CURRICULUM 2023 (Autonomous)

Version 2.0

B.TECH
Computer Science and Engineering (AI)

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

Mar Ivanios Vidyanagar, Nalanchira, Thiruvananthapuram – 695 015

August 2023

CURRICULUM AND DETAILED SYLLABI

FOR

B. TECH DEGREE PROGRAMME

IN

COMPUTER SCIENCE AND ENGINEERING

(Artificial Intelligence)

SEMESTER I & II

2023 SCHEME
(AUTONOMOUS)

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, Autonomous Institution Affiliated to APJ Abdul Kalam Technological University)

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MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH DEGREE PROGRAMME

IN

COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence)

FIRST YEAR SYLLABUS

2023 SCHEME

	Board of Studies (BoS)	Academic Council (AC)
Date of Approval	10/7/2023	9/8/2023
	26/3/2024	19/6/2024

Head of the Department
Chairman, Board of Studies

Principal
Chairman, Academic Council

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

Vision and Mission of the Institution

Vision:
To be an Institution moulding globally competent professionals as epitomes of Noble Values.

Mission:
To transform the Youth as technically competent, ethically sound and socially committed professionals, by providing a vibrant learning ambience for the welfare of humanity.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision and Mission of the Department

Vision:
To be a Centre of Excellence in Computer Science and Engineering providing quality education and researchfor the betterment of the society.

Mission:
To impart sound knowledge in theoretical and applied foundations of Computer Science and Engineering, andto train the students to solve real life issues to effectively define and shape life.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will be successful professionals in Industries of core or interdisciplinary nature or entrepreneurs, demonstrating effective leadership and excellent team work.

PEO2: Graduates will expand the horizon of knowledge through higher education or research,leading to self-directed professional development

PEO3: Graduates will demonstrate competency in AI & ML, professional attitude and ethics whileproviding solutions in societal and environmental contexts

PROGRAMME OUTCOMES (POs)

Engineering graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **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 healthand safety, and the cultural, societal, and environmental considerations.
4. **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.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **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.
7. **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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independentand life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: To apply Algorithmic Principles, Programming Skills and Software Engineering Principles to design, develop and evaluate Software Systems of varying complexities.

PSO2: To apply knowledge of System Integration to design and implement computer-based systems

PSO3: To solve real world and socially relevant problems using AI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence)

For the students admitted from 2023

Scheduling of Courses

i) Knowledge Segments and Credits

Every course of B. Tech Programme is placed in one of the nine categories as listed in the following table.

No semester shall have more than six lecture-based courses and two laboratory courses,

and/or drawing/seminar/project courses in the curriculum.

Sl. No.	Category	Category Code	2023
1	Humanities and Social Sciences including Management Courses	HSC	6
2	Basic Science Courses	BSC	26
3	Engineering Science Courses	ESC	24
4	Programme Core Courses, Comprehensive Course Work and Viva Voce	PCC	72
5	Programme Elective Courses	PEC	18
6	Institute Elective Courses	IEC	6
7	Project Work and Seminar	PWS	15
8	Professional Development Courses	PDC	--
9	Mandatory Student Activities (P/F)	MSA	3
	Total Mandatory Credits		**170**
	Value Added Courses (Optional) – Honours/Minor		15

ii) Semester-wise Credit Distribution

Semester	I	II	III	IV	V	VI	VII	VIII	*Total Credits*
Credits for Courses	19	21	23	22	25	23	20	14	**167**
	40		45		48		34		**167**

SEMESTER I										
Slot	**Cate-gory**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	BSC	23MAL10A	Linear Algebra and Calculus	3	1	0	0	5	4	4
B	BSC	23PYL10A	Engineering Physics	3	1	0	0	5	4	4
D	ESC	23ESB10E	Programming in C	2	1	2	0	4.5	5	4
E	ESC	23ESL10J	Basics of Electrical Engineering A	2	0	0	0	3	4	2
		23ESL10L	Basics of Electronics Engineering	2	0	0	0	3		2
G	ESC	23ESL1NA	Environmental Science	2	0	0	0	3	2	1*
S	BSC	23PYP10A	Engineering Physics Lab	0	0	2	0	1	2	1
T	ESC	23ESP10B	Electrical and Electronics Workshop	0	0	2	0	1	2	1
TOTAL								**25.5**	**23**	**19**

SEMESTER II										
Slot	**Cate-gory**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	BSC	23MAL10B	Vector Calculus, Differential Equations and Transforms	3	1	0	0	5	4	4
B	BSC	23CYL10A	Engineering Chemistry	3	1	0	0	5	4	4
C	ESC	23ESB10A	Engineering Graphics	2	0	2	0	4	4	3
D	ESC	23ESB10H	Programming using Python	2	0	2	0	4	4	3
E	PCC	23ESL10Q	Digital Electronics	3	0	0	0	4.5	3	3
G	HSC	23HSJ1NB	Professional Communication	2	0	0	2	5	4	1*
S	BSC	23CYP10A	Engineering Chemistry Lab	0	0	2	0	1	2	1
T	ESC	23ESB10P	Manufacturing and Construction Practices B	1	0	2	0	2.5	3	2
TOTAL								**31**	**28**	**21**

**Not to be considered for Grade/GPA/CGPA. Pass or Fail Only*

Curriculum Approved by BoS on 10/7/23,26/3/24 and Academic Council on 9/8/23,19/6/2024

Semester I and II

First Year Syllabus

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23MAL10A	LINEAR ALGEBRA AND CALCULUS	BSC	3	1	0	0	4	2023

i. COURSE OVERVIEW

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling andanalyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Solve systems of linear equations.	Apply
CO 2	Compute maxima and minima using partial derivatives.	Apply
CO 3	Compute areas and volumes of geometrical shapes usingmultiple integrals.	Apply
CO 4	Identify the convergence or divergence of an infinite series.	Apply
CO 5	Determine the Taylor and Fourier series expansion offunctions and learn their applications.	Apply

iii. SYLLABUS

Basics of Linear Algebra – Solution of systems of linear equations, row echelon form,rank, eigen values and eigen vectors, diagonalization of matrices, orthogonal transformation, quadratic forms.
Partial Differentiation and Applications – Limit and continuity of functions of two or more variables, partial derivatives, chain rule, total derivatives, maxima and minima

Multiple Integrals – Double and triple integrals, double integrals over rectangular and non-rectangular regions, changing the order of integration, finding areas and volume, mass and centre of gravity.

Infinite series – Convergence and divergence of Infinite series, geometric series and p-series, test

of convergence, Alternating series, absolute and conditional convergence.

Taylor series, Binomial series and series representation of exponential, trigonometric, logarithmic functions –Fourier Series– Euler's formulas, Fourier sine and cosine series, Half range expansions

iv(a)TEXTBOOKS

1. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10th Edition, 2015.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2016.

(b) REFERENCES

1. J. Stewart, Essential Calculus, Cengage, 2nd Edition, 2017.

2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage,7th Edition2012.

v. COURSE PLAN

Module	Contents	Hours
I	**Linear Algebra**: Systems of linear equations, Solution by Gauss elimination, row echelon form and rank of a matrix, fundamental theorem for linear systems (homogeneous and non-homogeneous, without proof), Eigen values and eigen vectors. Diagonalization of matrices, orthogonal transformation, quadratic forms and their canonical forms.	**12**
II	**Multivariable calculus-Differentiation**: Concept of limit and continuity of functions of two variables, partial derivatives, Differentials, Local Linear approximations, chain rule, total derivative, Relative maxima and minima, Absolute maxima and minima on closed and bounded set.	**12**

III	**Multivariable calculus-Integration**: Double integrals (Cartesian), reversing the order of integration, change of coordinates (Cartesian to polar), finding areas and volume using double integrals, mass and centre of gravity of inhomogeneous laminas using double integral. Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates (computations involving spheres, cylinders).	**12**
IV	**Sequences and Series**: Convergence of sequences and series, convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.	**12**
V	**Series representation of functions**: Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formulas, Convergence of Fourier series (without proof), half range sine and cosine series, Parseval's theorem (without proof).	**12**
	Total Hours	**60**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23PYL10A	ENGINEERING PHYSICS	BSC	3	1	0	0	4	2023

i. COURSE OVERVIEW

The aim of the course is to develop scientific attitude in students andoffer them an understanding of physical concepts behind various engineering applications. It creates an urge in students to think creatively in emerging areas of Physics.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Describe the characteristics of different types of oscillations and waves.	Understand
CO 2	Explain natural physical processes and related technological advances usingprinciples of optics	Understand
CO 3	Generalise the principles of quantum mechanics to explain the behaviour ofmatter in the atomic and subatomic level	Understand
CO 4	Describe the fundamentals of lasers and the principles behind various solidstate lighting devices and fibre optic communication system.	Understand
CO 5	Explain the fundamental ideas of Ultrasonics and acoustics in order to facilitate technological advancement.	Understand

iii. SYLLABUS

Oscillations and Waves: Harmonic oscillations – Damped harmonic oscillations, Forcedharmonic oscillations, Q- factor, Amplitude resonance, comparison of electrical andmechanical oscillator. Wave motion – Longitudinal waves and Transverse waves, One dimensional wave equation and solution, three-dimensional wave equations, Transverse vibrations along a stretched string.

Wave Optics: Interference of light – Cosine law, Wedge shaped films - Air wedge, Newton's rings, Antireflection coating. Diffraction- comparison of Fresnel and Fraunhoferdiffraction, Fraunhofer diffraction due to double slit, grating equation, Rayleigh's criterion, resolving power and dispersive power of grating.

Quantum Mechanics & Nano technology: Wave function, Uncertainty principle, Time dependent and time independent Schrodinger wave equations, Applications of Schrodingerwave equation - particle in one-dimensional potential well, quantum mechanical tunneling. Introduction to nanoscience and technology, significance of surface to volume ratio, Quantum confinement, Characterization techniques – XRD, UV-Visible Spectroscopy, Applications of nanomaterials.

Laser and Photonics: Principles of Laser, Properties of laser, Ruby laser and Helium neon laser, Applications of Laser. Holography-construction of hologram, reconstruction of hologram, Applications. Introduction to photonics - photonic devices - Light Emitting Diode, Solar cells, Optical fibre – Principle of OFC, Numerical aperture, Types of fibers– step index fibre , Graded index fibre, Fibre Optic Communication System, Applicationsof Optical fibre, Fibre optic sensors.

Acoustics & Ultrasonic: Acoustics - characteristics of musical sounds, absorption coefficient, reverberation time- Sabine's formula (no derivation), significance, factors affecting architectural acoustics and their remedies.

Ultrasonics - production by magnetostriction oscillator and piezoelectric oscillator, detection of ultrasonic waves - thermal and piezoelectric methods, ultrasonic diffractometer-, applications of ultrasonic waves -SONAR, NDT, medical applications.

iv(a)TEXTBOOKS

1. M.N. Avadhanulu, P.G. Kshirsagar, T.V.S Arun Murthy, A Text book of Engineering Physics, S. Chand & Co., Revised Edition, 2014

2. H.K. Malik, A.K. Singh, Engineering Physics, McGraw Hill Education, 2nd Edition, 2017

(b) REFERENCES

1. Arthur Beiser, Concepts of Modern Physics, Tata McGraw Hill Publications, 6th Edition, 2003.

2. Aruldhas G., Engineering Physics, Prentice Hall of India Pvt Ltd., 2015

3. Ajoy Ghatak, Optics, Mc Graw Hill Education, 6th Edition, 2017

4. David J. Griffiths, Introduction to Electrodynamics, Addison-Wesley ublishing, 4th Edition, 1999.

5. Choudhary, Nityanand, K. R. Deepak, S. H. Abdi, Perspective of Engineering: Physics: I, Acme Learning Pvt Ltd, first edition, 2009.

6. A. S. Vasudeva, A Text Book of Engineering Physics, S. Chand &Co., first edition:

2008.

7. Premlet B., Advanced Engineering Physics, Phasor Books,10th Edition, 2017.

v. COURSE PLAN

Module	Contents	Hours
I	**Oscillations and Waves**: Harmonic oscillations, damped harmonic motion - derivation of differential equation and its solution, over damped, critically damped and under damped cases, Quality factor- expression, forced oscillations - differential equation, derivation of expressions for amplitude and phase of forced oscillations, amplitude resonance - expression for resonant frequency, sharpness of resonance, electrical analogy of mechanical oscillators. Wave motion- distinction between transverse and longitudinal waves, derivation of one-dimensional wave equation and its solution, three-dimensional wave equation and its solution (no derivation), transverse vibration in a stretched string, statement of laws of Vibration	12
II	**Wave Optics**: Interference of light- theory of thin films - cosine law (Reflected system), derivation of the conditions of constructive and destructive interference, interference due to wedge shaped films - determination of thickness and test for optical planeness, Newton's rings-measurement of wavelength and refractive index, antireflection coatings. Diffraction of light, Fresnel and Fraunhofer classes of diffraction, diffraction due to double slit, diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, resolving and dispersive power of a grating with expression (no derivation)	12
III	**Quantum Mechanics & Nanotechnology**: Introduction for the need of Quantum mechanics, wave nature of Particles, de-Brogile wavelength, uncertainty principle, Applications-absence of electronsinside a nucleus and natural line broadening mechanism, physical meaning of wave function, formulation of time dependent and independent Schrodinger wave equations, Applications of Schrodinger equation - Particle in a one dimensional box- derivation for normalised wave function and energy Eigen values, Quantum mechanical tunnelling (qualitative). Introduction to nanoscience and technology, Effect of surface to volume ratio for nanomaterials, quantum confinement in one dimensional, two dimensional and three dimensional particles - nanosheets, nano wires and quantum dots, characterization techniques - XRD analysis, UV visible spectroscopy, applications of nanotechnology (qualitative ideas)	12

IV	**Laser and Photonics**: Properties of laser, Absorption and emission of radiation, Spontaneous emission and stimulated emission, Population inversion, Metastable states, basic components of laser, Active medium, pumping mechanism, Optical resonant cavity, working principle. Construction and working of Ruby laser and Helium neon laser, Applications of lasers. Holography – Advantage of hologram over photograph, Recording of hologram, reconstruction of hologram,Applications of hologram. Introduction to photonics - photonic devices - Light Emitting Diode, Solar cells - I-V characteristics, Fiber Optics - Principle of light propagation through optical fiber, Classification of optical fibers - Step index and Graded index fibres, Numerical aperture – Derivation, Fibre optic communication system (block diagram), Applications of optical fiber, Fiber optic sensors.	**12**
V	Acoustics & Ultrasonics: Acoustics - Classification of Sound-Musical Sound-Noise, Characteristics of Musical Sounds-Pitch or Frequency-Loudness or Intensity Measurement of Intensity Level-Decibel- Quality or timbre, Absorption coefficient, Reverberation, Reverberation Time-Significance - Sabine's formula (no derivation). Factors affecting architectural acoustics and their remedies. Ultrasonics - Production- Magnetostriction effect and Piezoelectric effect, Magnetostriction oscillator and Piezoelectric oscillator – Working, Detection of ultrasonic waves - Thermal and Piezoelectric methods. Ultrasonic diffractometer – determination of velocity, Applications of ultrasonic waves – industrial applications - SONAR,NDT, Medical applications.	**12**
	Total Hours	**60**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10E	PROGRAMMING IN C	ESC	2	1	2	0	4	2023

i. COURSE OVERVIEW

This course aims to introduce the concepts of structured programming. It covers basic concepts of the C programming language including arrays, functions, pointers and files. This course involves a lab component which equips the learner to solve computational problems through programming.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain the fundamentals of computer architecture and types of software.	Understand
CO 2	Develop a solution using algorithm /flowchart to a computational problem.	Apply
CO 3	Construct programs with control statements and arrays.	Apply
CO 4	Make use of user defined data types or functions to solve computational problems.	Apply
CO 5	Develop programs using files and pointers.	Apply

iii. SYLLABUS

Computer architecture & Programming Languages Basics of Computer architecture, Types of Programming Languages, System Software, Application Software, Introduction to structured programming, Algorithms, Flowcharts and Pseudo-codes.

C Programming Language Data Types, variables, keywords, Constants, Operators and Expressions, Control Flow Statements- Conditional statements, Iterative statements, programs.

Arrays and Strings Multidimensional arrays and matrices, String processing, Searching and sorting in 1D array.

Functions_ Scope of variable, Pass by reference and value methods, Recursive functions. Structures

and union, Storage Classes.
Pointers and Files- File Operations, Sequential access and random access, programs covering pointers and files, Introduction to data structures, Types of data structure, singly linked list.

iv(a)TEXTBOOKS

1. Byron Gottfried, *Programming with C* (Schaum's Outlines Series), McgrawHill Education, 3rd Edition, 2017.

2. H. M. Deitel, P. J. Deitel, *C: How to program*, 7th Edition, Pearson Education, 2010.

3. Anita Goel, Computer Fundamentals, Pearson, 1st Edition, 2010.

4. Ellis Horowits, SartajSahini, Susan Anderson Freed, *Fundamentals of Data Structure in C*, 2ndEdition, 2008.

(b) REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, *C Programming Language*,Pearson, 2ndEdition, 2015.

2. Rajaraman V, PHI, *Computer Basics and Programming in C*, 1st Edition, 2007.

3. Anita Goel and Ajay Mittal, *Computer fundamentals and Programming in C*, 1stEdition,2013.

v. COURSE PLAN

Module	Contents	Hours
I	**Basics of Computer architecture** - Von-Neumann Architecture- Processor, Memory, Input and Output devices. **Types of Programming Languages** - System Software, Application Software, Compilers, Interpreters, High level and Low level languages. **Introduction to structured programming** - Algorithm, Flowcharts and Pseudo-code - Examples	**8**
	Familiarization of basic Linux commands	**2**

II	**Basic structure of C program** - Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf, **Operators and Expressions** - Expressions, Arithmetic Operators, Relational Operators, Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence. **Control Flow Statements** - if Statement, if-else Statement, if-else-if Statement. Nested if Statement & switch Statement; **Iterative Statements** – while, do while & for loops; Unconditional Branching using goto statement, break and continue statements.	**9**
	Basic programs using data types, operators, and control statements in Java.	**6**
III	**Arrays** – One-dimensional Arrays - Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Example programs-Bubble sort, Linear search; Two-dimensional Arrays - Declaration of Two-dimensional Arrays, Initialization of Two-dimensional Arrays, Example programs-Matrix multiplication and Transpose of a matrix. **Character Arrays and Strings** – Declaration and Initialization, In-built String handling functions, Example Programs (with and without using built-in functions).	**9**
	Programs on one dimensional & two dimensional arrays, Strings.	**8**
IV	**Functions** - The prototype declaration, Function definition. Function call: Passing arguments to a function, by value, by reference. Scope of variable names. Recursive function calls. Storage Classes. **Structure and union in C** – Definition, Declaration of Structure Variables, Array of structures.	**8**
	Programs on functions, recursion, structure.	**8**
V	**Pointers**: Pointer variables. Declaring and dereferencing pointer variables. Accessing arrays through pointers. Static & Dynamic memory allocation, Memory allocation functions. **File Operations** - open, close, read & write. Sequential access and random access to files – rewind(), fseek(), ftell(), feof(), fread() & fwrite(). Simple programs on pointers and files. **Introduction to Data Structures** – Linear and Non-linear data structures, Singly Linked list.	**11**
	Programs on pointers and files.	**6**
	Total Hours	**75**

PROGRAMMING IN C LAB (Practical Part of 23ESB10E)

1. Program to read three integer values and find the largest of three numbers. **
2. Program to check whether a given year is a leap year or not. **
3. Display the grade of a student after reading his mark for a subject. (Use switch) **
4. Read a Natural Number and check whether the number is Armstrong or not. **
5. Read N integers, store t h e m in an array and search for an element in the array using the Linear Search algorithm. **
6. Read N integers, store them in an array and sort the elements in the array using the Bubble Sort algorithm. **
7. Write a menu driven program for performing matrix addition, trace of a matrix and transpose of a matrix. **
8. Read a string (word), store it in an array and check whether it is palindrome or not.
9. Read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it. **
10. Program to check whether a number is prime or not using function. **
11. Program to display the first N elements of Fibonacci series using function.
12. Program to find the product of two matrices. Use function to (i) read a matrix, (ii) finding product and (iii) display matrix **
13. Program to find the factorial of a number using recursion. **
14. Program to find the sum of digits of a number using recursion.
15. Using structure, read and print data of n employees (Name, Employee Id and Salary).
16. Read the marks of three subjects for n students of a class and display their names in the order of rank. (Use array of structure) **
17. Program to swap two numbers without a temporary variable, using pointers. **
18. Open a text input file and count the number of characters, words and lines in it; and store the results in an output file. **
19. Open a text file, read an array of integers from the user, write the odd numbers to a file 'Odd.txt' and even numbers to another file 'Even.txt'. **

Note: ** indicates mandatory lab experiments

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 60: 40

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Lab Work	:	10 marks
Lab Exam	:	10 marks
Total Continuous Assessment	:	**60 marks**
End Semester Examination	:	**40 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 40
- Exam Duration: 2 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10J	BASICS OF ELECTRICAL ENGINEERING A (Fractal Course)	ESC	4	0	0	0	2	2023

i. COURSE OVERVIEW

This course aims to equip the students with an understanding of the fundamental principles of electrical engineering.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Apply fundamental circuit laws and principles of electromagnetism to solve simple DC electric circuits and magnetic circuits respectively.	Apply
CO 2	Solve simple AC circuits using the alternating current fundamentals.	Apply
CO 3	Explain the principle of operation and characteristics of DC Motors	Understand

iii. SYLLABUS

Basic concepts of DC circuits: Ohm's Law and Kirchhoff's laws, Star-delta conversion, Analysis of DC circuits, Mesh analysis, Node analysis.

Magnetic Circuits: Basic Terminology, Simple Magnetic circuits, Electromagnetic Induction, Faraday's laws, Lenz's law, Self-inductance and mutual inductance.

ernating Current fundamentals: Basic definitions, Average, RMS values, AC Circuits, Phasor
resentation, Analysis of simple AC circuits (R, L, C, RL, RC, RLC Series circuits)
ree phase AC systems, Generation of three phase voltages, star and delta connections.
Motors-Constructional details of DC machines, Principle of operation, Back EMF, Torque
ıation, Types, Performance characteristics, Applications.

iv(a)TEXTBOOKS

1. William H. Hayt., Jr., Jack E. Kemmerly, Steven M. Durbin., Engineering Circuit

Analysis, McGraw-Hill, 8th Edition, 2012.

2. Kothari D. P. and Nagrath I. J., Basic Electrical Engineering, Tata McGraw Hill, 2010.

3. Fitzgerald A.E., David Higginbotham E., Arvin Grabel, Basic Electrical Engineering, Tata McGraw Hill, 5th Edition, 2009.

4. Bimbra P. S., Electric Machines, Khanna Publishers, 2nd Edition, 2017

(b) REFERENCES

1. Paul Breeze, Power Generation Technologies, Newnes,3rd Edition, 2019.

2. Allan Hambley R., Electrical Engineering: Principles & Applications, Pearson Education, 7th Edition, 2018.

3. Mittle V. N. and Arvind Mittal, Basic Electrical Engineering, McGraw Hill,2nd Edition, 2006.

4. Clayton A. E. and Hancock N. N., The Performance and Design of Direct Current Machines, CBS Publishers & Distributors, New Delhi, 3rd Edition, 2004.

v. COURSE PLAN

Module	Contents	Hours
I	**DC circuits:** Review of Elementary concepts of DC circuits, Current and Voltage Division Rules, Star-delta conversion (resistive networks only-derivation not required), Numerical problems. **Analysis of DC circuits:** Mesh current method, Node voltage method. Solution of network equations by matrix method, Numerical problems. **Magnetic Circuits:** Review of Magnetic Circuits, Series magnetic circuits with composite materials, Numerical problems.	**9**
II	**Electromagnetic Induction:** Faraday's laws, Lenz's law, statically induced and dynamically induced emfs, Self-inductance and mutual inductance, coefficient of coupling (derivation not required), Numerical Problems. **Alternating Current fundamentals:** Generation of alternating voltages, Basic definitions, Average and RMS values of sinusoidal waveforms, Numerical Problems. **Analysis of AC Circuits:** Phasor representation of sinusoidal quantities, Complex forms, Purely resistive, inductive and capacitive circuits; Analysis	**9**

	of RL, RC and RLC series circuits, active, reactive and apparent power. Numerical problems.	
III	**Three phase AC systems:** Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, Power in three phase circuits, Numerical problems. **DC Machines**-Constructional details of DC machines, Principle of operation of DC generator and DC motor, Back EMF, Torque equation, Types, Performance characteristics, Applications.	**12**
	Total Hours	**30**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 01
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 3 modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10L	BASICS OF ELECTRONICS ENGINEERING (Fractal Course)	ESC	4	0	0	0	2	2023

i. COURSE OVERVIEW

This course aims to equip the students with an understanding of the fundamental principles of electronics and communication engineering.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Describe the principles of semiconductor devices, its characteristics and various electronic circuits	Understand
CO 2	Explain the basic working of Op-Amp, logic gates, radio and cellular communication systems.	Understand

iii. SYLLABUS

PN Junction diode: Principle of operation, V-I characteristics, breakdown mechanisms, Zener diode and its characteristics.

Rectifiers and Power supplies: Block diagram of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator.

Bipolar Junction Transistors: structure, principle of operation, relation between current gains in Common Emitter (CE), Common Base (CB) and Common Collector (CC) configurations, input and output characteristics of CE configuration.

Amplifiers: Concept of voltage divider biasing, circuit diagram and working of CE (RC coupled) amplifier with its frequency response. Integrated Circuits: Analog IC; Operational Amplifier, block diagram, ideal characteristics, inverting and non-inverting Amplifier.

Digital IC: Logic Gates AND, OR, NOT, Universal Gates; truth table, De-Morgans law, Realization of simple Boolean functions.

Radio communication: Modulation, need for modulation, Principle of AM, mathematical expression, waveform, frequency spectrum and bandwidth of AM, Principle of FM, mathematical expression, waveform.

Radio Receivers: block diagram of super heterodyne receiver (AM & FM).

Mobile communication: Basic principles of cellular communications, concept of cells, frequency reuse, hand off.

iv(a)TEXTBOOKS

1. Boylested, R. L. and Nashelsky, L., *Electronic Devices and Circuit Theory*, Pearson Education, 10th Edition, 2009.

2. Thomas l Floyd, *Digital Fundamentals*, Pearson Education, 11th Edition, 2018.

3. Ramakant A Gaykwad, *Op-Amps and Linear Integrated Circuits*, Pearson Education, 4th Edition, 2015.

4. Wayne Tomasi and Neil Storey, *A Textbook on Basic Communication and Information Engineering*, Pearson, 5th Edition, 2010.

(b) REFERENCES

1. N.N. Bhargava , D.C. Kulshreshtha , S.C. Gupta, Basic Electronics and Linear Circuits, Tata McGraw - Hill Education, New Delhi, 2nd Edition, 2014.

v. COURSE PLAN

Module	Contents	Hours
I	**PN Junction diode:** Principle of operation, V-I characteristics, breakdown mechanisms, Zener diode and its characteristics **Rectifiers and Power supplies:** Block diagram of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator **Bipolar Junction Transistors:** structure, principle of operation, relation between current gains in Common Emitter (CE), Common Base (CB) and Common Collector (CC) configurations, input and output characteristics of CE configuration.	**10**
II	**Amplifiers:** Concept of voltage divider biasing, circuit diagram and working of CE (RC coupled) amplifier with its frequency response **Integrated Circuits:** Analog IC; Operational Amplifier, block diagram, ideal characteristics, inverting and non-inverting Amplifier **Digital IC:** Logic Gates AND, OR, NOT, Universal Gates; truth table, De-Morgans law, Realization of simple Boolean functions	**10**

III	**Radio communication:** Modulation, need for modulation, Principle of AM, mathematical expression, waveform, frequency spectrum and bandwidth of AM, Principle of FM, mathematical expression, waveform **Radio Receivers:** block diagram of super heterodyne receiver (AM&FM). **Mobile communication:** Basic principles of cellular communications, concept of cells, frequency reuse, hand off.	**10**
	Total Hours	**30**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 01
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 3 modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL1NA	ENVIRONMENTAL SCIENCE	ESC	2	0	0	0	1	2023

i. COURSE OVERVIEW

Goal of this course is to expose students to the significance of natural resource management, ecosystem restoration and biodiversity conservation. The course details the various problems related to environmental pollution and the legal provisions for environmental protection. The course also introduces the concept of sustainability, sustainable practices and the role of engineering in attaining sustainable development.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Identify the problems associated with the overutilization of natural resources and the role of engineers in natural resource management.	Understand
CO 2	Explain the concepts related to the ecosystem and the significance of ecosystem restoration and biodiversity conservation.	Understand
CO 3	Explain the causes, impacts and control measures of various types of environmental pollution.	Understand
CO 4	Summarize the various legal provisions for environmental protection.	Understand
CO 5	Discuss the concepts of sustainability and sustainable practices by utilizing engineering knowledge and principles.	Apply

iii. SYLLABUS

Interdisciplinary nature of environmental science: Scope and importance Natural resources and associated problems: Water resources, Energy resources, Food resources, Land resources

Ecosystems: Concept, Types, Functions, Productivity, Energy flow and Food chains of ecosystems. Characteristic features and functions of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem, Ecosystem Services

Biodiversity and its conservation: Species and ecosystem diversity, Value of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity

Environmental Pollution: Air, Water and Soil pollution. Solid and Hazardous Waste Management,

Role of individuals in prevention of pollution
Social issues and the environment: Environmental ethics, Contemporary Environmental issues, Water conservation- rainwater harvesting, watershed management, conservation of wetlands, Legal provisions for environmental protection.
Sustainability: Concept, Sustainable Development Goals. Sustainability Practices- Green Engineering, Sustainable habitat- Green buildings, Sustainable Urbanization, Industrial Ecology, Circular Economy- Case studies

iv(a)TEXTBOOKS

1. Erach Bharucha, Textbook for Environmental Studies, 3rd edition, UGC, New Delhi, 2021.
2. D. D. Mishra, Fundamental Concepts in Environmental Studies, 4th edition, S. Chand & Co. Ltd., 2014.
3. Kurian Joseph and R. Nagendran, Essentials of Environmental Studies, Pearson Education Pvt. Ltd, India, 2017.
4. David Allen and David R. Shonnard, Sustainable Engineering: Concepts, Design and Case Studies, 1st edition, Pearson, 2011.

(b) REFERENCES

1. Suresh K. Dhameja, Environmental Engineering and Management, 4th edition, S.K. Kataria & Sons, 2021.
2. Bradley Striebig, Adebayo A. Ogundipe and Maria Papadakis, Engineering Applications in Sustainable Design and Development, 1st edition, Cengage Learning, EMEA, 2015.

v. COURSE PLAN

Module	Contents	Hours
I	Interdisciplinary nature of Environment: Definition, scope and importance. Natural resources and associated problems: Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources (case studies). Food Resources: effects of modern agriculture, fertilizers pesticides problems, water logging, salinity. Land resources: land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources, Equitable use of resources.	6

II	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Productivity, Energy flow in the ecosystems. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, Types of ecosystems, Characteristic features and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem, Ecosystem services. Biodiversity and its Conservation: Introduction-Definition: species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values. Hotspots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity.	**6**
III	Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Noise pollution. Solid and Hazardous waste management: Causes, effects and control measures of urban and industrial wastes. 3R concept, Zero waste management -case studies. Role of an individual in prevention of pollution.	**6**
IV	Social issues and the Environment: Environmental ethics, Contemporary Environmental issues- Global warming, Climate change, Sea level rise. International efforts for environmental protection. Water conservation - rain water harvesting, watershed management, conservation of wetlands- Ramsar sites in India. Legal provisions for environmental protection. Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection act, Forest conservation act. National Action Plan on Climate Change	**6**
V	Sustainability**:** Introduction, Need and concept of sustainability, Evolution of sustainability, Social, Environmental and Economic sustainability. Sustainable development, Nexus between technology and sustainable development, Challenges for sustainable development, Sustainable Development Goals Sustainability Practices- Green engineering, Sustainable habitat-basic concepts, Green buildings, Green materials for building constructions, Green building certification, Methods of increasing the energy efficiency of buildings, Sustainable Urbanisation, Industrial Ecology, Circular Economy- Case studies.	**6**
	Total Hours	**30**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 100: 0

Continuous Assessment	
Attendance	: 5 marks

Assignments(Activity based)	:	15 marks
Course Based Tasks		
Mini Project	:	30 marks
Case Study	:	20 marks
Assessment Through Tests	:	30 marks
Total Continuous Assessment	:	**100 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 01 (At the end of the semester)
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 5 modules

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23PYP10A	ENGINEERING PHYSICS LAB	BSC	0	0	2	0	1	2023

i. COURSE OVERVIEW

The aim of this course is to enable the students to gain practical knowledge in Physics to correlate with the theoretical studies. It equips the students to utilize the acquired skills in an appropriate way to explore the prospects of modern technology. It brings more confidence in students and develop the ability to fabricate engineering and technical tools

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Determine the frequency of tuning fork using a Melde's string apparatus by setting up wave pattern in a stretched string.	Apply
CO 2	Determine the Numerical aperture and acceptance angle of optical fiber.	Apply
CO 3	Determine the wavelength of a monochromatic beam of light and thickness of thin wire using principle of interference	Apply
CO 4	Demonstrate diffraction of light using plane transmission grating.	Apply
CO 5	Draw the I-V characteristics of non ohmic devices.	Apply

iii. SYLLABUS

1. Melde's string apparatus- Measurement of frequency in the transverse mode.
2. Wavelength measurement of a monochromatic source of light using Newton's Rings method
3. Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.
4. Measurement of wavelength of a source of light using grating.
5. Determination of dispersive power and resolving power of a plane transmission grating.
6. Determination of the wavelength of any standard laser using diffraction grating.
7. I-V characteristics of solar cell.
8. To measure the Numerical aperture and acceptance angle of an optical fibre.

iv. REFERENCES

1. S.L. Gupta and V. Kumar, *Practical physics with viva voce*, Pragati Prakashan Publishers, Revised Edition, 2009..

2. M.N. Avadhanulu, A.A. Dani and Pokely P.M., *Experiments in Engineering Physics*, S. Chand &Co, 2008.

3. S. K. Gupta, Engineering Physics practicals, Krishna Prakashan Pvt. Ltd., 2014 4) P. R. Sasikumar, Practical Physics, PHI Ltd., 2011.

v. ASSESSMENT PATTERN

Continuous Assessment		
Attendance	:	5 marks
Assessment of Lab Work	:	55 marks
Continuous Assessment in Lab (Lab work + Record + Viva - voce) -40 marks and Internal Lab test -15 marks		
Final Lab Assessment	:	40 marks
TOTAL	**:**	**100 marks**

vi. FINAL ASSESSMENT (WRITTEN EXAMINATION)

- Maximum Marks: 40
- Test Duration: 1 hour

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESP10B	ELECTRICAL AND ELECTRONICS WORKSHOP	ESC	0	0	2	0	1	2023

i. COURSE OVERVIEW

To expose the students to the commonly used accessories and components in electrical installations and to provide hands on experience of wiring of electrical circuits.

To enable the students to familiarize, identify, construct, and debug the electronic components, devices and circuits. It also enables the student's engineering skills by soldering practices of electronic circuits.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Choose the appropriate tools, electrical accessories, protective elements for electrical wiring and study the different types of earthing and safety measures.	Remember
CO 2	Build a simple lighting circuit for domestic buildings using suitable accessories and materials.	Apply
CO 3	Identify the faults in electric circuits and batteries using appropriate devices.	Apply
CO 4	Make use of a solar powered circuit and obtain its VI characteristics.	Apply
CO 5	Construct the performance characteristics of DC Motors by performing load test.	Apply
CO 6	Test various electronic components.	Apply
CO 7	Implement basic electronic circuits on breadboard.	Apply
CO 8	Implement basic electronic circuits on general purpose PCB.	Apply

iii. SYLLABUS

Part A: Electrical Workshop

Familiarization/Identification of electrical accessories and protective elements, wiring of circuits using PVC conduits, wiring of simple solar chargeable circuit and determination of its characteristics, Demonstration of power distribution arrangement and earthing schemes, Identification of different types of batteries.

Part B: Electronics Workshop

Familiarization of electronic equipment and commonly used tools

Familiarization and testing of electronic components

Interconnection using bread board

a. Diode Characteristics

b. Single stage RC coupled Amplifier

c. Truth table verification of Logic Gates

Soldering Practice

a. DC Power Supply

b. Inverting and Non Inverting amplifier using Op-amp

iv. REFERENCES

1. Singh R. P., Electrical Workshop: Safety, Commissioning, Maintenance & Testing of Electrical Equipment, Dream tech Press, 3rd Edition, 2019.

2. John H. Watt, Terrell Croft American Electricians' Handbook: A Reference Book for the Practical Electrical Manual, McGraw-Hill, 9th Edition, 2002.

3. Navas K A, Electronics Lab Manual, , Volume 1, PHI Learning Private Limited, 5th Edition, 2015.

v. COURSE PLAN

Module	Contents	Hours
	ELECTRICAL WORKSHOP	
1.	Familiarization/Identification of electrical components with specification (Functionality, type, size, colour coding, symbol, cost etc. of Wires, Cables, Connectors, Fuses, MCB, ELCB, Switches and other electrical installation equipments with ratings).	**2**

2.	Understand the safety precautions to be observed in the workshop. Demonstration of usage of fire extinguishers and learn about basic first aid procedures.	**1**
3.	Wiring of one lamp controlled by one SPST switch and a plug socket (PVC conduit wiring).	**2**
4.	Wiring of light/fan circuit controlled by two SPDT switches (Staircase wiring).	**2**
5.	Wiring of a light circuit and a power circuit for domestic applications.	**2**
6.	Wiring of simple solar chargeable circuit and determination of its characteristics.	**2**
7.	a) Demonstration of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter. b) Application of tester and test lamp for identifying simple faults in electrical systems.	**1**
8.	a) Demonstration of Pipe and Plate Earthing Schemes. b) Testing of batteries using hydrometer.	**1**
9.	Load Test on a DC Shunt/Series Motor	**2**
ELECTRONICS WORKSHOP		
1.	Familiarization of electronic equipment and commonly used tools	**2**
2.	Familiarization and testing of electronic components	**2**
3.	Interconnection using bread board a. Diode Characteristics b. Single stage RC coupled Amplifier c. Truth table verification of Logic Gates	**6**
4.	Soldering Practice a. DC Power Supply b. Inverting and Non Inverting amplifier using Op-amp	**5**
	Total Hours	**30**

vi. ASSESSMENT PATTERN

Continuous Assessment		
Attendance	:	5 marks
Assessment of Lab Work	:	55 marks
Continuous Assessment in Lab (Lab work + Record + Viva - voce) -40 marks and Internal Lab test -15 marks		
Final Lab Assessment	:	40 marks
TOTAL	**:**	**100 marks**

vii. FINAL ASSESSMENT (WRITTEN EXAMINATION)

- Maximum Marks: 40
- Test Duration: 1 hour

SEMESTER II

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23MAL10B	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	BSC	3	1	0	0	4	2023

i. COURSE OVERVIEW

The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box. The topics treated in this course have applications in all branches of engineering.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Compute the derivatives and line integrals of vector functions and learn their applications.	Apply
CO 2	Evaluate surface and volume integrals and learn their inter- relations and applications.	Apply
CO 3	Solve linear ordinary differential equations.	Apply
CO 4	Apply Laplace transform to solve ODEs arising in engineering.	Apply
CO 5	Apply Fourier transforms of functions to solve problems arising in engineering.	Apply

iii. SYLLABUS

Vector Calculus – Derivative of vector function, Gradient, Divergence, Curl, Line integral, conservative fields.

Green's theorem, surface integral, Gauss divergence theorem, Stokes' theorem.

Ordinary Differential Equations – Homogeneous and Non-Homogeneous linear differential Equations, Euler-Cauchy equations. Method of undetermined coefficients and Method of variation of parameters.

Laplace transforms – Laplace Transform and its inverse, shifting theorems, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function. Dirac delta function. Convolution theorem and its applications.

Fourier Transforms – Fourier integral representation, Fourier sine and cosine integrals. Fourier transform and inverse Fourier transform. Fourier sine and cosine transforms, inverse sine and cosine transform. Convolution theorem

iv(a)TEXTBOOKS

1. H. Anton, I. Biven S.Davis, "Calculus", Wiley, 10th edition, 2015.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley &

(b) REFERENCES

1. George F Simmons: Differential Equation with Applications and its historical Notes,2e McGraw Hill Education India 2002.

2. Hemen Datta, Mathematical Methods for Science and Engineering, CengageLearing,1st. ed.

3. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10th Edition, 2015.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2018

v. COURSE PLAN

Module	Contents	Hours
I	Calculus of vector functions: Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields, Gradient and its properties, directional derivative, divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields, independence of path and potential function (results without proof).	**12**
II	Vector integral theorems: Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z) , Flux integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z), divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.	**12**

III	Ordinary differential equations: Homogenous linear differential equation of second order, superposition principle, general solution, homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only). Existence and uniqueness (without proof). Non homogenous linear ODEs-general solution, solution by the method of undetermined coefficients (for the right-hand side of the form xn, e^{kx}, $sinax$, $cosax$, $e^{kx}sinax$, $e^{kx}cosax$ and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficient using method of undetermined coefficient.	**12**
IV	Laplace transforms: Laplace Transform and its inverse ,Existence theorem (without proof) , linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function, Second shifting theorems. Dirac delta function and its Laplace transform, Solution of ordinary differential equation involving unit step function and Dirac delta functions. Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.	**12**
V	Fourier Transforms: Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof).	**12**
	Total Hours	**60**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23CYL10A	ENGINEERING CHEMISTRY	BSC	3	1	0	0	4	2023

i. COURSE OVERVIEW

The aim of the Engineering Chemistry program is to expose the students to basic concepts of chemistry and its Industrial as well as Engineering applications.It also let the students to familiarize with different topics such as new-generation engineering materials, storage devices, different instrumental methods etc.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Apply the basic concepts of Electrochemistry in various Engineeringproblems.	Apply
CO 2	Apply the basic concepts of UV-Visible, IR and NMR spectroscopictechniques to analyze organic compounds.	Apply
CO 3	Explain the significance of conducting polymers, Nanomaterials, Alloys and composite materials in Engineering.	Understand
CO 4	Explain relevant techniques used for the identification and separationof chemical compounds and mixtures.	Understand
CO 5	Explain the principles of Green chemistry and various water treatment methods used for sustainability.	Understand

iii. SYLLABUS

Electrochemistry: Cell prototype- Daniel cell, Nernst equation and its uses, Primary and secondary electrodes- construction and working, applications of electrochemical series. Potentiometric titration – Acid Base titration, Fundamentals of corrosion, Galvanic series, Wetand dry corrosion – types, mechanism and its prevention.

Electrochemical power sources: different types of cells, construction, working and applications– Dry cell, Electrolytic cells, Galvanic cells, Lead-acid cell, accumulator, Lithium ion cell- different electrode materials, Fuel cells, H_2-O_2 fuel cell.

Basics of Spectroscopy: Beer Lambert's law, Principles and applications of UV-Visible

spectroscopy, Fluorescence and its applications, Woodward-Feiser rule, instrumentation of UV-Visible spectroscope, colorimetry, Principles and applications of IR spectroscopy, Number of vibrational modes – CO_2 and H_2O, Determination of force constant of diatomic molecules, Principles and applications of NMR spectroscopy, Shielding, Deshielding, Chemical shift, spin-spin splitting, MRI technique.

Engineering Materials: Basics of Polymer chemistry, Types of copolymers, Preparation, properties and applications- Butadiene Styrene, Acrylonitrile Butadiene Styrene, Kevlar, conducting polymers- Polyaniline and Polypyrrole - preparation properties and applications, Organic Light Emitting Diode

Nanomaterials: Origin of nanomaterials, Classifications, Chemical synthesis- hydrolysis and reduction, Carbon Nano Tubes, Graphene, Quantum dots-applications.

Alloys and Composites: Cast iron, Principal non-ferrous alloys, need, properties and applications of composites, super alloys, Ceramics- structure and applications.

Instrumental methods in chemistry: Thermal methods, Thermo Gravimetric Analysis, Differential Thermal Analysis, Chromatography techniques- Thin Layer Chromatography, Column Chromatography, Gas Chromatography, High Performance Liquid Chromatography, Surface characterization using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy(XPS), Auger Electron Spectroscopy(AES).

Green Chemistry and Sustainability: Green chemistry – Principles, Matrices to express greenness- E-Factor, Atom Economy, Environmental Quotient, Green chemistry and Catalysis, R_4M_4 Models-Econoburette, Survismeter, E-waste disposal, Life Cycle Analysis, Benefits and limitations of conducting Life Cycle Analysis.

Water Technology: Water characteristics, hardness, disadvantages of hard water, Estimation of hardness- EDTA method, Ion exchange process for water softening, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand, its estimation and significance, Municipal water treatment, disinfection of water, Reverse Osmosis, Sewage water treatment.

iv(a)TEXTBOOKS

1. D. Harvey, N. Rutledge, *Industrial Chemistry*, ETP, first edition, 2018. ISBN: 9781788820554

2. M. Arif, A. Fernandez, K. P. Nair, *Engineering Chemistry*, first edition, Owl Books,2019.

3. S. Chawla, *A text book of Engineering Chemistry*, second edition, Dhanpat Rai & Co.2017.

4. Roy Varghese., *Engineering Chemistry*, Second Edition, Crown Pubs., 2019.

5. Prasanta Rath., *Engineering Chemistry*, First Edition, Cenage Learning, 2015.

(b) REFERENCES

1. C. N. Banwell, E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, McGraw-Hill, 4th edition, 2017.

2. H. H. Willard, L. L. Merritt, *Instrumental Methods of Analysis*, CBS Publishers, 7thedition, 2023.

3. A. J. Peacock, A. Calhoun, C. Hanser, *Polymer Chemistry: Properties and Application*, Verlag GmbH and Company KG, 2012.

4. C. Binns, *Introduction to Nanoscience and Nanotechnology*, Wiley, 2010.

5. Callister William.D., *Material Science and Engineering*, John Wiley, 2014.

6. Jurgen Garche, Tom Smolinka, *Electrochemical Power Sources- Fundamentals, Systems, and Applications*, Elsevier Science, Second edition, 2021.

v. COURSE PLAN

Module	Contents	Hours
I	**Electrochemistry:** Cell prototype- Daniel cell, Nernst equation and its uses, Primary and secondary electrodes- construction and working, applications of electrochemical series. Potentiometric titration – Acid Base titration, Fundamentals of corrosion, Galvanic series, Wetand dry corrosion – types, mechanism and its prevention. **Electrochemical power sources:** different types of cells, construction, working and applications– Dry cell, Electrolytic cells, Galvanic cells, Lead-acid cell, accumulator, Lithium ion cell- different electrode materials, Fuel cells, H_2-O_2 fuel cell.	**12**
II	**Basics of Spectroscopy**: Beer Lambert's law, Principles and applications of UV-Visible spectroscopy, Fluorescence and its applications, Woodward-Feiser rule, instrumentation of UV- Visible spectroscope, colorimetry, Principles and applications of IR spectroscopy, Number of vibrational modes – CO_2 and H_2O, Determination of force constant of diatomic molecules, Principles and applications of NMR spectroscopy, Shielding, Deshielding, Chemical shift, spin- spin splitting, MRI technique.	**12**

III	**Engineering Materials**: Basics of Polymer chemistry, Types of copolymers, Preparation, properties and applications- Butadiene Styrene, Acrylonitrile Butadiene Styrene, Kevlar,conducting polymers- Polyaniline and Polypyrrole - preparation properties and applications, Organic Light Emitting Diode **Nanomaterials**: Origin of nanomaterials, Classifications, Chemical synthesis- hydrolysis and reduction, Carbon Nano Tubes, Graphene, Quantum dots-applications. **Alloys and Composites:** Cast iron, Principal non-ferrous alloys, need, properties and applications of composites, super alloys, Ceramics- structure and applications.	**12**
IV	**Instrumental methods in chemistry:** Thermal methods, Thermo Gravimetric Analysis, Differential Thermal Analysis, Chromatography techniques- Thin Layer Chromatography, Column Chromatography, Gas Chromatography, High Performance Liquid Chromatography, Surface characterization using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy(XPS), Auger Electron Spectroscopy(AES).	**12**
V	**Green Chemistry and Sustainability:** Green chemistry – Principles, Matrices to express greenness- E-Factor, Atom Economy, Environmental Quotient, Green chemistry and Catalysis, R_4M_4 Models- Econoburette, Survismeter, E-waste disposal, Life Cycle Analysis, Benefits and limitations of conducting Life Cycle Analysis. **Water Technology:** Water characteristics, hardness, disadvantages of hard water, Estimation of hardness- EDTA method, Ion exchange process for water softening, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand, its estimation and significance, Municipal water treatment, disinfection of water, Reverse Osmosis, Sewage water treatment.	**12**
	Total Hours	**60**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10A	ENGINEERING GRAPHICS	ESC	2	0	2	0	3	2023

i. COURSE OVERVIEW

Aim of the course is to enable the student to effectively perform technical communication through graphical representation as per global standards. The student will be able to apply the principles of projection and will be introduced to the fundamentals of Computer Aided Drawing(CAD).

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Construct the orthographic projection of points and lines located in different quadrants.	Apply
CO 2	Prepare orthographic projection of solids by visualizing them in different positions.	Apply
CO 3	Prepare multiview projection and solid models of objects using CAD tools.	Apply
CO 4	Prepare assembly drawing of objects using CAD tools.	Apply
CO 5	Construct drawings of engineering systems.	Apply

iii. SYLLABUS

Introduction to engineering drawing: Basic principles of engineering drawing, Standards and conventions, types of lines, Introduction, planes of projection, projection of points in all the four quadrants. Projection of straight lines.

Orthographic projection of solids: Projection of regular solids. Introduction to section, development, isometric and perspective projection.

Introduction to Computer Aided Drawing: Introduction to drawing software, sketching of 2D simple geometries, editing and dimensioning of 2D geometries. 3D part development.

3D Assembly of Mechanical Components: Mechanical Joints and Couplings

Residential Building & Electrical Systems Drawing: Plan and elevation of simple buildings with dimensions, electrical drawings and circuit drawings.

iv(a)TEXTBOOKS

1. Bhatt N.D, Engineering Drawing, Charotar Publishing House Pvt. Ltd, 53rd Edition,

2. John K.C., Engineering Graphics, Prentice Hall India Publishers, 1st Edition, 2009.

3. C. M.Agrawal, BasantAgrawal, Engineering Graphics, Tata McGraw-Hill, 1stEdition,

(b) REFERENCES

1. G. S. Phull, H. S.Sandhu, Engineering Graphics, John Wiley & Sons IncPvt. Ltd, 1st Edition, 2014

2. P. I. Varghese, Engineering Graphics, V.I.P. Publishers,21st Edition, 2010.

3. Jolhe Dhananjay, Engineering Drawing with an Introduction to AutoCAD, (1e), McGraw Hill Education, 2017

v. COURSE PLAN

Module	Contents	Hours
I	**Introduction to engineering drawing:** Basic principles of engineering drawing, Standards and conventions, types of lines, Introduction, planes of projection, projection of points in all the four quadrants. Projection of straight lines inclined to one plane and inclined to both planes. Trace of line, inclination of lines with reference planes, true length of line inclined to both the reference planes	**12**
II	**Orthographic projection of solids:** Projection of simple solids such as triangular, rectangle, square, pentagonal and hexagonal prisms, pyramids, cone and cylinder. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes. Introduction to section, development, isometric and perspective projection	**12**
III	**Introduction to Computer Aided Drawing:** Role of CAD in design and development of new products, advantages of CAD. Creating two dimensional drawing with dimensions using suitable software Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software	**14**
IV	**3D Assembly of Mechanical Components:** Drawing of Cotter Joints, Knuckle Joint, Shaft couplings and Oldham's coupling	**12**

V	**Residential Building & Electrical Systems Drawing:** Drawing plan, section and elevation of single storied and two storied residential buildings with flat roof. Electrical Drawing layout for residential building. Circuit drawing and wiring drawing of simple systems.	**10**
	Total Hours	**60**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 60: 40

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Lab Work	:	20 marks
Total Continuous Assessment	:	**60 marks**
End Semester Examination	:	**40 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 40
- Exam Duration: 2 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10H	PROGRAMMING USING PYTHON	ESC	2	0	2	0	3	2023

i. COURSE OVERVIEW

The objective of the course is to introduce Python programming and develop programming skills to manage the development of software systems. It covers data processing in Python and introduces Machine Learning and Artificial Intelligence- based applications and tools, Data Science and Data Visualization applications.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Apply fundamental concepts, conditional and iterative statements in Python.	Apply
CO 2	Develop programs by utilizing user defined functions and Data structures in python	Apply
CO 3	Apply Object oriented concepts to develop programs in Python	Apply
CO 4	Implement programs in Python to process data stored in files by utilizing the modules NumPy, Matplotlib, and Pandas	Apply
CO 5	Develop Python Application using package Tkinter by utilizing database connectivity	Apply

iii. SYLLABUS

Basics of Python- Getting Started with Python Programming, Basic coding skills- Working with data types, Control statements, Selection structure, Iteration structure, Functions, Python data structures: Lists, Work with tuples, Sets, Dictionaries, Strings and lists, Object Oriented Programming: Design with classes, Exceptions, Visualization and File handling modules in python -NumPy, matplotlib, pandas.

iv(a)TEXTBOOKS

1. Kenneth A Lambert., Fundamentals of Python : First Programs, 2/e, Cengage Publishing, 2016

2. David J. Pine, Introduction to Python for Science and Engineering, CRC Press, 2021

(b) REFERENCES

1. Wes McKinney, Python for Data Analysis, 2/e, Shroff / O'Reilly Publishers, 2017

2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2/e, Schroff, 2016

3. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016

4. David M.Baezly, Python Essential Reference. Addison-Wesley Professional; 4/e, 2009.CharlesSeverance. Python for Informatics: Exploring Information.

v. COURSE PLAN

Module	Contents	Hours
I	**Basic coding skills** - Working with data types, Numeric data types and Character sets, Keywords, Variables and Assignment statement, Operators, Expressions, Working with numeric data, Type conversions, Comments in the program. Using built in functions and modules in math module. **Building Python Programs:** Control statements using break, continue and pass. Selection structure (if-else), Iteration structure (for, while).	6
	Programs on Conditional statements and Loops	6
II	**Functions:** Arguments and return values, Variable scopes and parameter passing, Named arguments, Main function, Working with recursion, Lambda functions. **Python data structures:** Lists - Basic List Operations and Methods, List of lists, Slicing, Searching and sorting list.	6
	Programs on functions, recursion and lists	6
III	**Work with tuples, Sets, Dictionaries** – Dictionary Methods, adding and removing keys, accessing and replacing values, traversing dictionaries. **Strings and lists** — String traversal and comparison with examples. **File handling:** The os and sys modules. Introduction to file I/O - Reading and writing text files, Manipulating binary files.	6

	Programs on tuples, dictionary, strings and files	6
IV	**Object Oriented Programming:** Design with classes - Objects and Classes, Methods, Instance Variables, Constructor, Accessors and Mutators. Structuring classes with Inheritance and Polymorphism. **Abstract Classes.** Exceptions - Handle a single exception, handle multiple exceptions.	6
	Programs on Object Oriented Programming concepts and exception handling.	6
V	**Packages**: NumPy - Basics, Creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers. Plotting and visualization. Matplotlib - Basic plot, Ticks, Labels, and Legends. Working with CSV files. – Pandas - Reading, Manipulating, and Processing Data. **Graphical User Interface**-tkinter fundamentals - Event Handling in tkinter, Exploring tkinter, Database Connectivity in Python.	6
	Programs on Python packages and Tkinter	6
	Total Hours	**60**

LIST OF EXPERIMENTS

1. CONDITIONAL STATEMENTS AND LOOPS

i. Write a Python program to check if a number is odd or even.
ii. Write a Python program to find the largest of three numbers.
iii. Write a Python program to check if a given year is leap year or not.
iv. Write a Python program to find the sum of n natural numbers.
v. Write a Python program to check if a number is Armstrong or not.
vi. Write a Python program to print first n terms Fibonacci series.

2. FUNCTIONS AND RECURSION

i. Write a Python program to find the product of N numbers.
ii. Write a Python program to find the second largest of N numbers.
iii. Write a Python program to implement linear search.
iv. Write a Python program to find the factorial of a number using recursion.
v. Write a Python program to find the sum of digits of a number using recursion.

3. LISTS

i. Write a Python program to swap the minimal and maximal elements of a given list of unique numbers.
ii. Write a Python program to implement binary search on a given list.
iii. Write a Python program to implement matrix multiplication.
iv. Given two positive integers m and n, m lines of n elements, giving an m x n matrix A, followed by an integer c, multiply every entry of the matrix by c and print the result.
v. Given two positive integers m and n, m lines of n elements, giving an m x n matrix A, find the maximum element along with its index position (i.e., row number and column number).

4. TUPLES AND DICTIONARY

i. Implement a simple menu driven Python program that stores student names and their corresponding total marks in a dictionary. Allow the user to add new students and marks, and provide an option to display the student with highest marks.

ii. Write a simple menu driven phonebook application in Python using a dictionary where the keys are names and the values are phone numbers. Implement functionalities to add a new contact, remove a contact, update a contact's number, and lookup a contact's number.

iii. Write a Python program that takes a string as input and counts the frequency of each letter (case insensitive) using a dictionary. Print the result in alphabetical order.

iv. Write a Python program that creates a tuple of student names and their corresponding scores. Then, print out the names of students who scored above 90.

v.Write a Python function that takes a list of integers and a target sum as input and returns a list of unique tuples where each tuple contains two integers from the input list that sum up to the target.

5. STRINGS AND FILES

i.Write a menu driven program to create, concatenate and print a string and accessing sub-string from a given string.

ii.Write a Python program to find the longest palindromic substring from a given sentence. Return the substring.

iii.Write a function in Python that counts the number of "Me" or "My" (in smaller case also) words present in a text file "STORY.TXT". If the "STORY.TXT" contents are as follows:

“My first book was Me and My Family. It gave me chance to be known to the world.”

iv.Write a function DISPLAYWORDS () in python to read lines from a text file STORY.TXT, and display those words, which are less than 4 characters in to another file “words.txt”. Create a dictionary with all words as key and their length is value.

6. OBJECT ORIENTED PROGRAMMING

i. Write a Python program which creates a class named 'Employee' having the following members: Name, Age, Phone number, Address, Salary. It also has a method named 'print- Salary()' which prints the salary of the Employee. Two classes 'Officer' and 'Manager' inherits the 'Employee' class. The 'Officer' and 'Manager' classes have data members 'spe-cialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an officer and a manager by making an object of both of these classes and print the same. (Exercise to understand inheritance).

ii. Write a Python program to create an abstract class named Shape that contains an empty method named numberOfSides(). Provide three classes named Rectangle, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the class- es contains only the method numberOfSides() that shows the number of sides in the given geometrical structures. (Exercise to understand polymorphism). **

7. PANDAS AND MATPLOTLIB

i. Implement a program to read data from existing CSV file ‘student.csv' with the columns (rno, name, ml, m2, m3) and then perform the following using Pandas and matplotlib library.

a) Read and display the first 10 rows of the CSV file.
b) Display the rno and name in the sorted order of name.
c) Add a new column total(m1+m2+m3) to the data frame.
d) Display rno, name and total marks of all the students in the descending order of total marks.
e) Find the highest and lowest mark in m2.
f) Plot the marks m3 against name

ii. Implement a program to read data from existing CSV file ‘Jobsearchdata.csv' and then perform the following using Pandas and matplotlib library.

a) Display the number of columns and rows of table.
b) Display the candiate details for each skillset.
c) Display the details of job seekers whose salary more than 25000
d) Display the candidate names and year of experience in the sorted order of name
e) Plot Distribution of people on preferred locations.

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 60: 40

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Lab Work	:	10 marks
Lab Exam	:	10 marka
Total Continuous Assessment	:	**60 marks**
End Semester Examination	:	**40 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 40
- Exam Duration: 2 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10Q	DIGITAL ELECTRONICS	BSC	3	0	0	0	3	2023

i. COURSE OVERVIEW

The goal of this course is to impart an understanding of the basic concepts of Boolean algebra and digital systems. This course covers the design and implementation of different types of practically used combinational and sequential circuits. This course helps the learners to develop application level digital logic circuits to solve real life problems.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems,perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers.	Understand
CO 2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates.	Apply
CO 3	Design combinational circuits - Adders, Code Converters, Encoders, Decoders, Multiplexer, Demultiplexer and design the Programmable Logic Devices -ROM and PLA.	Apply
CO 4	Design sequential circuits - Registers, Counters and Shift Registers.	Apply
CO 5	Illustrate algorithms to perform addition and subtraction on binary and BCD numbers.	Understand

iii. SYLLABUS

Number systems, Operations & Codes: Various Number systems - its arithmetic operation - Number Base Conversions- Representation of negative numbers-BCD Arithmetic.

Boolean Algebra: Postulates- Basic theorems and properties of Boolean Algebra-Boolean Functions-Simplification of Boolean Functions-Don't care Conditions-Digital Logic Gates

Combinational Logic circuits: Design procedure & Implementation of Binary Adders and Subtractors- BCD Adder-Code Converters-Decoder- Encoder-Mux – Demux

Sequential logic circuits: Flip-flops- Triggering of flip-flops- Master Slave flip- flops - Excitationtable and Characteristic Equation-Counter Design: Asynchronous & Synchronous Counters.

Shift registers: Shift register, Ring Counter- Johnson Counter
Arithmetic algorithms: Algorithms for arithmetic operations on Binary and BCD numbers.
Programmable Logic Devices: ROM-Implementation of PLA.

iv(a)TEXTBOOKS

1. M. Morris Mano, Digital Logic & Computer Design, 4/e, Pearson Education, 2013

2. Thomas L Floyd, Digital Fundamentals, 10/e, Pearson Education, 2009.

3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2007.

(b) REFERENCES

1. M. Morris Mano, Michael D Ciletti, Digital Design With An Introduction to the Verilog HDL, 5/e, Pearson Education, 2013.

2. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003.

v. COURSE PLAN

Module	Contents	Hours
I	**Number systems, Operations & Codes** Decimal, Binary, Octal and Hexadecimal Number Systems- Number Base Conversions. Addition, Subtraction, Multiplication and Divisionof binary numbers. Representation of negative numbers- Complements, Subtraction with complements. Addition and subtraction of BCD, Octal and Hexadecimal numbers.	9
II	**Boolean Algebra** Postulates of Boolean Algebra. Basic theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard forms.Simplification of Boolean Functions- Using Karnaugh- Map Method (upto five variables), Don't care conditions, Product of sums simplification, Digital Logic Gates- Implementation of Boolean functions using basic and universal gates.	9

III	**Combinational Logic Circuits** Design Procedure & Implementation of combinational logic circuits- Binary adders and subtractors, Binary Parallel adder, Carry lookahead adder, BCD adder, Code converter, Decoder, De multiplexer, Encoder, Multiplexer.	9
IV	**Sequential logic circuits** Flip-flops- SR, JK, T and D. Triggering of flip-flops- Master slave flip- flops, Excitation table and characteristic equation. Registers- register with parallel load. Counter design: Asynchronous counters- Binary and BCD counters, timing sequences	9
V	**Shift registers** Shift registers – Serial In Serial Out, Serial In Parallel Out,Bidirectional Shift Register with Parallel load. Ring counter. Johnsoncounter- timing sequences and state diagrams. **Arithmetic algorithms** Algorithms for addition and subtraction of binary numbers in signed magnitude and 2's complement representations. Algorithm for addition and subtraction of BCD numbers. **Programmable Logic devices** ROM. Programmable Logic Array (PLA)- Implementation of simple circuits using PLA.	9
	Total Hours	**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23HSJ1NB	PROFESSIONAL COMMUNICATION	HSC	2	0	0	2	1	2023

i. COURSE OVERVIEW

The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators. The course aims to enhance the employability and career Skills of students and orient the students towards grooming as a professional.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Demonstrate effective communication skills relevant to Engineering through writing and making presentations	Create
CO 2	Analyze a variety of textual and audio content for specific needs.	Analyze
CO 3	Evaluate a given technical/non-technical topic.	Analyze
CO 4	Create professional and technical documents.	Create
CO 5	Communicate proficiently in interviews and exam situations and all social situations.	Apply

iii. SYLLABUS

Communication Skills: Introducing yourself and others professionally, elevator pitch, recommendation letter, e-mails, netiquettes, telephone etiquettes, demi-official letters.
Business Communication and Technical writing: Product description, narrating an incident, report writing, agenda and minutes, memo, Asking for information and giving information, explaining processes and products, giving instructions, planning a course of action.
Creative Thinking, Critical Thinking Skills and problem solving: Expressing opinion, GD, Arguing, Reading critical texts (general and academic) and summarizing, listening and responding, Negotiation strategies and decision-making skills.
Presentation Skills: Oral Presentation Skills (Proposal presentation), Power point

presentation (Projects).

Interviews: CVs and Resumes, LinkedIn, Job application, Types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online interviews, one-to-one interview & panel interview, FAQs related to job interviews.

iv(a)TEXTBOOKS

1. Meenakshi Raman and Sangeetha Sharma (2018)."Professional Communication", 3rd Edition, Oxford University Press, 2018

2. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice", 2nd Edition, Oxford University Press, 2011

3. M. Ashraf Rizvi, "Effective Technical Communication". New Delhi: TataMcGrawHill Publications, 2007.

(b) REFERENCES

1. English for Engineers and Technologists (Combined edition, Vol.1and 2, Orient Blackswan 2010.

2. Stephen E. Lucas, "The art of Public Speaking", 10thEdition; McGraw Hill Education, 2012.

3. William Strunk Jr.& Bobwhite, "The Elements of Style",4th Edition, Pearson, 1999.

4. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.

5. Goodheart-Willcox, "Professional Communication", First Edition, 2017.

6. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 editions,2015.

7. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.

8. Anand Ganguly, "Success in Interview", RPH,5th Edition,2016.

9. Raman Sharma, "Technical Communications", Oxford Publication, London, 2024

v. COURSE PLAN

Module	Contents	Hours
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures **Non-verbal Communication and Body Language:** Forms of nonverbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language **Technical Writing:** Differences between technical and literary style, Elements of style; Common Errors. **Letter Writing:** Formal, informal and demi-official letters; business letters, Netiquettes: Effective mail messages	8
II	Need for Creativity in the 21stcentury, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of Creativity Critical thinking vs. Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem-solving, Problem-Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and Quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.	12
III	Reading, Comprehension, and Summarizing: Reading styles, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers. Listening Skills: Active and Passive listening, listening for general content, to fill up information, intensive listening, for specific information, to answer, and to understand. Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, Talks on engineering/technology, listening to documentaries and making notes, TED talks. Telephone etiquettes.	10
IV	Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively. Mirroring, Elevator Pitch Introducing Oneself -one's career goals	15
V	Formal writing and interview skills: Technical Writing: Differences between technical and literary style. Letter Writing (formal, informal and semi formal), Job applications, Minute preparation, CV preparation (differences between Bio-Data, CV and Resume), and LinkedIn profile. Statements of Purpose, Instructions, Checklists. Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online interviews	15
	Total Hours	**60**

vi) Lab Activities

1. Activity: SWOT analysis
2. Activity: Creating LinkedIn profile, preparing CV, mock interview
3. Activity: Reading a technical paper and summarizing
4. Activity: Interpret data in tables and graphs
5. Activity: Writing a report
6. Activity: Oral presentation on the given topic using appropriate non-verbal cues
7. Case Analysis of a challenging scenario
8. Problem solving using mind map/six thinking hats

vii . ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 100: 0

Continuous Assessment		
Attendance	:	5 marks
Regular Assessment		
Project Report Writing	:	10 marks
Technical presentation through PPT	:	10 marks
Listening Test	:	10 marks
Group discussion/mock job interview	:	10 marks
LinkedIn submission	:	5 marks
Case Study	:	20 marks
Project	:	30 marks
Total Continuous Assessment	:	**100 marks**
TOTAL	:	**100 marks**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23CYP10A	ENGINEERING CHEMISTRY LAB	BSC	0	0	2	0	1	2023

i. COURSE OVERVIEW

This course is designed to familiarize with the basic experiments in industrial chemistry and to accustom the students with the handling and analyzing chemicals and standard laboratory equipments.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Use volumetric titration techniques for quantitative analysis of water.	Apply
CO 2	Use spectroscopic techniques for analyzing and interpreting the IR spectraand NMR spectra of some organic compounds.	Apply
CO 3	Use instrumental techniques forquantitative chemical analysis.	Apply
CO 4	Organize scientific experiments as ateam to analyze the results of such experiments.	Analyze
CO 5	Interpret experimental data by themselves to apply them to real worldproblems.	Analyze

iii. SYLLABUS

1. Estimation of total hardness of water by EDTA method.
2. Analysis of IR and ^{1}H NMR spectra of organic compounds.
3. Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} insolution.
4. Determination of molar absorptivity of a compound.
5. Estimation of chloride in water by argentometric method.
6. Calibration of pH meter and determination of pH of a solution.

7. Potentiometric titration: Acid – base titration
8. Estimation of dissolved oxygen in water by Winkler's method.

iv. REFERENCES

1. R. K. Mohapatra, *Engineering Chemistry with Laboratory Experiments*, 2015, Firstedition, PHI Learning, New Delhi.

2. S. C. George, R. Jose, Lab *Manual of Engineering Chemistry*, 2019, First edition, S.Chand & Company Pvt Ltd, New Delhi.

3. E. Slowinski, W. C. Wolsey, *Chemical Principles in the Laboratory*, **2008,** Cengage Learning, 11th edition, New Delhi.

v. ASSESSMENT PATTERN

Continuous Assessment		
Attendance	:	5 marks
Assessment of Lab Work	:	55 marks
Continuous Assessment in Lab (Lab work + Record + Viva - voce) -40 marks and Internal Lab test -15 marks		
Total Continuous Assessment	**:**	**60 marks**
Final Lab Assessment	**:**	**40 marks**
TOTAL	**:**	**100 marks**

vi. FINAL ASSESSMENT (WRITTEN EXAMINATION)

- Maximum Marks: 40
- Test Duration: 1 hour

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10P	MANUFACTURING AND CONSTRUCTION PRACTICES-B	ESC	1	0	2	0	2	2023

i. COURSE OVERVIEW

- This subject is for exposing the students to the various theoretical and practical aspects of manufacturing processes and familiarizing various tools, measuring devices, practices and machines used in the workshop section.
- The goal of this course is to introduce the students to the field of Civil Engineering and its importance in the development of the Country. The course is designed to have lecture sessions on an introduction to the various fields of Civil Engineering and different aspects of construction. The workshop session will provide hands-on experience in certain construction-related activities including surveying and levelling.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain the basic manufacturing, metal joining and machining processes.	Understand
CO 2	Demonstrate general safety precautions in different mechanical workshop trades.	Understand
CO 3	Prepare simple models using fitting, carpentry, sheet metal, welding and 3D printing techniques.	Apply
CO 4	Identify the tools and equipment used in fitting, carpentry, sheet metal, welding and various machine tools.	Apply
CO 5	Explain the various disciplines of Civil Engineering and its relevance in the development of the nation.	Understand
CO 6	Explain the different structural elements of a building and the building rules and regulations.	Understand
CO 7	Apply engineering principles and tools to set-out a plan, estimate the area and profile of plots, and construct masonry walls.	Apply
CO 8	Examine the quality of different building blocks.	Apply
CO 9	Make use of plumbing tools to install fixtures like tap, T-Joint, elbow, bend etc.	Apply

iii. SYLLABUS

Introduction to Workshop practice: Workshop practice, shop floor precautions, ethics and First Aid knowledge. Studies of mechanical tools, components and their applications: Tools: Screw drivers, spanners, Allen keys, cutting pliers etc. and Accessories.

Sheet Metal–Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion. Welding– Elementary ideas of joining process-welding, soldering and brazing. Fitting– Study of tools, Practice in filing, cutting. Male and female joints. Carpentry– Study of tools and joints. Practice in planning, chiseling, marking and sawing.

Machine Tools (Basic elements, Working principle and types of operations), Lathe, Drilling Machine, Shaper, planer, slotter, Milling Machine, Grinding machine Machining processes: turning, taper turning, thread cutting, shaping, drilling, grinding, milling. Introduction to CNC and 3D Printing.

General Introduction to Civil Engineering: Relevance of Civil Engineering in the development of the nation. Brief introduction to major disciplines of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management, GIS.

Structural elements of a building: Foundation, plinth, lintel, masonry wall, column, beam, slab, sunshade, parapet, staircase. Plinth area, built up area, carpet area, floor area ratio. Permission plan of a building – Demonstration. Building rules and regulations: NBC, KBR & CRZ norms.

Surveying: Principles, instruments used. Levelling: Principles of levelling using dumpy level - simple levelling, differential levelling. Demonstration of Total Station. Brick masonry – Types of bonds, Masonry arches, number of bricks for construction, other types of building blocks. Construction materials – cement, mortar, concrete. Plumbing tools. Types of roofs, Flooring materials.

iv(a)TEXTBOOKS

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual) ISBN: 978-93-91505-332.

2. 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.

3. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th Edition, Pearson Education India Edition, 2002.

4. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, 1st Edition, 2003, Laxmi Publications.

5. Rangwala, Essentials of Civil Engineering, 1st Edition, 2012, Charotar Publishing House.

6. Mamlouk M. S. and Zaniewski J. P., Materials for Civil and Construction Engineering, Pearson Publishers, 4th Edition, 2017.

7. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying – Volume I, 17th Edition, 2016, Laxmi Publications.

(b) REFERENCES

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education,2008.

2. Roy A. Lindberg, Processes and Materials of Manufacture, 4th Edition, Prentice Hall India,1998.

3. Rao P.N., Manufacturing Technology, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

4. W. B. McKay, Building Construction- Volumes 1 to 4, 4th /5th Edition, 2013, Pearson Education India.

5. W.F. Chen and J.Y. Richard Liew (Eds.), The Civil Engineering Handbook, 2nd Edition, 2002, CRC Press (Taylor and Francis).

6. Kerala Municipality Building Rules, 2019, Local Self Government (RD) Department, Government of Kerala.

7. Kerala Panchayat Building Rules, 2019, Local Self Government (RD) Department, Government of Kerala.

8. SP 7: 2016, National Building Code of India 2016 (NBC 2016), Bureau of Indian Standards, New Delhi, 2016.

9. Coastal Regulation Zone Rules (CRZ rules), 2019, Ministry of Environment, Forest, and Climate Change (MoEFCC), Government of India.

v. COURSE PLAN

Module	Contents	Hours

I	Introduction to Workshop practice: Workshop practice, shop floor precautions, ethics and First Aid knowledge. Studies of mechanical tools, components and their applications: Tools: Screw drivers, spanners, Allen keys, cutting pliers etc. and Accessories.	2
II	Sheet Metal–Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion. Welding– Elementary ideas of joining process-welding, soldering and brazing. Fitting– Study of tools, Practice in filing, cutting. Male and female joints. Carpentry– Study of tools and joints. Practice in planning, chiseling, marking and sawing.	2
III	Machine Tools (Basic elements, working principle and types of operations), Lathe, Drilling Machine, Shaper, planer, slotter, Milling Machine, Grinding machine Machining processes: turning, taper turning, thread cutting, shaping, drilling, grinding, milling. Introduction to CNC and 3D Printing.	3
IV	General Introduction to Civil Engineering: Relevance of Civil Engineering in the development of the nation. Brief introduction to major disciplines of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management, GIS.	2
V	Structural elements of a building: Foundation, plinth, lintel, masonry wall, column, beam, slab, sunshade, parapet, staircase. Plinth area, built up area, carpet area, floor area ratio. Permission plan of a building – Demonstration. Building rules and regulations: NBC, KBR & CRZ norms.	2
VI	Surveying: Principles, instruments used. Levelling: Principles of levelling using dumpy level - simple levelling, differential levelling. Demonstration of Total Station. Brick masonry – Types of bonds, Masonry arches, number of bricks for construction, other types of building blocks. Construction materials – cement, mortar, concrete. Plumbing tools. Types of roofs, Flooring materials.	4
	Total Hours	**15**

LAB EXPERIMENTS

Cycle No. or Exp. No.	Experiment	No. of hours
1	Machine shop	1
2	Fitting shop	1
3	Carpentry	1
4	Welding shop (Arc welding + Gas welding)	1
5	Sheet Metal	1
6	CNC	1
7	3D Printing	1

8	Compute area of a given plot using tape, EDM etc.	1
9	Levelling – Plot the longitudinal section of a road.	1
10	Setting out of a building: Set out a building as per the given building plan. Each group can set out one or two rooms of the building.	1
11	Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) – corner portion – length of side walls 60 cm.	1
12	Cast paver blocks using mortar and test for strength (Include sustainable materials also).	1
13	Tests for strength of various types of building blocks.	1
14	Study on plumbing and install plumbing fixtures like Tap, T-Joint, Elbow, Bend, Threading etc.	1
15	Plan a rainwater harvesting system.	1
	Total Hours	**15**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 60: 40

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	10 marks
Assessment through Tests	:	20 marks
Lab Work	:	25 marks
Total Continuous Assessment	:	**60 marks**
End Semester Examination	:	**40 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02 (CAT 1 Manufacturing Practices and CAT 2 Construction Practices, or vice versa)
- Maximum Marks: 20
- Test Duration: 1 hour
- Topics: 3 modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 40 (20 marks for Construction Practices, 20 Marks for Manufacturing Practices)
- Exam Duration: 1 hour