ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (A)
(UGC Autonomous)
Approved by AICTE, Affiliated to Andhra University, Accredited by
(Estd : 2001)

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Academic Regulations (R23-ECE) Curriculum & Syllabi

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I Year Course structure										
Semester - I										
Course Code	Title of the course	Category	Periods				Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23MA1101	Linear Algebra and Multivariable Calculus	BS	3	-	-	3	40	60	100	3
23PY1101	Engineering Physics	BS	3	-	-	3	40	60	100	3
23EE3102	Circuit Theory	ES	2	1	-	3	40	60	100	3
23CS3101	Problem solving & Programming with C	ES	3	-	-	3	40	60	100	3
23ME3201	Computer Aided Engineering Graphics	ES	1	-	4	5	40	60	100	3
23CS9201	Information Technology Fundamentals	ES	-	-	3	3	50	50	100	1.5
23CS3201	Problem solving & Programming with C – lab.	ES	-	-	3	3	50	50	100	1.5
23PY1201	Engineering Physics Lab.	BS	-	-	3	3	50	50	100	1.5
23MC0102	Environmental Science	MC	2	-	-	2	50	0	50	-
Total			14	1	13	28	400	450	850	19.5
Semester - II										
Course Code	Title of the course	Category	Periods				Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23MA1102	Ordinary Differential Equations and Numerical Methods	BS	3	-	-	3	40	60	100	3
23CY1101	Engineering Chemistry	BS	3	-	-	3	40	60	100	3
23EC3101	Electronic Devices and Circuits	ES	3	-	-	3	40	60	100	3
23EC4101	Digital Electronics and Logic Design	PC	3	-	-	3	40	60	100	3
23EN2101	Communicative English	HS	3	-	-	3	40	60	100	3
23EN2201	Communicative English Lab	HS	-	-	3	3	50	50	100	1.5
23EC3201	Electronic Devices and Circuits Lab	ES			3	3	50	50	100	1.5
23CY1201	Engineering Chemistry Lab.	BS	-	-	3		50	50	100	1.5
23MC0101	Universal Human Values & Professional Ethics	MC	2	-	-	2	50	-	50	-
Total			17	0	9	23	400	450	850	19.5

LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

23MA1101   **Credits:3**

Instruction : 3 periods & 1 Tutorial/Week   Sessional Marks:40

End Exam : 3 Hours   End Exam Marks:60

Prerequisites: Matrices, Differentiation, Integration and Functions.

Course Objectives:

To provide the students with sufficient knowledge in calculus and matrix algebra, this can be used in their respective fields.

Course Outcomes: By the end of the course, students will be able to

1.	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret the various solutions of system of linear equations.
2.	Identify the special properties of a matrix such as the eigen value, eigen vector, employ orthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form.
3.	Equip themselves familiar with the functions of several variables.
4.	Evaluate double and triple integrals techniques over a region in two dimensional and three dimensional geometry.
5.	Express the given function in terms of sine and cosine.

CO-PO –PSO Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1							1	2			
CO2	3	2	1	1							1	2			
CO3	3	2	1	1							1	2			
CO4	3	2	1	1							1	2			
CO5	3	2	1	1							1	2			

Correlation levels   1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

	CO-PO-PSO Justification
1	CO1 is a basic tool which is used to find a solution of a complex problem after reducing it into a system of linear equations in many areas of the engineering sciences.
2	CO2 deals with eigen values, eigen vectors of a square matrix which are widely used in all the engineering branches like communications systems, Designing bridges, Machine learning.
3	CO3 deals with partial derivatives which are widely used in all the branches of engineering sciences.
4	CO4 delas with the techniques of multiple integrals which are used to find the area, volume and other physical and geometrical parameters in all the areas of engineering sciences.
5	CO5 is used to represent the given periodic function as an infinite sum of cosine and sine terms.

SYLLABUS

UNIT I   **10 Periods**
Linear Equations : Rank of matrix - Normal form of a matrix - PAQ form - Gauss Jordan method of finding the inverse - Consistency of linear system of equations.

Sections: 2.7 and 2.10.

UNIT II   **10 Periods**
Linear transformations and Quadratic forms :   Eigen values - Eigen vectors - Properties of eigen values (without proofs) - Cayley Hamilton theorem (without proof) - Reduction of quadratic form to canonical form - Nature of the Quadratic form.

Sections: 2.13, 2.14, 2.15, 2.17 and 2.18.

UNIT III   **10 Periods**
Multivariable Calculus : Total derivatives - Chain rule - Change of variables - Jacobians - Taylor's series expansion of two variable function - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

Sections: 5.5, 5.6, 5.7, 5.9, 5.11 and 5.12.

UNIT IV   **10 Periods**
Multiple Integrals : Double integrals - Change of order of integration - Double integration in polar coordinates - Areas enclosed by plane curves - Triple integrals - Volumes of solids (by using double and triple integrals).

Sections: 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6.

UNIT V   **10 Periods**

Fourier Series : Introduction - Euler's formulae (without proof) - Conditions for a Fourier expansion - Functions having points of discontinuity - Change of interval - Even and odd functions - Half range series.

Sections: 10.1, 10.2, 10.3, 10.4, 10.5, 10.6 and 10.7.

TEXT BOOKS:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. **N. P. Bali**, Engineering Mathematics, Lakshmi Publications.
3. **George B. Thomas, Maurice D. Weir and Joel Hass**, Thomas, Calculus, 13/e, Pearson Publishers, 2013.
4. **H. K. Dass**, Advanced Engineering Mathematics, S. Chand and complany Pvt. Ltd.
5. **Michael Greenberg**, Advanced Engineering Mathematics, Pearson, Second Edition.

R- 23 - ENGINEERING PHYSICS
(Common for ECE, EEE, Mechanical, Civil and Chemical)

Course Code: 23PY1101   **Credits: 03**

Instruction**:** L - 3, T- 1 P – 0   Sessional Marks: 40

End Exam : 3 Hours   EndExam Marks: 60

Prerequisites: Basic concepts of Physics in 12th level

Course Objectives

1. To impart knowledge in basic concepts of physics relevant to engineering applications

2. To introduce advances in technology for engineering applications

Course Outcomes: At the end of the course the student will be able to:

CO	COURSE OUTCOMES	Bloom's Taxonomy	Bloom's Taxonomy Level
CO-1	**Interpret** the relation between heat, work, and entropy with thermodynamic laws.	**Interpret**	L3
CO-2	**Explain and analyze** the relation between electric field, electric current and magnetic fields, production and applications of ultrasonics	**Explain Analyze**	L2 L4
CO-3	**Apply** the optical phenomena like Interference, Diffractionand Polarization to various fields.	**Apply**	L3
CO-4	**Explain** the working principle and applications of lasers andfiber optics.	**Explain**	L2
CO-5	**Interpret** the microscopic behavior of matter with quantummechanics.	**Interpret**	L3

CO	Bloom's Level
CO1	Action Verb from Blooms Taxonomy- **Interpret** / Cognitive level- Analysis (BL-3)
CO2	Action Verb from Blooms Taxonomy- **Explain, Analyse** / Cognitive level- Application (BL-2, L-4)
CO3	Action Verb from Blooms Taxonomy- **Apply** /Cognitive level- Understand (BL-3)
CO4	Action Verb from Blooms Taxonomy-**Explain** /Cognitive level- Applying (BL-2)
CO5	Action Verb from Blooms Taxonomy-**Interpret** /Cognitive level- Understand (BL-3)

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									1
CO2	3	3	1	1		1						
CO3	3	2		1								
CO4	3			1	1	1				1	1	2
CO5	3	2										

Correlation levels1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes

CO-PO Justification	
1	CO1 deals with the fundamental concepts of thermodynamic laws and entropy, which are associated in all working instruments and machines in the development of components, **related to** engineering problems. All the Thermodynamics concepts are related to electrical and mechanical devices in terms of understanding heat and heat dissipation mechanisms in daily life. So mapped to PO1, PO2, PO3 and PO12
2	CO2 deals with the fundamental laws of electromagnetism give us **deep insight** of **working nature** for different electronic devices and instruments. The knowledge of electromagnetism allows them to design systems with minimal electromagnetic interference, leading to more reliable and robust engineering solutions. The knowledge of basic properties and applications of ultrasonic waves will allow their utility in all fields of industry. So mapped to PO1, PO2, PO3, PO4 and PO6.
3	CO3 gives the knowledge of polarization allows them to design antennas with specific polarization characteristics, matching requirements of wireless communication applications. The study of Interference and diffraction phenomenon will help to analyse the colours in thin films, non-reflective surfaces, refractive index of materials and importance of polaroid's. So mapped to PO1, PO2 and PO4.
4	CO4 deals with the lasers and optical fibre properties and their basic principle of working mechanisms. From this knowledge students can gain insight into emerging technologies in various fields. So mapped to PO1, PO4, PO5, PO6, PO10, PO11 and PO12.
5	CO5 deals with the basic knowledge of Quantum mechanics will help to understand Microscopic **behaviour** of matter which decides the macroscopic property of the system. The conceptual knowledge of Quantum mechanics is useful to **identify** and analyse the complex engineering aspects. So mapped to PO1 and PO2.

SYLLABUS

UNIT – I   10 periods
Thermodynamics:
Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics.
A text book of Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications
Learning Outcomes:
The students will be able to
- Explain the relation between heat and work.
- Recognize how much heat is converted into work.
- Identify the relation between entropy and different thermodynamic phenomena.

UNIT-II 10 periods

ELECROMAGNETISM

Electric charge, electric flux, experimental law of Coulomb, electric field intensity (E), electric flux density (D), electric Potential (V).

Magnetic flux, magnetic field intensity (H), magnetic flux density (B), Biot-Savart's law, current density (J), first form of Ohm's law.

Electromagnetic induction - Faraday's law of induction,

Properties of Dielectrics and its classifications (Polar, Non-Polar), Electric dipole, polarization,

Properties of magnetic materials and classification (Dia, Para, Ferro), magnetic dipole, magnetization

Physics   -   Resnick & Halliday Volume II Wiley India Publications

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by Magnetostriction and Piezoelectric methods, Applications of ultrasonics.

A text book of Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Recognize the properties and production of ultrasoncs.
- Identify the use of ultrasonics in different fields.

UNIT–III

OPTICS & OPTICAL DEVICES **[10 periods]**

Interference: Parallel and wedge-shape thin films, Newton rings-Measurement of wavelength and refractive index, Applications as Non-reflecting coatings,.

Diffraction: Fraunhoffer Diffraction at a single slit, Applications - Dispersive and Resolving Powers.

Polarization: Double refraction, Nicol's prism, Production, detection, Applications – Anti-glare automobile headlights, Adjustable tint windows.

A text book of Engineering Physics M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications.

Learning Outcomes:

The students will be able to

- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Aanalyze the differences between interference and diffraction.
- Illustrate the concept of polarization of light and its applications.
- Classify the production and detection of different polarized light.

UNIT–IV   10 periods

Lasers: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, He-Ne laser, Nd – YAG, CO_2 and semiconductor laser, applications of lasers
Optical Fibres: Principle and working of optical fibre, structure, types, advantages of optical fibre, acceptance angle and acceptance cone, numerical aperture, applications of optical fibres

Modern Engineering Physics - S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications

 Learning Outcomes:

The students will be able to
- Explain the working principle and properties of lasers
- Analyze the production and applications of lasers.
- Explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation.
- Identify the applications of optical fibers in medical, communication and other fields.

UNIT–V   10 periods
Quantum mechanics:
Planck's hypothesis, wave-particle duality, introduction to quantum theory, de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ , Application of Schrodinger wave equation for a particle in one dimensional well – Eigen wave functions and energy Eigen values of the particle and Quantum mechanical tunnelling- Potential Barrier

Elements of Statistical mechanics: Elementary concepts of Maxwell-Boltzman , Bose-Einstein and Fermi-Dirac statistics (no derivation)
Modern Engineering Physics -- S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications
Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to
- Explain the dual nature of radiation and matter.
- Realize de Broglie concept of matter waves and Heisenberg uncertain principle.
- Identify Schrodinger wave equation to solve the problems.
- Explain the importance of fundamentals of statistical mechanics.

Text Books :
1. M.N.Avadhanulu & P.G.Kshirasagar, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.
2. S.L.Gupta & Sanjeev Gupta, "Modern Engineering Physics" -- Dhanpat   Rai Publications, 2011.

Reference Books:

1) V. Rajendran, "Engineering Physics" , McGrawHill Education Private Ltd, 2011.
2) S.O.Pilai, Sivakami , "Engineering Physics" – IV Edition, New Age International Publishers , 2011.
3) Young & Freedman, "University Physics" – XI Edition, Pearson Education, 2004.
4) A.Marikani, "Engineering Physics" -   PHI Learning Private Limited, 2009.
5) Resnick & Halliday, "Physics" Volume II – VI Edition,WileyIndia Publications 2001.
6) R K Gaur, S L Gupta, "Engineering Physics" – VIII Edtion,   Dhanpat Rai Publications, 2001.
7) D.K.Bhattacharya, Poonam Tandon, "Engineering Physics" – Oxford University Press, 2010.

CIRCUIT THEORY

23EE3102   **Credits:3**
Instruction : 3 periods & 1 Tutorial/Week   Sessional Marks:40
End Exam : 3 Hours   End Exam Marks:60

Course Objectives:
1. To get in depth knowledge of communication through satellite
2. To understand the design criterion
3. To introduce students to the principle of GPS.
4. To familiarize students with GPS signal structure.

Course Outcomes:
By the end of the course, students will be able to

1.	**Apply** the basic laws and **Determine** the parameters of electrical circuits
2.	**Apply** network theorems and **calculate** various parameters of DC circuits.
3.	**Explain** phasor diagrams for R, R-L, R-C and R-L-C circuits and **Determine** various powers for A.C circuits.
4.	**Analyze** the behavior of magnetically coupled circuits, two port network and **calculate** various parameters of two port network.
5.	**Explain** circuits under resonant condition and **determine** parameters of series and parallel RLC circuits.

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO4	2	3	1	-	1	-	-	-	-	-	-	1	2	-
CO5	2	3	-	1	1	-	-	-	-	-	-	1	1	-

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

	CO-PO-PSO Justification
1	CO1 deals with Simplification of electrical network with the knowledge of fundamentals of basic electrical engineering and mathematics and analyse the networks by applying basic laws and to recognize the need of fundamental laws in power system. So it is mapped with PO1, PO2, PO12 and PSO1
2	CO2 deals with solving problems for different theorems with the knowledge of fundamentals of basic electrical engineering and mathematics for d.c Circuits and their use in design in power systems. So it is mapped with PO1, PO2, PO3, PO12 and PSO1
3	CO3 deals with the measurement of various powers with the knowledge of fundamentals of basic electrical engineering and mathematics for a.c. Circuits and also to analyze phasor diagram of Power system. So it is mapped with PO1, PO2, PO12 and PSO1
4	CO4 analyzes two port networks, magnetically coupled circuits with the knowledge of basic electrical engineering, which are useful in power system applications. So, it is mapped to PO1, PO2, PO3, PO5 and PO12. Power system components can be designed using the T parameters, so it is mapped to PSO1.
5	CO5 helps the students to analyze natural and forced responses of circuits, analyze behavior of inductor, capacitor and resistor in transient and steady state conditions, hence mapped to PO1, PO2, PO4 and PSO5. Power system transient analysis under fault condition can also be studied and hence mapped to PO12. mapped to PSO1.

SYLLABUS

UNIT-I [10 Periods]
Elementary Network Theory
Electric Charge, Electric current, Voltage, Ohm's law, Classification of circuit elements, series and parallel combinations of Resistances, Inductances and Capacitances, Current and Voltage division rules, Source Transformation, Network reduction by Star-Delta transformation.

UNIT-II [14 Periods]
DC Circuit Analysis (Independent sources only)
Kirchhoff laws, Mesh analysis, Nodal analysis, Superposition theorem, Thevenin's and Norton's theorems, Maximum power transfer theorem for DC circuits.

UNIT-III [10 Periods]
AC Circuit Fundamentals
AC circuit analysis for R, L, C, series R-L, R-C, and R-L-C circuits and their respective phasor diagrams, Active, Reactive, Apparent and complex powers, power factor, Average, Effective values, Peak factor, and Form factor of various AC waveforms and functions.

UNIT-IV [16 Periods]
Coupled Circuits
Analysis of Magnetically coupled circuits, Series aiding, series opposing, parallel aiding and parallel opposing, and Dot convention
Two-Port Networks- Z, Y, h, ABCD parameters of two port networks.

UNIT-V   **[10 Periods]**
DC Transients
Initial conditions, Analysis of Source-free and Source-driven RL, RC circuits both in Time and Laplace domains

TEXTBOOK:
1. William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, "Engineering circuit analysis", 9th edition, McGraw-Hill publications, 2021.

RFERENCE BOOKS:

1. Charles K. Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", 7th edition, McGraw-Hill publications, 2022.
2. Gopal G Bhise, "Engineering Network Analysis & Filter Design" Umesh Publications.

Problem Solving and Programming Using C (Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)	
Code: 23CS3101	**Credits : 03**
Instruction **:** 3 Periods/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Course Objectives:
1. To learn how to solve a given problem.
2. To illustrate the basic concepts of C programming language.
3. To discuss the concepts of Functions, Arrays, Pointers and Structures.
4. To familiar with Dynamic memory allocation concepts.
5. To apply concepts of structures and files to solve real word problems.

Course Outcomes

After course completion, the students will be able to:

1	Demonstrate the ability to analyze complex problems and apply appropriate problem-solving techniques to devise effective solutions.
2	Apply control structures to solve programming problems effectively
3	Design efficient algorithms involving arrays, demonstrating a clear understanding of array data structures.
4	Solve programming problems that require the use of pointers, including pointer arithmetic and manipulation.
5	Demonstrate the ability to declare structure variables and define their member data types.

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	2				2					2	
CO2	3	3	3	3	2				2	2				2	
CO3	3	3	3	3	2	1	1	1	2		1	1		2	
CO4	3	3	3	3	2	1	1	1	2	1	2	1		2	
CO5	3	3	3	3	2	1	1	1	2	1	2	1		2	

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SYLLABUS

UNIT-1:   **10 Periods**
Introduction to Problem Solving: Problem Solving Aspect, Problem Identification, Problem Understanding, Algorithm Development, Solution Planning, Flowcharts, flowgorithm.
Overview of C: History of C, C Language Elements, Basic Structure of C Program, C Tokens-Variables and Data Types, Operators, Expressions and Type Conversions.

UNIT-2:   **10 Periods**
Control Statements: Selection Statements- if and switch statements.
Iterative Statements: for, while and do-while statements.
Jump Statements: break and continue statements.

UNIT-3:   **10 Periods**
Arrays: Declaration, accessing array elements, Storing values, Operations on arrays, Multi-dimensional arrays.
Functions: Introduction, Using Functions, Function declaration, Function definition and Function call, Parameter passing, Passing arrays to functions, Recursion, Storage classes.

UNIT-4:   **10 Periods**
Pointers: Declaration and Initialization of pointer variables, Pointer arithmetic, Pointers and arrays, Pointer to pointer, Array of pointers, Pointers and functions, Dynamic Memory Allocation.
Strings: Introduction to Strings, String handling functions, Preprocessor Directives.

UNIT-5:   **10 Periods**
Structures: Introduction, Nested Structures, Array of Structures, Structures and Functions, Unions.
Command-Line Arguments: Command-line Arguments
Files: Introduction, File Operations

Text Books:
1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.
3. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

Reference Books:
1. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson
2. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Second Edition, Prentice Hall Publication.
3. Paul Deitel, Harvey Deitel -C How to Program with an introduction to C++,Eighth Edition

COMPUTER AIDED ENGINERING GRAPHICS
(MECH, CHEM, CIVIL, CSD, CSM, EEE, ECE)

23ME3201   **Credits:3**
Instruction : 1 periods & 3 Practical/Week   Sessional Marks:50
End Exam : 3 Hours   End Exam Marks:50
Prerequisites: Nil

Course Objectives:
 ➢ The course is designed to introduce computer aided drafting skills and fundamentals of engineering drawing and further apply these principles to draw orthographic projections of points, planes, solids and isometric projections.

Course Outcomes:

By the end of the course, students will be able to

1.	**Draft** simple 2D drawings with dimensions using CAD software.
2.	**Draft** Engineering curves - conics , cycloids and involute using CAD software.
3.	**Project** orthographically points, lines and planes in various positions using CAD software.
4.	**Draw** orthographic projections of solids in various orientations using CAD software.
5.	**Construct** isometric views and isometric projections of simple Machine parts using CAD software.

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2			3			1		2		1		
CO2	2	2			3			1		2		1		
CO3	2	2			3			1		2		1		
CO4	2	2			3			1		2		1		
CO5	2	2			3			1		2		1		

Correlation levels1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification
1	CO-1 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-1 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-1 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-1 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-1 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-1 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study using any of the Drafting Tools).

2	CO-2 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-2 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-2 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-2 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-2 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-2 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study using any of the Drafting Tools).
3	CO-3 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-3 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-3 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-3 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-3 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-3 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study using any of the Drafting Tools).
4	CO-4 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-4 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-4 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-4 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-4 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-4 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study using any of the Drafting Tools).
5	CO-5 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-5 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-5 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-5 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-5 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-5 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study using any of the Drafting Tools).

SYLLABUS

UNIT I : COMPUTER AIDED DRAFTING

Introduction, Applications, CAD software- AutoCAD, GUI, function keys, Drawing entities, Drafting aids(limits, layers, dimensioning, object snap, zoom), modify commands, Block, WBlock and insert, List of commands, Setting Isometric mode, Iso-planes, isometric commands.

Weekly Exercises:

Week 1: a) Limits, command line, command list, function keys- Ortho, polar, Osnap, Otrack etc.

b) Draw lines using dynamic input, Ortho & Polar, Line divide, construction line.

c) Drawings using coordinate system, arbitrary coordinate system.

d) Selection & Modify commands – offset, move, copy, rotate, trim, Scale.

Week 2: a) Layers, Match property, line types

b) Arcs and Circles

c) Fillet and Chamfer

d) Annotations and Dimensioning

Week 3: a) Symmetrical drawings using mirror

b) Rectangular Array

c) Polar and Path Array

d) Annotations and Dimensioning

Week 4: **a)** polygons

b) hatching

c) block, wblock, group, ungroup, explode

d) iso planes

UNIT II: ENGINEERING CURVES

Conic sections- General methods, Cycloids, epi-cycloid, hypocycloid, Involute of circle and polygon

Week 5: **a)** Ellipse

b) Parabola

c) Hyperbola

Week 6: **a)** Cycloid

b) Hypocycloid

c) Epi-Cycloid

Week 7: **a)** Involute of polygon

b) Involute of a Circle

UNIT III: ORTHOGRAPHIC PROJECTIONS – POINTS & LINES & PLANES

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes) Projections of regular polygon planes – inclined to one plane, inclined to both the planes.

Weekly Exercises:

Week 8: a) Projection of points

b) Shortest distance of points from principle plane

Week 9: a) A line parallel to both the planes

b) A line inclined one plane

c) A line inclined to both the planes

Week 10: Projection of plane inclined to one plane.

Week 11: Projection of planes inclined to both planes

UNIT IV: ORTHOGRAPHIC PROJECTIONS – SOLIDS

Projection of solids: Prisms – Cylinder– Pyramids &Cones –simple positions & axis inclined to one plane.

Weekly Exercises:

Week 12: Projection of solids in simple positions.

Week 13: Projection of solids inclined to one plane.

UNIT V: ISOMETRIC PROJECTIONS

Isometric projections –Isometric scale, Isometric view & projection of prisms, pyramids, cone, cylinder, sphere, and their combination, conversion of orthographic projection into isometric projection.

Weekly Exercises:

    Week 14: Isometric Projection of Primitives

    Week 15: Isometric Projection of combination of solids

TEXT BOOKS:
1. **Pradeep Jain** "Engineering Graphics & Design" ISBN 9789391505066, Khanna Book Publishing
2. **N. D. Bhatt** *"Engineering Drawing"* Charotar Publishing House Pvt. Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. **K. L. Narayana & P. Kanniah** *"Engineering Drawing"*

2. **R. B. Choudary** *"Engineering Graphics* with Auto CAD"

3. **TrymbakaMurty** *"Computer Aided Engineering Drawing"*

4. **B.V.R. Gupta and M.Raja Roy** *"Engineering Drawing with Auto CAD"* ISBN-13 978-9384588960 I K   International Publishing House 3rd Edition : 2016

Information Technology Fundamentals (ITF) (Common to all Branches)	
Code: 23CS9201	**Credits : 00**
Instruction **:** 3 Periods Practical/Week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:
1. To make the students to know about the internal parts of computer, Generation ofComputers
2. To make the students to know how to assemble and disassemble a computer from itsparts
3. To make the students to install Operating system for a computer.
4. To provide technical training to the students on productivity tool like Word Processor,Spread Sheets, Presentations and LaTeX
5. To learn about networking of computers and use Internet facility for browsing andsearching

Course Outcomes
After course completion, the students will be able to:

1   Identify the Internal parts of computers to assemble and disassemble a computer from its parts.

2   Understand the installation process of different types Operating system for a computer by theirown**.**

3   Apply the procedure to interconnect two or more computers for information sharing.

4   Create the documents, building the resume using LaTeX.

5   Create the slide presentation using Beamer (LaTeX).

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3				2					3	3	2		2	
CO2	3				2					3	3	2		2	
CO3	3				2				3	3	3	2		2	
CO4	3				2				2	3	3	2		2	
CO5	3				2				2	3	3	2		2	

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Laboratory Experiments

Task 1:
Learn about Computer Hardware -1: Identifying the internal parts of computer with its peripherals, Block diagram of Computer, Generations of Computers. Write specifications for each part of a computer including peripherals and specifications of a system. Submit it inthe form of report.

Task 2:
Learn about Computer Hardware-2: Assemble and disassemble the Personal Computer, Internal and external connections of the computer, Troubleshoot the computer by identifying working and non-working parts. Submit a report about the working and non- working parts in a computer.

Task 3:
Installation of Operating System: Linux, Windows 7/8/10 Installation, install both the operating system in a computer and make the system as Dual boot. Student should record the entire installation process.

Task 4:
Installation of Device drivers: Install supported device drivers for the system- printer drivers, audio and video drivers, Graphic card drivers, USB drivers, install new application software and record the process of installations.

Task 5:
Networking: Connecting computers directly using a cable or wireless connectivity and share information, connecting computers using switch/hub or Local Area Network connection and share information, Wide Area Network Connection, crimpling activity, logical configuration. The entire process has to be documented.

Task 6:
Introduction to Web Design: Introduction to Web Design, Introduction to HTML tags, Cascading Style sheets and Applications using HTML and CSS.

Task 7:
Introduction to Virus and Antivirus: Types of Virus, virus engine, Antivirus- download freely available Anti-virus software, install it and use it to check for the threats to the computer being used. Student should submit information about the features of the installation process and antivirus used.

Task 8:
Introduction to LaTeX: LaTeX and its installation and different IDEs, Creating the document using Latex, content into sections using article and book class of Latex.
Styling Pages: Reviewing and customizing different paper sizes and formats. Formatting text, creating basic table, adding simple and dashed border, merging rows and columns, referencing and indexing. Student should submit a user manual of the LaTeX.

Task 9:
Resume/ CV Preparation using LaTeX: Create a new document with resume tag, adding sections of resume with different styles, apply Lists / Bullet Points, Adding Positions, finding styles and apply other CV styles, generating PDF.

Task 10:
Diagrams, Mathematics and Documentation : Images, Colors, Figures, Graphs, Tables, Lists, Block Structures, Smart Diagrams, Math Symbols, Mathematical Equations, Fractions, Matrices, Integrals, Partial Derivatives, Aligning Equations, Changing margins, Page Numbers, Headers and Footers, Paragraph, Pages and Page Breaking.

Task 11:
Make a Presentation using LaTeX: Introduction about Beamer Document, Use Themes, Apply Colors, Fonts, Styles, Add Symbols, Alignments, Lists, Math Equations, Figures, Graphs, Headers and Footers, Logos, Slide Partitions and sections and subsections.

References:
1. Introduction to Computers, Peter Norton, McGraw Hill
2. PC Hardware, Maintenance & Troubleshooting In-Depth, Reddy N.S.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Lamport L. LaTeX: a document preparation system: user's guide and reference Manual. Addison-Wesley: 1994

Problem Solving and Programming Using C Lab	
(Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)	
Code: 23CS3201	**Credits : 1.5**
Instruction **:** 3 Periods Practical/Week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:
1. To learn how to solve a given problem.
2. To illustrate the basic concepts of C programming language.
3. To discuss the concepts of Functions, Arrays, Pointers and Dynamic MemoryAllocation.
4. To understand and implement Structures and Unions.

Course Outcomes

After course completion, the students will be able to:

1	Develop an algorithm and flowchart by applying various control structures to solve real world problems
2	Apply iterative statements, arrays and modular programming to solve the complex problems
3	Implement Programs using pointers and String handling Functions.
4	Develop code for complex applications using structures, unions and file handling features

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3								2	
CO2	3	3	3	3	3	3								2	
CO3	3	3	3	3	3	3								2	
CO4	3	3	3	3	3	3								2	

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SYLLABUS

Sr. No	Module Name	Name of Program
1.	**Familiarization with programming environment** Introduction to Programming, Writing of Algorithms, Introduction to Drawing flow Charts /Preparation of Flowchart/ Steps for Writing Code in C/ Turbo C.	1. First Basic Program-Writing a Single Statement. 2. Writing a Program to print your Basic details Multi statements.
2	**Variable types and type conversions**	1. WAP to perform simple Input-Output Operations in C. 2. WAP to add two numbers. 3. WAP to perform simple arithmetic operations in C (Addition, Subtraction, Multiplication, Division, Modulus). 4. Write a simple program that print the result of all the operators available in c (including pre/ post increment, bitwise and logical). 5. WAP to find area and perimeter of circle. 6. WAP to find area and perimeter of rectangle. 7. Given the values of three variable entered by user, write a program to compute and display the value of x, where x=a/(b-c). 8. Write a program to convert one data type to another using auto conversion and casting. Take the value from user input.

3	**Branching and logical expressions**: Use of If, if- else,Else if, nested if statements andoperators with them and switch case statement	1. WAP to find whether a given number is positive or not.
		2. WAP to find greatest of two numbers.
		3. WAP to find greatest of three numbers using nested if/else if statements only.
		4. WAP to find greatest of three numbers using & operator.
		5. WAP to find whether a given number is even or odd.
		6. Given the marks of a student studying five different subject. Calculate average marks of students and assign him/her Grade based on following: Marks is equal or greater than 90 – Grade A Marks equal or more than 75 and less than 90 –Grade B Marks equal or more than 60 and less than 75 –Grade C Marks equal or more than 50 and less than 60 –Grade D Marks less than 50 –Grade F
		7. WAP to find roots of a quadratic equation: $ax^2+bx+c=0$
		8. WAP to print day of a week using switch case statement
		9. WAP to design a simple calculate using switch-case statements
4.	**Loops: do, while and for loops:** Use of while loop, do while, and for loop:their Syntax	1. WAP to print counting 1 to 10 using all loop
		2. WAP to print table of any number.
		3. WAP to print the factorial of given number.
		4. WAP to print the sum of digits of a given number.
	Using Loops:	1. WAP to print the Fibonacci series up to 10 level.
		2. WAP to find whether the given number is Armstrong or Not.
		3. WAP to find whether the given number is Palindrome or Not.
		4. WAP to find whether the given number is prime or not.
		5. WAP to reverse the digits of a given number.
5.	1D Arrays, 2D array Declaration of arrays, syntax, semantics, Operations on Arrays.	1. Program to insert 5 elements into array and print elements of array.
		2. WAP to merge two sorted array in one sorted array.
		3. WAP to add two matrices in 2-D array
		4. WAP to multiply two matrices in 2-D array.
		5. WAP to find transpose of a Matrix.
		6. WAP to find average of 10 numbers using array.
		7. WAP to print the following numbers in reverse order using array.

6.	**Functions** Simple function declaration, definition, functions with return type, call by value.	1. WAP to create function display a simple message. 2. WAP to create function to add two numbers. 3. WAP to create a function to swap two numbers using call by value. 4. WAP to generate Fibonacci series using recursive function. 5. WAP to swap two integers using call by value and call by reference method of passing arguments to a function.
7.	**Pointers** Pointer declaration, use of pointers in array, functions, call by reference, recursive functions	1. WAP to understand basic use of pointers. 2. WAP to implement call by reference for swapping of two numbers. 3. WAP to calculate factorial of a number using recursion. 4. WAP to Fibonacci series up to 20 using recursive functions
8.	**Structures and Unions** Basics of Structure Union and accessing data of structure**.**	1. WAP for user defined data type namely Student and implement it using Structure 2. WAP for user defined data type namely Book and implement it using Structures 3. WAP to create an array of structure. 4. WAP to Create an Union and perform operations.
9	**File Operations:** File opening modes, creation of files, reading and writing data files.	1. WAP to read a simple file using file handling. 2. WAP to write data in file. 3. WAP to append data in existing file.
10.	**Searching and sorting:** Various searching and sorting algorithms.	1. WAP to implement linear search 2. WAP to implement binary search 3. WAP to implement selection sort. 4. WAP to implement insertion sort. 5. WAP to implement quick sort. 6. WAP to implement merge sort. 7. WAP to implement bubble sort.

Text Books:
1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.
3. R.G. Dromey, How to Solve it by Computer, 1/e, Pearson Education, 2006.

Reference Books:
1. Pradip Dey, Manas Ghosh, Programming in C, Oxford University Press, AICTE Edition,
2. B. Gottfried, Programming with C, 3/e, Schaum's outlines, McGraw Hill (India), 2017.
3. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson.

R-23- ENGINEERING PHYSICS LAB
(Common for ECE, EEE, Mechanical, Civil and Chemical)

Course Code: 23PY1201 **Credits: 1.5**
Instruction**:** L - 0, T- 0 P – 3 Sessional Marks: 50
End Exam : 3 Hours EndExam Marks :50

Course Objectives:

To enable the students to acquire skill, technique and utilization of **the** Instruments

Course Outcomes:

At the end of this course, the students will be able to

	COURSE OUTCOMES
CO-1	**Apply** the theoretical knowledge as working principles of Laboratory experiments related to Optics, Mechanics, Electromagnetic and Electronics. (**L3**)
CO-2	**Adop**t the experimental procedure to perform the experiments for Data procurement / Acquisition. (**L3**)
CO-3	**Compute** the required parameters by suitable formula using experimental values (observed values) in Mechanics, Optics, Electromagnetic and Electronics. (**L3**)
CO-4	**Analyze** the experimental data and obtain the results through graphical interpretation. (**L4**)
CO-5	**Perform** effectively as an individual or as a team and be Accountable / Responsible to the work rendered. (**L4**)

CO-PO Mapping:

| COs | Program Outcomes (POs) | | | | | | | | | | | | PSOs | |
| | Domain Specific POs | | | | | Domain Independent POs | | | | | | | | |
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				1	2						3		
CO2		2	1											
CO3				2				1						
CO4	1			3								1		
CO5								2	3	1	2			

List of experiment (any eight to ten experiments have to be completed)

1. Estimation of thickness of a thin paper by forming parallel interference fringes-Wedge method.

2. Newton's rings- determination of radius of curvature of a convex lens

3. Find out the wavelengths of spectral lines in mercury spectrum-using diffraction grating in normal incidence position.

4. Evaluation of refractive indices o-ray and e-ray in quartz crystal   (double refraction)

5. Calculation of Cauchy's constants of the material of the prism using spectrometer.

6. Determination of band gap of semiconductor (thermistor) by varying resistance with temperature

7. Verification of laws of resistance and determination of specific resistance of wire by using Carey- Foster's bridge.

8. Calibration of a low-range voltmeter using potentiometer.

9. Study of variation of magnetic field along the axis of a current carrying circular coil – Stewart and Gee's apparatus

10. Evaluation of moment of inertia by using Flywheel

11. Estimation of rigidity modulus and moment of inertia using Torsional pendulum

12. Find the Numerical aperture of a given optical fibre

13. Determination of the velocity of ultrasound in liquids by using the phenomenon of diffraction of light by ultrasound

14. Estimation of the wavelength of diode laser using a transmission grating

15. Determination of Planck's constant

Beyond the Syllabus Experiments:

1. Determination of the particle size of micro particles (lycopodium powder) using laser diffracting grating.

2. Measurement of dielectric constant with temperature variation (Ba TiO_3)

3. Magnetic Hysteresis curve experiment (B-H curve)

4. Determination of Resolving power of the Grating

5. Determination of the frequency of an electrically maintained tuning fork - Meldi's experiment.

Learning Outcomes:

The students will be able to

- **Handle** optical instruments like microscope and spectrometer
- **Determine** thickness of a hair/paper with the concept of interference
- **Estimate** the wavelength and resolving power of different colors using diffraction grating
- **Plot** the intensity of the magnetic field of circular coil carrying current with varying distance

- **Determine** the band gap of a given semiconductor
- **Evaluate** the acceptance angle of an optical fiber and numerical aperture
- **Determine** resistance and resistivity of the given material
- **Plot** the accuracy / correction of low range voltmeter using potentiometer
- **Evaluate** the refractive index using double refraction phenomena
- **Determine** frequency of electrically maintained tuning fork
- **Evaluate** the loss of energy in magnetic materials

Prescribed Book

Physics Laboratory Manual   Prepared by Department of Physics ANITS

Reference books

1. D.P Siva Ramaiah and V. Krishna Murthy, "Practical Physics", Marutibook Depot, 2000.

2. A.R Vegi, "Comprehensive Practical Physics", Vegi Publishers Pvt.Ltd., 2004.

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ENVIRONMENTAL SCIENCE
With effect from 2023-24
Mandatory (Non Credit) course for all branches

Course Code - Category: 23MC0102   **Credits:0**

Lecture hours : 3 per week   Sessional Marks:50

Prerequisites : +1 & +2

COURSE OBJECTIVES:
- Inculcating in students the awareness toward components in environment
- Understand the importance natural resources, Structure, and functions of an ecosystem
- Inducing knowledge on Sources, effects, and methods to reduce environmental pollution
- Able to know the meaning of sustainable development and correlate social issues related to environment.

Course Outcomes:
By the end of the semester, the student will beable to:

CO.No.	Statement
CO-1	Identify the characteristics of various natural resources and can implement the conservation practices
CO-2	Realize the importance of Ecosystem and Biodiversity for maintaining ecological balance
CO-3	Classify, analyze various pollutants and can develop methods for solving problems related to environment
CO-4	Implement the environmental laws or defend issues by getting awareness on legal aspects related to environmental issues
CO-5	Promote awareness on local environmental issues by participating in group activities, seminars, takingproject work

UNIT I
INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES   **8 Periods**
Introduction: Definition, Multidisciplinary nature of environmental studies, Scope and Importance of Environmental Sciences, Need for public awareness.
Natural Resources: Renewable and Non-Renewable resources- Forest resources-use and overexploitation,deforestation, Water resources- aquifers, dams and benefits, conflicts over water; Food resources- effects of modern agriculture practices, Energy resources-conventional and non-conventional energy resources.
Activities:
Need for Public Awareness (Campaign), Renewable vs. Non-Renewable Resources(Group Discussion), Deforestation and its Impact, Water Conflict(Case studies).

UNIT- II
ECOSYSTEM & BIO DIVERSITY   8 Periods
Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession.

Biodiversity: Definition, types, India as a Mega diversity Nation, Values of biodiversity, Hot spots of biodiversity, Threats to biodiversity, Endangered and endemic species, Conservation of biodiversity.

Activities:
Ecosystem (Field trip), Food chain and Food Web (Models), Endangered Species (Case Studies), Ecosystem regulation, Values of Biodiversity (Group Discussion), Endangered Species Awareness (Poster presentation).

UNIT -III
ENVIRONMETAL POLLUTION AND WASTE MANAGEMENT 8 Periods
Pollution: Sources, effects and control measures of Air pollution, Noise Pollution, Water Pollution, SoilPollution, Radio Active Pollution; Climate Change, Ozone depletion, Acid rains – causes and adverse effects.

Solid waste management: Sources and effects of municipal waste, bio-medical waste, Industrial waste, e- waste, Process of waste management-composting, sanitary landfills, incineration. Green Chemistry concepts,

Activities:
Pollution (Slogan writing), Pollution Control Measures (Group Discussion) ,Climate Change (Case Studies), Waste-to-Art (Poster presentation).

UNIT- IV
SOCIAL ISSUES AND ENVIRONMENTAL LEGISLATIONS   8 Periods
Social Issues and the Environment: Sustainable development, Environmental Impact Assessment, Rain water harvesting, water shed management. Resettlement and rehabilitation of people, Environmental ethics.

Legislational Acts: Importance of Environmental legislation, Air (Prevention and Control of Pollution) act, Water (Prevention and control of Pollution) act, Wildlife Protection act, Forest Conservation act.

Activities:
Sustainable Development, Environmental Ethics (Group Discussion), Environmental Impact Assessment (EIA), Resettlement and Rehabilitation (Case Studies), Rainwater Harvesting(Model), Environmental Legislation (Awareness Campaign).

UNIT- V
HUMAN POPULATION AND THE ENVIRONMENT   5 Periods
Human population and environment- Population growth, Population explosion; Family Welfare Programmes; Role of information technology on environment and human health; Value Education – HIV/AIDS – Women andChild Welfare

FIELD WORK/PROJECT: Visit to a local area to document environmental problem and submit a Record

Activities:
Population Growth, Role of Information Technology and Environment, Women Empowerment, Family Welfare Program (Awareness Campaign), Women and Child Welfare (Case Study), Population and Environment (Short film).

Prescribed Book

1. **Anubha Kaushik & C.P.Kaushik**, "*Perspertives of Environmental Studies"* by 5th edition New AgeInternational Publications, 2015.

2. **Erach Bharucha** *Text book of "Environmental Studies for Undergraduate Courses*", universities PressCommission, 2013.

3. **Palaniswamy**- "*Environmental Studies"*, 2nd edition, Pearson education 2015.

Reference Books

1. **S. Deswal, A. Deswal**, "*Basic course in Environmental studies"*, 2nd edition, Dhanpatrai Publications, 2008.

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R23 ENGINEERING CHEMISTRY
(I/IV B.Tech EEE, Mech, ECE, Chemical)
WEF 2023-24

Course Code: 23CY1101/1102   **Credits**: 3
Instruction: 3 periods/ 1 Tutorial per week   **Sessional marks**: 40
End exam: 3 hours   **End exam marks**: 60
Prerequisites: Chemistry at +1 and +2 level

Course Objective:
Emphasizing fundamental principles and key concepts in engineering chemistry course enables students to:
- Attain a deep comprehension of the course's core objectives.
- Equips students to adeptly address dynamic challenges in the evolving engineering industry.

Course Outcomes:
By the end of the course, students will be able to

CO	Statement
1	Show a strong understanding of fundamental concepts in water quality, treatment; electrochemical devices, solar cells; corrosion, corrosion protection; fuels, combustion, petroleum processing; plastics, and their properties & manufacturing processes. (L2)
2	Apply acquired knowledge and skills in water quality and treatment; electrochemical devices and solar cells; corrosion and corrosion protection methods; fuels, combustion, petroleum processing and plastics, to effectively address practical scenarios, make informed decisions, and solve complex problems. (L3)
3	Assess water quality and treatment; Critically analyze principles and technologies related to electrochemical devices and solar cells; Evaluate intricate concepts and strategies in corrosion and corrosion protection and scrutinize complex concepts and processes in fuels, combustion, petroleum processing, as well as intricate applications in plastics and polymer technology. (L4)
4	Refine advanced analytical and decision-making skills across diverse areas, including water quality, treatment; electrochemical devices, solar cells; corrosion and corrosion protection; fuels, combustion, petroleum processing; plastics, and polymer technology, demonstrating expertise in principles, technologies, and practical applications. (L5)
5	Cultivate advanced problem-solving skills and creativity by synthesizing innovative solutions and strategies across diverse domains: water quality, treatment, electrochemical devices, solar cells, corrosion control, fuels, combustion, petroleum processing, and plastics and polymer technology. (L6)

UNIT-I Water Technology   **10 Periods**

Impurities in water - Specifications of water for domestic use (ICMR and WHO) - Hardness- Types, units of hardness, Numerical problems on hardness, Disadvantages in using hard water; Boiler troubles- Sludge & Scale formation, Internal Treatment (Carbonate, Phosphate & Calgon conditioning methods), Boiler corrosion.

Water softening method - Ion exchange resin process, advantages & disadvantages; Desalination methods - Reverse Osmosis & Electrodialysis. Municipal water treatment - Sedimentation with coagulation, Sterilisation - Chlorination (break point chlorination), UV treatment.

Learning Outcomes:

➢ Identify and differentiate water hardness types, understand drawbacks of hard water, and make informed decisions on water quality for domestic and industrial settings. (L1)

➢ Solve numerical problems on water hardness, accurately calculate hardness concentrations, and assess their potential impact on different water systems. (L2)

➢ Apply ion exchange resin process for water softening, ensuring cleaner water for specific uses, and understand benefits and limitations of softening techniques. (L3)

➢ Evaluate and compare desalination methods for potable water production, enabling informed selection based on efficiency, cost-effectiveness, and environmental impact. (L4)

UNIT-II Energy Storage Systems   **10 periods**

Introduction to Electrode potentials, Electro Chemical Series; Batteries - Primary battery - Dry Cell, Secondary battery - Lead Acid battery, Lithium-ion batteries; Fuel cells - Hydrogen - Oxygen fuel cells, Applications.

Advanced batteries for Electrical vehicles - Lithium iron phosphate, Solid state battery - advantages & applications; Solar cells – Types - Polycrystalline and Thin film Solar cells, Principle, Working and Applications.

Learning Outcomes:

➢ Recall and identify key concepts of electrode potentials, electrochemical series, primary and secondary batteries, and fuel cells. (L1)

➢ Explain the principles, working mechanisms, and characteristics of batteries, fuel cells, and solar cells, showcasing a comprehensive understanding of their functions and applications. (L2)

➢ Analyse and compare advanced batteries in terms of advantages and applications, enabling their suitability assessment for specific requirements and contexts. (L3)

➢ Evaluate and synthesize knowledge of electrode potentials, battery technologies, fuel cells, and solar cells, applying critical thinking to propose innovative solutions for advancements in energy storage and sustainable energy applications. (L4)

UNIT-III Corrosion and its prevention   **10 Periods**

Corrosion & detrimental effects on buildings, machines, equipment's -Theories of corrosion - Dry and wet corrosion; Types of corrosion - Galvanic corrosion, Concentration cell corrosion, Illustrations; Factors Influencing corrosion.

Corrosion protection - Cathodic protection – sacrificial anodic and impressed current cathodic protection methods; Metallic coatings - electroplating of copper and electroless Nickel plating, Basic Concepts of Physical Vapour Deposition coating (PVD) and Chemical Vapour Deposition coating (CVD).

Learning Outcomes:

➢ Recognize corrosion principles and distinguish between dry and wet corrosion, identifying various types. (L1)

➢ Explain corrosion theories and influential factors. Outline cathodic protection techniques and the process of electroplating copper and electroless nickel plating. (L2)

- Critically assess the efficiency of corrosion protection methods and advanced coating technologies. Formulate suitable corrosion protection strategies for a variety of structures and applications based on the evaluation. (L3)

UNIT-IV Fuels and Combustion   10 periods

Introduction; Calorific Value – Lower Calorific Value, Higher Calorific Value, Determination of Calorific Value of solid fuel using Bomb Calorimeter and Gaseous fuel using Boy's Calorimeter - Numerical Problems on Combustion.

Petroleum- Refining of petroleum - Synthetic petrol - Bergius process – Fischer-Tropsch process -Biodiesel.

Learning Outcomes:
- Retrieve fundamental knowledge about calorific value, methods for determining the calorific value of solid and gaseous fuels, and the process of petroleum refining. (L1)
- Understand the principle and working of Bomb Calorimeter and Boy's Calorimeter for determining calorific values and explain process for producing synthetic petrol. (L2)
- Apply the formulas and calculations to solve numerical problems related to combustion. (L3)
- Critically evaluate the challenges and potential solutions in the production and utilization of biodiesel. (L4)

UNIT-V Polymer Technology   10 Periods

Introduction - Distinction between Thermoplastics and Thermosetting plastics; Preparation, Properties & Engineering applications of plastics – Poly Vinyl Chloride (PVC), Teflon, Bakelite, and Acrylo Butadiene Styrene (ABS).

Compounding of plastics, Fabrication of plastics - Compression moulding (Mobile Phone Cases), Injection moulding (Car parts, bottle caps), Transfer moulding, Extrusion moulding (Pipes Hoses), Battery Trays), blown film moulding (PET bottles); Fibre Reinforced Polymer Composites (FRPC) - Applications of polymers in sensors, self-cleaning windows.

Learning Outcomes:
- Recognize differences between thermoplastics and thermosetting plastics and identify plastic fabrication methods. (L1)
- Understand the properties and applications of specific plastics like PVC, Teflon, Bakelite, and ABS, the concept of Fiber Reinforced Polymer Composites (FRPC) (L2)
- Apply the knowledge of plastics and their properties to select appropriate materials for specific engineering applications and principles of plastic fabrication techniques to design and manufacture products. (L3)
- Apply the understanding of Fiber Reinforced Polymer Composites (FRPC) to propose innovative applications in the field of sensors and self-cleaning windows. (L3)

Prescribed books
1. P. C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai & Sons, New Delhi.
Reference books
1. S.S.Dara ,"A text book of Engineering Chemistry" S.Chand & Co.New Delhi.
2. Dell, Ronald M Rand, David A J , "Understanding Batteries",. ,Royal society of Chemistry**.**

ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

23MA1102 **Credits:3**

Instruction : 3 periods & 1 Tutorial/Week   Sessional Marks:40

End Exam : 3 Hours   End Exam Marks:60

Prerequisites: Matrices, Differentiation, Differential equations, Integration and Functions.

Course Objectives:

Create and analyze mathematical models using first and higher order differential equations to solve application problems such as electrical circuits, orthogonal trajectories and Newton's law of cooling and also familiarize the student in various topics in numerical analysis such as interpolation, numerical differentiation, integration and direct methods for solving linear system of equations.

Course Outcomes: By the end of the course, students will be able to

1.	Demonstrate solutions to first order differential equations by various methods and solve basic application problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling.
2.	Discriminate among the structure and procedure of solving a higher order differential equations with constant coefficients and variable coefficients.
3.	Apply various numerical methods to solve linear and non-linear equations.
4.	Familiarize with numerical integration and differentiation.
5.	Understand Laplace transforms and its properties, and finding the solution of ordinary differential equations.

CO-PO –PSO Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1							1	2			
CO2	3	2	1	1							1	2			
CO3	3	2	1	1							1	2			
CO4	3	2	1	1							1	2			
CO5	3	2	1	1							1	2			

Correlation levels   1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

	CO-PO-PSO Justification
1	CO1 is widely used to solve complex engineering problems in all the areas like Fluid dynamics, Mass transfer, Signals and Systems, and Dynamics.
2	CO2 is widely used to solve complex engineering problems in all the areas like Fluid dynamics, Mass transfer, Signals and Systems, and Dynamics.
3	CO3 deals with the techniques that are used to find an approximate real root of the given algebraic and transcendental equations.
4	CO4 deals with the knowledge of interpolation, numerical differentiation and integration, which is used all the areas of engineering sciences.
5	CO5 deals with the knowledge of Laplace transforms which are widely used in all the areas of engineering sciences.

SYLLABUS

UNIT I   **10 Periods**
Ordinary differential equations of first order and its applications :   Linear equations - Bernoulli's equations - Exact differential equations - Equations reducible to exact equations - Orthogonal trajectories - Simple electric circuits (L –R circuit problems) - Newton's law of cooling.

Sections: 11.9, 11.10, 11.11, 11.12, 12.3, 12.5 and 12.6.

UNIT II   **10 Periods**
Higher order linear differential equations and its applications : Definitions - Operator D - Rules for finding the complementary function - Rules for finding the particular integral - Method of variation of parameters - Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation - Legendre's linear equation. Applications**:** L – C – R circuit problems.

Sections: 13.1, 13.3, 13.4, 13.6, 13.8(I), 13.9, 14.5(ii).

UNIT III   **10 Periods**
Numerical solutions of algebraic and transcendental equations :
Solution of algebraic and transcendental equations: Bisection method - Regula-Falsi method - Newton-Raphson method.
Solution of linear simultaneous equations: Gauss elimination - Gauss Jordan - Gauss Seidel.

Sections: 28.2, 28.3, 28.5, 28.6(1,2), 28.7(2)

UNIT IV   **10 Periods**

Interpolation, Numerical Differentiation and Integration : Finite differences - Other difference operators - Relation between operators - To find one or more missing terms - Newton's interpolation formulae. Interpolation with unequal intervals: Lagrange's interpolation formula.

Numerical differentiation: Newton's forward and backward differences formula to compute first and second derivatives.

Numerical integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Sections: 29.1(1,2), 29.4(i), 29.5, 29.6(1,2), 29.9, 29.10, 30.2(1,2), 30.6, 30.7, 30.8.

UNIT V   **10 Periods**

Laplace Transforms and its applications : Introduction - Definitions - Transforms of elementary functions - properties of Laplace transforms - Transforms of periodic functions - Transforms of derivatives - Transforms of integrals - Multiplication by t^n - Division by t – (All properties without proofs) - Evaluation of integrals by Laplace transforms.

Inverse transforms – method of partial fractions - Other methods of finding inverse transforms - Convolution theorem (without proof) - Application's to differential equations - Unit step function and unit impulsive functions.

Sections: 21.1, 21.2, 21.3, 21.4, 21.5, 21.7, 21.8, 21.9, 21.10, 21.11, 21.12, 21.13, 21.14, 21.15, 21.17 and 21.18.

TEXT BOOKS:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. **N. P. Bali**, Engineering Mathematics, Lakshmi Publications.
3. **George B. Thomas, Maurice D. Weir and Joel Hass**, Thomas, Calculus, 13/e, Pearson Publishers, 2013.
4. **H. K. Dass**, Advanced Engineering Mathematics, S. Chand and complany Pvt. Ltd.
5. **Michael Greenberg**, Advanced Engineering Mathematics, Pearson, Second Edition.

ELECTRONIC DEVICES AND CIRCUITS

Code: 23EC3101   Credits:3

Instruction: 3 Periods & 1 E/Week   Sessional Marks:40

End Exam: 3 Hours   End Exam Marks:60

Pre -requisites: Nil

Course Objectives:

- To introduce basic semiconductor devices, their characteristics and applications
- To understand analysis and design of simple diode circuits
- To analyze the C-V characteristics of two terminal MOS capacitor and MOSFET biasing circuits

Course Outcomes:

By the end of the course student will be able to

CO 1: Analyze PN junctions in semiconductor devices under various conditions and understand the breakdown mechanisms.

CO 2: Design and Analyze simple rectifiers and voltage regulators using diodes.

CO 3: Analyze the response of linear wave shaping circuits, clippers and clampers circuits.

CO 4: Illustrate the C-V characteristics of MOS capacitor and describe the behavior of BJTs and MOSFET in different region of operation.

CO 5: Ability to design and analyze simple BJT and MOSFET circuits.

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO	PO												PSO			Justification
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	3														1	PI 1.3.1
2	3														1	PI 1.3.1
3	3	2													1	PI 1.3.1, PI 2.1.3
4	2														1	PI 1.3.1
5	3	2													1	PI 1.3.1 PI 2.1.3

Justification of Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO's	Justification of CO's correlation with PO's and PSO's
CO1	Students will apply the fundamental engineering concepts to understand the working of PN diode **PO1.**
CO2	Students will apply the mathematical techniques and fundamental engineering concepts to calculate various parameters of rectifiers **PO1.**
CO3	Students will apply the mathematical techniques and fundamental engineering concepts to analyze linear and non linearwaveshaping circuits**PO1.**
	Students will be able to identify the right mathematical approach to analyze

	linear waveshaping circuits**PO2.**
CO4	Students will apply the fundamental engineering concepts to understand the working of BJT and MOSFET **PO1.**
CO5	Students will apply the mathematical techniques and fundamental engineering concepts to analyze MOSFET DC circuits**PO1.**
	Students will be able to identify the right mathematical approach to solve MOSFET circuits **PO2.**
Justification of Mapping of Course Outcomes with Program Specific Outcomes	
CO1-CO5	Students will be able to apply all the course outcomes to few key areas in embedded systems **PSO3**.

SYLLABUS

UNIT-I   9 periods
Semiconductor Diodes
Fermi level in Intrinsic & Extrinsic semiconductors. Mass-Action law. Mobility and conductivity, Hall effect, Drift and diffusion current, Band structure of PN junction in open circuited condition, Biased p-n junction, p-n junction current, I-V Characteristics, Diode resistance, Depletion and Diffusion capacitance, Avalanche and zener breakdown,
Other Diodes: LED, Varactor diode, Photodiode and PV Cell.

UNIT-IIRectifier circuits   9 periods
 Diode equivalent circuits: Piecewise-Linear equivalent circuit, simplified equivalent circuit, Ideal equivalent circuit, Half wave rectifier, Bridge rectifier, Center-tapped FWR, PIV, efficiency, ripple factor, voltage regulation, capacitor filter. Zener diode as voltage regulator.

UNIT-III   9 periods
Non-linear wave shaping circuits: Series and shunt diode clippers, clipping at two independent levels, clamping operation, Positive clamping circuit, Negative clamping circuit.
Linear wave shaping circuits: Step, pulse, square wave responses of RC low Pass filter and RC High Pass filter.

UNIT-IV   9 periods
Transistors
BJT: Transistor Action, CB, CE and CC configuration and their input output characteristics,BJT as amplifier and Switch
MOSFET: Two terminal MOS structure, C-V characteristics, Basic operation of Enhancement and Depletion type MOSFET, CMOS inverter.

UNIT-V   9 periods

MOSFET Biasing: MOSFET circuits at DC, Biasing in MOS Amplifier Circuits: Biasing by Fixing V_{GS}, Biasing by Fixing V_G and Connecting a Resistance in the Source, Biasing Using a Drain-to-Gate Feedback Resistor, Biasing Using a Constant-Current Source.

TEXT BOOKS:
1. Adel S Sedra, Kenneth C Smith and Arun N Chandorkar, "Microelectronic Circuits – Theory and Applications", Seventh Edition, Oxford University Press, 2017.
2. Robert L Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Eleventh Edition, Pearson India Education Services Pv Ltd., 2015.

REFERENCE BOOKS:
1. K.VenkataRao, Rama sudha. K, G.ManmadhaRao, "Pulse and Digital Circuits", Pearson.
2. Donald A. Neamon, "Electronic Circuit Analysis and Design", 4th Edition. TMH publications.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC DEVICES LABORATORY

Code: 23EC3201	Credits:3
Instruction: 3 Periods & 1 E/Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-3	Verify the working of diodes and their applications
CO2	BL-3	Verify the response of LP and HP RC circuits
CO3	BL-4	Analyse the working of a BJT common emitter/base/collector configuration.
CO4	BL-4	Analyse the frequency response of BJT and FET amplifiers.
CO5	BL-3	Verify the working of FET biasing circuits.

CO	Bloom's Level
CO1	Action Verb from Blooms Taxonomy-**Interpret**/ Cognitive level- Application (BL-2)
CO2	Action Verb from Blooms Taxonomy-**Calculate**/ Cognitive level- Application (BL-3)
CO3	Action Verb from Blooms Taxonomy- **Analyze** /Cognitive level- Analysis (BL-4)
CO4	Action Verb from Blooms Taxonomy-**Design**/Cognitive level- Application (BL-4)
CO5	Action Verb from Blooms Taxonomy- **Interpret**/Cognitive level- Analysis (BL-2)

Program Matrix

COs	Program Outcomes (POs)												PSOs		
	Domain Specific POs					Domain Independent POs									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-	1
CO3	2	1	-	1	-	-	-	-	-	-	-	1	-	-	1
CO4	2	1	-	2	-	-	-	-	-	-	-	1	-	-	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	-	1

Justification of Mapping of Course Outcomes with Program Outcomes:

Course outcome	PO Mapped	Level Mapped	Justification for Mapping
CO1	PO1	2	Students will be able to understand the Diode characteristics.
	PO2	2	Students will be able to apply the knowledge of diode concepts in realizing various applications like rectifiers, Zener diodes.
	PO12	1	Able to apply the knowledge of diode concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of VLSI and communicate them effectively to the concern.
CO2	PO1	2	Students will be able to apply the diode concepts to design a Non-linear circuit for different applications.
	PO2	1	Students will be able analyse Linear circuits for different types of input waveforms at different frequencies.
	PO12		Able to apply the knowledge of Low pass and High pass circuit concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of VLSI and communicate them effectively to the concern.
CO3	PO1	2	Students will be able to apply the knowledge of basic transistor concepts to differentiate CB, CE and CC configurations.
	PO2	1	Analyse the input and output characteristics of a NPN/PNP transistor in any configuration and able to identify different transistor operation regions
	PO4	1	Students will be able to Conductive investigations on BJT under various configurations.
	PO12	1	Able to apply the knowledge of BJT concepts in developing the new transistors in developing technology and their outcomes in multidisciplinary areas.
	PSO3	1	apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of VLSI and communicate them effectively to the concern.
CO4	PO1	2	Students will acquire the knowledge of BJTs and FETs working as amplifier
	PO2	1	Analyse the FET or MOSFET circuit input and output characteristics.
	PO4	2	Students will be able to Conductive investigations on FET under various biasing conditions.
	PO12	1	Able to apply the knowledge of FET concepts in developing the new MOS transistors in developing technology and their outcomes in multidisciplinary areas.
	PSO3	1	apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of VLSI and communicate them effectively to the concern.
CO5	PO1	2	Students will be able to understand the special Diode characteristics.
	PO2	1	Students will be able to apply the knowledge of special diode concepts in realizing various applications
	PO12	1	Able to apply the knowledge of FET concepts in developing the new MOS transistors in developing technology and their outcomes in multidisciplinary areas.
	PSO3	1	apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of VLSI and communicate them effectively to the concern.

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List of Experiments

1. Obtain the Forward & Reverse Bias Characteristics of PN Junction Diode.

2. Obtain the Zener diode characteristics and to verify Zener diode as voltage Regulator.

3. Verify the working of Half Wave Rectifier & Full Wave Rectifier with & without filters.

4. Verify the working of diode clippers and clampers.

5. Verify the response of LP and HP RC circuits for square wave input.

6. Obtain the Input & Output Characteristics of Transistor in CB Configuration

7. Obtain the Input & Output Characteristics of Transistor in CE Configuration

8. Obtain the Input & Output Characteristics of Transistor in CC Configuration

9. Observe the Frequency Response characteristics of CE Amplifier.

10. Obtain the transfer and drain characteristics of a JFET.

11. Observe the Frequency Response of Common Source FET amplifier.

12. Design and verify of FET Self-bias circuit.

Verified by:

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DigitalElectronicsandLogicDesign	
Code: 23EC4101	Credits:3
Instruction:3periods&1e/week	Sessionalmarks:40
Endexam:3hours	End exammarks:60

Pre-requisites: Nil

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-3	Perform conversions between different number systems and codes and apply the Boolean algebra to minimize the given logic expressions.
CO2	BL-3	Minimize the given Boolean expressions using K-Map (up to four variables) and QM method (up to5 variables).
CO3	BL-4	Design and Analyse combinational logic circuits.
CO4	BL-4	Design and Analyse sequential logic circuits.
CO5	BL-3	Analyse the characteristics of logic families and compare the performance in terms of performance metrics.

CO	Bloom's Level
CO1	Action Verb from Blooms Taxonomy-**Apply**/ Cognitive level- Application (BL-3)
CO2	Action Verb from Blooms Taxonomy-**Apply**/ Cognitive level- Application (BL-3)
CO3	Action Verb from Blooms Taxonomy-**Design**/Cognitive level- Analysis (BL-4)
CO4	Action Verb from Blooms Taxonomy-**Design**/Cognitive level- Application (BL-4)
CO5	Action Verb from Blooms Taxonomy-**Analyse**/Cognitive level- Analysis (BL-3)

Program Matrix

COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-	1
CO3	2	1	-	1	-	-	-	-	-	-	-	1	-	-	1
CO4	2	1	-	2	-	-	-	-	-	-	-	1	-	-	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	-	1

SYLLABUS

UNIT –I

[9Periods]

NUMBERSYSTEMS
Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers,Binarycodes:weightedandnon-
weightedBOOLEANALGEBRA:Basicdefinitions,AxiomaticDefinitions,Theoremsandproperties,Boole
anFunctions,Canonicaland standardforms.
(TB1-chapters1&2)

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UNIT– II

[9Periods]

LOGIC GATES- AND, OR, NAND, NOR, XOR,XNOR; Logic families-Introduction,CharacteristicsofDigitalICs,ResistorTransistorLogic(RTL),DiodeTransistorLogic(DTL),TransistorTransistorLogic(TTL),EmitterCoupledLogic(ECL),CMOSLogic,InterfacingCMOSand TTL.(**TB2-chapter 4)**

LOGICMINIMIZATION

TheK-Map Method: Twovariablemap,Threevariablemap,fourvariablemapPrimeImplicants,Don't Careconditions,NANDandNORimplementation,Quine-Mccluskey(QM)(uptofivevariables)Technique.(**TB1-chapters3)**

UNIT– III

[9Periods]

COMBINATIONALLOGIC DESIGN

Combinational circuits, Analysis Procedure, Design Procedure, Code Converters (BCD to XS3(XS3 toBCD)), Gray to Binary (Binary to Gray), Binary Adder-Subtractor, Decimal adder, Binary Multiplier,Magnitude comparator,Decoders,Encoders, Multiplexers, De-Multiplexer,Hazards.(**TB1-chapters 4&9.7)**

UNIT– IV

[9Periods]

SEQUENTIAL CIRCUITS-1

Sequential logic- Introduction to Latch and Flip flop, clocked S-R, JK, D, T flip flops. Excitation table of Flipflop, Flipflopconversion,Clockedflipflopdesign,Edgetriggeredflipflop,applicationsofflipflops.Registers,Ap plicationsofShiftregisters,universalshiftregister,**(TB2-chapters7&8(till8.5))**

UNIT –V

[9Periods]

SEQUENTIAL CIRCUITS-2

Counters- Ripplecounters,Synchronouscounters,counterwithunusedstates,Ringcounters,Johnsoncounter. Finite state Machines: Moore and Melay models- state diagram; state reduction; state assignment.

TEXTBOOKS:
1. M. MorrisManoandMichaelD.Ciletti,"DigitalDesign", 4thEdition,PearsonPublishers,2001.
2. R.PJain, "ModernDigitalElectronics", 3rdEdition, TMH,2003.

REFERENCEBOOKS:
1. William I.Fletcher, "An Engineering Approach to Digital Design",PHI, 1980.
2. John F.Wakerly,"Digital Design Principles and Practices", 3rd Edition, PrenticeHall,1999.

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R23 Engineering Chemistry Lab Syllabus
(1/IV B.Tech. EEE, ECE, MECH, Chemical)
WEF 2023-24

Course Code: 23CY1201/1202

L	T	P	E	O	Credits	Semester marks	Sessional
-	-	3	-	-	1.5	50	50

L- Lecture hour, T- Tutorial, P-Practical.

Course Objectives:
1. To impart students with practical knowledge and hands-on experience in analytical chemistry and its engineering applications.
2. To enhance students proficiency in utilizing instrumental analysis techniques for industrial and environmental applications.

By the end of the course, students will be able to

CO	Statement
1	Apply volumetric analysis and titration principles to prepare standard solutions, standardize acids with strong bases, and assess water quality, food, and soil samples.
2	Proficiently employ diverse analytical methods (spectrophotometric, pH metric, conductometric, and potentiometric) to estimate chemical properties of substances and accurately interpret data results.
3	Cultivate problem-solving and critical thinking skills through practical application of analytical methods and instrumentation in engineering design and decision-making.

List of Experiments:

1. Preparation of Standard solutions and Standardisation of Secondary standard solution.

2. Determination of Hardness, pH, TDS in ground water sample.

3. Estimation of Zinc in food samples by Complexometric method.

4. Analysis of Cement sample for Lime content to test the quality.

5. Estimation of available chlorine content in potable water using Iodometric method.

6. Estimation of Iron in an iron ore using potassium thiocyanate by Spectrophotometric method.

7. Determination of Strength of an acid in Lead acid battery by pH metric method

8. Estimate the strength of acids in an acid mixture by using Conductometric method.

9. Estimation of Chromium in Dichromate by using Potentiometric method.

10. Determination of Viscosity of various liquid fuels using Ostwald's Viscometer.

Demonstration Experiments

11. Determination of Dissolved Oxygen in a water sample using Iodometric method.

12. Synthesis of Bakelite a thermosetting polymer.

13. Determination of rate constant of ester hydrolysis.

Prescribed Textbooks:

1. Vogel's text book of Quantitative analysis, 5th edition, G.H.Jeffery, J.Bassett, J.Mendham, R.S.Denney.
2. Vogel's A text book of Macro and semi micro Inorganic analysis, revised by G.Svehla

COMMUNICATIVE ENGLISH

Code: 23EN2101

Credits:3 Instruction : 3 periods & 1 Tutorial/Week		Sessional Marks:40
End Exam : 3 Hours		End Exam Marks:60

Prerequisites: Basic English grammar

Course Objectives:
1. To develop awareness about the importance of LSRW skills
2. To implement verbal and nonverbal cues properly in their career and personal life
3. To prepare the students impress everyone with their effective communication skills
4. To familiarize the students with latest terminology and jargon.
5. To train them to attempt various vocabulary tests to get employment.

Course Outcomes:

1.	Comprehend LSRW skills and various linguistic aspects of multicultural milieu.**(L2)**
2.	Acquire verbal and nonverbal Communication skills through varied individual and team activities. **(L3)**
3.	Apply proper vocabulary and appropriate grammar to draft different types of writings collectively and separately for effective professional and personal communication**. (L3)**
4.	Analyze and relate advanced terminology in conceptual conversations, writings and in pronunciation. **(L4)**
5.	Distinguish and practice several kinds of vocabulary tests for better employability with competence. **(L4)**

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1									M	M		M		2	
CO2									M	M		M		2	
CO3									M	M		M		2	
CO4									M	M		M		2	
CO5									M	M		M		2	

Correlation levels1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SYLLABUS

UNIT I   **10 Periods**
Listening: Motivational Speech (Martin Luther King, Jr. Dr. Abdul Kalam, Sundar Pitchai etc.)
Speaking: Self Introduction – Introducing others
Reading: Motivational Speech or Essays (H G Wells, Stephen Hawking)
Writing: Paragraph Writing - Letter Writing – Profile Building

Grammar: Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory - Phrases & Clauses - Verb Forms
Vocabulary: Root words – Foreign words and Phrases **CO1**

UNIT II   **10 Periods**
Listening: TED Talks **–** (Can global food companies make the shift to regenerative agriculture?) and other new talks.
Speaking: Basics of Communication - Verbal, Nonverbal - Oral talk on selected topics (Women empowerment and gender issues) - Extempore
Reading: Newspaper reading
Writing: Written Communication – Essay Writing – Types of essays – Verbal and nonverbal cues
Grammar: Tenses - Agreement: Subject-verb, Noun-pronoun – Articles – Prepositions
Vocabulary: One-word Substitutes – Word Associations – Portmanteau Words   **CO2 & CO3**

UNIT III   **10 Periods**
Listening: Poems – Sonnets and Haikus
Speaking: Presenting point of view on current affairs
Reading: Editorials reading
Writing: Writing structured, analytical and argumentative essays on general topics
Grammar: Active & Passive Voice, Use of Passive Verbs in Academic Writing - Discourse Markers or Transition Words
Vocabulary: Modifiers and Misplaced Modifiers–Academic words– Synonyms–Antonyms **CO3**

UNIT IV   **10 Periods**
Listening: Role-plays
Speaking: Debate
Reading: Skimming and Scanning - Failure to Success Stories (Jadav Payeng, J K Rowling, Walt Disney & other new success stories)
Writing: Summary
Grammar: Direct and Indirect Speech – Degrees of Comparison
Vocabulary: Homonyms & Homophones – Collocations – Etymology **CO4**
UNIT V   **10 Periods**
Listening: News Bulletins- Recycle for Life: Karaikal's success in battling waste
Speaking: Mock Press, Floor Crossing
Reading: The role of Social Media analytics in new-age Digital Market-
Writing: Resume Writing – Dialogue Writing
Grammar: Quantifiers, Prescribed Phrases – Correction of Sentences
Vocabulary: Affixation – Paronyms – Acronyms – Word Building **CO5 & CO3**

*Note- Additional topics that can be introduced during the course but are out of the prescribed syllabus.

TEXT BOOKS:

1. **Text book prepared by the faculty of English, ANITS**

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for international students*, Routledge, 2014.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012(Student Book, Teacher Resource Book, CD & DVD).
4. Varma, Shalini. *Body Language: Your Success Mantra*. Amazon: India, 2005

E-Resources

1-language.com;http://www.5minuteenglish.com/https://www.englishpractice.com/
Grammar/Vocabulary English Language Learning Online;
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/;
http://www.nonstopenglish.com/
https://www.vocabulary.com/;
BBC Vocabulary Games
Free Rice Vocabulary Game
Reading
https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/
All Skills
https://www.englishclub.com/; http://www.world-english.org/http://learnenglish.britishcouncil.org/
Online Dictionaries
Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries
Listening:
Unit-I-
https://www.ted.com/talks/steve_presley_can_global_food_companies_make_the_shift_to_regenerative_agriculture
Unit-V- https://www.youtube.com/watch?v=_YlNmkbsL74&t=2s

https://www.ourbetterworld.org/series/environment/story/working-hand-in-hand-for-change?utm_source=taboola&utm_medium=indianexpress-indianexpress&utm_content=Watch+Hand+In+Hand+India+Make+Waste+Work&utm_campaign=OBW_ENV_SERIES_2022#tblciGiBX-q8Y7DpgDlPlmvjD7pcLI4ECqb3eMNOy27aIpILTMiCPuj0ogbbDp9K5kf2cAQ

Reading:
Unit-V-The role of Social Media-
https://timesofindia.indiatimes.com/education/upskill/the-role-of-social-media-analytics-in-new-age-digital-marketing/articleshow/101944496.cms

COMMUNICATIVE ENGLISH LAB

ENG LAB: 23EN2201   **Credits:1.5**

Instruction : 3 periods   Sessional Marks:50

End Exam : 3 Hours   End Exam Marks:50

Prerequisites: Basic English Grammar

Course Objectives:
1. To give idea about phonetics, linguistics and LSRW skills
2. To develop conversational skills among the students
3. To introduce different accents of English language through presentations
4. To train the students to do various exercises on vocabulary and grammar

Course Outcomes:

By the end of the course, students will be able to

1.	Understand various linguistic, phonetic and communicative aspects	L2
2.	Apply general conversational activities in different socio-cultural contexts with logical thinking.	L3
3.	Analyze cultural diversity of several nations' languages through presentations.	L4
4.	Appraise and reframe various exercises for getting better employability	L4

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1									2	2		2			
CO2									2	2		2			
CO3									2	2		2			
CO4									2	2		2			

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes:

	CO-PO-PSO Justification
1	CO1 is mapped with the POs 9, 10, 12. Students can understand various accents of English language and they learn and practice individually and in groups
2	CO2 is suitable to the POs 9, 10, 12 as it makes the students converse, understand and participate in various activities like JAM, Debate, Role-Play etc. Students perform singly and team-wise.
3	CO3 is mapped with the POs 9, 10, 12. Students understand cultural diversity and give effective individual and team presentations.

4	CO4 deals with POs 9, 10, 12 as students write and practice various exercises by using contemporary vocabulary.

SYLLABUS

UNIT I   **12 Periods**
Introduction to Phonetics – IPA – RP – Phonetic Transcription – Word stress or accent
UNIT II   **9 Periods**
Functional English – JAM – Debate – Situational Dialogues or Role Plays
UNIT III   **12 Periods**
Presentations on various topics from academic contexts and on international issues
UNIT IV   **9 Periods**
Discussing specific topics and practising exercises and short structural talks

REFERENCE BOOKS:

Reference Books
1. Everyday dialogues in English----- Robert J.Dixon.
2. Speak well----- orient black swan.
3. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
4. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
5. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012

e- Resources & other digital material Grammar/Listening/Writing   1-language.com
http://www.5minuteenglish.com/   https://www.englishpractice.com/   Listening
https://learningenglish.voanews.com/z/3613;   http://www.englishmedialab.com/listening.html
Speaking https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises All Skills https://www.englishclub.com/;
http://www.world-english.org/   http://learnenglish.britishcouncil.org/   Online   Dictionaries
Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Universal Human Values & Professional Ethics	
Code: 23MC0101	**Credits : 00**
Instruction **:** 2 Periods/Week	Sessional Marks : 50
End Exam : --	End Exam Marks : 00

Course Objectives:
1. Development of a holistic perspective based on self-exploration about him/her (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes
After course completion, the students will be able to:

1	Articulate Basic human aspirations and requirements for their fulfilment and identify the Role and process of Value education
2	Articulate the needs and activities of the self and body and frame program for self-regulation and health for harmony of the self and body
3	Recognize the value of Relationship and the nine feelings in Relationship for fulfilment of relationship for harmony in the family
4	Identify human goals and articulate systems for their fulfilment leading to harmony in the society; Also identify the characteristics of four orders of nature and mutually fulfilling interaction for harmony in nature.
5	Identify the nature of existence and the role of human being for harmony in existence; Also articulate ethical human conduct, humanistic constitution and holistic Criteria for Technologies, production systems and management models for Universal human order.

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1						2	2	3				2	2	2	
CO2								3				2			
CO3								3				2			
CO4						2	3	3	2			2	2	2	
CO5							2	3				2	2		

Correlation levels 1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SYLLABUS

UNIT – I   12 Periods

Introduction – Fulfillment of Basic Human Aspirations: Need for value education – Process of Value Education – Self-Exploration – Its content and process – Natural Acceptance and Experiential Validation – Basic Human Aspirations – Basic requirements for fulfillment of aspirations – Right understanding, Relationship and Physical Facility- Priority – Human Consciousness – Role of Education-Sanskar – Understanding Happiness and Prosperity – Programme for perpetual happiness and prosperity.

UNIT – II   12 Periods

Harmony in the Self: Human being as co-existence of Self and Body - Needs of Self and Body – Distinguishing Self and Body –Imaginations and its sources – Self-organized /Enslaved behavior - Harmony of the Self and body – Programme for self-regulation and health – Prosperity – Identification of physical facilities.

UNIT – III   12 Periods

Harmony in the Family: Human relationship – Feelings in Relationship – Trust – Intention and competence – Respect as right evaluation– Other feelings in Relationship – Love.

Harmony in the Society: Human Goals – Systems for fulfillment of human goals - Education-Sanskar - Health-Self regulation - Production-Work - Justice-Preservation - Exchange-Storage - Undivided Society, Universal Human Order.

UNIT – IV   10 Periods

Harmony in the Nature: Four Orders of Nature – Characteristics of the four orders – Mutually fulfilling interaction - Understanding the harmony in the Nature

Harmony in the Existence: Existence as Units in Space – Submergence of Units in Space – Existence as Co-existence - Development in the Existential Sense – Role of Human being in Existence

UNIT – V   10 Periods

Universal Human Values and Ethical Human Conduct: Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Humanistic Constitution and Humanistic Universal Order - Holistic Criteria for Technologies, production systems and management models - Holistic Community Model - Journey towards Universal Human Order.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

References:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)