiple requirements of globalized workplaces

4. Learn to articulate opinions and views with clarity.

5. Write business letters and reports.

6. Apply various communication strategies to achieve specific communication goals.

Module- I (6hrs.)

Introduction to Phonology and Morphology

- Phonetics- Vowel and Consonant Sounds (Identification & Articulation)
- Word- stress, stress in connected speech
- Intonation (Falling and Rising Tone)
- Vocabulary Building-The concept of Word Formation

Module- II (6hrs.)

Communication Skills

- The Basics of Business Communication- Process, types, levels
- Barriers to Communication Common obstacles to effective communication
- Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections
- Identify common audiences and design techniques for communicating with each audience

Module- III (6hrs.)

Organizational Communication

- Business Letters
- Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular
- Organizing e-mail messages, E-mail etiquette
- Techniques for writing precisely: Creating coherence, organizing principles –accuracy, clarity, brevity. Different styles of writing: descriptive, narrative, expository.

Module- IV (6hrs.)

Principles, techniques and skills for professional writing

- Logic in writing, thinking and problem-solving; applying deductive and inductive reasoning; Use of infographics in writing.

- Report Writing: Importance and Purpose, Types of Reports, Report Formats, Structure of Formal Reports, Writing Strategies. Interpreting data and writing reports
- Writing proposals and Statement of purpose

Text Books:

1 Kumar,S. &Lata, P. Communication Skills, OUP, New Delhi2011
2 Rizvi,Ashraf,M. Effective Technical Communication, Mc Graw Hill Education(India) Pvt. Ltd..Chennai,2018
3 Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011

Reference Books:

1. Professional Writing Skills, Chan, Janis Fisher and Diane Lutovich. San Anselmo, CA: Advanced Communication Designs.
2. Hauppauge, Geffner, Andrew P. Business English, New York: Barron's Educational Series.

Course Title : Chemistry I Laboratory
Course Code : CHM 1051

Contact hrs per week :	L	T	P	Total	Credit points
	0	0	2	2	1

Course outcomes:

The subject code CHM1051 corresponds to chemistry laboratory classes for the first year B. Tech students. This course enhances the students' experience regarding handling of various chemicals along with various laboratory equipment. Hands on experiments increase the depth of knowledge that is taught in the theory classes as well as it increases research aptitude in students because they can see the direct application of theoretical knowledge in practical field. The course outcomes of the subject are

1. Knowledge to estimate the hardness of water which is required to determine the usability of water used in industries.
2. Estimation of ions like Fe^{2+}, Cu^{2+} and Cl^{-} present in water sample to know the composition of industrialwater.
3. Study of reaction dynamics to control the speed and yield of various manufactured goods produced in polymer, metallurgical and pharmaceutical industries.
4. Handling physico-chemical instruments like viscometer, stalagmometer, pH-meter, potentiometer and conductometer.
5. Understanding the miscibility of solutes in various solvents required in paint, emulsion, biochemical and material industries.
6. Knowledge of sampling water can be employed for water treatment to prepare pollution free water.

List of Experiments:

1. Estimation of iron using KMnO4: self indicator.
2. Iodometric estimation of Cu^{2+}.
3. Determination of Viscosity.
4. Determination of surface tension.
5. Adsorption of acetic acid by charcoal.
6. Potentiometric determination of redox potentials.
7. Determination of total hardness and amount of calcium and magnesium separately in a given water sample.
8. Determination of the rate constant for acid catalyzed hydrolysis of ethylacetate.
9. Heterogeneous equilibrium (determination of partition coefficient of acetic acid in n-butanol and water mixture).
10. Conductometric titration for the determination of strength of a given HCl solution against a standard NaOH solution.
11. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

12. Determination of chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

Course Code: CSE 1051					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	0	0	3	3	1.5

Course Outcomes:

After completion of this course the students should be able:

1. To write simple programs relating to arithmetic and logical problems.
2. To be able to interpret, understand and debug syntax errors reported by the compiler.
3. To implement conditional branching, iteration (loops) and recursion.
4. To decompose a problem into modules (functions) and amalgamating the modules to generate a complete program.
5. To use arrays, pointers and structures effectively in writing programs.
6. To be able to create, read from and write into simple text files.

Software to be used: GNU C Compiler (GCC) with LINUX NB: Cygwin (Windows based) may be used in place of LINUX

Topic 1: LINUX commands and LINUX based editors

Topic 2: Basic Problem Solving

Topic 3: Control Statements (if, if-else, if-elseif-else, switch-case)

Topic 4: Loops - Part I (for, while, do-while)

Topic 5: Loops - Part II

Topic 6: One Dimensional Array

Topic 7: Array of Arrays

Topic 8: Character Arrays/ Strings

Topic 9: Basics of C Functions

Topic 10: Recursive Functions

Topic 11: Pointers

Topic 12: Structures

Topic 13: File Handling

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C – E Balagurusamy

Course Title : Basic Electrical Engg. Laboratory

Course Code : ELE 1051					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcomes: The students are expected to

1. Get an exposure to common electrical apparatus and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the application of common electrical measuring instruments.
4. Understand the basic characteristics of different electrical machines.

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. Verification of Thevenin's & Norton's theorem.
4. Verification of Superposition theorem
5. Verification of Maximum Power Transfer theorem
6. Calibration of ammeter and voltmeter.
7. Open circuit and Short circuit test of a single phase Transformer.
8. Study of R-L-C Series / Parallel circuit
9. Starting and reversing of speed of a D.C. shunt Motor
10. Speed control of DC shunt motor.
11. No load characteristics of D.C shunt Generators
12. Measurement of power in a three phase circuit by two wattmeter method

Course Title: English for Technical Writing Laboratory					
Course Code: HUM 1051					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	0	0	2	2	1

Course Outcome:

Students will be able to

1. Communicate in an official and formal environment.

2. Effectively communicate in a group and engage in relevant discussion.

3. Engage in research and prepare presentations on selected topics.

4 .Understand the dynamics of multicultural circumstances at workplace and act accordingly.

5. Organize content in an attempt to prepare official documents.

6. Appreciate the use of language to create beautiful expressions

Detailed Syllabus

Module- I (6hrs.)

The Art of Speaking

- Techniques for Effective Speaking
- Voice Modulation: Developing correct tone
- Using correct stress patterns: word stress, primary stress, secondary stress. Rhythm in connected speech
- Encoding Meaning Using Nonverbal Symbols,
- How to Improve Body Language
- Eye Communication, Facial Expression, Dress and Appearance
- Posture and Movement, Gesture, Paralanguage
- Encoding meaning using Verbal symbols: How words work and how to use words
- Volume, Pace, Pitch and Pause
- Structuring content for delivery in accordance with time, platform, and audience.

Module- II (6hrs)

Group Discussion

- Nature and purpose and characteristics of a successful Group Discussion
- Group discussion Strategies: Getting the GD started, contributing systematically, moving the discussion along, promoting optimal participation, Handling conflict, Effecting closure

Module- III (6hrs)

- Interviewing
  Types of Interviews, Format for Job Interviews: One-to-one and Panel Interviews, Telephonic Interviews, Interview through video conferencing.
- Cover Letter & CV
- Interview Preparation Techniques, Frequently Asked Questions, Answering Strategies, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews.

Module- IV (6hrs.)

Professional Presentation Skills

- Nature and Importance of Presentation skills
- Planning the Presentation: Define the purpose, analyze the Audience, Analyze the occasion and choose a suitable title.
- Preparing the Presentation: The central idea, main ideas, collecting support material, plan visual aids, design the slides
- Organizing the Presentation: Introduction-Getting audience attention, introduce the subject, establish credibility, preview the main ideas, Body-develop the main idea, present information sequentially and logically, Conclusion-summaries, re-emphasize, focus on the purpose, and provide closure.
- Improving Delivery: Choosing Delivery methods, handling stage fright
- Post-Presentation discussion: Handling Questions-opportunities and challenges.

References:

1. Carter, R. And Nunan, D. (Eds), The Cambridge guide to Teaching English to Speakers of Other Languages, CUP, 2001
2. Edward P. Bailey, Writing and Speaking At Work: A Practical Guide for Business Communication, Prentice Hall, 3rd Ed., 2004
3. Munter, M., Guide to Managerial Communication: Effective Business Writing and Speaking, Prentice Hall, 5th Ed., 1999
4. R. Anand, Job Readiness For IT & ITES- A Placement and Career Companion, , McGraw Hill Education.2015
5. Malhotra, A., Campus Placements, McGraw Hill Education.2015

1ST YEAR 2ND SEMESTER

Course Title: Mathematics II
Course Code: MTH 1201

Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	3	1	0	4	4

Course Outcomes

1. MTH 1201. 1. Demonstrate the knowledge of probabilistic approaches to solve wide range of engineering problem.
2. MTH 1201. 2. Recognize probability distribution for discrete and continuous variables to quantify physical and engineering phenomenon.
3. MTH 1201. 3. Develop numerical techniques to obtain approximate solutions to mathematical problems where analytical solutions are not possible to evaluate.
4. MTH 1201. 4. Analyze certain physical problems that can be transformed in terms of graphs and trees and solving problems involving searching, sorting and such other algorithms.
5. MTH 1201. 5. Apply techniques of Laplace Transform and its inverse in various advanced engineering problems.
6. MTH 1201. 6. Interpret differential equations and reduce them to mere algebraic equations using Laplace Transform to solve easily.

The objective of this course is to familiarize the students with numerical techniques, integral transforms, graph theory and probability. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Module-I Fundamentals of Probability [10L)

Random experiment, Sample space and events

Classical and Axiomatic definition of probability

Addition and Multiplication law of probability

Conditional probability

Bayes' Theorem

Random variables

General discussion on discrete and continuous distributions

Expectation and Variance

Examples of special distribution: Binomial and Normal Distribution

Module-II Numerical Methods [10L]

Solution of non-linear algebraic and transcendental equations: Bisection Method, Newton-Raphson Method, Regula-Falsi Method.

Solution of linear system of equations: Gauss elimination method, Gauss-Seidel Method, LU Factorization Method, Matrix Inversion Method.

Solution of Ordinary differential equations: Euler's and Modified Euler's Method , Runge-Kutta Method of 4th order.

Module-IIIBasic Graph Theory [10L]

Graphs: Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph

Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices

Matrix representation of a graph, Adjacency and incidence matrices of a graph

Graph isomorphism

Bipartite graph

Definition and properties of a tree

Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees

Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms

Module-IVLaplace Transformation [10L]

Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations.

Introduction to integral transformation

Functions of exponential order, Definition and existence of Laplace Transform(LT) (statement of initial and final value theorem only)

LT of elementary functions, Properties of Laplace Transformations , Evaluation of sine , cosine and exponential integrals using LT

LT of periodic and step functions

Definition and properties of inverse LT

Convolution Theorem (statement only) and its application to the evaluation of inverse LT

Solution of linear ODEs with constant coefficients (initial value problem) using LT

Suggested Books:

1. Advanced Engineering Mathematics , E.Kreyszig, Wiley Publications
2. Introduction to Probability and Statistics for Engineers and Scientists, S.Ross, Elsevier
3. Introductory methods of Numerical Analysis, S.S. Sastry, PHI learning
4. Introduction to Graph Theory, D. B. West, Prentice-Hall of India
5. Engineering Mathematics, B.S. Grewal, S. Chand & Co.

Course Title : Physics I					
Course Code : PHY 1001					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	3	0	0	3	3

Course Outcomes:

1. To develop basic understanding of the modern science to the technology related domain.
2. Analytical & logical skill development through solving problems.
3. To impart idea of concise notation for presenting equations arising from mathematical formulation of physical as well as geometrical problems percolating ability of forming mental pictures of them.
4. Imparting the essence and developing the knowledge of controlling distant object like satellite, data transfer through optical fiber, implication of laser technology, handling materials in terms of their electrical and magnetic properties etc.
5. To understand how the systems under force field work giving their trajectories which is the basic of classical Field theory
6. To impart basic knowledge of the electric and magnetic behavior of materials to increase the understanding of how and why electronic devices work

Module 1 : Mechanics (7+5)= 12L

Elementary concepts of grad, divergence and curl. Potential energy function; F=-grad V, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, Curl of a force field; Central forces ; conservation of angular momentum; Energy equation and energy diagrams; elliptical, parabolic and hyperbolic orbit; Kepler Problem; Application : Satellite manoeuvres .

Non-inertial frames of reference; rotating coordinate system; five term acceleration formula-centripetal and coriolis accelerations; applications: Weather system, Foucault pendulum.

Module 2: Optics =(4 +3+ 5) =

12L Oscillatory Motion:

Damped harmonic motion – Over damped, critically damped and lightly damped oscillators; Forced oscillation andresonance. Electrical equivalent of mechanical oscillator, Wave equation, plane wave solution.

Optics:

Elementary features of polarization of light waves. Double refraction, Production and analysis of linearly, elliptic and Circularly polarized light, Polaroid and application of polarizations.: Polarimeter.

Laser & Fiber Optics:

Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Fiber optics - principle of operation, numerical aperture, acceptance angle, Single mode , graded indexed fiber.

Module 3: Electrostatics (8+4)

= 12 L L Electrostatics in

freespace

Calculation of electric field and electrostatic potential for a charge distribution, Divergence and curl of electrostatic
field, Laplace's and Poisson's equation for electrostatic potential. Boundary conditions of electric field and electrostatic potential. Method of images , energy of a charge distribution and its expression in terms of electric field.

Electrostatics in a linear dielectric medium

Electrostatic field and potential of a dipole, Bound charges due to electric polarization, Electric displacement, Boundary conditions on displacement, Solving simple electrostatic problem in presence of dielectric – point charge at the centre of a dielectric sphere, charge in front of dielectric slab, Dielectric slab and dielectric sphere in uniform electric field.

Module 4: **(6+3+3) = 12L**

Magnetostatics :

Biot-Savart law, divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; equation for vector potential and it's solutions for given current densities.

Magneto statics in a linear magnetic medium:

Magnetization and associated bound currents; Auxiliary magnetic field H ; boundary conditions on B and H . Solving for magnetic field due to simple magnet like a bar magnet; Magnetic susceptibility; ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Faraday's Law:

Differential form of Faraday's law expressing curl of electric field in terms of time derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi static approximation. Energy stored in a magnetic field.

BOOKS

1. Theoretical Mechanics : M R Spiegel (Schaum Series) McGrow-Hill Book Company
2. Classical Mechanics : N C Rana and P S Joag Tata- McGrow-Hill Publishing Company Limited.
3. Vibrations and Waves : A P French, W W Norton and Company,
4. The Physics of Waves and Oscillations : N K Bajaj, Tata- McGrow-Hill Publishing Company Limited.
5. Optics : A Ghatak, Tata McGraw-Hill Publishing Company Limited.
6. Optics : E. Hecht, Addison Wesley
7. Fundamentals of Optics : F A Jenkins and H E White, McGrow-Hill Higher Education.
8. Atomic Physics (Modern Physics): S N Ghosal, S. Chand and Company.
9. Practical Quantum Mechanics : S Flugge, Springer (Reprint of the 1994 Edition)
10. Concepts of Modern Physics : A Baiser, Tata McGraw-Hill Publishing Company Limited.
11. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora.

Course Title : Introduction to Electronics Devices & Circuits					
Course Code : ECE 1001					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	3	0	0	3	3

Course Outcomes:

After going through this course, the students will be able to:

1. Categorize different semiconductor materials based on their energy bands and analyze the change in characteristics of those materials due to different types of doping.
2. Describe energy band of P-N Junction devices and solve problems related to P-N Junction Diode.
3. Design different application specific circuits using diodes.
4. Analyze various biasing configurations of Bipolar Junction Transistor.
5. Categorize different field-effect transistors and analyze their behavior.
6. Design and implement various practical electronic circuits.

Module I [10 L]
Basic Semiconductor Physics:
Crystalline materials, energy band theory, Conductors, Semiconductors and Insulators, Concept of Fermi energy level, intrinsic and extrinsic semiconductors, mass action law, drift and diffusion currents in semiconductor, Einstein relation.
Diodes and Diode Circuits:
Formation of p-n junction, energy band diagram, forward & reverse biased configurations, V-I characteristics, DC load line, breakdown mechanisms - Zener and avalanche breakdown, voltage regulation using Zener diode.

Rectifier circuits: half wave & full wave rectifiers: ripple factor, rectification efficiency, rectifier output without and with filters. Light emitting diode.

Module II [8 L]
Bipolar Junction Transistors (BJT):

pnp & npn BJT structures, different operating modes of BJT, current components in BJT, dc current gains in CE & CB configurations and their interrelation, input & output V-I characteristics of CE & CB configurations. Concept of Biasing: DC load line, Q-point, basic concept of amplification using BJT.

Module III [9 L]
Field Effect Transistors (FET):

Classification of FET, basic structure and operation of Junction Field Effect Transistor (n-channel)along with its V-I characteristics.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): Enhancement & depletion type MOSFETs (forboth n & p channel devices), drain & transfer characteristics.

Module IV [9 L]

Feedback in amplifiers:

Concept of feedback, different feedback topologies using block diagram only, effects of negative feedback (qualitative), Barkhausen criteria for sustained oscillation.

Operational Amplifier:

Usefulness of differential amplifier over single ended amplifier, ideal OPAMP characteristics, transfer characteristics of OPAMP, CMRR, slew rate,offset error voltages and current, concept of virtual ground

Basic circuits using OPAMP: Comparator, inverting and non-inverting amplifiers, voltage follower, adder, subtractor, integrator, differentiator.

Text Books:

1. Boylestad & Nashelsky:Electronic Devices & Circuit Theory
2. R.A Gayakwad:Op Amps and Linear IC's, PHI
3. D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

Reference Books:

1. Adel S. Sedra, Kenneth Carless Smith: Microelectronics Engineering
2. Millman & Halkias: Integrated Electronics.
3. Salivahanan: Electronics Devices & Circuits.
4. Albert Paul Malvino: Electronic Principle

Course Name: Universal Human Values and Professional Ethics					
Course Code : HUM 1002					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	2	1	0	3	3

Course Outcome:

Students will be able to

1. Appreciate the essential complementarily between 'values and 'skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

2. Develop a Holistic perspective towards life and profession

3. Develop a correct understanding of the Human reality and the rest of existence

4. Appreciate the relationship of values in terms of ethical human conduct.

5. Understand the importance of trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

6. Differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them.

Detailed Syllabus

Module 1 – Introduction to Value Education (6hrs.)

Understanding Values: Historical perspective to the development of values and its importance for the integration and harmony of the self and body

Understanding Human being as the Co-existence of the Self and the Body

Exploring Harmony of Self with the Body

Distinguishing between the Needs of the Self and the Body

Understanding and appreciating basic human aspirations-Maslow's Hierarchy of Needs Theory

Strategies, Methods toFulfil the Basic Human Aspirations

Continuous Happiness and Prosperity – the Basic Human Aspirations

Module 2 – Harmony in the Family and Society (10hrs.)

The self as a social being starting with the family as the smallest unit—the process of socialisation.

Development of the self in relation to the society – Cooley's and Mead's theories of socialization.

Self and Integrated personality-Morality, Courage and Integrity

Conflict of interest at home and society and its resolution through the implementation of the Human Values

Societal Values – Justice, Democracy and Rule of law

Establishing harmony in the society with the help of ethical conduct based on values- Ethics of Rights and Duties, Ethics of care, Ethicsjustice and Fairness, Work Ethics and quality of life at work.

Value crisis- disharmony in relationships, understanding harmony in the society

Solutions - contribution of the individualin establishing harmony in the society.

'Trust' and 'Respect'--the Foundational Values in Relationship

Exploring theFeeling of Trustand Respect

Module 3 – Implications of the Holistic Understanding – a Look at Professional Ethics (10hrs.)

Ethics and Ethical Values

Principles and theories of ethics--Consequential and non-consequential ethics,Utilitarianism, Kant's theory and other non-consequential perspectives

Professional Ethics- Right understanding of Professional Ethics

Canons of professional Ethics

Technology – various perspectives-its use, overuse and misuse

Privacy, data security and data protection, Artificial intelligence-harmony or disharmony, misinformation, deep fake, cyber-crime - a sociological perspective.

Code of Ethics, Violation of code of ethics, Whistle blowing, Institutionalising Ethics

Vision for the Universal Human Order,Exploring Systems to fulfil Human Endeavours

Module 4 – Harmony in the Nature/Existence (10hrs.)

Understanding Harmony in the Nature -Ecological Ethics

Sustainable development- Definition and Concept

Strategies for sustainable development- Small is beautiful,Slow is Beautiful
Sustainable Development--- The Modern Trends

Sustainable Development Goals- Case studies and Best practices

Exploring the Four Orders of Nature -Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

The Holistic Perception of Harmony in Existence

Suggested Readings:

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Asthana, G.P. Bagaria, Excel Books Pvt. Ltd. New Delhi

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

Course Title : Sports and Yoga					
Course Code : MEC 1216					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	0

On successful completion of the course, students will be able to

CO1: **understand** the importance of sound health and fitness principles as they relate to better health.
CO2: **learn** breathing exercises and healthy fitness activities
CO3: **perform** yoga movements in various combination and forms.
CO4: **improve** personal fitness through participation in sports and yogic activities.
CO5: **identify and apply** injury prevention principles related to yoga and physical fitness activities.
CO6: **demonstrate** an understanding of sound nutritional practices as related to health and physical performance.

Course Contents:
Module I:

Introduction to Physical Education
o Meaning & definition of Physical Education
o Aims & Objectives of Physical Education
o Changing trends in Physical Education

Historical Background
o Ancient & Modern Olympics (Summer & Winter)
o Olympic Symbols, Ideals, Objectives & Values
o Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Healthy Lifestyle
o Meaning & Importance of Physical Fitness & Wellness
o Components of Physical fitness
o Components of Health related fitness
o Components of wellness
o Preventing Health Threats through Lifestyle Change
o Concept of Positive Lifestyle

Module II
Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga
o Define Anatomy, Physiology & Its Importance
o Effect of exercise on the functioning of Various Body Systems. (Circulatory System,
o Respiratory System, Neuro-Muscular System etc.)

Kinesiology, Biomechanics & Sports

o Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
o Newton's Law of Motion & its application in sports.
o Friction and its effects in Sports.

Postures

o Meaning and Concept of Postures.
o Causes of Bad Posture.
o Advantages & disadvantages of weight training.
o Concept & advantages of Correct Posture.
o Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
o Corrective Measures for Postural Deformities

Module III:

Yoga

o Meaning & Importance of Yoga
o Elements of Yoga
o Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
o Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
o Relaxation Techniques for improving concentration - Yog-nidra

Yoga & Lifestyle

o Asanas as preventive measures.
o Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
o Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
o Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
o Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
o Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Module IV

Training and Planning in Sports

o Meaning of Training
o Warming up and limbering down
o Skill, Technique & Style
o Meaning and Objectives of Planning.
o Tournament – Knock-Out, League/Round Robin & Combination.

Psychology & Sports

o Definition & Importance of Psychology in Physical Edu. & Sports
o Define & Differentiate Between Growth & Development
o Adolescent Problems & Their Management
o Emotion: Concept, Type & Controlling of emotions
o Meaning, Concept & Types of Aggressions in Sports.
o Psychological benefits of exercise.
o Anxiety & Fear and its effects on Sports Performance.
o Motivation, its type & techniques.
o Understanding Stress & Coping Strategies.

Doping

o Meaning and Concept of Doping
o Prohibited Substances & Methods
o Side Effects of Prohibited Substances

Sports Medicine

o First Aid – Definition, Aims & Objectives.
o Sports injuries: Classification, Causes & Prevention.
o Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Title: Physics I Laboratory					
Course Code: PHY 1051					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	0	**0**	**2**	**2**	**1**

Course Outcomes:

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
5. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Minimum of six experiments taking at least one from each of the following four groups:

Group 1 : Experiments in General Properties of matter

1. Determination of Young's modulus by Flexure Method
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section.
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method.
5. Determination of coefficient of viscosity by Poiseulle's capillary flow method.

Group 2: Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of light by Newton's ring method.
3. Determination of wavelength of light by Fresnel's biprism method.
4. Determination of the wavelength of a given laser source by diffraction method

Group 3: Electricity & Magnetism experiments

1. Determination of dielectric constant of a given dielectric material.
2. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of
3. logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron.

Group 4: Quantum Physics Experiments

7. Determination of Planck's constant.
8. Determination of Stefan's radiation constant.
9. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum.
11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.
13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

Books of reference:

1. Optics – Eugene Hecht Pearson Education India Private Limited
2. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
3. Waves and Oscillations by N.K. Bajaj
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
6. Classical mechanics, Narayan Rana, Pramod Joag, McGraw HillEducation
7. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
8. Optics, Ghatak, McGraw Hill Education India Private Limited
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora

Course Title : Introduction to Electronics Devices & Circuits Laboratory					
Course Code : ECE 1051					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	0	2	2	1

Course Outcomes:

1. The students will correlate theory with diode behavior.
2. They will design and check rectifier operation with regulation etc.
3. Students will design different modes with BJT and FET and check the operations.
4. They will design and study adder, integrator etc. with OP-AMPs.

List of Experiments

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multi-metersetc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs in CB mode
7. Study of I-V characteristics of BJTs in CE mode
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.

Course Name: WORKSHOP /MANUFACTURING PRACTICES					
Course Code: MEC 1051					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	1	**0**	**3**	**4**	**2.5**

Course Outcomes:

On successful completion of the course, students will be able to

CO1: **Follow** the various safety practices in workshop and personal protective elements.

CO2: **Identify** tools, work material and measuring instruments useful for fitting, carpentry and sheet metal practices.

CO3: **Operate** machine tools, components and processes to prepare jobs of specific shape and size.

CO4: **Acquire** knowledge of foundry process and casting of a product.

CO5: **Perform** welding, brazing and soldering processes.

CO6: **Assemble** a simple product.

Syllabus:

(i) Lectures: (13 hours)

Detailed contents

1. Introduction on Workshop and familiarization with safety norms **(1 lecture)**
2. Carpentry and Fitting **(2 lectures)**
3. Sheet metal **(1 lecture)**
4. Metal casting **(1 lecture)**
5. Welding (arc welding & gas welding), brazing and soldering **(2 lectures)**
6. Manufacturing Methods- machining (Lathe, Shaping and Milling) **(4 lectures)**
7. Additive manufacturing **(1 lecture)**
8. Assembling of a product **(1 lecture)**

(ii) Workshop Practice:(39 hours)

1. Safety practices in workshop **(3 hours)**
2. Carpentry shop **(3 hours)**
3. Fitting shop **(6 hours)**
4. Foundry shop **(3 hours)**
5. Machine shop **(9 hours)**
6. Welding shop-Arc welding **(3 hours)**
7. Sheet metal shop and brazing **(6 hours)**
8. Soldering operation **(3 hours)**
9. Assembling of a product **(3 hours)**

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements ofWorkshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters andpublishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" PearsonEducation, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice HallIndia, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,2017.

Course Title : Engineering Graphics and Design
Course Code : MEC 1052

Contact hrs per	L	T	P	Total	Credit Points
week:	1	0	3	4	2.5

Course Outcomes:

After going through the course, the students will be able to

1. Visualize the basic concept of engineering drawing.
2. Use engineering drawing tools (conventional / modern tools).
3. Apply the various standards and symbols followed in engineering drawing.
4. Implement the concept of projections used in engineering graphics.
5. Relate the concept of sections to determine its true shape.
6. Execute the concept of isometric projections.

Lecture Plan (13 L)

1. Importance and principles of engineering drawing (1 L)
2. Lettering (1 L)
3. Concepts of Scale, dimensioning and Conic sections (3 L)
4. Introduction to concept of projection (Projections of points, lines and surfaces) (3 L)
5. Definitions of different solids and their projections (1 L)
6. Section of solids and sectional view (1 L)
7. Isometric projection (1 L)
8. Introduction to CAD (1 L)

Detailed contents of Laboratory hours (39 hours)

Module 1: Introduction to Engineering Drawing covering (**3 hours**)

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic sections like Ellipse (General method only); Involute; Scales – Plain, Diagonal.

Module 2: Orthographic Projections covering (**9 hours**)

Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.

Module 3: Projections of Regular Solidscovering, (**6 hours**)

Those axes inclined to both the Planes- Auxiliary Views.

Module 4: Sections and Sectional Views of Right Angular Solids covering (**3 hours**)

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Sectional orthographic views of geometrical solids.

Module 5: Isometric Projections covering (**6 hours**)

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, Conventions.

Module 6: Overview of Computer Graphics covering, (**3 hours**)

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

Module 7: Customization& CAD Drawing. (**3 hours**)

Consisting of 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, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

Module 8: Annotations, layering & other functions covering. (**3 hours**)

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation.

Module 9: Demonstration of a simple team design project that illustrates (**3 hours**)

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame.

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) “Elementary Engineering Drawing”; Charotan Publishing House

2. Narayana, k.L. and Kannaaiah P “Engineering Graphics”; TMH

3. Lakshminarayanan, V. and Vaish Wanar, R.s “Engineering Graphics” Jain Brothers.

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.

5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.