Electronics and Communication Engineering (ECE) Department

B.TECH. PROGRAMME

CURRICULUM

RELEASE DATE:

July, 2023

(Applicable from 2023 admitted batch)

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Institutional Vision & Mission

VISION:

To prepare dynamic and caring citizens to meet the challenges of global society while retaining their traditional values.

MISSION:

- To prepare students with strong foundation in their disciplines and other areas of learning.
- To provide an environment for critical and innovative thinking, and to encourage life-long learning.
- To develop entrepreneurial and professional skills.
- To promote research and developmental activities and interaction with industry.
- To inculcate leadership qualities for serving the society.

Departmental Vision & Mission

VISION

To produce graduates with firm foundation in electronics and Communication engineering, who will cater to the dynamic needs of the industry and who will provide a stimulating environment for higher education and quality research. They will be sensitive to the needs of the country and society and will prove themselves to be caring citizens.

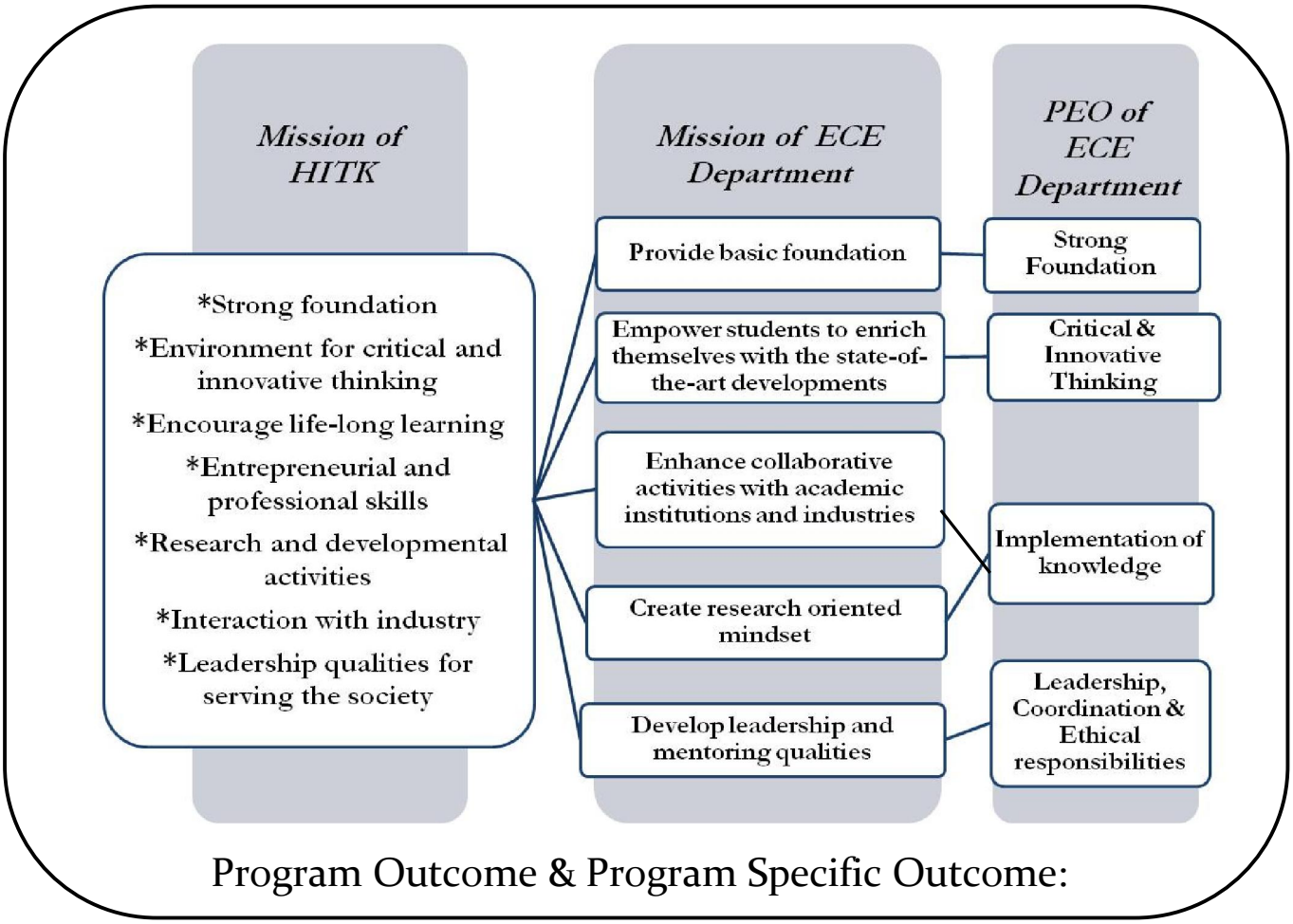
MISSION

- To harmonize the teaching-learning process and also to provide basic foundation to the students of the department so that they can adapt to the changing market needs in electronics and communication domains.
- To empower the students to enrich themselves with the state-of-the-art developments through seminars, workshops, participation in technical competitions, interaction with industry experts and paper presentations in conferences.
- To enhance collaborative activities with academic institutions and industries for evolving indigenous technological solutions that address societal and dynamic market needs in the Electronics and Communication domains and interdisciplinary areas.
- To create research oriented mindset to help solve myriad challenges of the future which will come before society and nation.
- To help the students to develop leadership qualities, and mentoring qualities. It will ensure that they will be well-rounded and complete individuals.

Program Educational Objective of ECE Department:

The graduate students with the B.Tech. (Electronics and Communication Engineering), degree from Heritage Institute of Technology, Kolkata is expected to prove the following qualities after a few years of getting this degree.

1. **Strong Foundation**: They will be able to establish their ability to analyze and synthesize current Electronics and Communication Engineering practices by assimilating its basic and advanced approaches on way to become successful professionals in industries.
2. **Critical & Innovative Thinking:** They will be able to prove their research orientation by their ability to handle versatile problems in Communication and related field by virtue of their knowledge acquired in course of the degree.
3. **Leadership, coordination & Ethical Responsibilities:** They will acquire leadership quality to demonstrate their ability to work in teams. They will prove themselves as good natured and well - behaved members of working teams as well as leaders in various diverse industries.
4. **Implementation of knowledge:** The graduate students will be able to implement the knowledge gained, through interaction & effective communication skills in work places. They will successfully show their learning and teaching abilities.



Program Outcome & Program Specific Outcome:

Program Outcomes :

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 : Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 : The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

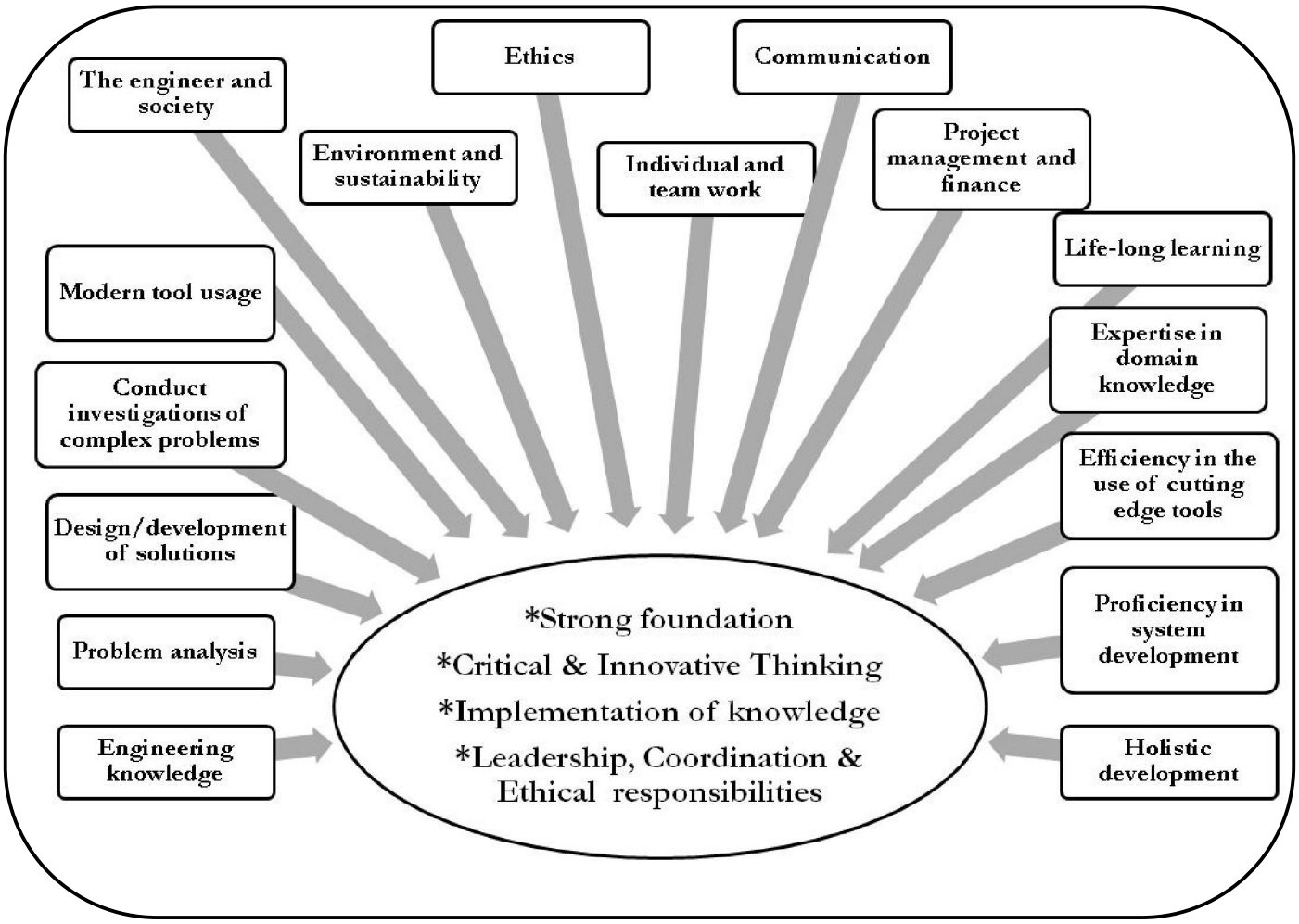
The graduates of the department will attain:

PSO1: Expertise in domain knowledge: The ability to absorb and apply fundamental knowledge of core Electronics and Communication Engineering subjects in the analysis of various types of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions.

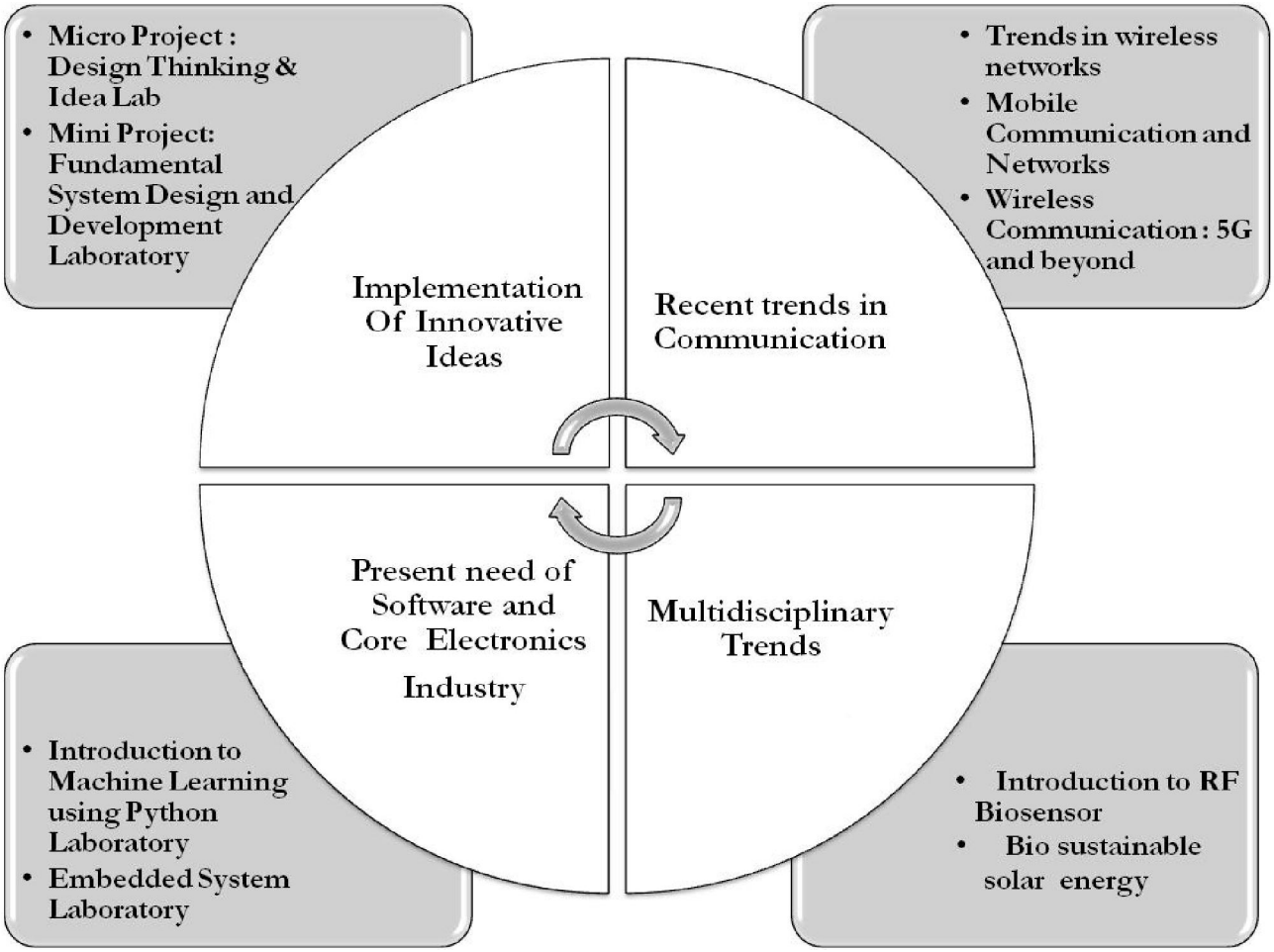
PSO2: Efficiency in the use of cutting edge tools: Competence in using electronic modern IT tools (both software and hardware) for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3: Proficiency in system development: The capability to apply the concepts of Electronics and Communication Engineering to design and develop a variety of components and systems for applications including, but not limited to, signal processing, Communication, Embedded systems, VLSI and control system.

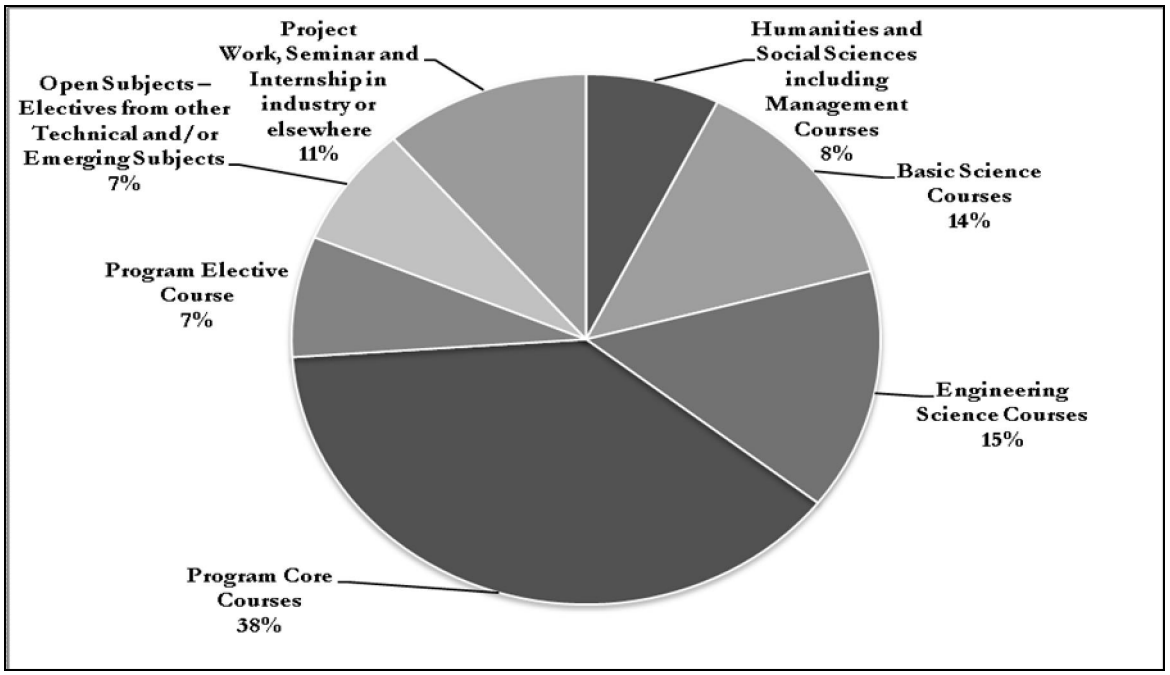
PSO4: Holistic development: Excellent adaptability to changing work environment, good interpersonal skills as a leader in a team in appreciation of professional ethics and societal responsibilities.



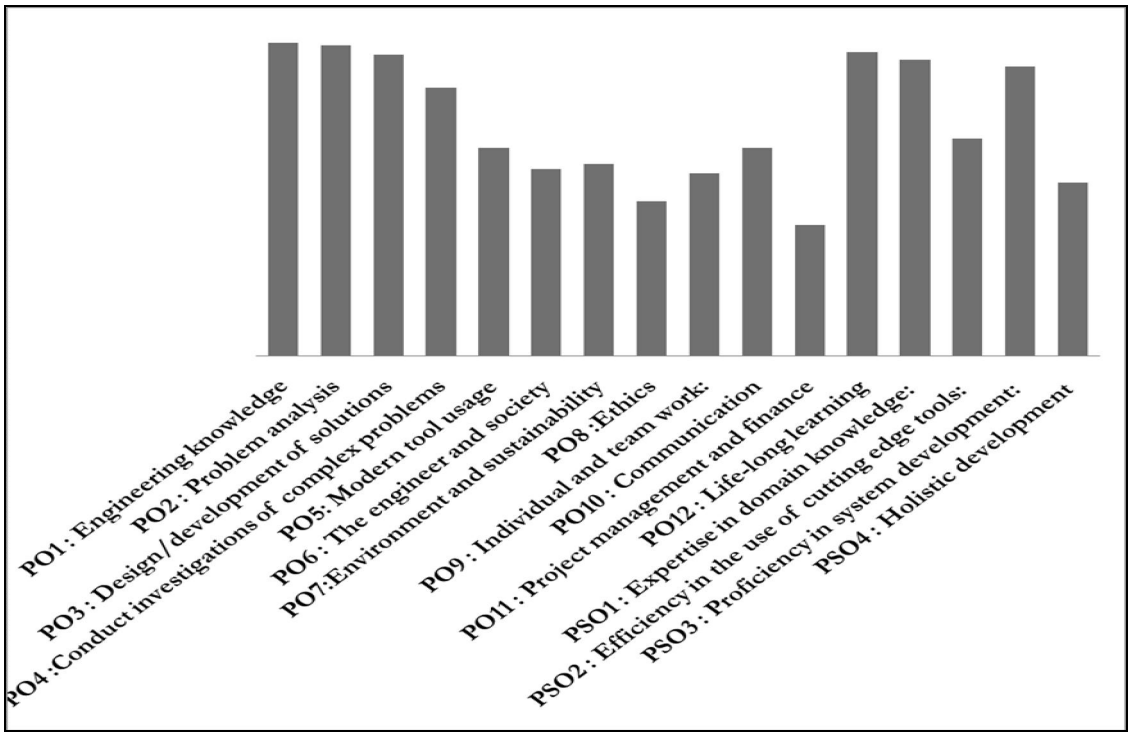
New Courses introduced



Components of Curriculum



Compliance of curriculam for attaning PO PSO



Credit Summary for B Tech Programmes in ECE with effect from 2023-2024

Sl. No.	Course Type	AICTE Suggested	ECE
1.	Humanities and Social Sciences including Management Courses	15	12
2.	Basic Science Courses	23	22
3.	Engineering Science Courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer, etc.	17	24
4.	Program Core Courses	61	62.5
5.	Program Elective Course Courses relevant to chosen Specialization / Branch	12	12
6.	Open Subjects – Electives from other Technical and/or Emerging Subjects	12	12
7.	Project Work, Seminar and Internship in industry or elsewhere	20	18.5
8.	Mandatory course Courses (Non-credit) [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	0	0
	Total	**160**	**163**
9	Honours Courses	20	20
	Grand Total	**180**	**183**

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 163 credits will be necessary for a student to be eligible to get B Tech degree.
- ✓ A student will be eligible to get B Tech degree with Honours if he/she completes an additional 20 credits.
- ✓ These could 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.

Curriculum Structure

1st Year 1st Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Basic Science course	**CHM 1001**	Chemistry I	3	0	0	3	3
2	Basic Science course	**MTH 1101**	Mathematics I	3	1	0	4	4
3	Engineering Science course	**CSE 1001**	Programming for Problem Solving	4	0	0	4	4
4	Engineering Science course	**ELE 1001**	Basic Electrical Engineering.	3	1	0	4	4
5	Humanities and Social Sciences including Management courses	**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	Engineering Science course	**CSE 1051**	Programming for Problem Solving Laboratory	0	0	3	3	1.5
3	Engineering Science course	**ELE 1051**	Basic Electrical Engineering Laboratory	0	0	2	2	1
4	Humanities and Social Sciences including Management courses	**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 :

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	Program Core Course	**ECE 1001**	Introduction to Electronic Devices and Circuits	3	0	0	3	3
4	Humanities and Social Sciences including Management courses	**HUM 1002**	Universal Human Values and Professional Ethics	2	1	0	3	3
Total Theory				11	2	0	13	**13**

B. Practical								
1	Basic Science course	**PHY 1051**	Physics I Laboratory	0	0	2	2	1
2	Program Core Course	**ECE 1051**	Introduction to Electronic Devices and Circuits Laboratory	0	0	2	2	1
3	Engineering Science course	**MEC 1051**	Workshop/ Manufacturing Practices	1	0	3	4	2.5
4	Engineering 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	Program Core Course	**ECE 2101**	Analog Circuits	3	0	0	3	3
2	Program Core Course	**ECE 2102**	Digital Systems Design	3	0	0	3	3
3	Program Core Course	**ECE 2103**	Signals and Systems	3	0	0	3	3
4	Program Core Course	**ECE 2104**	Network Theory	3	0	0	3	3
5	Basic Science course	**MTH 2001**	Mathematical Methods	2	0	0	2	2
6	Engineering Science course	**CSE 2004**	Data Structure and Basic Algorithms	3	0	0	3	3
Total Theory				17	0	0	**17**	**17**

B. Practical								
1	Program Core Course	**ECE 2151**	Analog Circuits Laboratory	0	0	2	2	1
2	Program Core Course	**ECE 2152**	Digital Systems Design Laboratory	0	0	2	2	1
3	Program Core Course	**ECE 2155**	Signals and Networks Laboratory	0	0	2	2	1
4	Engineering Science course	**CSE 2054**	Data Structure and Basic Algorithms Laboratory	0	0	2	2	1
Total Practical				0	0	8	**8**	**4**

C. Sessional								
1	Project	**ECE 2196**	Micro Project : Design Thinking & Idea Lab	0	0	2	2	1
Total Sessional				0	0	2	**2**	**1**
Total of Semester				**17**	**0**	**10**	**27**	**22**

2nd Year 2nd Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Program Core Course	**ECE 2201**	Introduction to Analog & Digital Communication	3	0	0	3	3
2	Program Core Course	**ECE 2202**	Control Systems	3	0	0	3	3
3	Program Core Course	**ECE 2203**	EM Theory & Transmission Lines	3	0	0	3	3
4	Program Core Course	**ECE 2204**	Digital Signal Processing	3	0	0	3	3
5	Program Core Course	**ECE 2205**	Electronic Devices	3	0	0	3	3
6	Basic Science Course	**MTH 2202**	Advanced Numerical Methods	3	0	0	3	3
Total Theory				18	0	0	**18**	**18**

B. Practical								
1	Program Core Course	**ECE 2251**	Introduction to Analog & Digital Communication Laboratory	0	0	2	2	1
2	Program Core Course	**ECE 2252**	Control Systems Laboratory	0	0	2	2	1
3	Program Core Course	**ECE 2253**	EM Theory & Transmission Lines Laboratory	0	0	2	2	1
4	Program Core Courses	**ECE 2254**	Digital Signal Processing Laboratory	0	0	2	2	1
5	Basic Science courses	**MTH 2252**	Advanced Numerical Methods Laboratory	0	0	2	2	1
Total Practical				0	0	10	**10**	**5**

C. Mandatory courseCourse(non-credit)								
1	Mandatory Course	**EVS 2016**	Environmental Sciences	2	0	0	2	0
Total of Semester				**20**	**0**	**10**	**30**	**23**

3rd Year, 1st. Semester

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Program Core Course	**ECE 3101**	Mobile Communication and Networks	3	0	0	3	3
2	Program Core Course	**ECE 3102**	Microwave Engineering	3	0	0	3	3
3	Program Core Course	**ECE 3103**	Processor Fundamentals and Microcontrollers	3	0	0	3	3
4	Program Core Course	**ECE 3104**	Microelectronic Devices and Analog VLSI design	3	0	0	3	3
5	Program Elective Course-1	**ECE 3131**	Artificial Intelligence	3	0	0	3	3
		ECE 3132	Computer Networks					
		ECE 3133	Introduction to Fiber Optics					
		ECE 3134	Computer Organization					
6	Open Elective course- 1	**i)ECE 3121**	i)Digital Image Processing & Pattern recognition	3	0	0	0	3
Total Theory				18	0	0	18	**18**

B. Practical								
1	Program Core Course	**ECE 3151**	Mobile Communication and Networks Laboratory	0	0	2	2	1
2	Program Core Course	**ECE 3152**	Microwave Engineering Laboratory	0	0	2	2	1
3	Program Core Course	**ECE 3153**	Processor Fundamentals and Microcontrollers Laboratory	0	0	2	2	1
4	Program Core Course	**ECE 3154**	Microelectronic Devices and Analog VLSI design Laboratory	0	0	2	2	1
5	Program Core Course	**ECE 3155**	Introduction to Machine Learning using Python Laboratory	1	0	3	4	2.5
Total Practical				1	0	11	**12**	**6.5**
Total of Semester				19	0	11	**30**	**24.5**

Open Elective course - 1	**i)ECE 3121** **ii) ECE 3122** **iii) ECE 3123** **iv) ECE 3124**	i) Digital Image Processing & Pattern recognition ii) Introduction to Machine Learning iii) Error Control Coding for Secure Data Transmission iv) Introduction to VLSI Design

Open Elective course -1 (to be offered by ECE Department)

3rd Year 2nd Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Program Core Course	**ECE 3201**	Digital VLSI Design	3	0	0	3	3
2	Engineering Science Course	**CSE 3208**	Object Oriented Programming Concept using JAVA	3	0	0	3	3
3	Humanities and Social Sciences including Management courses	**HUM 3201**	Economics for Engineers	3	0	0	3	3
4	Program Elective Course-2	**ECE 3231**	Trends in Wireless Networks	3	0	0	3	3
		ECE 3232	Information Theory and Coding					
		ECE 3233	Fundamentals of Cognitive Radio & Network					
		ECE 3234	Wireless Sensor Networks and security					
5	Program Elective Course-3	**ECE 3241**	Internet of Things	3	0	0	3	3
		ECE 3242	Wireless Communication : 5G and beyond					
		ECE 3243	Intelligent Radio Design					
		ECE 3244	Satellite Communication & Remote Sensing					
6	Open Elective course -2	**ECE 3221**	Artificial Intelligence in Radio Communication	3	0	0	3	3
Total Theory				18	0	0	**18**	**18**

B. Practical								
1	Program Core Course	**ECE 3251**	Digital VLSI Design Laboratory	0	0	2	2	1
2	Engineering Science Course	**CSE 3258**	Object Oriented Programming Concept using JAVA Laboratory	0	0	3	3	1.5
3	Program Core Course	**ECE 3253**	Embedded System Laboratory	1	0	2	3	2
Total Practical				1	0	7	**8**	**4.5**

C. Sessional								
1	Project	**ECE 3294**	Mini Project: Fundamental System Design and Development Laboratory	0	0	3	3	1.5
2	Project	**ECE 3295**	Project Stage – I	0	0	2	2	1
Total Sessional				0	0	5	**5**	**2.5**

D. Mandatory course Course(non-credit)								
1	Mandatory	**INC 3016**	Indian Constitution and Civil Society	2	0	0	2	0
Total of Semester				**21**	**0**	**12**	**33**	**25**

Open Elective course - 2	**i) ECE 3221** **ii) ECE 3222** **iii) ECE 3223** **iv) ECE 3224**	i) Artificial Intelligence in Radio Communication ii) Designing with Processors and Controllers iii) Analog and Digital Communication iv) Optical Fiber Communication

Open Elective course -2 (to be offered by ECE Department)

4th Year 1st Semester:

A. Theory								
Sl. No.	**Category**	**Course Code**	**Course Name**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	Program Elective Course-4	**i) ECE 4131**	i) Introduction to MEMS	3	0	0	3	3
		ii)ECE 4132	ii) Application of Green Energy					
		iii)ECE 4133	iii) Network Security					
		iv)ECE 4134	iv) Nanoelectronics & Nanophotonics					
		v) ECE 4135	v) Electromagnetic Interference and Compatibility					
2	Open Elective course- 3	**i)ECE 4121**	i) Principles of Radar	3	0	0	3	3
3	Open Elective course- 4	**i) BTC 4124**	i) Biology for Engineers	3	0	0	3	3
		ii) BTC 4126	ii) Bioenergy and other Non-conventional Energy					
		iii) ECE 4125	iii) Bio sustainable solar energy					
		iv) ECE 4126	iv) Introduction to RF Biosensor					
4	HU	**HUM 4101**	Principles of Management	3	0	0	3	3
Total Theory				12	0	0	**12**	**12**

B. Sessional								
5	Seminar	**ECE 4193**	Seminar	0	0	4	4	2
6	Project	**ECE 4195**	Project Stage – II	0	0	12	12	6
7	Industrial Training/ Internship	**ECE 4191**	Industrial Training/Internship	-	-	-	-	2
Total Sessional				0	0	16	**16**	**10**
Total of Semester				12	0	16	**28**	**22**

Open Elective course -3	**i) ECE 4121** **ii)ECE 4122** **iii) ECE 4123** **iv) ECE 4124**	i) Principles of Radar ii) Evolution of Mobile Communication: 1G to 5G iii) Introduction to Software Defined Radio iv) Ad Hoc Wireless Networks

Open Elective course 3 (to be offered by ECE Department)

4th Year 2nd Semester:

A. Sessional								
4	Project Work	**ECE 4295**	Project Work III & Dissertation	0	0	6	6	3
5	Viva Voce.	**ECE 4297**	Comprehensive Viva Voce	-	-	-	-	2
Total Sessional				0	0	6	**6**	**5**
Total of Semester				0	0	6	**6**	**5**

1ST YEAR 1ST SEMESTER

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 (Chemistry-1) for the first year B. Tech students, offered as Chemistry for Engineering and is common to all Branches of Engineering Disciplines. The course provides basic knowledge of theory and applications in the subjects like Thermodynamics, Quantum mechanics, Electrochemistry, & Energy conversion, Structure and reactivity of molecules. Spectroscopic techniques and their applications, Synthesis & use of Drug molecules. The Course Outcome for the subject code CHM1001, is furnished below:

1. Knowledge acquisition of bulk properties of materials and understanding of reaction processes using thermodynamic considerations.
2. Conception of energy conversion and its importance in clean energy scenario, the operating principles for batteries, fuel cells and the materials and reactions involved there in, their applications as sustainable energy devices, particularly in automobiles sectors to reduce environmental pollution.
3. Analytic view of microscopic chemistry in terms of atomic structure, molecular orbital and intermolecular forces to reinforce strong background on materials science and engineering.
4. Rationalize periodic trends of elements to explain various physico - chemical properties.
5. Understanding of the spectrum of electromagnetic radiation used for exciting different molecular energy levels in various spectroscopic techniques.
6. Knowledge of stereochemistry and conception of the mechanism of major chemical reactions involved in synthesis of drug molecules.

MODULE 1

Thermodynamics

The 1st and 2nd laws of thermodynamics and thermodynamic functions like free energy, work function and entropy; Carnot cycle, Joule-Thomson effect, Gibbs-Helmholtz equation; Chemical Potential, Gibbs- Duhem Equation and Clausius-Clapeyron Equation. 5L

Electrochemical Cell

Generation of electromotive force in electrochemical cells and application of Nernst equation; Electrode potentials and the redox reactions; Cell configuration and half cell reactions; Standard Hydrogen Electrode, Reference electrode, evaluation of thermodynamic functions; Electrochemical corrosion.

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

MODULE 2

Molecular Structure

Molecular geometry, Hybridization, Ionic, dipolar and van Der Waals interactions; Molecular Orbital Theory and its application in diatomic molecule; Pi-molecular orbital of unsaturated system; Band structure of solids, intrinsic and extrinsic semiconductors and the role of doping on band structures. 5L

Periodic Properties

Effective nuclear charge, penetration of orbitals; variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes; ionization energies, electron affinity and electro-negativity, polarizability, oxidation states, coordination numbers and geometries; hard-soft acid base theory. 4L

MODULE 3

Atomic structure and Wave Mechanics

Brief outline of the atomic structure, wave particle duality, Heisenberg uncertainty principle; Introduction to quantum mechanics, Schrodinger wave equation for particle in one dimensional box. 5L

Spectroscopic Techniques & Applications

Electromagnetic spectrum: Interaction of EMR with matter; Principle and applications of

Fluorescence & Phosphorescence, UV-Visible, , Infrared and NMR spectroscopy

4L

MODULE 4

Stereochemistry

Representations of 3- dimensional structures, structural isomers and stereo-isomers; configurations, symmetry and chirality; enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. 5L

Organic reactions and synthesis of drug molecules

Introduction to reaction mechanism: substitution, addition, elimination and oxidation, reduction reactions. Synthesis of commonly used drug molecules. 4L

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 : 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 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: 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:

CSE1001.1: Remember and understand the functionalities of the different hardware and software components present in a computer system, the standard representations of various types of data in a computer system.

CSE1001.2: Illustrate how a computer system with one way of representation can be converted to one another equivalent representation.

CSE1001.3: Construct flow charts for any arithmetic or logical problems in hand.

CSE1001.4: Remember and understand the C programming development environment, writing, compiling, debugging, linking and executing a C program using that development environment, basic syntax and semantics of C programming language and interpret the outcome of any given C program.

CSE1001.5: Use loop constructs, conditional branching, iteration, recursion to solve simple engineering problems.

CSE1001.6: Apply pointers, arrays, structures, files to formulate simple engineering problems.

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.

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: Programming for Problem Solving Lab					
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.					
Course Code : ELE 1001					
Contact Hours per week	L	T	P	Tota l	Credit Points
	3	1	0	4	4

Course Outcomes

After attending the course, the students will be able to

ELE1001.1 Analyze DC electrical circuits using KCL, KVL and network theorems like Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.

ELE1001.2 Analyze DC Machines; Starters and speed control of DC motors.

ELE1001.3 Analyze magnetic circuits.

ELE1001.4 Analyze single and three phase AC circuits.

ELE1001.5 Analyze the operation of single phase transformers.

ELE1001.6 Analyze the operation of three phase induction motors

Module-I: [11 L]

DC Network Theorem: Kirchhoff's law, Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton 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. [10L]

Module-III [11 L]

Three phase system: 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 : 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

ELE1051.1 Get an exposure to common electrical apparatus and their ratings.

ELE1051.2 Make electrical connections by wires of appropriate ratings.

ELE1051.3 Understand the application of common electrical measuring instruments.

ELE1051.4 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					
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: 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 : Physics I					
Course Code : PHY 1001					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course the students will be able to:

1. Understanding physical systems in terms of their modeling of time evolution.
2. Comprehending wave interpretation of natural phenomena and implications of allied observations.
3. Understanding theoretical backgrounds associated to some experiments based on wave phenomena.
4. Grasping an analytic view of micro and macroscopic world.
5. Accessing the knowledge of the behavior of a particle under the influence of different potential.
6. Understanding conservative systems based on their particle and wave nature.

Module –I **[10L]**

Mechanics:

Plane-polar coordinate system-velocity and acceleration of a particle-trajectory under central force-conservation principle-Kepler's laws -Rotating frame of reference-Five point acceleration formula-Coriolis effect-deflection of a moving particle.

Module – II **[10L]**

Oscillation:

Constitutive equation of damping-nature of solutions for large, critical and weak damping-relaxation time, logarithmic decrement, energy decay (qualitative discussion) -Forced oscillation-transient and steady state-amplitude and velocity resonance---power transfer theorem-quality factor-series LCR circuit with AC source.

Module –III **[10L]**

Optics:

Plane Progressive Wave-phase/wave-length/frequency-qualitative description of light as an electromagnetic wave-Huygens principle-polarization (state of polarization, general equation of ellipse, transformation of polarized lights)-interference (basic theory from superposition principle)-Division of wave front (Young's double slit experiment)-Division of amplitude (thin film, wedge, Newton's ring)-Diffraction (single slit, double slit, grating, Resolving Power).

Module – IV **[10L]**

Quantum Mechanics:

An informal discussion from Planck to de Broglie as the historical context of quantum mechanics-Quantum Mechanics of a particle-operator-eigen value problem- Unitary-Hermitian frame work-position and momentum operator-Canonical Commutation Relations (CCR)- Schrodinger equation-time dependent/time independent Schrodinger equation-wave function-stationary states-probability density-probability current density-normalization-expectation value-uncertainty-Bound state problem-particle in a one dimensional box- scattering state problem-potential step-reflection and transmission coefficients- tunneling.

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

Course Outcomes:

After successfully completing this course the students will be able to:

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

MINIMUM OF SIX EXPERIMENTS TAKING ATLEAST ONE FROM EACH OF THE FOLLOWING FOUR GROUPS:

Group I: Experiments in Optics

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

Group II: Electricity & Magnetism experiments

1. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
2. Determination of dielectric constant of a given dielectric material.
3. Determination of Hall coefficient of a semiconductor by four probe method.
4. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
5. Determination of Magnetic Field Measurement for a current carrying coil.
6. Determination of unknown resistance using Carey Foster's bridge

Group III: Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.

Group IV: Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
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. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseulle's capillary flow method

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-III Basic 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-IV Laplace 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 : 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 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: 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: 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)

(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 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.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 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 week:	**L**	**T**	P	Total	Credit Points
	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)
9. Viva-voce (1L)

Detailed contents of Laboratory hours (39 hours)

Module 1: Introduction to Engineering Drawing (**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 (**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 Solids (**6 hours**)

Those axes inclined to both the Planes- Auxiliary Views.

Module 4: Sections and Sectional Views of Right Angular Solids (**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 (**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 (**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 tolerance; 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 (**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.