CURRICULUM AND DETAILED SYLLABI

FOR

B. TECH DEGREE PROGRAMME

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTERS I & II

2020 SCHEME

(AUTONOMOUS)

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

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

MAR IVANIOS VIDYANAGAR, NALANCHIRA, THIRUVANANTHAPURAM – 695015, KERALA.

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Passed in BoS Meetings held on 18/11/2020, 04/02/2021, 25/11/2021 & 11/08/2022

Approved in AC Meetings held on 30/12/2020, 17/02/2021, 22/04/2022 & 29/08/2022

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. TECH DEGREE PROGRAMME

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND DETAILED SYLLABI (S1-S2)

Items	Board of Studies (BoS)	Academic Council (AC)
Date of Approval	18.11.2020	30.12.2020
	04.02.2021	17.02.2021
	25.11.2021	22.04.2022
	11.08.2022	29.08.2022

Sd/-
Head of Department
Chairman, Board of Studies

Sd/-
Principal
Chairman, Academic Council

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

Vision and Mission of the Institution

Vision:

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

Mission:

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

DEPARTMENT OF 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 the society.

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 solution sin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in 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 and Communication 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 2020-21

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.

Table 1: Credit distribution and the Knowledge Domains

Sl. No.	Category	Category Code	Total credits
1	Humanities and Social Sciences including Management Courses	HSC	8
2	Basic Science Courses	BSC	26
3	Engineering Science Courses	ESC	22
4	Programme Core Courses, Comprehensive Course Work and Viva Voce	PCC	76
5	Programme Elective Courses	PEC	15
6	Open Elective Courses	OEC	3
7	Project Work and Seminar	PWS	10
8	Mandatory Non-credit Courses (P/F) with Grade	MNC	---
9	Mandatory Student Activities (P/F)	MSA	2
	Total Mandatory Credits		**162**
	Value Added Courses (Optional) – Honours/Minor	VAC	20

ii) Semester-wise Credit Distribution

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	***Total Credits***
Credits for Courses	*17*	*21*	*22*	*22*	*23*	*23*	*15*	*17*	***160***
Activity Points (Min.)	*40*				*60*				***100***
Credits for Activities	*2*								***2***
Total Credits									***162***
Value Added Courses (Optional) – Honours / Minor									***20***
Total Credits									***182***

SEMESTER I						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	BSC	MA0U10A	Linear Algebra and Calculus	3-1-0	4	4
B 1/2	BSC	PH0U10A	Engineering Physics A	3-1-0	4	4
		CY0U10A	Engineering Chemistry A	3-1-0	4	4
C 1/2	ESC	ES0U10A	Engineering Mechanics	2-1-0	3	3
		ES0U10B	Engineering Graphics	2-0-2	4	3
D 1/2	ESC	ES0U10C	Basics of Civil and Mechanical Engineering	4-0-0	4	4
		ES0U10D	Basics of Electrical and Electronics Engineering	4-0-0	4	4
E	HSC	HS0U10A	Life Skills	2-0-2	4	---
S 1/2	BSC	PH0U18A	Engineering Physics Lab	0-0-2	2	1
		CY0U18A	Engineering Chemistry Lab	0-0-2	2	1
T 1/2	ESC	ES0U18A	Civil and Mechanical Workshop	0-0-2	2	1
		ES0U18B	Electrical and Electronics Workshop	0-0-2	2	1
			TOTAL		**23/24**	**17**

SEMESTER II						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	BSC	MA0U10B	Vector Calculus, Differential Equations and Transforms	3-1-0	4	4
B 1/2	BSC	PH0U10A	Engineering Physics A	3-1-0	4	4
		CY0U10A	Engineering Chemistry	3-1-0	4	4
C 1/2	ESC	ES0U10A	Engineering Mechanics	2-1-0	3	3
		ES0U10B	Engineering Graphics	2-0-2	4	3
D 1/2	ESC	ES0U10C	Basics of Civil and Mechanical Engineering	4-0-0	4	4
		ES0U10D	Basics of Electrical and Electronics Engineering	4-0-0	4	4
E	HSC	HS0U10B	Professional Communication	2-0-2	4	---
F	ESC	ES0U10E	Programming in **C**	2-1-2	5	4
S 1/2	BSC	PH0U18A	Engineering Physics Lab	0-0-2	2	1
		CY0U18A	Engineering Chemistry Lab	0-0-2	2	1
T 1/2	ESC	ES0U18A	Civil and Mechanical Workshop	0-0-2	2	1
		ES0U18B	Electrical and Electronics Workshop	0-0-2	2	1
			TOTAL		**28/29**	**21**

SEMESTER III						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	BSC	MA0U20A	Partial Differential Equations and Complex Analysis	3-1-0	4	4
B	PCC	EC1U20A	Solid State Devices	3-1-0	4	4
C	PCC	EC1U20B	Logic Circuit Design	3-1-0	4	4
D	PCC	EC1U20C	Network Theory	3-1-0	4	4
E 1/2	ESC	ES0U20A	Design & Engineering	2-0-0	2	2
	HSC	HS0U20A	Professional Ethics	2-0-0	2	2
F	MNC	NC0U20A	Sustainable Engineering	2-0-0	2	---
S	PCC	EC1U28A	Scientific Computing Lab	0-0-3	3	2
T	PCC	EC1U28B	Logic Design Lab	0-0-3	3	2
R/M	VAC		Remedial/Minor Course	3-1-0/ 4-0-0	4	4
			TOTAL		**26/30**	**22/26**

SEMESTER IV						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	BSC	MA0U20C	Probability, Random Processes and Numerical Methods	3-1-0	4	4
B	PCC	EC1U20D	Analog Circuits	3-1-0	4	4
C	PCC	EC1U20E	Signals and Systems	3-1-0	4	4
D	PCC	EC1U20F	Computer Architecture and Microcontrollers	3-1-0	4	4
E ½	ESC	ES0U20A	Design & Engineering	2-0-0	2	2
	HSC	HS0U20A	Professional Ethics	2-0-0	2	2
F	MNC	NC0U20B	Constitution of India	2-0-0	2	---
S	PCC	EC1U28C	Analog Circuits and Simulation Lab	0-0-3	3	2
T	PCC	EC1U28D	Microcontroller Lab	0-0-3	3	2
R/M/H	VAC		Remedial/Minor/Honours Course	3-1-0/ 4-0-0	4	4
			TOTAL		**26/30**	**22/26**

SEMESTER V						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	PCC	EC1U30A	Linear Integrated Circuits	3-1-0	4	4
B	PCC	EC1U30B	Digital Signal Processing	3-1-0	4	4
C	PCC	EC1U30C	Analog and Digital Communication	3-1-0	4	4
D	PCC	EC1U30D	Control Systems	3-1-0	4	4
E ½	HSC	HS0U30A	Industrial Economics and Foreign Trade	3-0-0	3	3
		HS0U30B	Management for Engineers	3-0-0	3	3
F	MNC	NC0U30A	Disaster Management	2-0-0	2	--
S	PCC	EC1U38A	Analog Integrated Circuits and Simulation Lab	0-0-3	3	2
T	PCC	EC1U38B	Digital Signal Processing Lab	0-0-3	3	2
R/ M/ H	VAC		Remedial/Minor/Honours Course	3-1-0/ 4-0-0	4	4
			TOTAL		**27/31**	**23/27**

SEMESTER VI						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	PCC	EC1U30E	Electromagnetics	3-1-0	4	4
B	PCC	EC1U30F	VLSI Circuit Design	3-1-0	4	4
C	PCC	EC1U30G	Information Theory and Coding	3-1-0	4	4
D	PEC	EC1UXXX	Programme Elective I	2-1-0 /3-0-0	3	3
E 1/2	HSC	HS0U30A	Industrial Economics and Foreign Trade	3-0-0	3	3
		HS0U30B	Management for Engineers	3-0-0	3	3
F	PCC	EC1U30H	Comprehensive Course work	1-0-0	1	1
S	PCC	EC1U38C	Communication Lab	0-0-3	3	2
T	PWS	EC1U39A	Mini Project	0-0-3	3	2
R/ M/ H	VAC		Remedial/Minor/Honours Course	3-1-0/ 4-0-0	4	4
			TOTAL		**25/29**	**23/27**

PROGRAMME ELECTIVE I

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
D	PEC	EC1U31A	Digital System Design	2-1-0	3	3
		EC1U31B	Power Electronics	3-0-0	3	3
		EC1U31C	Data Analysis	2-1-0	3	3
		EC1U31D	Embedded System	3-0-0	3	3
		EC1U31E	Digital Image Processing	2-1-0	3	3
		EC1U31F	Introduction to MEMS	2-1-0	3	3
		EC1U31G	Quantum Computing	2-1-0	3	3

SEMESTER VII						
Slot	**Category Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	PCC	EC1U40A	Microwaves and Antennas	2-1-0	3	3
B	PEC	EC1UXXX	Programme Elective II	2-1-0/ 3-0-0	3	3
C	OEC	EC0UXXX	Open Elective	2-1-0/ 3-0-0	3	3
D	MNC	NC0U40A	Industrial Safety Engineering	2-1-0	3	---
E	PCC	EC1U48A	Electromagnetics Lab	0-0-3	3	2
T	PWS	EC1U49A	Seminar	0-0-3	3	2
U	PWS	EC1U49B	Project Phase I	0-0-6	6	2
R/ M/ H	VAC		Remedial/Minor/Honours Course	0-1-6/ 4-0-0	7/4	4
TOTAL					**24/(31/28)**	**15/19**

PROGRAMME ELECTIVE II

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
B	PEC	EC1U41A	Optical Fiber Communication	3-0-0	3	3
		EC1U41B	Computer Networks	3-0-0	3	3
		EC1U41C	Opto Electronic Devices	2-1-0	3	3
		EC1U41D	Instrumentation	2-1-0	3	3
		EC1U41E	Error Control Codes	2-1-0	3	3
		EC1U41F	Machine Learning	2-1-0	3	3
		EC1U41G	DSP Architectures	2-1-0	3	3

OPEN ELECTIVE

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
C	OEC	EC0U41A	Mechatronics	2-1-0	3	3
		EC0U41B	Biomedical Instrumentation	3-0-0	3	3
		EC0U41C	Electronic Hardware for Engineers	3-0-0	3	3
		EC0U41D	IoT and Applications	2-1-0	3	3
		EC0U41E	Entertainment Electronics	2-1-0	3	3

SEMESTER VIII						
Slot	**Cate-gory Code**	**Course Number**	**Courses**	**L-T-P**	**Hours**	**Credit**
A	PCC	EC1U40B	Wireless Communication	3-0-0	3	3
B	PEC	EC1UXXX	Programme Elective III	3-0-0/ 2-1-0	3	3
C	PEC	EC1UXXX	Programme Elective IV	3-0-0/ 2-1-0	3	3
D	PEC	EC1UXXX	Programme Elective V	3-0-0/ 2-1-0	3	3
T	PCC	EC1U40C	Comprehensive Viva Voce	1-0-0	1	1
U	PWS	EC1U49C	Project Phase II	0-0-12	12	4
R/ M/ H	VAC		Remedial/Minor/Honours Course	0-1-6	7	4
			TOTAL		**25/32**	17/21

PROGRAMME ELECTIVE III

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
B	PEC	EC1U42A	Biomedical Engineering	3-0-0	3	3
		EC1U42B	Satellite Communication	3-0-0	3	3
		EC1U42C	Secure Communication	3-0-0	3	3
		EC1U42D	Pattern Recognition	3-0-0	3	3
		EC1U42E	RF Circuit Design	3-0-0	3	3
		EC1U42F	Mixed Signal Circuit Design	2-1-0	3	3
		EC1U42G	Entrepreneurship	3-0-0	3	3

PROGRAMME ELECTIVE IV

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
C	PEC	EC1U43A	Modern Communication Systems	3-0-0	3	3
		EC1U43B	Real Time Operating Systems	2-1-0	3	3
		EC1U43C	Adaptive Signal Processing	2-1-0	3	3
		EC1U43D	Microwave Devices and Circuits	3-0-0	3	3
		EC1U43E	Speech & Audio Processing	3-0-0	3	3
		EC1U43F	Analog CMOS Design	2-1-0	3	3
		EC1U43G	Robotics	3-0-0	3	3

PROGRAMME ELECTIVE V

Slot	Category Code	Course Number	Courses	L-T-P	Hours	Credit
D	PEC	EC1U44A	Mechatronics	3-0-0	3	3
		EC1U44B	Optimization Techniques	2-1-0	3	3
		EC1U44C	Computer Vision	2-1-0	3	3
		EC1U44D	Low Power VLSI	2-1-0	3	3
		EC1U44E	Internet of Things	2-1-0	3	3
		EC1U44F	Renewable Energy Systems	3-0-0	3	3
		EC1U44G	Organic Electronics	3-0-0	3	3

B. Tech (MINOR)

Semester	BASKET I				BASKET II				BASKET III			
	Course Number	Course	L-T-P	Credit	Course Number	Course	L-T-P	Credit	Course Number	Course	L-T-P	Credit
S3	EC0M 20A	Electronic Circuits	3-1-0	4	EC0M 20B	Analog Communication	4-0-0	4	EC0M 20C	Introduction to Signals and Systems	3-1-0	4
S4	EC0M 20D	Microcontrollers	3-1-0	4	EC0M 20E	Digital Communication	3-1-0	4	EC0M 20F	Introduction to Digital Signal Processing	3-1-0	4
S5	EC0M 30A	Embedded System Design	3-1-0	4	EC0M 30B	Communication Systems	4-0-0	4	EC0M 30C	Topics in Digital Image Processing	3-1-0	4
S6	EC0M 30D	VLSI Circuits	3-1-0	4	EC0M 30E	Data Networks	4-0-0	4	EC0M 30F	Topics in Computer Vision	3-1-0	4
S7	EC0M 49A	Mini Project	0-1-6	4	EC0M 49A	Mini Project	0-1-6	4	EC0M 49A	Mini Project	0-1-6	4
S8	EC0M 49B	Mini Project	0-1-6	4	EC0M 49B	Mini Project	0-1-6	4	EC0M 49B	Mini Project	0-1-6	4

B. Tech (HONOURS)

Semester	GROUP I				GROUP II				GROUP III			
	Course Number	Course	L-T-P	Credit	Course Number	Course	L-T-P	Credit	Course Number	Course	L-T-P	Credit
S4	EC1H 20A	Nanoelectronics	4-0-0	4	EC1H 20B	Stochastic Process for Communication	4-0-0	4	EC1H 20C	Stochastic Signal Processing	4-0-0	4
S5	EC1H 30A	FPGA based System Design	4-0-0	4	EC1H 30B	Detection and Estimation Theory	4-0-0	4	EC1H 30C	Computational Tools for Signal Processing	4-0-0	4
S6	EC1H 30D	Electronic Design and Automation Tools	4-0-0	4	EC1H 30E	MIMO and Multiuser Communication Systems	4-0-0	4	EC1H 30F	Detection and Estimation Theory	4-0-0	4
S7	EC1H 40A	RF MEMS	4-0-0	4	EC1H 40B	Design and Analysis of Antennas	4-0-0	4	EC1H 40C	Multirate Signal Processing and Wavelets	4-0-0	4
S8	EC1H 49A	Mini Project	0-1-6	4	EC1H 49A	Mini Project	0-1-6	4	EC1H 49A	Mini Project	0-1-6	4

SEMESTER - I

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
MA0U10A	LINEAR ALGEBRA AND CALCULUS	BSC	3	1	0	4	2020

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 familiarises students with some basic techniques in matrix theory which are essential for analysing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analysing 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.	Evaluate
CO 3	Compute areas and volumes of geometrical shapes using multiple integrals.	Evaluate
CO 4	Identify the convergence or divergence of an infinite series.	Evaluate
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, rowechelonform, 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*, John Wiley & Sons, 10thEdition, 2016.

b) REFERENCES

1) J. Stewart, *Essential Calculus*, Cengage,2ndEdition,2017.
2) G. B. Thomas and R. L. Finney, *Calculus and Analytic geometry*,9thEdition, Pearson, Reprint,2002.
3) Peter V. O'Neil, *Advanced Engineering Mathematics*, Cengage, 7th Edition 2012.

v) COURSE PLAN

Module	Contents	No. of 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	**12**

	convergence.	
V	Series representation of functions: Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formulas, Convergence of Fourier series (without proof), half range sine and cosine series, Parseval's theorem (without proof).	**12**
	Total hours	**60**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain10questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
PH0U10A	ENGINEERING PHYSICS-A (FOR CIRCUIT BRANCHES)	BSC	3	1	0	4	2020

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.	Remember
CO 2	Apply the principles of wave optics to explain natural physical processes and related technological advances.	Understand
CO 3	Use the principles of quantum mechanics to analyse the behaviour of matter in the atomic and subatomic level	Understand
CO 4	Apply the fundamental ideas of magnetism and vector calculus to arrive at Maxwell's equations.	Understand
CO 5	Describe the principles behind various superconducting applications, solid-state lighting devices and fibre optic communication system.	Apply

iii) SYLLABUS

Oscillations and Waves: Damped oscillations, Forced oscillations, One dimensional and three-dimensional wave equations, Transverse vibrations along a stretched string

Wave Optics: Interference of light- Air wedge, Newton's rings, Antireflection coating, Diffraction-Fraunhofer diffraction at a single slit, Grating equation, Rayleigh's criterion

Quantum Mechanics & Nano technology: Wave function, Time dependent and time independent Schrodinger wave equations, One-dimensional potential well, Introduction to nanoscience and technology, Quantum confinement, Properties of nanomaterials

Magnetism & Electro Magnetic Theory: Magnetic field and Magnetic flux density, fundamental laws, magnetic permeability and susceptibility, classification of magnetic materials, fundamentals of vector calculus and theorems, equation of continuity, Maxwell's equations in vacuum, velocity of electromagnetic waves in freespace.

Superconductivity & Photonics: Super conductivity- Meissner effect, Type I &II superconductors, applications of superconductors, Introduction to photonics-photonic devices-Light Emitting Diode, Photo detectors -Junction and PIN photodiodes, Solar cells-I-V characteristics, Optical fibre -Principle, Numerical aperture, Types of fibres, 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

3) Arthur Beiser, Concepts of Modern Physics, Tata McGraw Hill Publications, 6thEdition, 2003.

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

5) Ajoy Ghatak, Optics, Mc Graw Hill Education, 6th Edition, 2017

6) David J. Griffiths, Introduction to Electrodynamics, Pearson, 4th Edition, 2013.

7) Premlet B., *Advanced Engineering Physics*, Phasor Books,10thEdition, 2017.

v) COURSE PLAN

Module	Contents	No. of 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, Quality factor and sharpness of resonance, electrical analogy of mechanical oscillators Wave motion- derivation of one-dimensional wave equation and its solution, three-dimensional wave equation and its solution (no derivation), distinction between transverse and longitudinal waves, transverse vibration in a stretched string, statement of laws of vibration	**12**
II	Wave Optics: Interference of light-principle of superposition of waves, 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 grating-Grating equation, Rayleigh criterion for limit of resolution, resolving and dispersive power of a grating with expression	**12**

	(no derivation)	
III	Quantum Mechanics & Nanotechnology: Introduction for the need of Quantum mechanics, wave nature of Particles, uncertainty principle, Applications-absence of electrons inside a nucleus and natural line broadening mechanism, formulation of time dependent and independent Schrodinger wave equations-physical meaning of wave function, Particle in a one dimensional box- derivation for normalised wave function and energy eigen values, Quantum mechanical tunnelling (qualitative). Introduction to nanoscience and technology, increase in surface to volume ratio for nanomaterials, quantum confinement in one dimension, two dimension and three dimension-nano sheets, nano wires and quantum dots, properties of nanomaterials-mechanical, electrical and optical, applications of nanotechnology (qualitative ideas)	**12**
IV	Magnetism and Electromagnetic theory: Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law in terms of emf produced by changing magnetic flux, Magnetic permeability and susceptibility, classification of magnetic materials-para, dia and ferromagnetic materials Fundamentals of vector calculus, concept of divergence, gradient and curl along with physical significance, line, surface and volume integrals, Gauss divergence theorem & Stokes' theorem, equation of continuity, derivation of Maxwell's equations in vacuum, comparison of displacement current with conduction current, electromagnetic waves, velocity of electromagnetic waves in free space, flow of energy and Poynting's vector (no derivation)	**12**
V	Superconductivity & Photonics: Superconducting phenomena, Meissner effect and perfect diamagnetism, types of superconductors-Type I and Type II, BCS Theory (Qualitative), high temperature superconductors-applications of super conductivity Introduction to photonics-photonic devices-Light Emitting Diode, Photo detectors -Junction and PIN photodiodes, Solar cells-I-V characteristics, Optic fibre-principle of propagation of light, types of fibres-step index and graded index fibres, numerical aperture – derivation, fibre optic communication system (block diagram), industrial, medical and technological applications of optical fibre, fibre optic sensors-intensity modulated and phase modulated sensors.	**12**
	Total hours	**60**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	50	100	3 Hours

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain10questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10A	ENGINEERING MECHANICS	ESC	2	1	0	3	2020

i) COURSE OVERVIEW

Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion. After this course students will be able to recognize similar problems in real- world situations and respond accordingly.

ii) COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Explain the principles and theorems related to rigid body mechanics.	Understand
CO 2	Describe the components of system of forces acting on the rigid body.	Understand
CO 3	Apply the properties of distributed areas and masses for solving problems involving rigid bodies.	Apply
CO 4	Apply the conditions of equilibrium to various practical problems involving different force systems.	Apply
CO 5	Apply appropriate principles to solve problems in rigid body mechanics.	Apply

iii) SYLLABUS

Statics of rigid bodies: Classification of force systems, Composition and resolution of forces, Resultant and equilibrium equations, Methods of projections, Varignon's Theorem of moments.

Friction: Analysis of single and connected bodies. Parallel coplanar forces, couple. Beam reactions.

Properties of surfaces: Centroid of composite areas, Moment of inertia of areas, Polar moment of inertia, Theorem of Pappus-Guldinus, Forces in space.

Dynamics: D'Alembert's principle, Motion on horizontal and inclined surfaces, Motion of connected bodies. Impulse momentum and work energy relation. Curvilinear translation.

Rotation: Kinematics of rotation. Plane motion of rigid body: Instantaneous centre. Simple harmonic motion: Mechanical vibrations.

iv) (a) TEXTBOOKS

1) Timoshenko, S., Young, D. H., Rao, J. V. and Pati, S., *Engineering Mechanics*, Mc-Graw Hill Publishers, 2017.
2) Beer, F. P. and Johnston, R., *Vector Mechanics for Engineers: Statics and Dynamics*, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 12thEdition, 2005.
3) Bansal, R. K., *A Textbook of Engineering Mechanics*, Laxmi Publications, 8thEdition, 2016.
4) Sharma, D. P., Hibbeler, R. C. and Shames, I. H., *Engineering Mechanics*, Pearson Publishers, 2011.

(b) REFERENCES

1) Bhavikkatti, S. S., *Engineering Mechanics*, New Age International Publishers, 2016.
2) Merriam, J. L. and Kraige, L. G., *Engineering Mechanics* - Vols. 1 and 2, John Wiley, 7thEdition, 2006.
3) Hibbeler, R. C. and Gupta, A., *Engineering Mechanics*, Vol. I Statics, Vol II Dynamics, Pearson Education, 2009.
4) Shames, I. H., *Engineering Mechanics - Statics and Dynamics*, Prentice Hall of India,4th Edition 2005.

v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to engineering mechanics - Introduction on statics and dynamics - Basic principles of statics - Parallelogram law, Equilibrium law - Superposition and transmissibility, Law of action and reaction. Free body diagrams - Degree of freedom-Types of supports and nature of reactions -Exercises for free body diagram preparation - Composition and resolution of forces, Resultant and equilibrium equations. Concurrent coplanar forces - Analysis of concurrent forces - Methods of projections - Methods of moment - Varignon's Theorem of Moments.	**9**
II	Friction - Sliding friction - Coulomb's laws of friction - Analysis of single bodies - Analysis of connected bodies. Parallel coplanar forces - Couple - Resultant of parallel forces - Centre of parallel forces - Equilibrium of parallel forces - Simple beam subject to concentrated vertical loads. General coplanar force system - Resultant and equilibrium equations.	**9**
III	Centroid of regular geometrical shapes - Centroid of Composite areas. Moment of inertia- Parallel axis theorem - Perpendicular axis theorem	**9**

	-Polar moment of inertia, Radius of gyration. Mass moment of inertia of ring, cylinder and uniform disc. Theorem of Pappus Guldinus. Introduction to forces in space -Vectorial representation of forces, moments and couples - Resultant and equilibrium equations for concurrent forces in space - Concurrent forces in space.	
IV	Introduction to dynamics - Rectilinear translation - Equations of kinematics. Introduction to kinetics - Equation of motion - D'Alembert's principle - Motion on horizontal and inclined surfaces - Motion of connected bodies. Curvilinear translation - Projectile motion - Introduction to kinetics - equation of motion. Impulse momentum equation and work energy equation. Moment of momentum and work energy equation (Curvilinear translation).	**9**
V	Rotation - Kinematics of rotation- Equation of motion for a rigid body rotating about a fixed axis - Rotation under a constant moment. Plane motion of rigid body- Instantaneous centre of rotation (concept only). Introduction to harmonic oscillation - Free vibrations - Simple harmonic motion – Differential equation and solution. Degree of freedom - Examples of single degree of freedom (SDOF) systems - Idealisation of mechanical systems as spring-mass systems (concept only). SDOF spring mass system - Equation of motion -Undamped free vibration response - Concept of natural frequency. Effect of damping on free vibration response (concept only).	**9**
	Total hours	**45**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain10questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10C	BASICS OF CIVIL AND MECHANICAL ENGINEERING	ESC	4	0	0	4	2020

i) COURSE OVERVIEW

The goal of this course is to provide an insight on the essentials of Civil and Mechanical Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.

ii) COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Explain different types of buildings, their components, materials, construction techniques and basic infrastructure services.	Understand
CO 2	Describe the importance, objectives and principles of surveying.	Understand
CO 3	Apply the principles of levelling to find the level difference between points.	Apply
CO 4	Summarise the different materials and systems in the context of green buildings.	Understand
CO 5	Analyse thermodynamic cycles and Illustrate the working and features of IC Engines	Apply
CO 6	Explain the basic principles of Refrigeration and Air Conditioning and working of hydraulic machines	Understand
CO 7	Explain the working of power transmission elements, basic manufacturing, metal joining and machining processes	Understand

iii) SYLLABUS

Introduction to Civil Engineering: Relevance and major disciplines of Civil Engineering, Introduction to buildings: Types and different components of buildings, Building rules and regulations, Building area.

Introduction to surveying: Objectives, Principle, Classification, Levelling, Introduction to modern surveying instrument- Total Station.

Construction materials: Bricks, Stones, Sand, Timber, Cement, Cement mortar, Concrete, Steel, Modern construction materials.

Building construction: Foundations, Brick masonry, Roofs and floors, Basic infrastructure services, Green buildings.

Basics of Mechanical Engineering: Fundamental of thermodynamics. Analysis of thermodynamic cycles and working of internal combustion engines. CRDI, MPFI and concept of hybrid vehicles.

Refrigeration and power transmission systems - Analysis of reversed Carnot cycle and vapour compression cycle. Introduction to psychrometry. Layout of unit and central air conditioner.

Description and basic analysis of hydraulic pump and turbine. Working of different power transmission devices.

Manufacturing methods and machine tools - Description of various manufacturing, metal joining process and basic machining operations.

Working of different machines tools and CNC machine. Introduction to CAD/CAM, additive and rapid manufacturing.

iv) (a) TEXT BOOKS

1) Mamlouk, M. S., and Zaniewski, J. P., *Materials for Civil and Construction Engineering*, Pearson Publishers, 4th Edition, 2017.
2) Rangwala, S. C., *Essentials of Civil Engineering*, Charotar Publishing House, 1st Edition, 2012.
3) Clifford, M., Simmons, K. and Shipway, P., *An Introduction to Mechanical Engineering Part I* - CRC Press, 2009.
4) Kumar, P., *Basic Mechanical Engineering*, Pearson India, 2013.

(b) REFERENCES

1) Chen, W. F. and Liew, J. Y. R. (Eds), *The Civil Engineering Handbook*, CRC Press (Taylor and Francis), 2ndEdition, 2002
2) Punmia, B. C., Ashok, K. J. and Arun, K. J., *Surveying*, Vol. I, Laxmi Publications (P) ltd., New Delhi, 17thEdition, 2016
3) *Kerala Municipal Building Rules*, LSGD, Govt. of Kerala, 2019
4) SP 7: 2016, *National Building Code of India*, BIS, New Delhi, 2016.
5) Wylen, G. J. V., Sonntag, R. and Borgnakke, C., *Fundamentals of Classical Thermodynamics*, John Wiley & Sons,2012.
6) Sawhney, G. S., *Fundamentals of Mechanical Engineering*, PHI Learning; 3rd Revised Edition, 2015.

v) COURSE PLAN

Module	Contents	No. of hours
I	**General Introduction to Civil Engineering:** Relevance of Civil Engineering in the overall infrastructure development of the Country. Responsibility of an engineer in ensuring the safety of built environment. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Transportation Engineering, Geotechnical Engineering, Water Resources Engineering and	**10**

	Environmental Engineering. **Introduction to buildings:** Types of buildings, selection of site for buildings, components of a residential building and their functions. **Building rules and regulations:** Relevance of NBC, KBR & CRZ norms (brief discussion only). **Building area:** Plinth area, built up area, floor area, carpet area and floor area ratio for a building as per KBR. **Surveying:** Importance, classification, objectives and principles, instruments used. Levelling- principles, dumpy level, simple levelling, differential levelling- problems. Introduction to modern surveying instruments-Total Station.	
II	**Construction materials:** Conventional construction materials: types, properties and uses of building materials: bricks, stones, cement, sand and timber. **Cement Mortar:** Materials and properties. **Cement concrete:** Constituent materials, properties and types. **Steel:** Steel sections and steel reinforcements, types and uses. **Modern construction materials:** Architectural glass, ceramics, plastics, composite materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials. Modern uses of gypsum, pre-fabricated building components (brief discussion only).	**10**
III	**Building Construction: Foundations:** Bearing capacity of soil (definition only), functions of foundations, types – shallow and deep (brief discussion only). Load bearing and framed structures (concept only). **Brick masonry:** Header and stretcher bond, English bond and Flemish bond. **Roofs and floors:** Functions, types; flooring materials (brief discussion only). **Basic infrastructure services:** MEP, HVAC, elevators, escalators and ramps (Civil Engineering aspects only), fire safety for buildings. **Green buildings:** Materials, energy systems and water management and environment for green buildings (brief discussion only).	**10**
IV	**Fundamentals of thermodynamics**: Review of basics of thermodynamics- system, surroundings, process, cycle- quasistatic process, laws of thermodynamics. Analysis of thermodynamic cycles: Carnot, Otto, Diesel cycles, Derivation of efficiency of these cycles, Problems to calculate heat added, heat rejected, net-work and efficiency. **IC Engines**: CI, SI, 2- Stroke, 4-Stroke engines. Listing the parts of different types of IC Engines. Efficiencies of IC Engines (Definitions only), Air, Fuel, cooling and lubricating systems in SI and CI Engines, CRDI, MPFI. Concept of hybrid engines.	**10**
V	**Refrigeration**: Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, Layout of unit	**10**

	and central air conditioners. **Hydraulic machines**: Working principle of Reciprocating pump, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan turbine. Overall efficiency, Problems on calculation of input and output power of pumps and turbines (No velocity triangles) **Power Transmission Devices**: Belt and Chain drives, Gear and Gear trains, Single plate clutches.	
VI	**Manufacturing Process**: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, Soldering and Brazing and their applications. **Basic Machining Operations**: Turning, Drilling, Milling and Grinding. Lathe, Drilling machine, Milling machine. **Computer Aided Machining**: CNC Machine. Principle of CAD/CAM, Rapid and Additive manufacturing.	**10**
	Total hours	**60**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part I – Basic Civil Engineering and Part II – Basic Mechanical Engineering. Part I and PART II carries 50 marks each. For the end semester examination, part I contain 2 parts - Part A and Part B. Part A contain 5 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module out of which one to be answered. Each question carries 10 mark and can have maximum 2 sub-divisions. The pattern for end semester examination for part II is same as that of part I. However, student should answer both part I and part 2 in separate answer booklets.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
HS0U10A	LIFE SKILLS	HSC	2	0	2	-	2020

i) COURSE OVERVIEW

This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underly personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

ii) COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Identify different skills required in personal and professional life.	Understand
CO 2	Apply well defined techniques to cope with emotions and stress and to provide an awareness of the self.	Apply
CO 3	Apply appropriate thinking tools and techniques for creative problem solving.	Apply
CO 4	Explain the importance of teamwork, team performance, team conflicts and leadership.	Understand
CO 5	Explain the basic mechanics of effective communication and demonstrate these through presentations.	Understand

iii) SYLLABUS

Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO, Life skills for professionals, personality development, IQ, EQ, and SQ.

Self-awareness & Stress Management: Definition and need for self-awareness; Tools and techniques of SA, Stress, reasons and effects, the four A's of stress management, Techniques and Approaches, PATH method and relaxation techniques.

Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats, Mind Mapping & Analytical Thinking.

Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

Leadership Skills: Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, Leadership Grid & leadership Formulation**.**

iv) (a) TEXT BOOKS

1) Remesh S., Vishnu R. G., *Life Skills for Engineers*, Ridhima Publications, 1st Edition,2016.
2) *Life Skills for Engineers*, Complied by ICT Academy of Kerala, McGraw Hill Education (India) Private Ltd., 2016.

(b) REFERENCES

1) Shiv Khera, *You Can Win*, Macmillan Books, NewYork,2003.
2) Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third impression, 2017.
3) Caruso, D. R. and Salovey P, *The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership*, John Wiley & Sons,2004.
4) Larry James, *The First Book of Life Skills*; Embassy Books, 1st Edition,2016.

v) COURSE PLAN

Module	Contents	No. of hours
I	**Overview of Life Skills**: Meaning and significance of life skills **Life skills identified by WHO**: Self- awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion. **Life skills for professionals:** positive thinking, right attitude, attention to detail, having the big picture, learning skills, research skills, perseverance, setting goals and achieving them, helping others, leadership, motivation, self-motivation, and motivating others, personality development, IQ, EQ, and SQ.	**6**
	Activities based on Creative thinking tools	
II	**Self-awareness**: Definition, need for self-awareness; Coping With Stress and Emotions, Human Values, tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback. **Stress Management**: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action-oriented, emotion-oriented, acceptance- oriented, resilience, Gratitude Training, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques. **Morals, Values and Ethics**: Integrity, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Time management, Cooperation, Commitment,	**6**

	Empathy, Self-Confidence, Character, Spirituality, Avoiding Procrastination, Sense of Engineering Ethics.	
	Case studies on Morals and Ethics	
III	**21st century skills**: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, 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, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking Thinking Hats, Mind Mapping, Forced Connections.	**6**
	Problem solving using Mind map/Six Thinking Hats	
IV	**Group and Team Dynamics**: Introduction to Groups: Composition, formation, Cycle, thinking, clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group vs Team, Team Dynamics, Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.	**6**
	Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions.	
V	**Leadership**: Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.	**6**
	Presentation **Presentation Skills:** Oral presentation and public speaking skills; business presentations	
	Total hours	**30**

Life skills: Practical part – 15 hours

1. Activities based on Creative thinking tools- 3 hours
2. Case studies on Morals and Ethics- 3hours
3. Problem solving using Mind map/Six Thinking Hats- 3 hours
4. Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions.- 3 hours
5. Oral presentation and public speaking skills; business presentations- 3 hours

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	50	50	2 Hours

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (One test only, should include first three modules)	**25 Marks**
Regular assessment	**15 Marks**

Regular assessment:

Group Discussion (Marks: 9)

Create groups of about 6students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation are as follows:

- **Communication Skills :3 marks**
- **Subject Clarity :2marks**
- **Group Dynamics :2 marks**
- **Behaviours & Mannerisms :2 marks**
-

Presentation Skills (Marks: 6)

Identify a suitable topic and ask the students to
Prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation are as follows:

- **Communication Skills :2 marks**
- **Platform Skills :2 marks**
- **Subject Clarity/Knowledge :2 marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B.

Part A: There will be one question from each MODULE (five questions in total, five marks each). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

(i) Content Clarity/Subject Knowledge
(ii) Presentation style
(iii) Organization of content

Part B: The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows;

(i) Analyze the case situation
(ii) Key players/characters of the case
(iii) Identification of the problem (both major & minor if exists)
(iv) Bring out alternatives
(v) Analyze each alternative against the problem
(vi) Choose the best alternative
(vii) Implement as solution
(viii) Conclusion
(ix) Answer the question at the end of the case

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
PH0U18A	ENGINEERING PHYSICS LAB	BSC	0	0	2	1	2020

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.	Understand
CO 2	Examine wave patterns using CRO to measure basic physical quantities viz. frequency and amplitude.	Remember
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.	Understand
CO 5	Draw the I-V characteristics of non ohmic devices.	Remember

iii) SYLLABUS

1. Melde's string apparatus- Measurement of frequency in the transverse mode.
2. Wave length 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. CRO-Measurement of frequency and amplitude of wave forms.

iv) REFERENCES

1) S.L. Gupta and V. Kumar, *Practical physics with viva voce*, Pragati Prakashan Publishers, Revised Edition, 2009.
2) M.N. Avadhanulu, A.A. Dani and Pokely P.M., *Experiments in Engineering Physics*, S. Chand &Co, 2008.
3) S. K. Gupta, *Engineering Physics practicals*, Krishna Prakashan Pvt. Ltd., 2014
4) P. R. Sasikumar, *Practical Physics*, PHI Ltd., 2011.

v) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	70	30	1 Hour

Continuous Internal Evaluation Pattern

Attendance	**20 Marks**
Class work/ Assessment /Viva-voce	**50 Marks**

End Semester Examination Pattern: Written Objective Examination of one hour.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U18A	CIVIL AND MECHANICAL WORKSHOP	ESC	0	0	2	1	2020

i) COURSE OVERVIEW

The course is designed to train the students to identify and manage the tools, materials and methods required to execute basic Civil and Mechanical Engineering activities. Students will be introduced to a team working environment where they develop the necessary skills for planning, preparing and executing a basic Engineering activity. It also enables the student to familiarize various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components.

ii) COURSE OUTCOMES

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

Course Outcomes	Description	Level
CO 1	Name different devices and tools used for Civil Engineering measurements.	Remember
CO 2	Explain the use of various techniques and devices used in Civil Engineering measurements.	Understand
CO 3	Choose materials and methods required for basic Civil Engineering activities like field measurements, masonry work and plumbing.	Apply
CO 4	Demonstrate the steps involved in basic Civil Engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.	Apply
CO 5	Identify the tools and equipment used in fitting, carpentry, sheet metal, foundry, welding and smithy and various machine tools.	Remember
CO 6	Prepare simple models in fitting, carpentry, sheet metal, foundry, welding and smithy trades.	Apply
CO 7	Demonstrate general safety precautions in different mechanical workshop trades.	Understand

iii) SYLLABUS

A) CIVIL WORKSHOP

1) Set out a one room building of given plan using tape only method and using tape and cross staff.
2) a) Use screw gauge and vernier calliper to measure the diameter of a steel rod and thickness of a flat bar.
   b) Calculate the area of a built-up space and a small piece of land- Use standard measuring tape and digital distance measuring devices.

3) a) Construct a wall using currently used building blocks such as bricks (1 ½ thick brick wall using English bond), hollow blocks, solid blocks, etc. Use spirit level to assess the tilt of walls.
   b) Estimate the number of different types of building blocks required to construct a wall of given dimensions.
   c) Transfer the level from one point to another point using a water level.
4) Find the level difference between any two points using dumpy level (differential levelling).
5) a) Introduce the students to plumbing tools, different types of pipes, types of connections, traps, valves, fixtures and sanitary fittings.
   b) Study of installation of rain water harvesting system in an educational campus.
6) Introduce students to the principle and working of Total Station.
7) Demonstration of a simple construction work using concrete.

B) MECHANICAL WORKSHOP

1) General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge, Study of mechanical tools
2) Carpentry: Understanding of carpentry tools and making minimum one model.
3) Foundry: Understanding of foundry tools and making minimum one model.
4) Sheet metal: Understanding of sheet metal working and making minimum one model.
5) Fitting: Understanding of fitting tools and making minimum one model.
6) Welding: Understanding of fitting tools and making minimum one model.
7) Smithy: Understanding of smithy tools and making minimum one model.
8) Machine Tools: Demonstration of various machines like shaping and slotting machine, Milling machine, Grinding Machine, Lathe, Drilling Machine, CNC Machines, Power Tools.
   Demonstration of 3D Printer.

iv) REFERENCES

1) Khanna, P. N., *Indian Practical Civil Engineering Handbook*, Engineers Publishers, 2012.
2) Punmia, B. C., Ashok, K. J. and Arun, K.J., *Surveying*, Vol. I, Laxmi Publications (P) ltd., New Delhi, 17th Edition, 2016.
3) Arora, S. P. and Bindra, S. P., *Building Construction*, Dhanpat Rai Publications,43rd Edition,2019.
4) Rangwala, S. C., *Engineering Materials*, Charotar Publishing House, Anand, 43rdEdition, 2019.
5) Sawhney, G.S., *Mechanical Experiments and Workshop Practice*, Dream tech Press, 2019.
6) Varun, B., *Engineering Workshop: Civil and Mechanical Engineering Practice*, Notion Press, 1stEdition, 2020.

v) COURSE PLAN

Experiment No.		List of exercises/experiments	No. of hours
A) CIVILWORKSHOP			
I		Set out a one room building of given plan using tape only method and using tape and cross staff.	**2**
II	**a)**	Use screw gauge and vernier calliper to measure the diameter of a steel rod and thickness of a flat bar.	**2**
	b)	Calculate the area of a built-up space and a small piece of land- Use standard measuring tape and digital distance measuring devices.	
III	**a)**	Construct a wall using currently used building blocks such as bricks (1 ½ thick brick wall using English bond), hollow blocks, solid blocks, etc. Use spirit level to assess the tilt of walls.	**2**
	b)	Estimate the number of different types of building blocks required to construct a wall of given dimensions.	
	c)	Transfer the level from one point to another point using a water level.	
IV		Find the level difference between any two points using dumpy level (differential levelling).	**3**
V	**a)**	Introduce the students to plumbing tools, different types of pipes, types of connections, traps, valves, fixtures and sanitary fittings.	**2**
	b)	Study of installation of rain water harvesting system in an educational campus.	
VI		Introduce students to the principle and working of Total Station.	**2**
VII		Demonstration of a simple construction work using concrete.	**2**
		Total hours	**15**
B) MECHANICAL WORKSHOP			
I		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 ries: Bearings, seals, O-rings, circlips, keys etc.	**1**
II		**Carpentry** - Understanding of carpentry tools and making minimum one model. • Lap joint • Cross lap joint • Dovetail joint • Mortise joints	**2**
III		**Foundry** - Understanding of foundry tools and making minimum one model. • Bench Moulding • Floor Moulding • Core making • Pattern making	**2**
IV		**Sheet metal** - Understanding of sheet metal working and making minimum one model.	**2**

	• Cylindrical shape • Conical shape • Prismatic shaped job from sheet metal	
V	**Fitting -** Understanding of fitting tools and making minimum one model. • Square Joint • V- Joint • Male and female fitting	**2**
VI	**Welding -** Understanding of welding equipment's and making minimum one model. • Minimum any one welding practice • Making Joints using electric arc welding	**2**
VII	**Smithy -** Understanding of smithy tools and making minimum one model. • Square prism • Hexagonal headed bolt • Hexagonal prism • Octagonal prism	**2**
VIII	**Machine tools –** Demonstration of various machine tools like • Shaping and slotting machine • Milling machine • Grinding Machine • Lathe • Drilling Machine • CNC Machines • Power Tools **Demonstration of 3D Printer**	**2**
	Total hours	**15**

v) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	**70**	**30**	**1 Hour**

Continuous Internal Evaluation Pattern

Attendance	**20 Marks**
Class work/ Assessment /Viva-voce	**50 Marks**

End Semester Examination Pattern: Written Objective Examination of one hour.

SEMESTER II

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
MA0U10B	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	BSC	3	1	0	4	2020

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.	Evaluate
CO 2	Evaluate surface and volume integrals and learn their inter-relations and applications.	Evaluate
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*, John Wiley &Sons, 10th Edition, 2016.

(b) REFERENCES

1) George F Simmons*: Differential Equation with Applications and its historical Notes*, McGraw Hill Education India, 2nd Edition, 2002.
2) Hemen Dutta, *Mathematical Methods for Science and Engineering*, Cengage Learning, 1stEdition, 2020.
3) B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th Edition, 2018.

v) COURSE PLAN

Module	Contents	No. of hours
I	Calculus of vector functions: Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields, Gradient and its properties, directional derivative, divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields, independence of path and potential function (results without proof).	**12**
II	Vector integral theorems: Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z) , Flux integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z), divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.	**12**
III	Ordinary differential equations: Homogenous linear differential equation of second order, superposition principle, general solution, homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only). Existence and uniqueness (without proof). Non homogenous linear ODEs-general solution, solution by the method of undetermined coefficients (for the right-hand side of the form xn, e^{kx}, $sinax$, $cosax$, $e^{kx}sinax$, $e^{kx}cosax$and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficient using method of undetermined coefficient.	**12**
IV	Laplace transforms: Laplace Transform and its inverse ,Existence theorem (without proof) , linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and	**12**

	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.	
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

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain10questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
CY0U10A	ENGINEERING CHEMISTRY – A	BSC	3	1	0	4	2020

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	Explain the basic concepts of electrochemistry and corrosion to explore its industrial functions in various engineering fields.	Understand
CO 2	Explain the various spectroscopic techniques like UV-Visible, IR, NMR and its applications.	Understand
CO 3	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.	Apply
CO 4	Apply the knowledge of conducting polymers and advanced polymers in engineering.	Apply
CO 5	Explain various types of water treatment methods and to develop skills for treating industrial and domestic wastewater	Understand

iii) SYLLABUS

Electrochemistry – Cell prototypes, Nernst equation and its uses, different types of cells and applications of electrochemical series. Fundamentals of corrosion and its prevention.

Basics of Spectroscopy – Principles and applications of UV-Vis, IR and NMR spectroscopy, instrumentation of UV-Vis spectroscope, colorimetry, MRI technique.

Instrumental methods in chemistry and Engineering materials – TGA, DTA, and chromatography techniques; Basics of polymer chemistry, BS, ABS and Kevlar and conducting polymers, Classifications of nanomaterials, synthesis, SEM, CNT, graphene.

Stereochemistry and polymer chemistry– Different types of isomers with examples; Notations; Conformational analysis, Types of polymers, ABS, Kevlar and applications, Polyaniline and Poly pyrrole - preparation properties and applications, OLED.

Water Technology–Types of hard water and its elimination, DO, BOD and COD and its significance, disinfection of water, reverse osmosis, sewage water treatment.

iv) (a) TEXT BOOKS

1) D. Harvey, N. Rutledge, *Industrial Chemistry*, ETP,1st Edition, 2018. ISBN: 9781788820554
2) P. W. Atkins, J de Paula, *Atkins' Physical Chemistry*, Oxford University Press, 11th Edition 2014. ISBN: 9780199697403
3) M. Arif, A. Fernandez, K. P. Nair, *Engineering Chemistry*, Owl Books, 1st Edition, 2015.
4) S. Chawla, *A text book of Engineering Chemistry*, Dhanpat Rai& Co., 2nd Edition, 2013.

(b) REFERENCES

1) C. N. Banwell, E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, McGraw-Hill, 4th Edition, 2001. ISBN: 9780074620250
2) H. H. Willard, L. L. Merritt, *Instrumental Methods of Analysis*, CBS Publishers, 7th Edition, 2005. ISBN: 9788123909431
3) A. J. Peacock, A. Calhoun, C. Hanser, *Polymer Chemistry: Properties and Application*, Verlag GmbH & Company KG, 2012. ISBN: 9783446433434
4) C. Binns, *Introduction to Nanoscience and Nanotechnology*, Wiley, 2010. ISBN:9780471776475
5) Roy K. Varghese, *Engineering Chemistry*, 1st Edition, Crownplus Publishers, 2019.

v) COURSE PLAN

Module	Contents	No. of hours
I	**Electrochemistry and corrosion:** Introduction - Differences between electrolytic and electrochemical cells- Daniel cell - redox reactions - cell representation. Different types of electrodes (brief) - Reference electrodes- SHE - Calomel electrode - Glass Electrode – Construction and Working. Single electrode potential – definition - Helmholtz electrical double layer - Determination of E^0 using calomel electrode. Determination of pH using glass electrode. Electrochemical series and its applications. Free energy and EMF-Nernst Equation – Derivation - single electrode and cell (Numericals) –Application-Variation of EMF with temperature. Potentiometric titration - Introduction -Redox titration only. Lithium ion cell - construction and working. Conductivity- Measurement of conductivity of a solution (Numericals). Corrosion-Electro chemical corrosion – mechanism. Galvanic series- cathodic protection - electroless plating –Copper and Nickel plating.	**12**
II	**Spectroscopic Techniques and applications:** Introduction- Types of spectrum - electromagnetic spectrum - molecular energy levels - Beer Lambert's law (Numericals). UV-Visible Spectroscopy – Principle - Types of electronic transitions – Energy level diagram of ethane, butadiene, benzene and hexatriene.	

	Instrumentation of UV-Visible spectrometer and applications. IR-Spectroscopy – Principle - Number of vibrational modes - Vibrational energy states of a diatomic molecule and -Determination of force constant of diatomic molecule (Numericals) –Applications. 1H NMR spectroscopy – Principle - Relation between field strength and frequency- chemical shift - spin-spin splitting (spectral problems) - coupling constant(definition) - applications of NMR- including MRI (brief).	**12**
III	**Instrumental Methods and Nanomaterials:** Thermal analysis – TGA- Principle, instrumentation (block diagram) and applications – TGA of CaC2O4.H2O and polymers. DTA-Principle, instrumentation (block diagram) and applications - DTA of CaC2O4.H2O. Chromatographic methods - Basic principles and applications of column and TLC- Retention factor. GC and HPLC-Principle, instrumentation (block diagram) - retention time and applications. Nanomaterials - Definition - Classification - Chemical methods of preparation -Hydrolysis and Reduction - Applications of nanomaterials – Surface characterisation -SEM – Principle and instrumentation (block diagram).	**12**
IV	**Stereochemistry and Polymer Chemistry**: Isomerism-Structural, chain, position, functional, tautomerism and matamerism- Definition with examples - Representation of 3D structures-Newman, Sawhorse, Wedge and Fischer projection of substituted methane and ethane. Stereoisomerism - Geometrical isomerism in double bonds and cycloalkanes (cis-trans and E-Z notations). R-S Notation – Rules and examples - Optical isomerism, Chirality, Enantiomers and Diastereoisomers-Definition with examples. Conformational analysis of ethane, butane, cyclohexane, mono and di methyl substituted cyclohexane. Copolymers - Definition - Types - Random, Alternating, Block and Graft copolymers - ABS - preparation, properties and applications. Kevlar-preparation, properties and applications. Conducting polymers - Doping -Polyaniline and Polypyrrole - preparation properties and applications. OLED - Principle, construction and advantages.	**12**
V	**Water Chemistry and Sewage Water Treatment:** Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Units of hardness- ppm and mg/L - Degree of hardness (Numericals) - Estimation of hardness-EDTA method (Numerical). Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. Municipal water treatment (brief) - Disinfection methods - chlorination, ozone and UV irradiation. Dissolved oxygen (DO) -Estimation (only brief procedure-Winkler's method), BOD and COD-definition, estimation (only brief procedure) and significance (Numericals).	**12**

	Sewage water treatment - Primary, Secondary and Tertiary - Flow diagram - Trickling filter and UASB process.	
	Total hours	**60**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contain10questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10B	ENGINEERING GRAPHICS	ESC	2	0	2	3	2020

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 multiview orthographic projection of solids by visualizing them in different positions.	Apply
CO 3	Construct sectional views and develop surfaces of a given solid.	Apply
CO 4	Prepare pictorial drawings using the principles of isometric and perspective projection to visualize objects in three dimensions.	Apply
CO 5	Convert pictorial views into orthographic views.	Apply
CO 6	Prepare multiview projection and solid models of objects using CAD tools.	Apply

iii) SYLLABUS

Introduction - Relevance of technical drawing in engineering field, BIS code of practice for technical drawing.

Orthographic projection - Projection of points and lines in different quadrants, traces of line. Projection of solids in simple position, axis inclined to one reference plane and axis inclined to both reference planes.

Sections of Solids - Sections of solids cut by different section planes, true shape of the sections

Development of Surfaces - Development of surfaces of solids and solids cut by different section planes.

Isometric Projection - Isometric view and projection of solids and their combinations.

Perspective Projection - Perspective projection of solids with axis perpendicular to the ground plane.

Conversion of Pictorial Views - Conversion of pictorial views into orthographic views.

Introduction to Computer Aided Drawing - Creating 2D drawing and 3D models of various components using suitable modelling software.

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, Basant Agrawal, *Engineering Graphics*, Tata McGraw-Hill, 1stEdition, 2012.

(b) REFERENCES

1) G. S. Phull, H. S.Sandhu, *Engineering Graphics*, John Wiley & Sons Inc Pvt. Ltd, 1stEdition, 2014.
2) P. I.Varghese, *Engineering Graphics*, V.I.P. Publishers,21st Edition, 2010.
3) Anil Kumar K.N., *Engineering Graphics*, Adhyuth Narayan Publishers, 4th Edition, 2009.

v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction: Relevance of technical drawing in engineering field. Types of lines, dimensioning, BIS code of practice for technical drawing. Orthographic projection of points and lines: Projection of points in different 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.	**8**
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.	**9**
III	Sections of Solids: Sections of prisms, pyramids, cone, cylinder with axis in vertical position and cut by different section planes. True shape of the sections. Locating the section plane when the true shape of the section is given. Development of surfaces: Development of surfaces of the above solids and solids cut by different section planes. Finding the shortest distance between two points on the surface.	**9**

IV	Isometric projection: Isometric view and projection of prisms, pyramids, cone, cylinder, frustum of pyramid, frustum of cone, sphere, hemisphere and their combinations.	**6**
V	Perspective projection: Perspective projection of prisms and pyramids with axis perpendicular to the ground plane, axis perpendicular to picture plane. Conversion of pictorial view: Conversion of pictorial view into orthographic views.	**5**
	SECTION B *(To be conducted in CAD Lab)*	
	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. (Minimum 2 exercises mandatory) Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software. (Minimum 2 exercises mandatory)	**8**
	Total hours	**45**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks** **Section A – 15 marks** **Section B – 10 marks**
Assignment/Project/Case Study etc.	**15 Marks** **Section A – 10 marks** **Section B – 5 marks**

End Semester Examination Pattern:

ESE will be of 3hour duration on A4 size answer booklet and will be for 100 marks. The question paper shall contain two questions from each module of Section A only. Student has to answer any one question from each module. Each question carries 20 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10D	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	ESC	4	0	0	4	2020

i) COURSE OVERVIEW

This course aims to equip the students with an understanding of the fundamental principles of electrical, 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	Apply fundamental circuit laws and principles of electromagnetism to solve simple DC electric circuits and magnetic circuits respectively.	Apply
CO 2	Describe the fundamentals of AC generation to perform simple AC circuit analysis.	Understand
CO 3	Describe the principles of passive components, semiconductor devices and its characteristics.	Understand
CO 4	Explain the working of electronic circuits, instrumentation, radio and cellular communication systems.	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.

Introduction to Semiconductor devices: Evolution of electronics, Resistors, Capacitors, Inductors PN Junction diodes and Bipolar Junction Transistors.

Basic electronic circuits and instrumentation: DC power supply, Full wave bridge rectifier, Capacitor filter, Simple Zener voltage regulator, Amplifiers, Public Address system and Electronic Equipments.

Introduction to Communication Systems: Evolution of communication systems, Radio communication, Principle of antenna and Mobile communication.

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) Boylested, R. L. and Nashelsky, L., *Electronic Devices and Circuit Theory*, Pearson Education, 10thEdition, 2009.
5) Wayne Tomasi and Neil Storey, *A Textbook on Basic Communication and Information Engineering*, Pearson, 5thEdition, 2010.

(b) REFERENCES

1) Paul Breeze, *Power Generation Technologies*, Newnes,3rd Edition, 2019.
2) Allan HambleyR., *Electrical Engineering: Principles & Applications*, Pearson Education,7thEdition, 2018.
3) Mittle V. N. and Arvind Mittal, *Basic Electrical Engineering*, McGraw Hill,2ndEdition, 2006.
4) N.N. Bhargava , D.C. Kulshreshtha , S.C. Gupta, *Basic Electronics and Linear Circuits*, Tata McGraw - Hill Education, New Delhi, 2nd Edition, 2014.

v) COURSE PLAN

Module	Contents	No. of 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.	9
	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.	
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.	9

	Alternating Current fundamentals: Generation of alternating voltages, Basic definitions, Average and RMS values of sinusoidal waveforms, Numerical Problems.	
	Power Generating Stations: Solar, Wind, Hydro-electric and Nuclear power stations, Basic concepts with block diagrams only.	
III	**Analysis of AC Circuits:** Transient Analysis of RL circuit, Steady state Analysis of RL circuit, Phasor representation of sinusoidal quantities, Complex forms. **Analysis of simple AC circuits:** Purely resistive, inductive and capacitive circuits; Analysis of RL, RC and RLC series circuits, active, reactive and apparent power. Illustrations using simple example.	**12**
	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 circuit, Numerical problems.	
IV	**Introduction to Semiconductor devices**	
	Evolution of electronics – Vacuum tubes to nano electronics (In evolutional perspective only)	**1**
	Resistors, Capacitors and Inductors: types, specifications, standard values, colour coding (No constructional features)	**2**
	PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown and Zener breakdown	**2**
	Bipolar Junction Transistors: PNP and NPN structures, principle of operation, relation between current gains in CE, CB and CC Configurations, input and output characteristics of common emitter configuration.	**5**
V	**Basic electronic circuits and instrumentation**	
	Rectifiers and Power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator	**3**
	Amplifiers: Concept of voltage divider biasing, circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, block diagram of Public Address system.	**5**

	Electronic Instrumentation: Block diagram of an electronic instrumentation system, functions of various equipments (multimeter, DSO and function generator)	**2**
VI	**Introduction to Communication Systems**	
	Evolution of communication systems: Telegraphy to 5G	**1**
	Radio communication: Principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver. **Principle of antenna:** Radiation from accelerated charge	**5**
	Mobile communication: Basic principles of cellular communications, principle and block diagram of GSM.	**4**
	Total hours	**60**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	**50**	**100**	**3 Hours**

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Tests (2 numbers)	**25 Marks**
Assignment/Quiz/Course project	**15 Marks**

End Semester Examination Pattern:

There will be two parts; Part I – Basic Civil Engineering and Part II – Basic Mechanical Engineering. Part I and PART II carries 50 marks each. For the end semester examination, part I contain 2 parts - Part A and Part B. Part A contain 5 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module out of which one to be answered. Each question carries 10 mark and can have maximum 2 sub-divisions. The pattern for end semester examination for part II is same as that of part I. However, student should answer both part I and part 2 in separate answer booklets.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
HS0U10B	PROFESSIONAL COMMUNICATION	HSC	2	0	2	--	2020

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	Develop effective language skills relevant to Engineering as a profession and demonstrate these through writing and making presentations.	Create
CO 2	Analyze, interpret and effectively summarize a variety of textual and audio content for specific needs	Analyse
CO 3	Apply appropriate thinking and problem solving techniques to solve new case studies.	Apply
CO 4	Present and analyse a given technical/non-technical topic in a group setting and arrive at generalizations/consensus.	Analyse
CO 5	Create professional and technical documents that are clear and adhering to all thenecessary conventions.	Create
CO 6	Manage and apply interviewing skills.	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, Job application, Types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (Skype) 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*, Oxford University Press, 3rdEdition, 2018.
2) Meenakshi Raman and Sangeetha Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2nd Edition, 2011.
3) Ashraf Rizvi M., *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*, 4thEdition, Pearson, 1999.
4) David F. Beer and David, *Guide to writing as an Engineer*, John Willey. New York, 2004.
5) Goodheart-Willcox, *Professional Communication*, 1stEdition, 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

Module	Contents	No. of hours
I	Use of language in communication: Significance of technical communication Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports, sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies. Language Development: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice. Technology-based communication: Effective email messages, slide presentations, editing skills using software. Modern day research and study skills: search engines, repositories, forums such as GitHub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora; Plagiarism	**6**

II	Reading, Comprehension, and Summarizing: Reading styles, speed, valuation, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, SQ3R method, PQRST method, speed reading. Comprehension: techniques, understanding textbooks, marking and underlining, Note-taking: recognizing non-verbal cues.	**6**
III	Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively. Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills.	**6**
IV	Listening and Interview Skills Listening: 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. Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews	**6**
V	Formal writing: 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 Reports. Elements of style, Common Errors in Writing: describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists. Analytical and issue-based Essays and Report Writing: basics of report writing; Referencing Style (IEEE Format), structure of a report; types of reports, references, bibliography	**6**
	Total Hours	**30**

LAB ACTIVITIES

- **Written:** Letter writing, CV writing, Linkedin profile, Attending a meeting and Minutes Preparation, Vocabulary Building
- **Spoken:** Phonetics, MMFS (Multimedia Feedback System), Mirroring, Elevator Pitch, telephone etiquette, qualities of a good presentation with emphasis on body language and use of visual aids.
- **Listening**: Exercises based on audio materials like TED talks, radio and podcasts. .
- **Reading:** Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills
- **Mock interview and Debate/Group Discussion:** concepts, types, Do's and don'ts - intensive practice

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	50	50	2 Hours

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Class work/ Assessment /Viva-voce	**25 Marks**
Continuous Assessment Marks	**15 Marks**

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U10E	PROGRAMMING IN C	ESC	2	1	2	4	2020

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
CO4	Make use of user defined data types or functions to solve computational problems.	Apply
CO5	Develop programs using files and pointers.	Apply

iii) SYLLABUS

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

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

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

Functions – Scope of variable, Pass by reference and value methods, Recursive functions. Structures and union, Storage Classes

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

iv) (a) 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*, 2ndEdition, 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

Module	Contents	No. of hours
I	Basics of Computer architecture.-Von-Neumann Architecture-Processor, Memory, Input and Output devices. Types of Programming Languages, System Software, Application Software: Compilers, Interpreters, high level and low level languages Introduction to structured programming, Algorithm, flowcharts and Pseudo-code – Examples	**8**
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 Loop, Break and Continue statements.	**9**
III	Arrays. Strings-string handling functions. Multidimensional arrays and matrices. Linear search and Bubble Sort in array. 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	**8**
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 covering pointers and files. Introduction to Data Structures: Linear and Non-linear data structures, Singly Linked list and its operations.	**11**
	Total hours	**45**

C PROGRAMMING LAB (Practical Part of ES0U10E)-Total hours 15

1. Familiarization of console I/O and operators in C
   i) Display "Hello World"
   ii) Read two numbers, add them and display their sum
   iii) Read the radius of a circle, calculate its area and display it
   iv) Area of triangle after reading its sides
2. Read 3 integer values and find largest of three numbers.
3. Check whether given year is leap year.
4. Display the grade of a student after reading his mark for a subject. (Use switch)
5. Read a Natural Number and check whether the number is prime or not
6. Read a Natural Number and check whether the number is Armstrong or not
7. Display second largest number after reading n numbers from user. (Without array).
8. Read n integers, store them in an array and find their sum and average
9. Read n integers, store them in an array and search for an element in the array using an algorithm for Linear Search
10. Read n integers, store them in an array and sort the elements in the array using Bubble Sort algorithm
11. Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) read a matrix, (ii) find the sum of two matrices, (iii) find the product of two matrices, (i) find the transpose of a matrix and (v) display a matrix.
12. Display sum of diagonal elements of a matrix
13. Read a string (word), store it in an array and check whether it is a palindrome word or not.
14. Read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it.
15. Display first n prime numbers using Function.
16. Program to find the sum of digits of a number using recursion
17. Using structure, read and print data of n employees(Name, Employee Id and Salary)
18. 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)
19. Input and Print the sum of elements of an array using pointers
20. Create a file and perform the following
    i) Write data to the file
    ii) Read the data in a given file & display the file content on console
    iii) append new data and display on console
21. Open a text input file and count number of characters, words and lines in it; and store the results in an output file.
22. Implementation of Singly Linked List.

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
150	50	100	3 Hours

Continuous Internal Evaluation Pattern:

Attendance	**10 Marks**
Continuous Assessment Test 1 (For theory – 2 hours)	**20 Marks**
Continuous Assessment Test 2 (For lab, internal eamination – 2 hours)	**20 Marks**

Internal Examination Pattern: There will be two parts; Part A and Part B. Part A contains 5 questions with 2 questions from each module (2.5 modules x 2 = 5), having 3 marks for each question. Students should answer all questions. Part B also contains 5 questions with 2 questions from each module (2.5 modules x 2 = 5), of which a student should answer any one. The questions should not have subdivisions and each one carries 7 marks.

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
CY0U18A	ENGINEERING CHEMISTRY LAB	BSC	0	0	2	1	2020

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 analysing 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	Apply different techniques of quantitative chemical analysis to generate basic experimental skills.	Apply
CO 2	Explain the use of spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds.	Understand
CO 3	Use instrumental techniques for chemical analysis.	Apply
CO 4	Organize scientific experiments as a team and analyse the results of such experiments.	Evaluate
CO 5	Create an experiment by themselves and applying them to real world problems and data.	Create

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) Mohapatra R. K., *Engineering Chemistry with Laboratory Experiments*, PHI Learning, New Delhi, 1st Edition, 2015.
2) George S. C., Jose R., *Lab Manual of Engineering Chemistry*, S. Chand & Company Pvt Ltd, New Delhi, 1st Edition, 2019.
3) Slowinski E., Wolsey W. C., *Chemical Principles in the Laboratory*, Cengage Learning, New Delhi, 11th Edition, 2008.

v) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	70	30	1 Hour

Continuous Internal Evaluation Pattern

Attendance	**20 Marks**
Class work/ Assessment /Viva-voce	**50 Marks**

End Semester Examination Pattern: Written Objective Examination of one hour.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
ES0U18B	ELECTRICAL AND ELECTRONICS WORKSHOP	ESC	0	0	2	1	2020

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 students 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	Identify electrical accessories, protective elements and their standard symbols and the tools used for electrical wiring.	Remember
CO 2	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.	Apply
CO 3	Identify different types of batteries and different types of earthing.	Remember
CO 4	Explain the working and purpose of fuse, MCB, ELCB etc. and solar powered circuit.	Understand
CO 5	Test various electronic components.	Understand
CO 6	Draw circuit schematics with EDA tools.	Apply
CO 7	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 components, drawing of electronic circuit diagrams, Familiarization of testing instruments, testing of electronic components, Inter-connection methods, soldering practice, Printed circuit boards, Assembling of electronic circuits in PCB.

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) NavasK A, *Electronics Lab Manual*, , Volume 1, PHI Learning Private Limited, 5th Edition, 2015.

v) COURSE PLAN

Experiment No.	PART I ELECTRICAL WORKSHOP List of exercises/experiments	No. of hours
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	Wiring of one lamp controlled by one SPST switch and a plug socket (PVC conduit wiring).	**2**
3	Wiring of light/fan circuit controlled by two SPDT switches (Staircase wiring).	**2**
4	Wiring of a light circuit and a power circuit for domestic applications.	**2**
5	Wiring of simple solar chargeable circuit and determination of its characteristics.	**2**
6	Demonstration of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	**2**
7	Understand the safety precautions to be observed in the workshop and learn about safety procedures of first aid in case of electrical hazards.	**2**
8	Video demonstration of Pipe and Plate Earthing Schemes.	**1**
	Total hours	**15**
Experiment No.	**PART II ELECTRONICS WORKSHOP List of Exercises / Experiments**	**No. of hours**
1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. (Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.))	**2**
2	Drawing of electronic circuit diagrams using standard symbols and introduction to EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.	**2**
3	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO	**2**

	etc.] [Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station etc.]	
4	Testing of electronic components [Resistor, Capacitor, Diode, Transistor and JFET using multimeter]	**2**
5	Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general-purpose PCB, Crimping.]	**2**
6	Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design (using Proteus) and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]	**2**
7	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning 1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, Zener/IC regulator 2. Square wave generation using IC 555 timer in IC base.	**3**
	Total hours	**15**

vi) ASSESSMENT PATTERN

Mark distribution

Total Marks	Continuous Internal Evaluation Marks	End Semester Evaluation Marks	End Semester Examination Duration
100	**70**	**30**	**1 Hour**

Continuous Internal Evaluation Pattern

Attendance	**20 Marks**
Class work/ Assessment /Viva-voce	**50 Marks**

End Semester Examination Pattern: Written Objective Examination of one hour.