CURRICULUM
2023
(Autonomous)
Version 1.0

B. TECH
ELECTRONICS AND COMMUNICATION ENGINEERING

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

Mar Ivanios Vidyanagar, Nalanchira, Thiruvananthapuram – 695 015

June 2023

CURRICULUM and SYLLABI

FOR

B. TECH DEGREE PROGRAMME

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTERS 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 ELECTRONICS AND COMMUNICATION ENGINEERING

B. TECH DEGREE PROGRAMME

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM and SYLLABI
for
SEMESTERS I & II

Items	Board of Studies (BoS)	Academic Council (AC)
Date of Approval	11.07.2023	09.08.2023
	04-04-2024	19.06.2024

Sd/-

Head of Department
Chairman, Board of Studies

Sd/-

Principal
Chairman, Academic Council

MAR BASELIOS COLLEGE OF ENGINEE RING 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 ELECTRONICS AND COMMUNICATION ENGINEERING

Vision and Mission of the Department

Vision:

To be a Centre of Excellence in Electronics and Communication Engineering Education and Research for the service of humanity.

Mission:

To provide quality Engineering Education and to carry out Research in the field of Electronics and Communication Engineering addressing the challenges faced by thesociety.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: The graduates of the Programme will have a successful career as Professionals in Industry or as Entrepreneurs, encompassing a broad spectrum of areas related to Electronics and Communication Engineering.

PEO2: They will be able to adapt to the changing needs of Industry and Academia through continuous learning and professional upgrading.

PEO3: They will exhibit social responsibility in their pursuit of technical excellence.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will have the ability 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 engineering problems 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 health and 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 modeling 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 engagein independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Design Electronic Circuits and Systems for Communication, Monitoring and Control Applications.

PSO2: Demonstrate the knowledge, in Electronics, Signal processing, Embedded Systems andCommunication Engineering, required for providing technical solutions to real world problems

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.TECH. PROGRAMME IN ELECTRONICS AND COMMUNICATION ENGINEERING

For the students admitted from 2023-24

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 table below. 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	Total credits
1	Humanities and Social Sciences including Management Courses	HSC	**9**
2	Basic Science Courses	BSC	**26**
3	Engineering Science Courses	ESC	**21**
4	Programme Core Courses	PCC	**72**
5	Programme Elective Courses	PEC	**18**
6	Institute Elective Courses	IEC	**6**
7	Project Work, Seminar, Comprehensive Course Viva Voce and Internship	PWS	**15**
8	Mandatory Student Activities (P/F)	MSA	**3**
	Total Mandatory Credits		**170**
	Value Added Courses (Optional) – Honours/Minor	VAC	15

ii) Semester-wise Credit Distribution

Semester	***I***	***II***	***III***	***IV***	***V***	***VI***	***VII***	***VIII***	***Total***
Credits for Courses	***19***	***22***	***23***	***21***	***22***	***22***	***24***	***14***	***167***
Credits for Activities		***3***							***3***
	Total Credits								***170***
	Value Added Courses (Optional) – Honours / Minor								***15***
	Total Credits								***185***

SEMESTER I										
Slot	Category	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	23ESB10D	Problem Solving and 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**

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

SEMESTER II										
Slot	Category	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	23ESB10G	Python Programming	2	0	2	0	4	4	3
E	PCC	23ECL10A	Network Theory	3	1	0	0	5	4	4
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								**31.5**	**29**	**22**

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

SEMESTER III										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	BSC	23MAL20A	Partial Differential Equations and Complex Analysis	3	1	0	0	5	4	4
B	PCC	23ECL20A	Analog Circuits	3	1	0	0	5	4	4
C	PCC	23ECL20B	Solid State Devices	3	1	0	0	5	4	4
D	PCC	23ECJ20C	Logic Circuit Design	2	1	0	1	4.5	4	4
E	ESC	23ESL00A	Design Engineering	2	0	0	0	3	2	2
G	HSC	23HSL2NA	Professional Ethics	2	0	0	0	3	2	1*
S	PCC	23ECP20A	Analog Circuits Lab	0	0	3	0	1.5	3	2
T	PCC	23ECP20B	Logic Circuit Design Lab	0	0	3	0	1.5	3	2
M	VAC	23ECL2MX	Minor Course	3	0	0	0	4.5	3	3
				2	1	0	0	3.5		
TOTAL								**28.5/ 33/32**	**26/ 29**	**23/ 26**

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

SEMESTER IV										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	BSC	23MAL20C	Probability, Random Processes and Numerical Methods	3	1	0	0	5	4	4
B	PCC	23ECL20D	Linear Integrated Circuits	3	1	0	0	5	4	4
C	PCC	23ECL20E	Signals and Systems	3	1	0	0	5	4	4
D	PCC	23ECJ20F	Microcontroller based system design	3	0	2	1	6.5	6	5
E	HSC	23HSL2NB	Universal Human Values-II	2	1	0	0	3.5	3	1*
G	ESC	23ESL2NC	Industrial Safety Engineering	2	1	0	0	3.5	3	1*
S	PCC	23ECP20C	Linear Integrated Circuits Lab	0	0	3	0	1.5	3	2
M/H	VAC	23ECL2MX / 23ECL2HX	Minor / Honours Course	3	0	0	0	4.5	3	3
				2	1	0	0	3.5		
TOTAL								**30/3 4.5/ 33.5**	**27/ 30/ 33**	**21/ 24/ 27**

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

SEMESTER V										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	PCC	23ECL30A	Analog and Digital Communication	3	1	0	0	5	4	4
B	PCC	23ECL30B	Digital Signal Processing	3	1	0	0	5	4	4
C	PCC	23ECL30C	Electromagnetic Field Theory	3	1	0	0	5	4	4
D	PEC	23ECL31X	Program Elective I	3	0	0	0	4.5	3	3
E	HSC	23HSL00A	Management for Engineers	3	0	0	0	4.5	3	3
S	PCC	23ECP30A	Communication Lab	0	0	3	0	1.5	3	2
T	PCC	23ECP30B	Digital Signal Processing Lab	0	0	3	0	1.5	3	2
M/H	VAC	23ECL3MX / 23ECL3HX	Minor/Honours Course	3	0	0	0	4.5	3	3
				2	1	0	0	3.5		
TOTAL								**27/ 31.5 /30.5**	**24/ 27/ 30**	**22/25/ 28**

SEMESTER VI										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	PCC	23ECL30D	Control Systems	3	1	0	0	5	4	4
B	PCC	23ECJ30E	VLSI Circuit Design	3	1	2	0	6	6	5
D	PEC	23ECL32X	Program Elective II	3	0	0	0	4.5	3	3
E	IEC	23IEL31X	Institute Elective I	3	0	0	0	4.5	3	3
F	HSC	23HSL30A	Business Economics and Accountancy	3	0	0	0	4.5	3	3
T	PWS	23ECS38A	Seminar	0	0	4	0	2	4	2
U	PWS	23ECJ38B	Mini Project	0	0	3	0	1.5	3	2
M/H	VAC	23ECL3MX / 23ECL3HX	Minor/Honours Course	3	0	0	0	4.5	3	3
				2	1	0	0	3.5		
TOTAL								**28 /32.5 /31.5**	**26/ 29/ 32**	**22/2 5/ 28**

SEMESTER VII										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	PCC	23ECL40A	Information Theory and Coding	3	1	0	0	5	4	4
B	PCC	23ECL40B	Wireless Communication	3	0	0	0	4.5	3	3
C	PCC	23ECL40C	Computer Networks	3	0	0	0	4.5	3	3
D	PEC	23ECL43X	Program Elective III	3	0	0	0	4.5	3	3
E	IEC	23IEL42X	Institute Elective II	3	0	0	0	4.5	3	3
T	PWS	23ECV48A	Comprehensive Course Viva	0	0	2	0	1	2	1
U	PWS	23ECJ48A	Project	0	0	10	0	5	10	5
		23ECI48A	Internship*							
S	PCC	23ECP40A	Advanced Communication Lab	0	0	3	0	1.5	3	2
M/H	VAC	23ECL4MX / 23ECL4HX	Minor/Honours Course	0	1	6	0	4.5	3	3
				3	0	0	0	4.5		
TOTAL								**35.5/ 40/40**	**31/34 /37**	**24/ 27/ 30**

** Students can opt for Internship either in S7 or S8. However, in S7, the internship can be permitted only if there are no pending Programme/Course requirements in the semester, that need to be completed in College in the offline mode, such as laboratory sessions.*

SEMESTER VIII										
Slot	**Category**	**Course Code**	**Courses**	**Credit Structure**				**SS**	**Hours**	**Credit**
				L	**T**	**P**	**J**			
A	PEC	23ECL44X	Program Elective IV	3	0	0	0	4.5	3	3
B	PEC	23ECL45X	Program Elective V	3	0	0	0	4.5	3	3
C	PEC	23ECL46X	Program Elective VI	3	0	0	0	4.5	3	3
U	PWS	23ECJ48B	Project	0	0	10	0	5	10	5
		23ECI48B	Internship*							
H	VAC	23ECL4HX	Honours Course					3	6	3
TOTAL								**18.5 / 21.5**	**25/31**	**14/17**

MINOR BASKETS

Semester	BASKET I EMBEDDED SYSTEMS AND APPLICATIONS				BASKET II MULTIDIMENSIONAL DATA PROCESSING			
	Course Code	**Course**	**L-T-P-J**	**Credit**	**Course Code**	**Course**	**L-T-P-J**	**Credit**
S3	23ECL2 MA	Electronic Circuits	2-1-0-0	3	23ECL2 MC	Introduction to Multidimensional Data	2-1-0-0	3
S4	23ECL2 MB	Microcontrollers	2-1-0-0	3	23ECL2 MD	Machine Learning for data processing	2-1-0-0	3
S5	23ECL3 MA	Embedded System Design	3-0-0-0	3	23ECL3 MC	Deep Learning	2-1-0-0	3
S6	23ECL3 MB	Design for IoT	3-0-0-0	3	23ECL3 MD	Computational tools for AI	2-1-0-0	3
S7	23ECJ4 MA	Mini Project	0-0-6-0	3	23ECJ4 MB	Mini Project	0-0-6-0	3
S8	23ECJ4 MA	Mini Project	0-0-6-0	3	23ECJ4 MB	Mini Project	0-0-6-0	3

MINOR BASKETS (cont…)

Semester	BASKET III ROBOTICS				BASKET IV BIOMEDICAL ENGINEERING			
	Course Code	Course	L-T-P-J	Credit	Course Code	Course	L-T-P-J	Credit
S3	23ECL2 ME	Fundamentals of Robotics	3-0-0-0	3	23ECL2 MG	Fundamentals of Biomedical E ngineering	3-0-0-0	3
S4	23ECL2 MF	Introduction to Industrial Automation	2-1-0-0	3	23ECL2 MH	Assistive Technologies	3-0-0-0	3
S5	23ECL3 ME	Vision System	3-0-0-0	3	23ECL3 MG	Medical Devices Engineering	3-0-0-0	3
S6	23ECL3 MF	Artificial Intelligence for Robotics	3-0-0-0	3	23ECL3 MH	Bio Signal and Image Processing	3-0-0-0	3
S7	23ECJ4 MC	Mini Project	0-0-6-0	3	23ECJ4 MD	Mini Project	0-0-6-0	3
S8	23ECJ4 MC	Mini Project	0-0-6-0	3	23ECJ4 MD	Mini Project	0-0-6-0	3

HONOURS BASKETS

Semester	GROUP I VLSI AND EMBEDDED SYSTEMS				GROUP II COMMUNICATION				GROUP III SIGNAL PROCESSING			
	Course Code	Course	L-T-P-J	Credit	Course Code	Course	L-T-P-J	Credit	Course Code	Course	L-T-P-J	Credit
S4	23ECL 2HB	Nanoelectronics	3-0-0-0	3	23ECL 2HD	Random Process and Applications	2-1-0-0	3	23ECL 2HF	Wavelet Transform and Applications	2-1-0-0	3
S5	23ECL 3HA	FPGA based System Design	3-0-0-0	3	23ECL 3HC	Detection and Estimation Theory	3-0-0-0	3	23ECL 3HE	DSP System Design	3-0-0-0	3
S6	23ECL 3HB	Electronics Design and Automation	3-0-0-0	3	23ECL 3HD	Design and Analysis of Antennas	3-0-0-0	3	23ECL 3HF	Multirate Signal Processing	2-1-0-0	3
S7	23ECL 4HA	RF MEMS	3-0-0-0	3	23ECL 4HB	MIMO and Multiuser Communication Systems	3-0-0-0	3	23ECL 4HC	Computational tools for Signal Processing	2-1-0-0	3
S8	23ECJ 4HA	Mini Project	0-0-6-0	3	23ECJ 4HB	Mini Project	0-0-6-0	3	23ECJ 4HC	Mini Project	0-0-6-0	3

SEMESTER I

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 and analyzing 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 using multiple integrals.	Apply
CO 4	Identify the convergence or divergence of an infinite series.	Apply
CO 5	Determine the Taylor and Fourier series expansion of functions 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) TEXT BOOKS

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, 9th Edition, Pearson, Reprint, 2002.
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage,7th Edition 2012.

v. COURSE PLAN

Modules	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,	**12**

	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).	
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 and offer 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 using principles of optics	Understand
CO 3	Generalise the principles of quantum mechanics to explain the behaviour of matter in the atomic and subatomic level	Understand
CO 4	Describe the fundamentals of lasers and the principles behind various solid state lighting devices and fibre optic communication system.	Understand
CO 5	Explain the fundamental ideas of Ultrasonics and facilitate technological advancement.	Understand

iii. SYLLABUS

Oscillations and Waves: Harmonic oscillations – Damped harmonic oscillations, Forced harmonic oscillations, Q- factor, Amplitude resonance, comparison of electrical and mechanical 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 Fraunhofer diffraction, 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

Schrodinger wave 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, Applications of 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) TEXT BOOKS

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 publishing, 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

Modules	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 electrons inside 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 - nano sheets, 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
23ESB10D	PROBLEM SOLVING AND 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 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

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

iv (a) TEXT BOOKS

1. Byron Gottfried, Programming with C (Schaum's Outlines Series), Mcgraw Hill 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, Sartaj Sahini, Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, 2008.

(b) REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, C Programming Language, Pearson, 2nd Edition, 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, 1st Edition, 2013.

v. COURSE PLAN

Modules	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, -Algorithms, flow charts, examples.	**8**
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 and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence. **Control Flow Statements:** If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For	**9**

	Loop, Break and Continue statements.	
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, and Initialization of Two-dimensional Arrays. **String processing:** In built string handling functions Simple programs covering arrays and strings.	**9**
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, Array of structures	**9**
V	**Pointers:** Pointer variables. Declaring and dereferencing pointer variables. Accessing arrays through pointers. **File Operations**: open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind (), fseek (), ftell (), feof (), fread (), fwrite ()), simple programs.	**10**
Total Hours		**45**

C PROGRAMMING LAB

No	Experiment	Hours
1	**Familiarization of console I/O and operators in C** • Display "Hello world " • Read two numbers, add them and display their sum • Read the radius of a circle, calculate its area and display it • Area of triangle after reading its sides	**3**
2	**Familiarization of conditional statements in C** • Read 3 integer values and find largest of three numbers. • Check whether given year is leap year or not • Display the grade of a student after reading his mark for a subject. (Use switch)	**3**
3	**Familiarization of looping statements in C** • Read a Natural Number and check whether the number is prime or not • Read a Natural Number and check whether the number is Armstrong or not	**3**
4	**Familiarization of Array in C** • Display second largest number after reading n numbers from user. (Without array). • Read n integers, store them in an array and find their sum and average	**3**
5	**Implementation of Algorithms using array in C**	**3**

	• Implementation of Linear Search • Implementation of Bubble Sort algorithm	
6	**Familiarization of 2D Array in C** • Write a program for performing matrix addition, multiplication and finding the transpose. • Display sum of diagonal elements of a matrix	**3**
7	**Familiarization of Strings in C** • Read a string (word), store it in an array and check whether it is a palindrome word or not. • Read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it.	**3**
8	**Familiarization of Functions in C** • Display first n prime numbers using Function. • Program to find the sum of digits of a number using recursion	**3**
9	**Familiarization of Structure in C** • Using structure, read and print data of n employees (Name, Employee Id and Salary) • 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)	**3**

10	**Familiarization of Pointers and files in C**
	• Input and Print the sum of elements of an array using pointers
	• Create a file and perform the following
	  • Write data to the file
	  • Read the data in a given file & display the file content on console
		3

	Total Hours	**30**

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	2	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.

Alternating Current fundamentals: Basic definitions, Average, RMS values, AC Circuits, Phasor representation, Analysis of simple AC circuits (R, L, C, RL, RC, RLC Series circuits)

Three phase AC systems, Generation of three phase voltages, star and delta connections. C Motors-Constructional details of DC machines, Principle of operation, Back EMF, Torque equation, Types, Performance characteristics, Applications

iv (a) TEXT BOOKS

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

Modules	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.	**9**

	Analysis of AC Circuits: Phasor representation of sinusoidal quantities, Complex forms, Purely resistive, inductive and capacitive circuits; Analysis 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	2	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) TEXT BOOKS

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

Modules	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	**10**

	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	
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.	Apply
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	Summarise 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) TEXT BOOKS

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

(b) REFERENCES

1. Suresh K.Dhameja, Environmental Engineering and Management, S.K. Kataria & Sons, 2013.
2. Bradley Striebig, Adebayo A. Ogundipe and Maria Papadakis, Engineering Applications in Sustainable Design and Development, 2015.

v. COURSE PLAN

Modules	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
Assessment through Tests	:	30 marks
Course based tasks		
i. Mini Project	:	30 marks
ii. Case Study	:	20 marks
Total Continuous Assessment	:	**100 marks**
TOTAL	:	**100marks**

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, 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 : Final Assessment – 60 : 40

Continuous Assessment		
Attendance	:	5 marks
Continuous Assessment in Lab(Lab work + Evaluation + Viva - voce)	:	55 marks
Total Continuous Assessment	:	**60 marks**
Final Assessment	:	**40 marks**
TOTAL	:	**100 marks**

vi. FINAL ASSESSMENT (Written Examination)

- Maximum Marks : 40
- Exam 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 byperforming 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

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.

Familiarization of electronic equipment and commonly used tools, Familiarization and testing of electronic components, Interconnection using bread board, Diode Characteristics,

Single stage RC coupled Amplifier, Truth table verification of Lgic Gates, Soldering Practice, DC Power Supply, 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 basicfirst 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 itscharacteristics.	**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 inelectrical 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 : Final Assessment – 60 : 40

Continuous Assessment		
Attendance	:	5 marks
Continuous Assessment in Lab(Lab work + Evaluation + Viva - voce)	:	55 marks
Total Continuous Assessment	:	**60 marks**
Final Assessment	:	**40 marks**
TOTAL	:	**100 marks**

vi. FINAL ASSESSMENT (Written Examination)

- Maximum Marks : 40
- Exam 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) TEXT BOOKS

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. 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, 4th Edition, 2018.

v. COURSE PLAN

Modules	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	**12**

	(without proof) and its applications to finding line integrals of vector fields and work done.	
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}, $sinax$, $cosax$, $e^{kx}sinax$, $e^{kx}\cos ax$ 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 Engineering problems.	Apply
CO 2	Apply the basic concepts of UV-Visible, IR and NMR spectroscopic techniques 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 separation of 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, Wet and 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, H2-O2 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, R4M4 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) TEXT BOOKS

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

Modules	Contents	Hours
I	**Electrochemistry:** Cell prototype- Daniel cell, Nernst equation - Derivation and its uses, Primary and secondary electrodes- SHE, Saturated Calomel Electrode, Glass Electrode- construction and working, applications of electrochemical series. Potentiometric titration – Acid Base titration - Principle, Fundamentals of corrosion, Galvanic series, Wet and 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**
	Basics of Spectroscopy: Beer Lambert's law, Numericals, Principles and applications of UV-Visible spectroscopy, Fluorescence and its applications, Woodward-Feiser rule and its application to molecules, instrumentation of UV- Visible spectroscope, colorimetry, Principles and applications of IR spectroscopy, Vibrational modes of linear and non-linear molecules,	**12**

II	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, Application to molecules, MRI technique- Principle and instrumentation.	
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 – Principle and working. **Nanomaterials**: Origin of nanomaterials, Classifications based on dimensions and materials, Chemical methods of synthesis- hydrolysis and reduction, Carbon Nano Tubes, Graphene, and Quantum dots-applications. **Alloys and Composites:** Cast iron, Principal non-ferrous alloys- Properties and applications, properties and applications of composites, super alloys, Ceramics- structure and applications.	**12**
IV	**Instrumental methods in chemistry:** Thermal methods, Principle, instrumentation and applications- Thermo Gravimetric Analysis, Differential Thermal Analysis. Chromatography techniques- Principles of Thin Layer Chromatography, Column Chromatography, Principle, instrumentation and applications - Gas Chromatography, High Performance Liquid Chromatography. Surface characterization using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES) – Principle, Instrumentation and working.	**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, determination of hardness – numericals. Disadvantages of hard water in	**12**

	industries, 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.	
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 standard machine components using CAD tools.	Apply
CO 5	Construct drawings of engineering systems.	Apply

iii. SYLLABUS

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

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

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

Simple assembly drawing (2D, 3D). Plan and elevation of simple buildings with dimensions, electrical drawings and circuit drawings.

Iv (a) TEXT BOOKS

1. Bhatt N.D, Engineering Drawing, Charotar Publishing House Pvt. Ltd, 53rd Edition, 2019.
2. John K.C., Engineering Graphics, Prentice Hall India Publishers, 1st Edition, 2009.
3. C. M.Agrawal, BasantAgrawal, Engineering Graphics, Tata McGraw-Hill, 1st Edition, 2012.

(b) REFERENCES

1. G. S. Phull, H. S.Sandhu, Engineering Graphics, John Wiley & Sons Inc Pvt. 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

Modules	Contents	Hours
I	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	9
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	9
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	9

	Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software	
IV	Drawing of Cotter Joints, Knuckle Joint, Shaft couplings and Oldham's coupling	**9**
V	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	**9**
Total Hours		**45**

vi. ASSESSMENT PATTERN

Continuous Assessment : End Semester Examination – 60 : 40

Continuous Assessment		
Attendance	:	5 marks
Assignments/Project/Case Study etc	:	15 marks
Assessment through Tests	:	20 marks
Lab work	:	20 marks
Total Continuous Assessment	:	**60 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

ix. END SEMESTER EXAMINATION

- Maximum Marks: 40
- Exam Duration: 2 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10G	**Python Programming**	**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.

ii. COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Explain the fundamental concepts in Python	Understand
CO 2	Illustrate uses of conditional statements and iterative statements in Python	Apply
CO 3	Make use of user defined functions and Data structures in python.	Apply
CO 4	Apply Object oriented concepts to develop programs in Python	Apply
CO 5	Implement programs in Python to process data stored in files by utilizing the modules NumPy, Matplotlib, and Pandas	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) TEXT BOOKS

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.

v. COURSE PLAN

Modules	Contents	Hours
I	**Getting Started with Python Programming** - Running code in the interactive shell, Editing, Saving, and Running a script. Using editors - IDLE, Jupyter. **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. Input, Processing, and Output. Formatting output. How Python works. Detecting and correcting syntax errors. Using built in functions and modules in math module.	**6**
II	**Building Python Programs: Control statements** using break, continue and pass. **Selection structure** (if-else, elif), **Iteration structure** (for, while). **Functions**: Arguments and return values, Variable scopes and parameter passing, Named arguments, Main function, Working	**6**

	with recursion, Lambda functions.	
III	**Python data structures: Lists -** Basic List Operations and Methods, List of lists, Slicing, Searching, and sorting list. Tuple and Sets. **Dictionaries** – Dictionary Methods, adding and removing keys, accessing and replacing values, traversing dictionaries. **Strings and lists** — String traversal and comparison with examples.	**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**
V	**Visualization and File handling:** The os and sys modules. Introduction to file I/O - Reading and writing text files, Manipulating binary files. 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.	**6**
Total Hours		**45**

Python Programming: Experiments

Sl No.	Experiment	Hours
1	Illustrate uses of conditional statements and iterative statements in Python • Write a python program to find smallest among three numbers. • Write a program in Python, to check if the entered number is a palindrome number or not. • Write a python program to print Fibonacci series.	**3**
2	Develop programs by utilizing Data structures in python	**6**

	• Write a program to implement Bubble sort. • Write a program to implement Linear search. • Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure	
3	Develop programs by utilizing user defined functions in python • Write a program to display first n prime numbers using Function. • Write a program to find the sum of digits of a number using recursion	**3**
4	String Handling in Python • Write a program to count the number of occurrences of each letter in each String. • Write a Python program to find the string similarity between two given strings.	**3**
5	Implement Object oriented concepts • 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 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an officer and a manager by making an object of both classes and print the same. (Exercise to understand inheritance). • Write a Python program to calculate the area of different shapes namely circle, rectangle and triangle using the concept of polymorphism**.**	**6**
6	File Handling in Python. • Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.	**3**

7	Implement programs in Python to process data stored in files by modules NumPy, Matplotlib, and Pandas • Matrix multiplication using NumPy Array. • Analyze any csv file using Pandas and visualize the output using Matplotlib.	**6**
Total Hours		**30**

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
23ECL10A	NETWORK THEORY	PCC	3	1	0	0	4	2023

PRE-REQUISITE : 23ESL10J - Basics of Electrical Engineering
23ESL10L - Basics of Electronics Engineering

i. COURSE OVERVIEW

The goal of this course is to enable the students in solving dc and ac circuits using network theorems, to apply Laplace transform to determine the transient response of networks subjected to test signals and to analyse single and two ports network functions

ii. COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Use loop/nodal analysis and/or network theorems to solve dc and ac circuits.	Apply
CO 2	Use Laplace Transforms to determine the transient behaviour of RLC networks.	Apply
CO 3	Analyse two port network parameters.	Apply
CO 4	Use pole-zero plot to study the time domain response of a network.	Apply

iii. SYLLABUS

Mesh and Node Analysis

Mesh and node analysis of network containing independent and dependent sources for dc and ac sources. Super mesh and super node analysis.

Network Theorems

Network theorems applied to dc and ac circuits: Thevenin’s theorem, Norton’s theorem,

Superposition theorem, Reciprocity theorem, Maximum power transfer theorem.

Application of Laplace Transforms

Laplace Transforms and inverse Laplace transform. Transformation of basic signals and circuits into s-domain using Laplace transforms. Analysis of RL, RC, and RLC networks for determining the transient response.

Network functions

Network functions for single port and two port networks. Properties of driving point and

transfer functions. Impedance (Z), admittance (Y), transmission (T) and hybrid (h) parameters of two port network.

Pole zero plots and network parameters

Time domain response from pole zero plot. Interrelationship among Z and Y parameters.

Reciprocal and Symmetrical two port networks.

Iv (a) TEXT BOOKS

1. Valkenburg V., "Network Analysis", Pearson, 3/e, 2019.
2. Sudhakar A, Shyammohan S. P., "Circuits and Networks- Analysis and Synthesis", McGraw Hill, 5/e, 2015.
3. Charles K. Alexander, Matthew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill Education, 5/e, 2013.

(b) REFERENCES

1. Edminister, "Electric Circuits – Schaum's Outline Series", McGraw-Hill, 2009.
2. Ravish R., "Network Analysis and Synthesis", 2/e, McGraw-Hill, 2015.
3. William D. Stanley, "Network Analysis with Applications", 4/e, Pearson, 2006.
4. K. S. Suresh Kumar, "Electric Circuits and Networks", Pearson, 2008.

v. COURSE PLAN

Modules	Contents	Hours
I	Mesh and node analysis of network containing independent and dependent sources for dc and ac sources. Super mesh and super node analysis.	**9**
II	Network theorems applied to dc and ac circuits: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Maximum power transfer theorem.	**9**
III	Laplace Transforms and inverse Laplace transform. Transformation of basic signals and circuits into s-domain using Laplace transforms. Analysis of RL, RC, and RLC networks for determining the transient response.	**10**
IV	Network functions for single port and two port networks. Properties of driving point and transfer functions. Impedance (Z), admittance (Y), transmission (T) and hybrid (h) parameters of two port	**9**

	network.	
V	Time domain response from pole zero plot. Interrelationship among Z and Y parameters. Reciprocal and Symmetrical two port networks.	**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) TEXT BOOKS

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: Tata McGraw Hill Publications, 2007.

(b) REFERENCES

1. English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Blackswan 2010.
2. Stephen E. Lucas, "The Art of Public Speaking", 10th Edition; McGraw Hill Education, 2012.
3. William Strunk Jr. & E.B. White, "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, 6th edition, 2015.
7. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1st edition, 2013.
8. Anand Ganguly, "Success in Interview", RPH, 5th Edition, 2016.
9. Raman Sharma, "Technical Communications", Oxford Publication, London, 2004.

v. COURSE PLAN

Modules	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 21st century, 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	**15**

	questions, individual presentation practice, presenting visuals effectively. Mirroring, Elevator Pitch Introducing Oneself -one's career goals	
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

vi. 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	:	**100marks**

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 spectra and NMR spectra of some organic compounds.	Apply
CO 3	Use instrumental techniques for quantitative chemical analysis.	Apply
CO 4	Organize scientific experiments as a team to analyze the results of such experiments.	Analyze
CO 5	Interpret experimental data by themselves to apply them to real world problems.	Analyze

iii. SYLLABUS

1. Estimation of total hardness of water by EDTA method.
2. Analysis of IR and 1H NMR spectra of organic compounds.
3. Determination of wavelength of absorption maximum and colorimetric estimation of Fe3+ in solution.
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, First edition, 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 : Final Assessment – 60 : 40

Continuous Assessment		
Attendance	:	5 marks
Continuous Assessment in Lab(Lab work + Evaluation + Viva - voce)	:	55 marks
Total Continuous Assessment	:	**60 marks**
Final Assessment	:	**40 marks**
TOTAL	:	**100 marks**

vi. FINAL ASSESSMENT (Written Examination)

- Maximum Marks : 40
- Exam 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 for exposing the students to the various theoretical and practical aspects of, manufacturing processes and familiarize various tools, measuring device, practices and machines used in 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 wall.	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
3. Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
4. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

5. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, 1st Edition, 2003, Laxmi Publications.
6. Rangwala, Essentials of Civil Engineering, 1 st Edition, 2012, Charotar Publishing House..
7. Mamlouk M. S. and Zaniewski J. P., Materials for Civil and Construction Engineering, Pearson Publishers, 4th Edition, 2017.
8. 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. 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

Modules	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**

Exp. No.	Experiment	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	**15**

v. ASSESSMENT PATTERN

Continuous Assessment : Final Assessment – 60 : 40

Continuous Assessment		
Attendance	:	5 marks
Continuous Assessment Test	:	20 marks
Assessment of Lab Work	:	25 marks
Assignment	:	10 marks
Total Continuous Assessment	:	**60 marks**
Final Assessment	:	**40 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of tests: 02 (CAT1 Manufacturing Practices and CAT2 Construction Practices, or vice versa)
- Maximum Marks: 20
- Test Duration: 1 hour
- Topics: 3 modules

viii. FINAL ASSESSMENT

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