School of Engineering & Technology

Department of Computer Science and Engineering, Electrical Engineering and Electronics and Communication Engineering

B.Tech.- Computer Science and Engineering, Electrical Engineering, Electronics and Communication Engineering

Semester I & II

AY 2023-24

Semester I

Theory/ Practical	Sl. No	Course Type	Course Code	Course Name	Hours per week			Credit	Mark	
					L	T	P	C	CA	FA
T	1.	BSC		Chemistry	3	0	0	3	40	60
P	2.	BSC		Chemistry Laboratory	0	0	2	1	50	50
T	3.	BSC		Mathematics - I	3	1	0	4	40	60
T	4.	ESC		Programming for Problem Solving	2	0	0	2	40	60
P	5.	ESC		Programming for Problem Solving Laboratory	0	0	4	2	50	50
T/P	6.	HSMC		English for Technical Communication	2	0	2	3	50	50
T	7.	HSMC		Universal Human Values	2	1	0	3	00	100
P	8.	ESC		Workshop	0	0	4	2	50	50
P	9.	AU		Sports & Yoga	2	0	0	0	00	100
				Total	**14**	**2**	**12**	**20**	**320**	**580**

Semester II

Theory/ Practical	Sl. No	Course Type	Course Code	Course Name	Hours per week			Credit	Mark	
					L	T	P	C	CA	FA
T	1.	BSC		Physics	3	0	0	3	40	60
P	2.	BSC		Physics Laboratory	0	0	2	1	50	50
T	3.	BSC		Biology for Engineers	3	0	0	3	40	60
T	4.	BSC		Mathematics - II	3	1	0	4	40	60
T	5.	ESC		Basic Electrical Engineering	3	1	0	4	40	60
P	6.	ESC		Basic Electrical Engineering Laboratory	0	0	2	1	50	50
T/P	7.	ESC		Engineering Graphics and Design	1	0	4	3	50	50
P	8.	ESC		Programming using C++	0	0	2	1	50	50
P	9.	AU		Design Thinking and Idea Lab	2	0	2	0	00	100
Total					**15**	**2**	**12**	**20**	**360**	**540**

Internal Members/ BoS

External Members/ BoS

DETAILED SYLLABUS SEMESTER I

BSC	CHEMISTRY	L	T	P	C
		3	0	0	3

Prerequisite: Basic Science

Course Objectives:

1. To provide knowledge of molecular orbital theory along with electronic configuration on the basis of Schrodinger wave equation for simple homonuclear and heteronuclear diatomic molecules.
2. To analyze different compounds with the help of different spectroscopic techniques.
3. To make students aware of the relationships between different thermodynamics properties with reference to chemical systems.
4. To provide knowledge about different periodic properties and corrosion.
5. To provide an insight into different types of fuel and applications of various engineering materials.

Course Outcome:

After successful completion of the course, the students will be able

CO1: To analyse microscopic chemistry in terms of atomic and molecular orbitals.

CO 2: To apply the fundamental principles and applications of different spectroscopic techniques.

CO 3: To explain bulk properties and processes using thermodynamic considerations.

CO 4: To rationalize periodic properties such as ionization potential, electro negativity and oxidation states along with the study of corrosion in different materials.

CO 5: To explain the chemistry of different types of fuel and engineering materials.

Module 1:ATOMIC AND MOLECULAR STRUCTURE — **6 hours**

Wave property of matter, Schrodinger's wave equation, wave function, radial and angular wave functions, Eigen function, Eigen value, Particle in an one dimensional box and quantization of energy, Three dimensional potential box and degeneracy of energy states, Molecular Orbital Theory – Applications of MO Theory in diatomic molecules (N_2, O_2, NO and CO)

Module 2:SPECTROSCOPIC TECHNIQUES AND APPLICATIONS — **7 hours**

Principle of spectroscopy, principle and applications of UV – Visible spectroscopy, infra-red spectroscopy, applications of nuclear magnetic resonance spectroscopy, atomic absorption spectroscopy and flame photometry. Fluorescence and its applications in medicine.

Module 3:USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA — **6 hours**

Entropy and randomness, Entropy change in reversible and irreversible processes, free energy, free energy as a criteria for spontaneity of a process, relationship between free energy change and entropy change,Dependence of Gibbs free energy on temperature and pressure, free energy and EMF, Cell potentials, the Nernst equation and applications.

Module 4:PERIODIC PROPERTIES — **5 hours**

Effective nuclear charge, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinities and electronegativity, polarizability, oxidation states, hard and soft acids and bases.

Module 5: CORROSION AND ITS PREVENTION — **5 hours**

Definition, causes, effects, Dry or chemical corrosion andwet or electrochemical corrosion - their mechanisms. Types of electrochemical corrosion (Differential aeration, Galvanic, Concentration cell), Typical electrochemical corrosion like Pitting, Waterline. Factors affecting corrosion, passivity, Protection against corrosion.

MODULE 6 : FUEL AND COMBUSTION — **7 hours**

Classification of fuel, calorific value, characteristics of a good fuel, determination of calorific value of fuel using the Bomb Calorimeter, calorific value from Dulong's formulae, classification of coal, proximate and ultimate analysis of coal, fractional distillation of petroleum, cracking, thermal and catalytic cracking, Refining of gasoline, Reforming, knocking, octane rating of fuel, Chemical structure of knocking, Antiknocking agents, Diesel fuel, cetane number, additives for diesel fuel,	
MODULE 7 : ADVANCED ENGINEERING MATERIALS	**9 hours**
Cement - Cement and its classification, Portland cement, raw materials, manufacture, and its setting and hardening. Refractory materials - Definition, classification into acidic, basic and neutral refractories and their uses. Lubricants – Definition and function of lubricants, classification, additives for lubricants.	
Total hours	**45 hours**

Text Book(s)	
1.	Engineering Chemistry - Jain &Jain ,DhanpatRai& Company.
2.	A Text Book of Engineering Chemistry – Dr. Sunita Rattan, . K. Kataria& Sons.
3.	A Text Book of Engineering Chemistry - Dr. RajashreeKhare, S. K. Kataria& Sons.

Reference Books	
1.	Physical Chemistry, P. W. Atkins, Oxford.
2.	Concise Inorganic Chemistry, J. D. Lee ,Blackwell Science
3.	Fundamentals of Molecular Spectroscopy, C. N. Banwell, E. M. McCash,Tata McGraw – Hill.
4.	Principles of Physical Chemistry,Puri, Sharma, Pathania,ShobanLalNagin Chand & Co.
5.	Spectroscopy of Organic Compunds, P. S. Kalsi, Wiley Eastern.

BSC	CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Basic Science

Course Objectives:

1. To make students familiar with different quantitative analysis.
2. To enable students carry out experiments using theoretical knowledge.
3. To provide knowledge of different properties of liquids by experimental methods.

Course Outcome:

After successful completion of the course, the students will be able

CO1: To conduct quantitative analysis of a given substance by using different types of volumetrictitrations.

CO2: To apply theoretical knowledge to carry out different experiments skillfully.

CO3: To learn the physical properties like surface tension and viscosity of liquids by conducting the experiments.

List of Experiments

1. Estimation of hardness of water by a standard solution of EDTA
2. Estimation of Fe^{2+} by a standard solution of $KMnO_4$
3. Estimation of Cu^{2+} by a standard solution of $Na_2S_2O_3$
4. Conductometric titration between strong acid and strong alkali
5. pH-metric titration between strong acid and strong alkali
6. Determination of surface tension of a liquid at room temperature w.r.t water by drop number method using stalagmometer
7. Determination of coefficient of viscosity of a given solution at room temperature by Ostwald's Viscometer.
8. Preparation of potash alum, $[K_2SO_4.Al_2(SO_4)_3.2H_2O]$

List of Equipments

- Ostwald's viscometer
- Stalagmometer
- Conductivity meter
- pH meter

Total hours: 15 hour

Text Book(s)

1	Laboratory Manual on Engineering Chemistry by S. K. Bhasin and Sudha Rani.
2	Practical Engineering chemistry by Sunitha and Rathna.

Reference Books

1.	A Textbook of Practical Chemistry by Dr.Sudarsan Barua

BSC	MATHEMATICS-I (Calculus and Linear Algebra)	L	T	P	C
		3	1	0	4

Pre-requisite: Knowledge of Mathematics at Class XI & XII

Course Objectives:

1. To equip the students with standard concepts and tools at an intermediate to advanced level
2. To familiarize the prospective engineers with techniques in calculus, multivariate differentiation and integration and their applications
3. To make students capable of using matrix methods and linear algebra as tools to solve engineering problems

Course Outcome:

After successful completion of the course, the students will learn
CO1: to apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
CO 2: to apply the Mean Value Theorems that in Engineering problems.
CO 3: the tool of power series and infinite series for learning advanced Engineering Mathematics.
CO 4: to acquaint with mathematical tools needed in evaluating multiple integrals and their usage.
CO 5: to use the essential tool of matrices and linear algebra in a comprehensive manner.

Module 1: Basic Calculus	**12 hours**
Curvature, evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	
Module 2:Single-variable Calculus (Differentiation)	**12hours**
Rolle's Theorem, Mean value theorems and applications; Extreme values of functions; Linear approximation; Indeterminate forms and L' Hospital's rule;Taylor and Maclaurin theorem	
Module 3: Sequences and series	**12 hours**
Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence; Power series, Convergence of Taylor series, Error estimates.	
Module 4: Multivariable Calculus	**12hours**
Partial derivatives, Total derivative; Directional derivatives, Gradient,Divergence and Curl;Tangent plane and normal line; Center of mass and Gravity (constant and variable densities);Orthogonal curvilinear coordinates; Scalar line integrals, Vector line integrals, Scalar surface integrals, Vector surface integrals, Volume integrals, Theorems of Green, Stokes and Gauss.	
Module 5:Linear Algebra	**12 hours**
Linear Systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Orthogonal transformation; Diagonalization of matrices; Cayley-Hamilton Theorem.	
Total hours	**60 hours**

Text Book
1.**AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Khanna Book Publishing Co.**
Reference Book(s)
1. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022. 2.. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021. 3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 4. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006. 5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008. 8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

ESC	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C
		3	0	0	3

Prerequisite: Basic computer knowledge, basic mathematics

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.
5. To understated and formulate algorithm for programming script
6. To analyze the output based on the given input variable

Course Outcome:

After successful completion of the course, the students will learn
CO1: Illustrate basic concepts of computer and C programming.
CO2: Apply the concepts of conditional and looping statements.
CO3: Demonstrate the ability to write C program using arrays, structures, pointers and files.
CO4: Develop modular programs using C language.

MODULE 1: Introduction to Programming	**6 hours**
Introduction to Programming; Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.	
MODULE 2: Introduction to C	**6 hours**
Using Comments, Keywords, Identifiers, Tokens, Basic Data Types, Writing C Expressions using Operators, Precedence of Operators, I/O Statements in C	
MODULE 3: Conditional Branching and Loops	**6hours**
Conditional Branching Statements, Iterative Statements, Nested Loops, Break and Continue Statements, Goto Statements.	
MODULE 4: Arrays and Strings	**6 hours**
1-D Array-Declaration, Accessing Array Elements, Array Operations, 2-D Array-Matrix Addition, Subtraction, Multiplication, Character Arrays, Strings, String Manipulation Function.	
MODULE 5: Functions	**8 hours**
Function Declaration/Prototype, Function Definition, Function Call, Return Statement, Passing Parameters, Scope of Variables, Storage Classes, Recursive Function. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	
MODULE 6: Structure	**7 hours**
Structures, Defining Structures, Accessing Members, Array of Structures.	
MODULE 7: Pointers and File handling	**6 hours**
Pointers, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, File handling.	
Total hours	**45 hours**

Text Books

1.	Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
2.	YashavantKanetkar, Let us C, BPBPublication

Reference Book

Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

BSC	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisite: Basic computer knowledge, Basic Mathematics

Course Objectives:

1. To translate given algorithms to a working and correct program.
2. To be able to correct syntax errors as reported by the compilers.
3. To be able to identify and correct logical errors encountered at run time.
4. To be able to write iterative as well as recursive programs.
5. To be able to represent data in arrays, strings and structures and manipulate them through a program.
6. To be able to declare pointers of different types and use them in defining self-referential structures.
7. To be able to create, read and write to and from simple text files.

Course Outcome: After successful completion of the course, the students will be able

1. CO1: Translate a given algorithm to C program and become familiarized with programming environments.
2. CO2: Build programs using modular programming and recursion.
3. CO3: Build programs using built-in and user defined data types for data processing.
4. CO4: Build programs for data processing using dynamic memory management.
5. CO5: Solve a computational problem through team work.
6. CO6: Exhibit self-learning by writing programs for solving problems in differentiation and integration by numerical methods.

List of Experiments

1. Familiarization with programming environment (editors, compilation, debugging etc.)
2. Simple computational problems using expressions and precedence
3. Problems involving using if-then-else and switch statements
4. Iterative problems e.g., sum of series, factorial, Fibonacci series etc.
5. 1D, 2D Array manipulation: summation, finding odd/even in a set, string handling etc.
6. Matrix problems (addition, multiplication etc.), String operations (finding length, concatenation, comparing etc.)
7. Simple function illustrating the concepts, call by value
8. Recursive functions for summation, Fibonacci series, and factorial
9. Pointers, call by reference, passing arrays to functions, passing address of structure to function, passing array of structure to function, pointers and arrays, function pointer, dynamic allocation of block of memory and accessing the elements
10. File operations on text files, binary files. Total Hours: 30 hours

Text Book(s)

1	Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
2	YashavantKanetkar, Let us C, BPBPublication
3	E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill
4	YashavantKanetkar, Understanding Pointers in C, BPBPublication
5	Practical Engineering chemistry by Sunitha and Rathna.

Reference Book

1.	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

HSMC	ENGLISH FOR TECHNICAL WRITING	L	T	P	C
		2	0	2	3

Prerequisite: English language competence of 10+2 level

Course Objectives: the objectives of this course are to:

1.Provide learning environment to practice listening, speaking, reading and writing skills
2.Assist the students to carry on the tasks and activities through guided instructions and materials
3.Effectively integrate English language learning with employability skills and training
4.Provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Course Outcome: After successful completion of this course, the students will be able to

1. develop their basic as well as domain specific vocabulary
2. apply the basic principles of effective writing in constructing meaningful sentences and paragraphs, and writing different styles of texts
3. produce various academic and professional texts like essays, reports, and letters
4. enhance their English language skills and employability skills through activities and training in a language laboratory

Module 1: Vocabulary Building	**8 hours**

The concept of Word Formation, root words, prefixes and suffixes, synonyms, antonyms, and standard abbreviations,collocations, domain specific vocabulary used in real life contexts, vocabulary building exercises

Module 2: Basic Writing Skills	**8 hours**

Mechanisms of writing: importance of proper punctuation, English punctuation marks, capitalization, semantic markers.Sentence Structures: simple, complex, compound. Use of phrases and clauses in sentences.Paragraphs: parts of a paragraph, topic sentence, supporting sentences, concluding sentence.Organizing principles of paragraphs, Creating coherence and unity, techniques for writing precisely

Module 3: Nature and Style of sensible Writing	**10 hours**

Describing, defining classifying, providing examples or evidence, writing introduction and conclusion of a long text.

Module 4: Identifying Common Errors in writing	**4 hours**

Subject-verb agreement, noun-pronoun agreement, misplaced modifiers, articles, prepositions, redundancies, clichés

Module 5: Writing Practices	**7 hours**

Comprehension, formal letter writing, essay writing, report writing: features, types, format, structure, report writing process, sources of data collection, plagiarism.

Module 6: **Oral Communication** (This Module involves interactive practice sessions in Language Lab)	**8 hours**

Listening Comprehension
Pronunciation, Intonation, Stress and Rhythm
Common Everyday Situations: Conversations and Dialogues
Communication at Workplace
Interviews
Formal Presentations

Total hours	**45 hours**

Text Book

1. AICTE's Prescribed Textbook: English (with Lab Manual) ISBN: 978-93-91505-097

Reference Books

1.	Effective Communication Skills. Kul Bhushan Kumar, Khanna Book Publishing, 2022.
2.	Practical English Usage. Michael Swan. OUP. 1995.
3.	Remedial English Grammar. F.T. Wood. Macmillan.2007
4.	On Writing Well. William Zinsser. Harper Resource Book. 2001
5.	Study Writing. Liz Hamp- Lyons and Ben Heasly. Cambridge University Press. 2006.
6.	Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7.	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

HSMC	Universal Human Values-II: Understanding Harmony And Ethical Human Conduct	L	T	P	C
		2	1	0	3

Prerequisite: UHV 1 / SIP

Course Objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Course Outcome:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Module:1 Introduction — **9 hours**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) , Understanding Value Education ,Sharing about Oneself ,Self-exploration as the Process for Value Education , Continuous Happiness and Prosperity – the Basic Human Aspirations , Exploring Human Consciousness ,Happiness and Prosperity – Current Scenario , Method to Fulfill the Basic Human Aspirations ,Exploring Natural Acceptance

Module:2 Harmony in the Human Being — **9 hours**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, Exploring the difference of Needs of Self and Body. The Body as an Instrument of the Self. Understanding Harmony in the Self. Exploring Sources of Imagination in the Self. Harmony of the Self with the Body. Programme to ensure self-regulation and Health. Exploring Harmony of Self with the Body

Module:3 Harmony in the Family and Society — **9 hours**

Harmony in the Family – the Basic Unit of Human Interaction. Trust' – the Foundational Value in Relationship. Exploring the Feeling of Trust. 'Respect' – as the Right Evaluation.Exploring the Feeling of Respect.Other Feelings, Justice in Human-to-Human Relationship. Understanding Harmony in the Society. Vision for the Universal Human Order. Exploring Systems to fulfil Human Goal.

Module:4 Harmony in the Nature/Existence — **9 hours**

Understanding Harmony in the Nature. Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature. Exploring the Four Orders of Nature. Realizing Existence as Co-existence at All Levels. The Holistic Perception of Harmony in Existence Exploring Co-existence in Existence.

Module:5 Implications of the Holistic Understanding — **9 hours**

Natural Acceptance of Human Values. Definitiveness of (Ethical) Human Conduct. Exploring Ethical Human Conduct. A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order. Competence in Professional Ethics. Exploring Humanistic Models in Education. Holistic Technologies, Production Systems and Management Models-Typical Case Studies. Strategies for Transition towards Value-based Life and Profession. Exploring Steps of Transition towards Universal Human Order.	
Total hours	**45 hours**
Text Book	
1.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47
Reference Books	
1.	JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
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.

ESC	MANUFACTURING PRACTICE WORKSHOP	L	T	P	C
		0	0	4	2

Prerequisite: None

Course Objectives: The objectives of this course are to:

1. To impart knowledge and skill to use tools, machines, equipment, and measuring instruments.
2. To educate students of safe handling of machines and to develop the hands-on practical workshop skills.

Course Outcome: After successful completion of this course, the students will be able to

1. Select tools and machinery according to the job.
2. Use hand tools in different shops for performing different operations.
3. Prepare job according to the drawing.

Module 1: Welding — **5 hours**

(a) Theoretical Instructions: Introduction to welding processes, Safety Precautions, Demonstration of different equipments, tools used in welding, various fluxes & electrodes used in welding. Introduction of AC & DC welding and its applications.

(b) Practical Demonstrations: Demonstration of all basic tools & personal protective equipments. Demonstration of operations such as measuring, marking, punching and cutting. Demonstration of different types of joints by using arc welding, gas welding and flame brazing.

Module 2: Turning — **5 hours**

(a) Theoretical Instructions: Introduction of machine and machine tools, Safety Precautions, Different equipments and tools used, basic metal cutting operations. Introduction of various types of cutting tools (Nomenclature) and their material.

(b) Practical Demonstrations: Demonstration on Lathe & basic operations such as drilling, facing, turning, taper turning, step turning, knurling, chamfering, threading. Demonstration of basic measuring instruments.

Module 3: Machining — **5 hours**

(a) **Theoretical Instructions:** Introduction to machine tools such as milling, shaper and surface grinder. Safety Precautions. Demonstration of different tools and material used, Demonstration of basic measuring instruments used.

(b) **Practical Demonstrations:** Demonstration on basic operations such as gear cutting, hexagonal bolt, grinding, slot cutting and fitting.

Module 4: Fitting — **5 hours**

(a) Theoretical Instructions: Introduction to fitting work, safety precautions, Demonstration of basic hand tools, holding devices and basic fitting operations such as measuring, marking, punching, filing, sawing, drilling, tapping and dieing.

(b) Practical Demonstrations: Demonstration of all basic hand tools, measuring tools & equipments. Demonstration of simple operations such as marking, measuring, punching, filing, sawing, drilling, tapping and dieing.

Module 5: Carpentry — **5 hours**

(a) Theoretical Instructions: Introduction to Carpentry, Safety Precautions, demonstration of different tools used in carpentry. Various types of joints. Brief description of wood cutting machines.

(b) Practical Demonstrations: Demonstration & practice of different carpentry operation like marking and measuring, cutting, planning, chiseling, filing and chamfering.

Module 6: Blacksmithy — **5 hours**

(a) Theoretical Instructions: Introduction, Safety precautions, Demonstration of basic hand tools and holding devices, Description of all forging operations such as heating, hammering,

finishing, forge welding, normalizing and tempering. Comparison of hot & cold working. **(b) Practical Demonstrations:** Demonstration & practice of different smithy operations like cutting, hammering, punching, bending etc. Demonstration & practice of making a square dimension from a cylindrical bar and vice versa. Total Hours : 30 hours	
Text Book(s)	
1.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Media promoters and publishers private limited, Mumbai, Vol. I 2008 and Vol. II 2010.
2.	Kalpakjian S, Steven S. Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 4th Edition, 2002
3.	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw-Hill House, 2017
Reference Book	
1.	Workshop Practice – Singh S., S.K. Kataria & Sons. 2003.

AU	Sports and Yoga	L	T	P	C
		2	0	0	0

Prerequisite: Nil

Course Objectives:

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.
2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
3. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
4. To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Outcome:

On successful completion of the course the students will be able:

1. To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
3. To learn breathing exercises and healthy fitness activities
4. To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
5. To perform yoga movements in various combination and forms.
6. To assess current personal fitness levels.
7. To identify opportModuleies for participation in yoga and sports activities.
8. To develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
9. To improve personal fitness through participation in sports and yogic activities.
10. To develop understanding of psychological problems associated with the age and lifestyle. 11. To demonstrate an understanding of sound nutritional practices as related to health and physical performance.
12. To assess yoga activities in terms of fitness value.
13. To identify and apply injury prevention principles related to yoga and physical fitness activities.
14. To understand and correctly apply biomechanical and physiological principles elated to exercise and training.

Module:1 Introduction to Physical Education

Meaning & definition of Physical Education
Aims & Objectives of Physical Education
Changing trends in Physical Education

Module:2 Olympic Movement

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

Module:3 Physical Fitness, Wellness & Lifestyle

Meaning & Importance of Physical Fitness & Wellness
Components of Physical fitness
Components of Health related fitness

Components of wellness o Preventing Health Threats through Lifestyle Change Concept of Positive Lifestyle
Module:4 Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga
Define Anatomy, Physiology & Its Importance Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)
Module:5 Kinesiology, Biomechanics & Sports
Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports Newton's Law of Motion & its application in sports. Friction and its effects in Sports.
Module: 6 Postures
Meaning and Concept of Postures. Causes of Bad Posture. Advantages & disadvantages of weight training. Concept & advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis. Corrective Measures for Postural Deformities
Module: 7 Yoga
Meaning & Importance of Yoga Elements of Yoga o Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana) Relaxation Techniques for improving concentration - Yog-nidra
Module: 8 Yoga & Lifestyle
Asanas as preventive measures. Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana. Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana. Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana. Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana. Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.
Module: 9 Training and Planning in Sports
Meaning of Training Warming up and limbering down Skill, Technique & Style Meaning and Objectives of Planning. Tournament – Knock-Out, League/Round Robin & Combination.
Module:10 Psychology & Sports
Definition & Importance of Psychology in Physical Edu. & Sports Define & Differentiate Between Growth & Development Adolescent Problems & Their Management Emotion: Concept, Type & Controlling of emotions Meaning, Concept & Types of Aggressions in Sports.

Psychological benefits of exercise. Anxiety & Fear and its effects on Sports Performance. Motivation, its type & techniques. Understanding Stress & Coping Strategies.
Module:11 Doping
Meaning and Concept of Doping Prohibited Substances & Methods Side Effects of Prohibited Substances
Module:12 Sports Medicine
First Aid – Definition, Aims & Objectives. Sports injuries: Classification, Causes & Prevention. Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries
Module:13 Sports / Games
Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc. History of the Game/Sport. Latest General Rules of the Game/Sport. Specifications of Play Fields and Related Sports Equipment. Important Tournaments and Venues. Sports Personalities. Proper Sports Gear and its Importance. Total Hours: 30 Hours

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

DETAILED SYLLABUS SEMESTER II

BSC	PHYSICS	L	T	P	C
		3	1	0	4

Prerequisite: Physics and Mathematics course of 12th standard.

Course Objectives:

1. To enhance the fundamental knowledge in mathematics to understand engineering courses.
2. To have a broader concept of electrostatics related to dilectrics.
3. To be aware of magnetic behavior of different substances by understanding basics of magnetism and electromagnetic theory.
4. To enhance the knowledge of wave propagation to be applied in engineering fields.
5. To have a wider perspective of wave theory.

Course Outcome: After successful completion of the course, the students will be able

CO1: understand the concept of fundamental of mathematical physics and apply in solving problems.
CO 2: to apply the mathematical physics to study the dielectric properties of matter.
CO 3: understand the basics of electromagnetism by applying magnetostatics and electrostatics theory.
CO 4: to understand the concept of transverse and longitudinal wave propagation.
CO 5: to understand the geometrical optics, wave optics and lasers.

Module 1: Mathematical Physics	**12 hours**

Del operator, Laplacian operrtor gradient, divergenge and curl, problems related to these concepts, their physical significance (qualitative), Gauss's theorem, Stoke's Theorem

Module 2: Electrostatics in vacuum and other dielectric media	**12 hours**

Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the center of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field

Module 3: Magnetostatics and Electromagnetic theory	**12 hours**

Bio-Savart law, Ampere's law, Inconsistency of Amere's law, Displacement current, Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF, magnetic substances, paramagnetic, diamagnetic, ferromagnetic, Maxwell's equations (qualitative)

Module 4: Harmonic motion , Non-dispersive transverse and longitudinal waves	**12 hours**

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, Transverse wave on a string, the wave equation on a string, Harmonic waves, longitudinal waves and the wave equation for them

Module 5: Optics	**12 hours**

Spherical and chromatic aberrations, Achromatism in different cases, interference of light in Newton's rings experiment, Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, , different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium)

Total hours	**60 hours**

Text Book(s)

1.	Introduction to Electrodynamics, D.J Griffiths, 3rd Edn., 1998, Benjamin Cummings.
2.	Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill
3.	Education Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
4.	Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill
5.	Ian G. Main, Oscillations and waves in physics.
Reference Books	
1.	The Feynman Lectures on Physics, Vol I, II,III
2.	Bhattacharya & Nag, Engineering Physics
3.	O. Svelto, Principles of Lasers

BSC	PHYSICS LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Basics of 12 standard Physics lab

Course Objectives:

1) To develop the laboratory skill in handling equipments.
2) Provide the basic idea of various electromagnet theorems
3) To develop the technical skill & ideas through continuous interactions..
4) To understand the basic concepts for performing different experiment for further application

Course Outcomes:

CO1: Learning basic concept of various measuring instruments
CO2: Learning the basic concept measuring various electrical components by using Digital multimeter
CO3: Understand the concept of focal length and power of lens
CO4: Understand the concept of measuring inductance of coils.
CO5: Learning the concept of resonant and anti-resonant frequency concept of LCR circuit.
CO6: The basic idea focal length, refractive index of a material and diffraction of light.

List of Experiments

1. Measured the length, breadth and diameter of particular shapes by using slide calipers and screw gauge.
2. To measure the
   a) Resistance, Capacitance and Inductance
   b) AC & DC Voltage and current by using Digital Multimeter
3. To determine the inductance of a coil by Anderson's bridge
4. To study a series LCR circuit and determine it's
   a) Resonant frequency and b) Quality factor Q
5. To study a parallel LCR circuit and determine its
   a) Anti-resonant frequency and b) Quality factor Q.
6. Measure the self-inductance of a coil by Rayleig's method.
7. To determination of the power of (a) Convex lens (b) Concave lens
8. To find the radius of curvature of a Plano convex lens using Newton's ring apparatus
9. To find the refractive index of water using a convex lens and a plain mirror.
10. To find the refractive index of the material of the Prism with the help of spectrometer.

Total Hours **15 Hours**

Text Book(s)

1	A text book on Practical Physics: K.G. Mazumdar &B.Ghosh
2	A text book on Practical Physics: Dr. Samir Kumar Ghosh

Reference books

1.	B.Sc. Practical Physics by C.l. Arora.
2.	Bhattacharya & Nag. Engineering Physics.

BSC	MATHEMATICS-II (ODE & Complex Variables)	L	T	P	C
		3	1	0	4

Pre-requisite: Knowledge of Mathematics at Class XI & XII

Course Objectives:

1. To familiarize the prospective engineers with techniques in ordinary differential equations and complex variables
2. To provide the basic tools of mathematics for the purpose of modelling the problems and obtaining solutions.

Course Outcome:

After successful completion of the course, the students will learn

CO 1: the effective mathematical tools for the solutions of differential equations that model physical processes.

CO 2: the tools of differentiation and integration of functions of a complex variable that are used in varioustechniques dealing engineering problems.

Module 1:First Order Ordinary Differential Equations — **15hours**

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

Module 2:Ordinary Differential Equations of Higher Orders — **15 hours**

Second order linear differential equations with variable coefficients: Euler-Cauchy equations, Solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method, Bessel's equation and Bessel's functions of the first kind and their properties.

Module 3: Complex Variable – Differentiation — **15 hours**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 4: Complex Variable – Integration — **15 hours**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Total Lecture hours — **60 hours**

Text Book

1. AICTE's Prescribed Textbook: Mathematics-II (Calculus, Ordinary Differential Equations and Complex Variable), Khanna Book Publishing Co.

Reference Books

1. ReenaGarg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
2. ReenaGarg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
7. S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984
8. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
9. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958

BSC	BIOLOGY FOR ENGINEERS	L	T	P	C
		2	0	0	2

Prerequisite: Biology in intermediate level

Course Outcome:

After studying the course, the student will be able to:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level
8. Apply thermodynamic principles to biological systems.
9. Identify and classify microorganisms

Module:1 Introduction — **4 hours**

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module:2 Classification — **3 hours**

The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Module:3 Genetics — **3 hours**

"Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module:4 Biomolecules — **3 hours**

All forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module:5 Enzymes	**3 hours**
Without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	
Module: 6 Information Transfer	**3 hours**
The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure - from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. DICOM Image formats, The DNA Technology (Use and Application) Regulation Bill, 2019	
Module: 7 Macromolecular Analysis	**3 hours**
How to analyses biological processes at the reductionistic level Proteins - structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	
Module: 8 Metabolism	**4 hours**
The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	
Module: 9 Microbiology	**4 hours**
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	
Total hours	**30 hours**

Text Book

1.	General Biology, Uma Devi Koduru, Khanna Book Publishing Company.

Reference Books

1.	Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2.	Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3.	Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4.	Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5.	Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

ESC	BASIC ELECTRICAL ENGINEERING	L	T	P	C
		3	1	0	4

Pre-requisite: Physics and Mathematics in intermediate level

Course Objectives:

1. The network reduction techniques such as source transformation, mesh analysis, nodal analysis and network theorems to solve different networks
2. The various configurations of electromagnetic induction used in magnetic circuits
3. The steady state response of complex electrical circuits with single phase AC supply
4. The three phase systems for star and delta connected systems and perform three phase power calculations for balanced and unbalanced loads.
5. The fundamentals of instrumentation in measurements and calibration of instruments.
6. The different parameters for characterizing different circuits like rectifiers, filters, voltage regulators etc. using p-n junction diodes, Zener diodes and BJTs.
7. The different cables, wiring systems, wiring circuits, earthing and its purpose, fuse, MCBs and their role in electrical installations.

Course Outcome: After successful completion of the course, the students will be able

1. Analyze DC networks and theorems using various solution techniques.
2. Apply fundamental concepts of magnetic circuits and AC networks to solve problems.
3. Explain different types of measuring instruments and their workings.
4. Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, BJT, rectifiers and different filter circuits.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Module 1: DC Networks — **10 hours**

Definitions of active, passive, linear non-linear circuit elements and networks; Kirchhoff's laws; Nodal and mesh analysis; Voltage and current sources; Network theorems: Superposition, Thevenin's, Norton's and Maximum power transfer.

Module 2: Magnetic Circuits — **10 hours**

Definitions of mmf, flux, flux-density and reluctance; comparison between electric and magnetic circuits; series, parallel and series-parallel circuits and their solutions; energy stored in a magnetic circuit; lifting power of a magnet; electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 3: AC Circuits — **10 hours**

Waveforms of alternating voltages and currents, instantaneous, average and RMS values, form factor & peak factor, forms of representation of alternating quantities, concept of phasor & phasor diagrams, Concept of lead & lag, reactances & impedances, AC circuits-resistive, inductive, capacitive, RL, RC & RLC series, parallel and series parallel combination, impedance triangle, admittance, active & reactive power & power factor, Concepts of 3-phase AC, connections, phase & line values in star & delta connections, solutions of simple 3-phase balanced circuits with resistive & reactive loads, 3-phase power, and phase sequence

Module 4: Instruments — **10 hours**

Classification of instruments; essentials of indicating type instruments-deflecting controlling and damping torque; types of indicating instruments; moving coil and moving iron ammeters and voltmeters; extension of range of instruments-use of shunts and multiplier

Module 5: Electronics — **10 hours**

Diode as a rectifier-half wave and full wave rectifier circuits; ripples in output waveform-ripple factor; introduction to filters; Zener diode and its application as voltage regulator; bipolar junction transistor and its classification, static characteristics.

Module 6: Basics of Electrical Installations	**10 hours**
Basic knowledge of domestic wiring, types of cables, types of wiring; circuit layouts-single phase AC mains to DB; 3 phase connections; accessories-main switch, ceiling rose, fuse, MCB etc., Earthing-purpose & methods.	
Total hours	**60 hours**
Text Book(s)	
1.	Basic Electrical Engineering: I J Nagrath and DP Kothari, McGraw Hill Education Pvt Ltd.
	Basic Electrical Engineering: Mittle and Mittle, McGraw Hill Education (India) Pvt Ltd.
2.	Electro Technology: H Cotton, CBS Publishing.
3.	Electrical and Electronic Technology-Edward Hughes, Pearson Education India.
4.	
Reference Book(s)	
1.	Basic Electrical Engineering: Ravish R Singh, McGraw Hill Education (India) Pvt Ltd.
2.	Basic Electrical Engineering: K. Uma Rao, Pearson Education India.
3.	Basic Electrical and Electronics Engineering: R.K. Rajput, University Science Press.
4.	Basic Electrical and Electronics Engineering: J.B. Gupta, S.K. Kataria and Sons

ESC	BASIC ELECTRICAL ENGINEERINGLABORATORY	L	T	P	C
		0	0	2	1

Prerequisite: Physics and Mathematics in intermediate level

Course Objectives:

The students will try to learn

1. Implement different circuits and verify circuit concepts for DC and AC circuits.
2. Measure the parameters for RL, RC and RLC circuits.
3. Prove the various theorems used to reduce the complexity of electrical network.

Course Outcome:

After successful completion of the course, the students will be able learn

CO1: Practical implementation of Electrical fundamentals.

CO2: To demonstrate measurement and calibration using electrical instruments.

CO3: To implement various electrical theorems and study parameters ofelectrical and electronic circuits.

List of Experiments

1. Basic safety precautions, introduction and use of measuring instruments.
2. Calibration of a Milliammeter as a Voltmeter
3. Calibration of a Millivoltmeter as an Ammeter
4. Verification of Thevenins Theorem
5. Verification of Maximum Power Transfer Theorem
6. Study of R-L-C Series Circuit
7. Forward Characteristics of Semiconductor Diode
8. Measurement of power in a single phase AC circuit using Wattmeter.
9. Demonstration of layout of house wiring
10. Demonstration of measurement of insulation resistance

List of Equipments

- AC, DC Voltmeter
- AC, DC Ammeter
- Wattmeter meter
- Rheostat
- DC supply

Total Hours: 15

Text Book

1	Basic Electrical Engineering: I J Nagrath and DP Kothari, McGraw Hill Education Pvt Ltd.
2	Basic Electrical Engineering: Mittle and Mittle, McGraw Hill Education (India) Pvt Ltd.
3	Electrical and Electronic Technology-Edward Hughes, Pearson Education India.

Reference Books

1.	Basic Electrical Engineering manual; available at the department of Electrical Engineering, GCU

ESC	ENGINEERING GRAPHICS AND DESIGN	L	T	P	C
		1	0	4	3

Prerequisite: Basic Mathematics

Course Objectives:

1. To provide the basic knowledge about Engineering Drawing.
2. Detailed concepts are given in projections, technical drawing, dimensioning and specifications

Course Outcome:

Upon completion of this course, the student will be able to

1. To prepare themselves to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. To prepare themselves to communicate effectively
3. To prepare themselves to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Module:1 Introduction to Engineering Drawing — **9 hours**

i. Principles of Engineering Graphics and their significance, usage of Drawing instruments
ii. Lettering - Single stroke letter – Vertical and inclined capital and small letter
iii. Scales – Plain, Diagonal and Vernier Scales
iv. Curves - Ellipse, parabola, hyperbola, different methods of construction of conic sections, tangents and normal to conics

Module:2 Orthographic Projections — **9 hours**

i. Principles of Orthographic Projections-Conventions
ii. Projections of Points and lines inclined to bothplanes
iii. Projection of lines (First angle only) : Line parallel to one or both planes, line perpendicular to a plane, line inclined to one plane and parallel to other, line inclined to both plane.
iv. Projections of planes (First angle only): Plane perpendicular to one plane and parallel to other, plane perpendicular to both plane, plane inclined to one plane and perpendicular to other.
v. Projection of solids (First angle only) : Axis perpendicular to one plane and parallel to other, axis parallel to both plane, axis inclined to one plane and parallel to other, axis inclined to both plane.

Module:3 Sections and Sectional Views of Right Angular Solids — **9 hours**

Section of solids: Section plane parallel to one plane and perpendicular to other, section plane inclined to one plane and perpendicular to other. Development of surfaces of Right Regular Solids-Prism, Pyramid, Cylinder and Cone

Module:4 Isometric Projections — **9 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:5 Introduction of Computer Graphics — **6 hours**

Listing the computer technologies that impact on graphical communication, Demonstratingknowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, ObjectProperties, Draw, Modify and Dimension), Drawing Area (Background,

Crosshairs, CoordinateSystem), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (whereapplicable), 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:6 Demonstration of simple team design (Students Project as group work)		**3 hours**
Geometry and topology of engineered components: creation of engineering models and theirpresentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshedtopologies for engineering analysis and tool-path generation for component manufacture; geometricdimensioning and tolerancing; Drawingsectional elevation showing foundation to ceiling; Introduction to Building Information Modelling(BIM).		
Total hours		**45 hours**
Text Book		
1.	AICTE's Prescribed Textbook: Engineering Graphics & Design (ISBN: 978-93-91505-066)	
Reference Books		
1.	Jain, Maheshwari, Gautam (2021), Engineering Graphics & Design, Khanna Book Publishing.	
2.	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing.	
3.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson.	
4.	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.	
5.	Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.	
6.	Corresponding set of CAD Software Theory and User Manuals.	

ESC	DESIGN THINKING	L	T	P	C
		0	0	2	1

Prerequisite: NA

Course Objectives: The objectives of this course are to:

1. To instill the core ideas of design thinking
2. To educate students on the design process as a tool for innovation.
3. To create, conceptualize, build and present ideas on the basis of prototypes
4. To provide an authentic opportunity for students to develop teamwork and leadership skills.

Course Outcome: After successful completion of this course, the students will be able to

- Compare and classify the various learning styles and memory techniques and Apply them in their engineering education.
- Analyze emotional experience and produce great designs, be a more effective engineer, and communicate with high emotional and intellectual impact.
- Understand the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices.
- Perceive individual differences and its impact on everyday decisions and further Create a better customer experience.

Module 1: Design Thinking Overview	**2 hours**
Understanding the Process of Learning, Remembering and Emotions, Kolb's Learning Styles, Memory Retention and enhancement techniques, Assessment and Interpretation, Principles of Design Thinking	
Module 2: Design Thinking Approach in Stages	**5 hours**
Design process: Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs	
Module 3: Adopt and Adapt Design Thinking	**5 hours**
Design team-Team formation, Conceptualization: Visual thinking, Drawing/sketching, New concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, 3D printing; Experimenting/testing.	
Module 4: Feedback, Re-Design & Re-Create	**3 hours**
Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, **Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".**	
Total hours	**15 hours**

Text Book(s)

1.	E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.
2.	Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
3.	Idris Mootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

Reference Books

1.	Ulrich &Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
2.	Kevin Henry, Drawing for Product designers, 2012, Laurence King Publishing Ltd

AU	IDEA Lab Workshop	L	T	P	C
		2	0	2	0

Prerequisite: Mathematics, Physics,

Course Objectives: The objectives of this course are to:

5. Learn all the skills associated with the tools and inventory associated with the IDEA Lab.
6. Learn useful mechanical and electronic fabrication processes.
7. Learn necessary skills to build useful and standalone system/ project with enclosures.
8. Learn necessary skills to create print and electronic documentation for the system/project.

Course Outcome: After successful completion of this course, the students should be able to

1. Think outside the box and generate new and innovative ideas.
2. Identify and solve problems using critical thinking skills and creative problem-solving techniques.
3. Work collaboratively in a team, motivate others and understand the importance of effective communication, cooperation and conflict resolution to achieve a common goal.
4. Use various technologies and tools to develop, implement and explore new plans testing their ideas.

Module 1: Introduction to Tools — **2 hours**

- Introduction to basic hand tools - Tape measure, Vernier caliper, Hammers, Fasteners, Wrenches, Pliers, Saws, Tube cutter, Chisels, Vice and Clamps, Tapping and Threading. Adhesives.
- Introduction to Power tools - Power saws, Jigsaw, Angle grinder, Belt sander, Bench grinder, Rotary tools. Various types of drill bits.

Module 2: Mechanical Cutting/Joining Process — **8 hours**

- Mechanical cutting processes - Basic Turning, Milling, Drilling, Grinding, Carpentry, Black Smithy operations, Wood Lathe.
- Basic welding, brazing and other joining techniques for assembly.

Module 3: Additive & Subtractive Manufacturing — **8 hours**

- 3D printing and prototyping technology, 3D printing using FDM, SLS and SLA.
- Basics of 3D scanning, point cloud data generation for reverse engineering.
- Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers.

Module 4: Basic Electronic Components and Devices — **2 hours**

- Electronic component familiarization, familiarization & use of basic measurement instruments - DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal, and function generator. Understanding electronic system design flow.

Module 5: PCB Fabrication — **10 hours**

- Schematic design and PCB layout and Gerber creation using Eagle CAD, Circuit prototyping using (a) breadboard (b) custom PCB. Single and double-sided PCB prototype fabrication in the lab. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven.

Module 6: Sensors and Arduino Programming — **6 hours**

- Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Power Supply design (Linear and Switching types), Wireless power supply, Solar panels, Battery types and charging.

Total hours	**36 hours**
Text Book(s)	
1.	Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.
2.	3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
3.	Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing," Springer, 2010
4.	Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer, 2004.
5.	All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book Publishing Company, New Delhi.
6.	The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
7.	Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542
8.	Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 978-9352133703
9.	Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill. ISBN-13: 978-1259641633
10.	Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13: 978-1260019193.
Reference Books	
1.	The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
2.	The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan (Author). Weldon Owen; 2017. ISBN-13: 978-1681881584.
3.	Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978-9352137374
4.	Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer. Cambridge University Press. ISBN-13: 978-0521878586
5.	Electronic Product Design, G. Kaduskar and V.B. Baru, Wiley India.

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