ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)

ACCREDITED BY NBA & NAAC

Affiliated to Andhra University

DEPARTMENT OF INFORMATION TECHNOLOGY

Academic Regulations

Course Structure & Detailed Syllabus (R-23)

Applicable for the batch admitted in 2023-24

IT - COURSE STRUCTURE R23

FIRST YEAR SEMESTER – I											
Code	**Course**	**Category**	**L**	**T**	**P**	**S**	**Total**	**Sessional Marks**	**External Marks**	**Total Marks**	**Credits**
23MA1101	Linear Algebra and Multivariable Calculus	BS	3	0	0	0	3	40	60	100	3
23EN2101	Communicative English	HS	3	0	0	0	3	40	60	100	3
23CY1103	Applied Chemistry	BS	3	0	0	0	3	40	60	100	3
23EE3101	Basics of Electrical & Electronics Engineering	ES	3	0	0	0	3	40	60	100	3
23CS3101	Problem solving with C	ES	3	0	0	0	3	40	60	100	3
23ME3202	Engineering and IT Workshop	ES	0	0	3	0	3	50	50	100	1.5
23EN2201	Communicative English Language Lab	HS	0	0	3	0	3	50	50	100	1.5
23CS32011	Problem solving and Programming Using C Lab.	ES	0	0	3	0	3	50	50	100	1.5
23MC0101	Universal Human Values and Ethics	MC	3	0	0	0	3	50	-	50	0
TOTAL			**18**	**0**	**9**	**0**	**27**	**400**	**450**	**850**	**20**
FIRST YEAR SEMESTER – II											
Code	**Course**	**Category**	**L**	**T**	**P**	**S**	**Total**	**Sessional Marks**	**External Marks**	**Total Marks**	**Credits**
23MA1102	Ordinary Differential Equations And Numerical Methods	BS	3	0	0	0	3	40	60	100	3
23EC3103	Digital Logic Design	ES	3	0	0	0	3	40	60	100	3
23PY1102	Applied Physics	BS	3	0	0	0	3	40	60	100	3
23IT4111	Data structures & Algorithms	PC	3	0	0	0	3	40	60	100	3
23IT4112	Object Oriented Programming through C++	PC	2	0	2	0	4	40	60	100	3
23ME3204	Computer Aided Drafting And Modelling Lab	ES	0	0	3	0	3	50	50	100	1.5
23PY1202	Applied Physics Lab.	BS	0	0	3	0	3	50	50	100	1.5
23IT4211	Data Structure Lab With C	PC	0	0	3	0	3	50	50	100	1.5
23MC0102	Environmental sciences	MC	3	0	0	0	3	50	0	50	-
TOTAL			**17**	**0**	**11**		**28**	**400**	**450**	**850**	**20**

SEMESTER – 1

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

PREREQUISITE: Matrices, Differentiation, Integration and Functions..

Course Objective:

1. 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.

Mapping of Course Outcomes with POs and PSOs

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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 deals 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 company Pvt. Ltd.
5. Michael Greenberg, Advanced Engineering Mathematics, Pearson, Second Edition.

COMMUNICATIVE ENGLISH

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

COs/ POs PSOs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1									2	2		2		2	
CO2									2	2		2		2	
CO3									2	2		2		2	
CO4									2	2		2		2	
CO5									2	2		2		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 mapped with PO 9,10, and 12 as many of the LSRW skills are related to both individual performance and team activity-based. Students can use language in multicultural and multidisciplinary events with effective communication skills. It's a life-long learning.
2	CO2 is mapped with PO 9,10, and 12 as students do activities in teams and individually to get effective communication skills and learn new avenues of English language.

3	CO3 is mapped with PO 9,10, and 12 as effective writing skills and communication skills are developed through group activities and individual presentations.
4	CO4 is mapped with PO 9,10, and 12 as using new vocabulary or terminology is needed for collective and single performances
5	CO5 is mapped with PO 9,10, and 12 as language exercises are done in groups and in isolated tests which develop students' oral and written communication skills.

SYLLABUS

UNIT I **10 Periods**

Theory: Motivational Speech or Essay - Letter Writing – Profile Building
Grammar: Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory - Phrases & Clauses - Verb Forms CO1
Vocabulary: Root words – Synonyms – Antonyms

UNIT II **10 Periods**

Theory: Basics of Communication – Verbal, Nonverbal and Written Communication – Paragraph Writing
Grammar: Tenses - Agreement: Subject-verb, Noun-pronoun – Articles – Prepositions
Vocabulary: One-word Substitutes – Word Associations – Portmanteau Words CO2

UNIT III **10 Periods**

Theory: Essay 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 verbs – Foreign Words CO3

UNIT IV **10 Periods**

Theory: Skimming and Scanning – Failure to Success Stories for Reference
Grammar: Direct and Indirect Speech – Degrees of Comparison
Vocabulary: Homonyms & Homophones – Collocations – Etymology CO4

UNIT V **10 Periods**

Theory: Resume Writing – Quantifiers – Dialogue Writing
Grammar: Prescribed Phrases – Correction of Sentences
Vocabulary: Affixation – Paronyms – Acronyms – Word Building CO5
*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 DictionariesCambridge dictionary online
- MacMillan dictionary
- Oxford learner's dictionaries

APPLIED CHEMISTRY

23CY1102 **Credits: 3**

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

End Exam: 3 Hours End Exam Marks: 60

Prerequisites: Chemistry at +1 and +2 level

Course Objectives:

1. To create an understanding on the analytical terms and implement methodologies for water analysis.
2. To induce knowledge on various alternate energy sources, materials in computer aided equipment's.
3. To enlighten them with the principles, technological aspects of green chemistry and Biomolecules.

Course Outcomes:

1.	Apply methodologies to determine the water quality parameters.
2.	Understand the meaning of the term's accuracy, precision and errors and apply them for various Chemical analytical data.
3.	Select anodic and cathodic materials for functioning of batteries/ cells based on the concepts of electrode potentials
4.	Predict the electrical conductivity of solids based on band theory and also able to identify the applications of nanomaterial for various engineering applications.
5.	Identify various Green solvents, apply principles of Green chemistry and differentiate RNA & DNA.

CO-PO –PSO Mapping

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1		1	1	1				1	3	2	
CO2	3	1				1	1	2				1	3	1	
CO3	3	1				1	1	2				1	3	1	
CO4	3					1	1	1				1	3		
CO5	3					1	1	2				1	3		

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	Acquire keen knowledge on analytical terms and solve numerical problems. Distinguish various types of reactions and can apply methodologies to handle data and determine stastical quantities.
2	Understand drawbacks of hard water, and make informed decisions on water quality for domestic and industrial settings.
3	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.
4	Understanding on the basic conduction process in semiconductors. Gain knowledge on various display units and their applications
5	Will get explored on green methodologies and their applications. Acquire knowledge and differentiate DNA & RNA.

SYLLABUS

Unit -1Water chemistry and treatment 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; Alkalinity, determination of alkalinity, disadvantages of alkalinity with a case study of caustic embrittlement in boilers.

Water softening method - Ion exchange resin process, advantages & disadvantages;

Desalination methods - Reverse Osmosis & Electrodialysis. Municipal water treatment - Sedimentation with coagulation, Sterilization - Chlorination (break point chlorination), UV treatment.

Unit-2 Errors in chemical analysis & Spectrophotometric Techniques 10 Periods

Errors in chemical analysis- Mean, Median, Accuracy, Precision; types of errors, source of errors, minimize errors; statistical terms- mode, variance, standard deviation; Significant figures; statistical Analysis of chemical, health and environmental data.

Spectrophotometric techniques: Interaction of radiation and matter, Absorbance & Transmittance, absorption spectra & emission spectra, Beers-Lamberts law; Principle, instrumentation and medical applications of UV-Vis double beam spectrophotometer, flame photometer.

Unit-3 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.

Unit-4 Chemistry of materials **10 Periods**

Introduction to solids, Band theory of solids, Role of dopants on band structures, organic semiconductors, Engineering Applications, Compound semiconductors; fabrication methods of semiconducting materials, wafer manufacturing, oxidation diffusion and ion implantation;

Liquid crystals- Types of liquid crystals- working of LCD, LED, OLED, Applications of liquid crystals.

Nanomaterials, Synthesis by Sol-Gel Process; Characterization of Nanomaterials - Instrumentation-working of Scanning electron microscope and Transmission electron microscope; Applications of nanomaterials.

Unit -5 **10 Periods**

Green Chemistry & Biomolecules

Principles of Green chemistry, Alternative solvents, Renewable feed stock-biodiesel production, Design Synthesis for Energy Efficiency-Microwave radiation, sonochemistry.

Biomolecules: Amino acids, classification; Nucleic Acids, Chemical composition of nucleic acids, structure of Nucleic acids, biological functions of nucleic acids.

TEXT BOOKS:

1. Engineering chemistry -Pc jai nans M.Jain-Dhanpath Rai & Sons , New Delhi.
2. Engineering Chemistry by O.G.Pallanna, MecGrawhil, Chennai
3. Hand book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell publishing
4. Vogel's text book of Quantitative analysis, 5^{th} edition, G.H.Jeffery, J.Bassett, J.Mendham, R.S.Denney.

REFERENCES:

1. A text book of Engineering Chemistry-S.S.Dara- S.Chand & Co.New Delhi.
2. Dell,Ronald M Rand, David A J. Understanding Batteries, Royal society of Chemistry, (2001)
3. Anastas;P.T, Warner,J.C.Green Chemistry; Theory and Practice, Oxford University and Press InC., Newyork, 1998.
4. Chemistry of Biomolecules, 2^{nd} Edition, Dr.S.P.Bhutani, Routledge, Taylor & Francis Group.

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING

(Common for CSE, CSE (AI & ML, DS), IT, Mechanical and Chemical)

23EE3101 **Credits: 3**

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

End Exam: 3 Hours End Exam Marks: 60

Prerequisites: Basic Knowledge of electric current concepts from Intermediate

Course Objectives:

1. To analyze using basic network theorems and reduction techniques for DC circuits.
2. To understand behavior of magnetic circuits and operation of electrical machines.
3. To understand operation and phasor diagrams of various basic electronic components.

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

CO1	**Apply** network theorems and **calculate** various parameters of DC circuits.
CO2	**Analyze** the behavior of magnetic circuits and **calculate** the parameters of magnetic circuits
CO3	**Analyze** the construction and working of DC and AC machines
CO4	**Illustrate** the construction & working of PN Diode, Half wave and Full wave rectifiers.
CO5	**Explain** the construction &operation of Transistor and FET

CO- PO, PSO Matrix

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2								3		
CO2	3	3	2	2								3		
CO3	3	3	3	3	3			3				3		
CO4	3			3	3			3				3		3
CO5	3			3	3			3				3		3

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 basic knowledge about different circuit elements; Ohm's and Kirchhoff's laws will be discussed. Also used to analyze the complex engineering problems using DC theorems. It is also used to design the solutions for complex engineering problems and needs life-long learning to solve the various problems related to DC theorems. To some extent can be used to design the experiments. So it is highly mapped to PO1, PO2, PO3 and PO12. Also mapped to PO4 with medium level.

2	CO2 deals with basic Knowledge of different terminologies in magnetic circuits, to analyze complex magnetic circuits using engineering sciences also needs life-long learning to update to the new technology. So highly mapped to PO1, PO2 and PO12. Up to some extent can be used to design the solutions for complex magnetic circuits and in design of experiments. So it can be mapped to PO3 and PO4 with medium level.
3	CO3 deals with knowledge of engineering fundamentals in construction, principles of DC & AC electrical machines, analyzing the problems related to electrical machines, design the solutions for complex engineering problems and can be used to research based experiments using modern tools like MATLAB, simulator etc. So it leads to go for life-long learning. It also deals with society, legal and health issues. Also need to consider professional ethics and responsibilities norms of engineering of engineering practice. So CO3 is highly mapped to PO1, PO2, PO3, PO4, PO5, PO6, PO8 and PO12. And is mapped to PSO2 with medium level as it deals with electrical drives and their control in
4	CO4 deals with the construction & working of PN Diode, Half wave and Full wave rectifiers that require basic engineering sciences, used in research based applications, it can also be used in modern tools like simulators, MATLAB etc.. It leads to life-long learning to update to new technologies. Also need to consider professional ethics and responsibilities norms of engineering of engineering practice. It can also be used as power switching device and their control for industrial and research applications. So it is highly mapped to PO1, PO4, PO5, PO8, PO12 and PSO2.
5	CO5 deals with the construction & working of PN Diode, Half wave and Full wave rectifiers that require basic engineering sciences, used in research based applications, it can also be used in modern tools like simulators, MATLAB etc.. Also need to consider professional ethics and responsibilities norms of engineering of engineering practice. It leads to life-long learning to update to new technologies. It can also be used as power switching device and their control for industrial and research applications. So it is highly mapped to PO1, PO4, PO5, PO8, PO12 and PSO2.

SYLLABUS

UNIT-I **[10 Periods]**

DC Circuits

Circuit Elements, Basic Laws, KCL, KVL, Linearity principle (Superposition), Mesh and Nodal analysis, Thevenin's and Norton's theorems.

UNIT-II **[10 Periods]**

Magnetic Circuits

Definition of Magnetic circuit, Reluctance, Magneto-motive force, Magnetic flux, Simple problems on series magnetic circuits, Faraday's Law of Electromagnetic induction, statically and dynamically induced EMF.

UNIT-III **[14 Periods]**

DC Machines

DC Generator construction, Working of DC generator, DC Motor working principle, significance of back EMF, Applications

AC Machines

Transformer construction, working principle, Three-phase induction motor construction, Three-phase induction motor working principle.

UNIT-IV **[12 Periods]**

Semiconductor Diode and Rectifiers

Intrinsic and Extrinsic Semiconductors, PN Junction Diode-Forward and Reverse biases, Avalanche break down, Construction, Operation and Characteristics of Half wave rectifier, Full wave centre tapped and bridge rectifiers.

UNIT-V **[14 Periods]**

Transistor, FET/MOSFET Characteristics

The common base configuration, Input and Output characteristics, Construction of FET, Transfer and Drain characteristics, Construction of MOSFET, and Characteristics of enhancement and depletion modes.

TEXTBOOKS:

1. V.K. MEHTA & ROHIT MEHTA, "Principles of Electrical Engineering and Electronics", 2nd edition, S. Chand Publications

REFERENCE BOOKS:

1. J. B. Gupta, "A textbook of electrical Engineering", S.K Katari & Sons Publication.

PROBLEM SOLVING AND PROGRAMMING USING C

(Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)

23CS3101 **Credits: 03**

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

End Exam: 3 Hours End Exam Marks: 60

Prerequisites: Nil

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

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1				2				2		
CO2	3	3	3	3	2			1	2	2			2		
CO3	3	3	3	3	2	1		1	2		1	1	2	1	
CO4	3	3	3	3	2	1		1	2	1	2	1	2	1	
CO5	3	3	3	3	2	1		1	2	1	2	1	2	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 analyzing complex problems and applying problem-solving techniques, which requires a solid foundation of application of engineering knowledge, problem analysis, design/development of solutions, investigations of complex problems, modern tool usage, and considering the societal implications of engineering practice.
2	CO2 equips students with essential problem-solving and programming skills, which are crucial in addressing complex engineering problems and using modern tools effectively to develop solutions for the betterment of society.
3	CO3 can be attainable by enabling students to gain engineering knowledge, apply problem analysis, develop solutions, investigate complex problems, utilize modern tools, consider the engineer's role in society, and enhance their programming and software development skills in a progressive approach.
4	CO4 can be attained by enabling students to develop comprehensive expertise in utilizing pointers for efficient problem-solving while integrating a broad range of essential engineering and programming competencies with a societal context.
5	CO5 can be attained by aligning with the broader objectives of engineering knowledge application, problem analysis, design/development of solutions, and investigation of complex problems, modern tool usage, and consideration of societal and ethical responsibilities in professional engineering practice in progressive manner.

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, continue and goto 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, Scope of variable, Types of functions, 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 I/O functions, 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

TEXT BOOKS:

1. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

REFERENCES:

1. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e,Pearson
2. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured ProgrammingApproach Using C, 3/e, Cengage Learning, 2007.
3. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, SecondEdition, Prentice Hall Publication.
4. Paul Deitel, Harvey Deitel -C How to Program with an introduction to C++, EighthEdition

ENGINEERING AND IT WORKSHOP

(Common for CHEM, CSD, CSM, EEE, IT)

23ME3202 **Credits: 1.5**

Instruction: 3 Practical/Week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Prerequisites: Nil

Course Objectives:

1. To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, tin smithy and house wiring
2. Explain the internal parts of a computer, peripherals, I/O ports, connecting Cables.
3. Demonstrate OS installation and Hardware Troubleshooting.
4. Demonstrate Office Tools such as Word processors, Spread-sheets, and Presentation.To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, tin smithy and house wiring

Course Outcomes:

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

1.	**Produce** a variety of carpentry, fitting and Tin Smithy jobs.
2.	**Prepare** electrical circuits for Series & Parallel connection and Stair case wiring.
3.	**Demonstrate** the capability of OS installation, network connectivity and Hardware Troubleshooting
4.	**Draft, present** and **perform** analyses on a given problem using MS-office tools

CO-PO –PSO Mapping

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2						1							
CO2	1	2						1							
CO3	1	2		2				1	1						
CO4	1	3			1			1	1	2		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	CO-1 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-1 satisfies two competencies (2.3 & 2.4), it is mapped at medium level to PO-2. As CO-1 satisfies one competency (8.1), it is mapped at low level to PO-8.
2	CO-2 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-2 satisfies two competencies (2.3 & 2.4), it is mapped at medium level to PO-2. As CO-2 satisfies one competency (8.1), it is mapped at low level to PO-8.

3	CO-3 satisfies only competency-1.4, so it is mapped to PO-1 at low level. CO-3 satisfies two competencies- (2.1 & 2.2) so it is mapped to PO-2 at medium level. As CO-3 satisfies one competency-4.1& 4.3, it is mapped at medium level to PO-4. As CO-3 satisfies one competency (8.1), it is mapped at low level to PO-8.
4	CO-4 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-4 satisfies three competencies- (2.2, 2.3 & 2.4) it is mapped at high level to PO-2. As CO-4 satisfies one competency (5.1), it is mapped at low level to PO-5. As CO-4 satisfies one competency (8.1), it is mapped at low level to PO-8. As CO-4 satisfies one competency-9.1, it is mapped at low level to PO-9. As CO-4 satisfies two competencies-(10.1 & 10.2), it is mapped at medium level to PO-10.

ENGINEERING WORKSHOP SYLLABUS

List of Experiments

Carpentry	1. Cross Lap Joint
	2. Dovetail Joint
Fitting	1. V Fit
	2. Square Fit
Tin Smithy	1. Taper Tray
	2. Square Box without lid
House Wiring	1. Parallel / Series Connection of three bulbs
	2. Stair Case wiring

Reference book:

1. **S.K.Hajra Choudhury** "*Elements of Workshop Technology" Vol I Manufacturing Processes,* ISBN:8185099146(2017).
2. **Lab Manual**

IT WORKSHOP SYLLABUS

Week 1: Introduction to PC Hardware

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Week 2:

Task 1: OS Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

Task 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Week 3: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

Week 4: MS word & PowerPoint Presentation

Task 1: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

Task 2: Create basic power point presentation: PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts.

Week 5: Spreadsheet Orientation:

Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Format Cells, Summation, auto fill, Formatting Text. Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

Case Study:

1. Create Department Newsletter of Latest academic year.
2. Create a presentation on short term goals vs long term goals.
3. Perform result analysis

Reference Books:

1. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
2. MOS Study Guide for Microsoft Word, Excel, Power point & Outlook by Joan Lambert & Joyce Cox

COMMUNICATIVE ENGLISH LANGUAGE 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

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
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:

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

PROBLEM SOLVING AND PROGRAMMING USING C LAB

(Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)

23CS3201 **Credits: 1.5**

Instruction: 3 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 Memory Allocation.
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.

CO-PO –PSO Mapping

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2							2		
CO2	3	3	3	3	3	2							2	1	
CO3	3	3	3	3	3	2							2	1	
CO4	3	3	3	3	3	2							2	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 equips students with essential problem-solving abilities using algorithms, control structures, and flowcharts while integrating engineering principles and ethical considerations.
2	CO2 can be attained by equipping students with essential programming techniques and problem-solving abilities, thereby preparing them to contribute effectively to the engineering field, society, and their professional development.
3	CO3 can be attained by enabling students to develop comprehensive expertise in utilizing pointers for efficient problem-solving while integrating a broad range of essential engineering and programming competencies with a societal context.
4	CO4 can be attained by aligning with the broader objectives of engineering knowledge application, problem analysis, design/development of solutions, and investigation of complex problems, modern tool usage, and consideration of societal and ethical

	responsibilities in professional engineering practice in progressive manner.

SYLLABUS

Week-1: Draw flowcharts for fundamental algorithms.
Week-2: C Programs to demonstrate C-tokens.
Week-3: C Programs on usage of operators.
Week-4: C Programs to demonstrate Decision making and branching (Selection).
Week-5: C Programs to demonstrate different loops.
Week-6: C Programs to demonstrate 1-D arrays.
Week-7: C Programs to demonstrate multi-dimensional arrays.
Week-8: C Programs to demonstrate functions.
Week-9: C Programs on pointers.
Week-10: C Programs to perform operations on Strings with String handling functions and without String handling functions.
Week-11: C Programs on Structures and Unions.
Week-12: C Programs to demonstrate Files.

TEXT BOOKS:

1. R.G. Dromey, How to Solve it by Computer, 1/e, Pearson Education, 2006.
2. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.

REFERENCES:

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Pradip Dey, Manas Ghosh, Programming in C, Oxford University Press, AICTE Edition,
3. B. Gottfried, Programming with C, 3/e, Schaum's outlines, McGraw Hill (India), 2017.
4. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson.

UNIVERSAL HUMAN VALUES AND ETHICS

(Common for All Branches)

23MC0101 **Credits: 0**

Instruction: 3 Lectures /week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

None. Universal Human Values 1 through Induction Program (desirable)

Course objectives:

The objective of the course is to enable the student in

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:

By the end of the course, students are expected 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.

Mapping of course outcomes with program outcomes:

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2	2	3				2	2	2	2
CO2								3				2			
CO3								3				2			
CO4						2	3	3	2			2	2	2	2
CO5							2	3				2	2		2

SYLLABUS

UNIT – I **12 Periods**

Introduction –Fulfilment 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 fulfilment 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.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship with family and society, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

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 –Activities of the Self – Imaginations and its sources – Self-organized /Enslaved behaviour - Self as the doer, seer and enjoyer – Harmony of the Self and body – Programme for self-regulation and health – Prosperity – Identification of physical facilities.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT – III **12 Periods**

Harmony in the Family: Human relationship – Feelings in Relationship – Trust – Intention and competence – Respect as right evaluation – Over, under and otherwise-evaluation – Minimum content of Respect – Complete content of Respect – Other feelings in Relationship – Love – Response and Reaction.

Include practice sessions to reflect on relationships in family, real life examples, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT – IV **10 Periods**

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

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

Include practice sessions to reflect on relationships in hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V **10 Periods**

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

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

Include practice Exercises and Case Studies in Practice (tutorial) Sessions e.g.,to discuss the conduct as an engineer or scientist etc.

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: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
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 –PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - MaulanaAbulKalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

SEMESTER – 2

ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

23MA1202 **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:

1. 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:

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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 1/3rd and 3/8th 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 tn - 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.

REFERENCES:

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.

DIGITAL LOGIC DESIGN

(Other Departments)

Code: 23EC3103 **Credits: 3**

Instruction: 3 periods &1 Tut/Week Sessional marks: 40

End exam: 3hours End exam marks: 60

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 logic gates and K-Maps
CO3	BL-4	Design and Analyze combinational logic circuits.
CO4	BL-4	Design and Analyse sequential logic circuits like flip-flops and registers
CO5	BL-3	Design and Analyse counters logic circuits and PLDs

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-**Design** /Cognitive level- Analysis (BL-4)

Program Matrix

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1									1			1
CO2	2	2	2									1			1
CO3	2	2	2									1			1
CO4	2	2	2									1			1
CO5	2	2	2									1			1

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

Justification of CO mapping with POs and PSOs

Course outcome	PO Mapped	Level Mapped	Justification for Mapping
CO1	PO1	1	Student will be able to apply the knowledge of basic engineering sciences, core engineering in designing various digital systems.
	PO2	1	Able to identify, analyse the problems in digital domain.
	PO3	1	Able to apply the knowledge of number systems and conversions in developing digital systems and related projects
	PO12	1	Able to apply the knowledge of digital 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 embedded and VLSI and communicate them effectively to the concern.
CO2	PO1	2	Student will be able to apply the knowledge of core engineering to compute the concept in modelling and designing computer based systems.
	PO2	2	Able to identify, analyze the problems in different domains
	PO3	2	Able to apply the knowledge of engineering to develop and assess projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital 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 embedded and VLSI and communicate them effectively to the concern.
CO3	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering concepts in designing computer based systems.
	PO2	2	Able to identify, analyze the complex problems in different domains.
	PO3	2	Able to apply the knowledge of combinational circuits in designing digital systems and assess projects in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital 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 embedded and VLSI and communicate them effectively to the concern.
	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering and computing concept in designing computer based systems.

CO4	PO2	2	Able to identify, analyze the problems in different domains
	PO3	2	Able to apply the knowledge of sequential circuits in designing digital systems and projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital 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 embedded and VLSI and communicate them effectively to the concern.
CO5	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering and computing concept in designing computer based systems.
	PO2	2	Able to identify, analyse the problems in different domains
	PO3	2	Able to apply the knowledge of counters and PLDs in designing digital systems and assess projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital 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 embedded and VLSI and communicate them effectively to the concern.

SYLLABUS

UNIT –I **[9Periods]**

NUMBER SYSTEMS

Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers, Binary codes: weighted and non-weighted BOOLEAN ALGEBRA: Basic definitions, Axiomatic Definitions, Theorems and properties, Boolean Functions, Canonical and standard forms.

(TB1-chapters1&2)

UNIT– II **[9Periods]**

LOGIC GATES- AND, OR, NAND, NOR, XOR,XNOR (TB2-chapter 4)

LOGICMINIMIZATION

The K-Map Method: Two variable map, Three variable map, four variable map Prime Implicants, Don't

Care conditions, NAND and NOR implementation, Quine-Mccluskey (QM) (up to four variables) Technique.(TB1-chapters3)

UNIT– III **[9Periods]**

COMBINATIONAL LOGIC DESIGN

Combinational circuits, Analysis Procedure, Design Procedure, Code Converters (BCD to XS3 (XS3 to BCD)), Gray to Binary (Binary to Gray), Binary Adder-Subtractor, Decimal adder, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers. De-Multiplexer

(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 Flip flop, Flip flop conversion, Clocked flip flop design, Edge triggered flip flop

Registers, Applications of Shift registers, universal shift register,(TB2-chapters7&8(till8.5))

UNIT –V **[9Periods]**

SEQUENTIAL CIRCUITS-2

Counters- Ripple counters, Synchronous counters, Ring counters, Johnson counter.

PLD's- PAL, PLA and PROM

TEXTBOOKS

1. M. Morris Mano and Michael D.Ciletti, "Digital Design", 6th Edition, Pearson Publishers,2018.
2. R. P Jain, "Modern Digital Electronics", 5th Edition, TMH, 2022.

REFERENCEBOOKS

1. William I.Fletcher, "An Engineering Approach to Digital Design", PHI, 2015.
2. John F.Wakerly,"Digital Design Principles and Practices", 3rd Edition, Prentice Hall,2015

APPLIED PHYSICS

(Common for CSE, CSM & CSD and IT)

23PY1102 **Credits: 03**

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

End Exam: 3 Hours End Exam Marks:60

Prerequisites: NIL

Course Objectives:

1. To enhance student's knowledge of theoretical and modern technological aspects in physics and to introduce fundamentals 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	BL	CO Statement
CO1	BL-4	**Classify** the properties of magnetic and super conducting materials to enhance the performance of device applications.
CO2	BL-3	**Identify** the various dielectric materials for mechanical and communication device applications.
CO3	BL-2	**Understand** the Synthesis and characterization of nano phase materials for industrial applications.
CO4	BL-3	**Apply** the optical phenomena like Interference, Diffraction to various fields and make use of Lasers and Optical Fibers in emerging Fields.
CO5	BL-2	**Extend** the knowledge of basic concepts of semiconductors to **illustrate** the semiconductor devices

CO	Bloom's Level
CO1	Action Verb from Blooms Taxonomy- **Classify**/ Cognitive level- Analysis (BL-4)
CO2	Action Verb from Blooms Taxonomy- **Identify**/ Cognitive level- Application (BL-3)
CO3	Action Verb from Blooms Taxonomy- **Understand**/Cognitive level- Understand (BL-2)
CO4	Action Verb from Blooms Taxonomy-**Apply**/Cognitive level- Applying (BL-3)
CO5	Action Verb from Blooms Taxonomy-**Illustrate**/Cognitive level- Understand (BL-2)

CO-PO Mapping:

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**3**	**3**	**1**	2	**1**	**1**	**1**				**2**	**1**	**3**
CO2	**2**	**2**	**3**		2	**1**	**1**	**1**				**2**	**1**	**3**
CO3	**2**	**2**	**3**		2	**1**	**1**	**1**				**2**	**1**	**3**
CO4	**2**	**2**	**3**	**3**	2	**1**	**1**	**1**				**2**	**1**	**3**

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

CO	Justification
1	CO1 deals the properties of magnetic materials and superconductorsin designing the system components to apply appropriate techniques EMI (electromagnetic interference) issues in computer systems, for life-long learning in technology like spintronics. So mapped to PO1, PO2, PO3, PO4, PO5, PO10 and PO12.
2	From CO2, the knowledge of dielectric nature of materials, properties equip them with skills necessary to design integrity and work effectively in fields that require an energetic technology. So mapped to PO1, PO2, PO3, PO4, PO5, and PO10.
3	CO3 deals the knowledge with skills to contribute to the development of nano - electronics, Nano photonics and sensors. From the understanding of manufacturing process involved in nano materials, student can gain insight into computational nano science, which involve modelling and simulating behaviour of nano structures. So this knowledge enables them to utilize computational techniques to predict the properties of nano materials. So mapped to PO1, PO2, PO3, PO4, PO5, PO10 and PO12.
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 like Quantum computing, Quantum cryptography and Silicon photonics can contribute to their development. So mapped to PO1, PO4, PO5, PO10 and PO12
5	CO5 deals the knowledge of semiconductors in emerging technologies such as Quantum computing, opto - electrics and wearable devices. This knowledge prepares to work on cutting – edge research and development projects that require an understanding of semiconductors and their applications. So mapped to PO1, PO2, PO3, PO4, PO5, PO10 and PO12.

SYLLABUS

UNIT-I **10 periods**

Magnetic materials: Definition of magnetic permeability, magnetization and magnetic susceptibility, classification of magnetic materials, properties of diamagnetic and paramagnetic materials, ferromagnetic materials - hysteresis curve , domain theory of ferromagnetism, soft and hard ferromagnetic materials and its applications

Modern Engineering physics S.L Gupta and Sanjeev Gupta, Dhanpat Rai publications

Superconductivity: Introduction, properties of superconductors, effect of temperature and magnetic field, Meissoner effect, flux quantization, type – I and type – II superconductors, applications of superconductors, BCS theory (qualitative)

A text book of engineering physics- M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publication

Learning Outcomes:

The students will be able to

- Classify the magnetic materials based on susceptibility and their temperature dependence
- Explain the applications of dielectric and magnetic materials
- Apply the concept of magnetism to magnetic data storage devices
- Classify superconductors based on Meissner’s effect

UNIT–II **10 periods**

Dielectric materials: Definition of electric dipole moment, dielectric polarization and dielectric constant, Types of polarization – electronic, ionic and oriental polarization, expression for polarisability, internal fields in solids, Classius – Mossotti equation, properties of ferroelectric materials and their applications.

Electromagnetism: Electromagnetic induction, Maxwell's equations and Electromagnetic wave equations in free space.

Modern Engineering physics S.L Gupta and Sanjeev Gupta, Dhanpat Rai publications

Learning Outcomes:

The students will be able to

- Explain the concepts of dielectric constant and polarization in dielectric materials
- Summarize various types of polarization of dielectrics
- Interpret internal fields with Claussius- Mosotti relation in dielectrics

UNIT–III **10 periods**

Nanophase materials: Introduction to nanophase materials, properties of nanophase materials, synthesis of nanophase materials – chemical vapour deposition, sol-gel method, mechanical attrition method, applications of nanophase materials

Modern Engineering physics S.L Gupta and Sanjeev Gupta, Dhanpat Rai publications

Engineering Physics -- A.Marikani, PHI Learning Private Limited

Learning Outcomes:

The students will be able to

- Understand the nano phase particles with bulk materials
- Explore the various synthesizing patterns of the Nano materials
- Summarize the various characterization techniques of nano materials
- Explain the applications of Nanophase materials

UNIT–IV **10 periods**

Interference: Introduction, principle of superposition, coherence, Young's double slit experiment, conditions for interference, interference in thin films by reflection, wedge shaped film and Newton's rings

Diffraction: Introduction, Fresnel and Fraunhoffer diffraction, diffraction at a single slit

Lasers and Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, semiconductor laser, applications of lasers, principle of propagation of light in optical fibres, acceptance angle and acceptance cone, Numerical Aperture, Optical fibres in communication system.

Modern Engineering physics S.L Gupta and Sanjeev Gupta, Dhanpat Rai publications

Learning Outcomes:

The students will be able to

- Explain the need of coherent sources and the conditions for interference
- Analyze the differences between interference and diffraction with applications
- Understand the working principle of LASER light Sources
- Apply the concepts to learn the types of lasers
- Identifies the Applications of lasers in various fields
- Explain the working principle of optical fibers
- Identify the applications of optical fibers in various fields

UNIT–V **10 periods**

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Fermi level, carrier concentration in intrinsic semiconductor, direct and indirect band gap semiconductors. Lorentz force, Hall Effect and its applications.

Physics of semiconductor devices: Energy diagram of p-n diode, working of a diode, volt-ampere characteristics of p-n junction, light emitting diode (LED), liquid crystal display (LCD), photodiode

Modern Engineering physics S.L Gupta and Sanjeev Gupta, Dhanpat Rai publications

Learning Outcomes:

The students will be able to

- Classify the Intrinsic and extrinsic semiconductors
- Interpret the direct and indirect band gap semiconductors
- Identify the type of semiconductor using Hall effect
- Identify applications of semiconductors in various electronic devices

Reference books:

1) Engineering physics - V.Rajendran Tata McGraw Hill Education Private Limited
2) Engineering Physics -- Dattu Ramanlal Joshi Tata McGraw Hill Education Private Limited
3) Engineering Physics -- A.Marikani PHI Learning Private Limited
4) Engineering Physics - D.K.Bhattacharya, Poonam Tandon Oxford University Press

DATA STRUCTURES USING C

23IT4111 **Credits: 3**
Instruction: 3 periods /Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

PREREQUISITE: Programming with 'C'.

Course Objective:

1. Assess how the choice of data structures impacts the performance of programs.
2. Choose the appropriate data structure and algorithm design method for a specified application.
3. Solve problems using data structures such as sorting, searching, linear lists, stacks, queues, hash tables, binary trees, binary search trees and graphs

Course Outcomes:

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

1.	Solve real world problems by applying Data structure concepts
2.	Select appropriate Searching and sorting technique for a given dataset
3.	Design and implement abstract data types such as linked list, stack, queue and tree in static and dynamic context using C programming language.
4.	Apply Non-linear data structures to solve complex engineering problems.

Mapping of Course Outcomes with POs and PSOs

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**3**	**3**	**1**	2	**1**	**1**	**1**				**2**	**1**	**3**
CO2	**2**	**2**	**3**		2	**1**	**1**	**1**				**2**	**1**	**3**
CO3	**2**	**2**	**3**		2	**1**	**1**	**1**				**2**	**1**	**3**
CO4	**2**	**2**	**3**	**3**	2	**1**	**1**	**1**				**2**	**1**	**3**

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

SYLLABUS

UNIT – 1 **12 periods**

Introduction to Data Structures: Algorithms, performance analysis- time complexity and space complexity.

Searching: Sequential search and binary search.

Sorting: bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.

Introduction to Data Structures, Types of Data Structures, ADT.

Learning Outcome: At the end of this Unit the student will be able to

- Understand common searching and sorting techniques.
- Compare quick, and merge sorting in terms of their overall runtime efficiency.

UNIT-2: **10 periods**

Lists: List data structure and its implementation using Array. Linked List, List ADT, Single Linked List, Double Linked List and Circular Linked List - implementations.

Learning Outcome: At the end of this Unit the student will be able to

- Implement List data structure using array and Linked list.
- Compare advantages & disadvantages of static and dynamic implementations.

UNIT-3: **12 periods**

Stacks and Queues: Stack ADT, Primitive Operations, implementation of stack using arrays and linked lists, Applications of Stack (Arithmetic Expression Conversions & Evaluations, recursive function calls).

Queue ADT, Primitive Operations, **Linear Queue, Circular Queue, Priority Queue** implementations using arrays and linked lists, Applications of Queues.

Learning Outcome: At the end of this Unit the student will be able to

- Describe specific problems to which stacks and queues are suited.
- Demonstrate the operations of stacks and queues.
- Apply stacks to a specific application.
- Apply queues to a specific application.

UNIT-4: **10 periods**

Trees: Introduction to Trees, Terminology, Binary Trees, Binary Tree Traversals, Applications of Binary Trees (Binary Search Tree, Expression Tree), Implementation of Binary tree and Binary Search trees using Recursion.

Learning Outcome: At the end of this Unit the student will be able to

- Know the difference between binary trees and binary search trees.
- Apply trees to solve specific application requirements.

UNIT-5: **10 periods**

Graphs: Introduction to Graphs, Terminology, representation of Graphs (adjacency matrix, adjacency List), Transitive closure of a graph (Warshall's), Single-source shortest path Algorithm (Dijkstra's), Minimum spanning trees (Prim's, Kruskal's), Applications.

Learning Outcome: At the end of this Unit the student will be able to

- Demonstrate the use of graphs as a solution to a particular application requirement.
- Know the difference between directed and undirected graph.
- Explain means of generating spanning trees.

TEXT BOOK:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C" Pearson Education, 2nd Edition, 1995
2. Fundamentals of Data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Universities Press (India) Limited.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structure, computer science Press.
2. Richard F, Gilberg , Forouzan, Cengage ,"Data Structures", 2/e, 2005

OBJECT ORIENTED PROGRAMMING WITH C++

23IT4112 **Credits: 3**
Instruction: 2 Lectures & 2 Practical /Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

PREREQUISITE: Programming with 'C' Lab.

Course Objectives:

1. Understand the syntax and principles of Object oriented programming language.
2. Design and development of secure and extendable C++ applications.
3. Understand read/write files usingI/O Streams.
4. Understand use of template classes/functions and handling runtime exceptions.

Course Outcomes:

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

1.	Understand the syntax and principles of Object oriented programming language.
2.	Design and development of secure and extendable C++ applications.
3.	Understand read/write files usingI/O Streams.
4.	Understand use of template classes/functions and handling runtime exceptions.

Mapping of Course Outcomes with POs and PSOs

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3				3		3	2	2	2
CO2	2	3	3	3	3				3		3	2	2	3
CO3	2	3	3	3	3				3		3	2	2	3
CO4	2	3	3	3	3				3		3	2	2	3

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

SYLLABUS

Unit-1:

Basic Concepts of OOP: Procedural Paradigms, Object Oriented Paradigm, OOP Principles and Terminology, OOP benefits, Procedure and Object Oriented programming languages, advantages and disadvantages.

Introduction to C++ : Basic Structure C++ Program, variable and Constants, Symbolic Constants, basic data types and derived data type, variable declaration, dynamic initialization, type modifiers, type casting, i/o statements in C++, operators and example programs**,** Control Structures-Programs using all control structures and statements, Functions: Function Prototypes, Function Components, Returning values from functions, actual and formal arguments, parameter passing methods, Inline functions.

1. Write a CPP Program to demonstrate the structure of a C++ program (CO1)
2. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem. (CO1)

3. Write a C++ program to find both the largest and smallest number in a list of integers. (CO1)
4. Write a CPP Program to calculate square and cube of a number using inline functions and macros. (Demonstrate the use of inline functions compared to macros). (CO1)
5. 4.Write a CPP Program to find the area of a rectangle, a triangle and surface area of a sphere using function overloading(CO1)
6. Write a CPP Program to swap two numbers using call by value, call by address, call by reference and return by reference. (CO1)

Unit-2:

Classes and Objects: Introduction to class, class definition, class specification, Member functions, data members, access specifiers, scope resolution operator, Object definition and creation, array of objects, pointers, Pointers to objects, this pointer, dynamic allocation operator, friend functions, const and volatile functions, static members, nested classes, local classes.

Constructors and destructors: Definition of constructor and destructor, default constructor, parameterized constructor, copy constructor, constructor with dynamic allocation, explicit constructor.

1. Write a CPP Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private). (CO2)
2. Write a CPP Program to access the member functions inside and outside a class. (CO2)
3. Write a CPP Program to access private data using non-member functions. (Use friend function). (CO2)
4. Write a CPP Program to pass objects to functions by pass by value method. (CO1)
5. To define a class to represent a bank account. Include the following members: Data members: 1) Name of the depositor 2) Account number 3) Type of account 4) Balance amount in the account. Member functions: 1) To assign initial values 2) To deposit an amount 3) To withdraw an amount after checking the balance 4) To display name and balance. (CO3)
6. Write a CPP Program to declare main () function as member function and overload it. (CO2)
7. Create the ZooAnimal constructor function. The function has 4 parameters -- a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cageNumber, weightDate, and weight respectively. (CO2)

Unit-3:

Inheritance: Definition, base class, derived class, using access specifiers in inheritance, Types of Inheritance, protected data with private inheritance, constructor in derived and base class, abstract classes.

Virtual functions and Polymorphism: Function overloading, arrays and strings, Operator overloading through unary and binary operator, Friend functions, overloading Assignment operator, Virtual functions, Pure Virtual function.

1. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: (CO3)

   void setlength(float) to set the length data member

void setwidth(float) to set the width data member

float perimeter() to calculate and return the perimeter of the rectangle

float area() to calculate and return the area of the rectangle

void show() to display the length and width of the rectangle

intsameArea(Rectangle) that has one parameter of type Rectangle. sameArea() returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

- Write the definitions for each of the above member functions.
- Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9.
- Display each rectangle and its area and perimeter. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result

2. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following (CO3)
    a. Veena, guitear, sitar, sarod and mandolin under string
    b. Flute, clarinet, saxophone, nadaswaram and piccolo under wind
    c. Table, mridangam, bangos, drums and tambour under perc

    It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows
    - String instruments
    - Wind instruments
    - Percussion instruments

    The show method should display the relevant details according to user choice. The base class variable must be accessible only to its derived classes.
3. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y coordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept (CO3)
4. Create a class called car. Initialize the color and body attributes to “blue” and “wagon”. there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message “Beautiful music fills the passenger compartment” execute the methods to show the messages (CO3)
    1. Mycar is a blue wagon
    2. My father’s car is red convertible.
5. Write a CPP Program to declare virtual base class. Derive a class using two virtual classes. (CO2)
6. Write a CPP Program to implementation of Virtual Function. (CO1)
7. Write a CPP Program to Implementation of Pure Virtual Function. (CO1)

8. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation(CO2)
9. Write a C++ program to perform operations on complex numbers using operator overloading(CO1)

Unit-4:

Streams and Files in C++: Stream Classes, Formatted and unformatted data, manipulators, user defined manipulators, file streams, file pointer manipulation; file open and close, file handling, random access.

1 Write a CPP Program to write and read text in a file. Use ofstream and ifstream classes And Write a CPP Program to open a file for writing and reading purpose. Use open () function (CO3)

2 Write a C++ program to write number 1 to 100 in a data file NOTES.TXT (CO3)

3 Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT".(CO3)

Example:

If the file "STORY.TXT" contains the following lines,

The rose is red.

A girl is playing there.

There is a playground.

An aeroplane is in the sky.

Numbers are not allowed in the password.

The function should display the output as 3

Unit-5:

Templates, Exception handling: Class templates, Function templates, Member function templates, Exception handling - try-catch-throw paradigm, exception specification, terminate and un expected functions- uncaught exception, exception handling mechanism, multiple catch, nested try, Rethrowing the exceptions.

1. Write a CPP Program to find the factorial of a number. Throw multiple exceptions and define multiple catch statements to handle exceptions. (CO4)
2. Write a C++ Program to illustrate template class (CO4)
3. Write a C++ program that uses function templates to solve problems 2 and 3 experiments in Unit-1 (CO4)
4. Write a program to implement Exception Handling with minimum 5 exceptions Classes including two built-in exceptions. (CO4)
5. Write a program to concatenate 2 strings using STL String class functions. (CO4)
6. Write a simple C++ program to store and display integer elements using STL Vector class. (CO4)

Text Books:

1. Object Oriented Programming through C++ by RobatLaphore.

Reference Books:

1. Object Oriented Programming in C++: N. Barkakati, PHI
2. Object oriented Programming using C++: E. Balagurusamy, PHI.
3. The Complete reference in C++ by Herbert Shieldt, TMH
4. The C++ Programming Language by B. Stroustrup, Pearson Education

COMPUTER AIDED DRAFTING AND MODELLING LAB

(For CSE & IT)

23ME3205 **Credits: 1.5**

Instruction: 3 Practical /Week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Prerequisites: Nil

Course Objectives:

- The course is designed to develop skill to use software to create 2D and 3D models.

Course Outcomes:

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

1.	**Draft** 2D drawings with dimensions using CAD software.
2.	**Design** 3D Wireframe model with dimensions using CAD software.
3.	**Design** 3D Surface model with dimensions using CAD software.
4.	**Design** 3D model with dimensions using CAD software.

CO-PO –PSO Mapping

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**2**	**1**		**3**			**1**		**2**		**1**			
CO2	**1**	**2**	**1**		**3**			**1**		**2**		**1**			
CO3	**1**	**2**	**1**		**3**			**1**		**2**		**1**			
CO4	**1**	**2**	**1**		**3**			**1**		**2**		**1**			
CO5															

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	CO-1 satisfies one Competency-1.3, so it is mapped to PO-1 at low level. As CO-1 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-1 satisfies one Competency-3.1, so it is mapped to PO-3 at low level. 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, so it is mapped to PO-12 at low level.

2	CO-2 satisfies one Competency-1.3, so it is mapped to PO-1 at low level. As CO-2 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-2 satisfies one Competency-3.1, so it is mapped to PO-3 at low level. 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.
3	CO-3 satisfies one Competency-1.3, so it is mapped to PO-1 at low level. As CO-3 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-3 satisfies one Competency-3.1, so it is mapped to PO-3 at low level. 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.
4	CO-4 satisfies one Competency-1.3, so it is mapped to PO-1 at low level. As CO-4 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-4 satisfies one Competency-3.1, so it is mapped to PO-3 at low level. 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.

SYLLABUS

Module 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:

Exercise 1: Auto CAD Layout and Drafting Aids

Exercise 2: 2D Drafting exercise on modify commands, Block

Exercise 3: 2D Drafting exercise on layers and annotations

Exercise 4: 2D Drafting exercise on Symmetrical drawings and Array function

Exercise 5: 2D Drafting exercise on Polygons and Hatching

Exercise 6: Orthographic Views

Exercise 7: Isometric Views

Module II: 3D WIREFRAME MODELLING

VPOINT, Coordinate System, UCS, 3D Cylindrical Coordinate Method, 3D Spherical Coordinate Method.

Weekly Exercises:

Exercise 8: 3D Wireframe modelling by VPOINT method.

Exercise 9: 3D Wireframe modelling by UCS method.

Module III: 3D SURFACE MODELLING

3D Surface modelling: VPOINT, UCS, SHADEMODE, ELEV, 3DFACE, PFACE, Revolve surface, Tabulated surfaces, Ruled surface, Edge surfaces, 3DMESH, primitives

Weekly Exercises:

Exercise 10: 3D Surface modelling by Elevation method.

Exercise 11: 3D Surface modelling by Revolve surface Method.

Exercise 12: 3D Surface modelling using Primitives.

Module IV: 3D SOLID MODELLING

VPOINT, UCS, SHADEMODE, REGION, EXTRUDE, REVOLVE, BOOLEAN OPERATIONS: UNION, SUBTRACT, INTERSECT; 3DARRAY, FILLET, CHAMFER, ROTATE3D, MIRROR3D, SLICE

Exercise 13: 3D Modelling by Extrude.

Exercise 14: 3D Modelling by Revolve.

Exercise 15: 3D Modelling by BOOLEAN OPERATIONS.

Exercise 16: 3D Modelling by 3DARRAY

REFERENCES:

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.
3. Lab Manual

APPLIED PHYSICS LAB

(Common for CSE, CSM & CSDS and IT)

Course Code: 23PY1202 **Credits: 1.5**

Instruction: L - 0, T- 0 P – 3 Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Course Objectives:

1. 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	Adopt 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/ POs PSOs	**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. Determination of the frequency of an electrically maintained tuning fork - Melde's experiment.
11. Find the Numerical aperture of a given optical fiber
12. Estimation of the wavelength of diode laser using a transmission grating
13. Determination of dielectric constant by variation of temperature method (Ferro electric crystal)
14. Magnetic Hysteresis curve experiment (B-H curve)
15. V-I characteristics of Semiconductor diode.

Beyond the syllabus Experiments:

16. Determination of the velocity of ultrasound in liquids by using the phenomenon of diffraction of light by ultrasound
17. Determination of the particle size of micro particles (Lycopodium powder) using laser diffracting grating.
18. Estimation of rigidity modulus and moment of inertia using Tensional pendulum
19. Evaluation of moment of inertia by using Flywheel
20. Estimation of the Resolving power of the Grating

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 colours 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

1. 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.

DATA STRUCTURES LAB USING C

23IT4211 **Credits: 1.5**

Instruction: 3 practical /Week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

PREREQUISITE: Programming with 'C' Lab.

Course Objectives:

1. Assess how the choice of data structures through C impacts the performance of programs
2. Choose the appropriate data structure through C and algorithm design method for a specified application.
3. Solve problems using data structures through such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

Course Outcomes:

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

1.	Identify appropriate searching and sorting techniques to solve the given Scenario.
2.	Develop Programs employing dynamic memory management.
3.	Apply suitable ADT to solve the given problem.

Mapping of Course Outcomes with POs and PSOs

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	1	1	1	1		2	1	3
CO2	3	3	3	3	2	2	1	1	1	1		2	1	3
CO3	3	3	3	3	2	2	1	1	1	1		2	1	3

Note: Every lab must be practiced in GDB Compiler/Hacker Rank platform and the execution part of rubrics (apart from viva, observation and record) must be evaluated based on the GDB/Hacker Rank performance.

List of Programs

WEEK 1: **[CO1]**

Binary Search

1. John and Sam like to play with numbers. You have to distribute n1 and n2 integers between John and Sam respectively. You cannot give the same numbers to both John and Sam. Also, John doesn't like the numbers that are divisible by prime number x and Sam doesn't like the numbers that are divisible by a prime number y. So you cannot distribute the numbers to them that they do not like. Find the minimum value of n, that you can use to distribute from set 1,2,3,…,n. You can choose not to distribute some numbers at all.

Input format

- The first line contains an integer T - denoting the number of test cases.

- The first line of each test case contains 4 space-separated integers n1, n2, x, y.

Output format

Print a single integer - the minimum number n, that you can use to distribute numbers from the set 1,2,3,…,n.

Constraints

$1 \leq T \leq 100$

$1 \leq n1, n2 < 10^9$

$n1+n2 \leq 10^9$

$2 \leq x < y \leq 10^5$

Sample Input	Sample Output
1 **3 1 2 3**	**5**

WEEK 2: [CO1]

Bubble Sort

2. It's Lolympics 2016 right now, and we all know who's the best player there right now: **Kalyani**! Obviously, he has a huge female fan following and he has to make sure they are all happy and rooting for him to win the gold medals. But with fan following comes arrogance and lack of time. Thus, he has sufficient time to interact with atmost **T** of his fans. Each fan is defined by two parameters: **Name** and **Fan Quotient**. The name defines the name of the fan, while the fan quotient is a measure of the fan's devotion towards Kalyani. Higher the fan quotient, greater is the devotion. Kalyani now wants to meet **T** of his fans. While selecting the fans he wants to meet, he wants to make sure that a fan with a higher fan quotient should be given a chance in favour of those with lesser fan quotient. In case of ties, he sorts their name lexicographically and chooses the lexicographically lesser named fan. Given details of **N** fans, can you help out Kalyani by giving him a list of fans he would be interacting with?

Input Format:

The first line contains **N** and **T**, the number of fans and the maximum number of fans Kalyani can meet. Each of the next **N** lines contains a string and an integer separated by a space. The string denotes the name of the fan while the integer depicts the fan quotient.

Output Format:

Output **T** lines, each containing the name of the fans selected. Fans with higher fan quotient should be outputted first and in case of a tie, the lexicographically minimum name should come first.

Constraints:

$1 \leq T \leq N \leq 1000$

$1 \leq \text{lengthof name} \leq 20$

$1 \leq \text{fanquotient} \leq 10^9$

Name would only consist of characters in set **[a-z]**. It is not guaranteed that the names are distinct.

Sample Input	Sample Output
3 2	shreya

surbhi 3 surpanakha 3 shreya 5	surbhi

WEEK 3: [CO1]

Quick Sort

3. You are given an array *A*. You can decrement any element of the array by *1*. This operation can be repeated any number of times. A number is said to be missing if it is the smallest positive number which is a multiple of *2* that is not present in the array *A*. You have to find the maximum missing number after all possible decrements of the elements.

Input Format:

The first line of input contains *T* denoting number if test cases.

The first line of each test case contains *N*, the size of the array.

The second line of each test case contains *N* space separated integers.

Output Format:

Print the answer for each test case in a new line.

Constraints:

$1 \leq T \leq 10$

$1 \leq N \leq 10^5$

$0 \leq A_i \leq 10^9$

Sample Input	Sample Output
2 6 1 3 3 3 6 7 3 3 0 2	8 4

WEEK 4: [CO1]

Merge Sort

4. You are given a string of length *2N* consisting of only digits from *0 to 9*. You can make a move to choose an arbitrary position and replace the digit in that position with any digit from *0 to 9*.

Task

Determine the minimum number moves required to make the sum of the first *N* digits equal to the sum of the *N* digits that follow.

Note: *1*-based indexing is used.

Input format

Note: This is the input format you must use to provide custom input (available above the **Compile and Test** button).

- The first line contains *T* denoting the number of test cases. *T* also specifies the number of times you have to run the *solve* function on a different set of inputs.
- For each test case:
    - The first line contains an integer *N*.

- The next line contains a string *S* of length *2N*.

Output format

For each test case, print the answer in a new line.

Constraints

$1 \leq T \leq 10$

$1 \leq N \leq 10^5$

Sample Input	Sample Output
1 2 1325	1

WEEK-5: [CO2, CO3]

Single Linked List

5. You are given a linked list that contains N integers. You have performed the following reverse operation on the list:

- Select all the subparts of the list that contain only even integers. For example, if the list is {1,2,8,9,12,16}, then the selected subparts will be {2,8}, {12,16}.
- Reverse the selected subpart such as {8,2} and {16,12}.

Now, you are required to retrieve the original list.

Note: You should use the following definition of the linked list for this problem:

```
Class Node {
  Object data;
  Node next;
}
```

Input format

- First line: N
- Next line: N space-separated integers that denote elements of the reverse list

Output format

Print the N elements of the original list.

Constraints

$1 \leq N \leq 10^3$

$1 \leq A_i \leq 10^9$

Sample Input	Sample Output
9 2 18 24 3 5 7 9 6 12	24 18 2 3 5 7 9 12 6

WEEK-6: [CO2, CO3]

Doubly Linked List

6. Implement a menu driven Program in C for the following operations on **Doubly Linked List (DLL)** of Student Data with the fields: **Roll No, Name, Dept, SEM, CGPA, PhNo**

a. Create a DLL of N Student Data by using end insertion.

b. Display the status of DLL and count the number of nodes in it

c. Perform Insertion and Deletion at End of DLL

d. Perform Insertion and Deletion at Front of DLL

e. Demonstrate how this DLL can be used as Double Ended Queue

f. Exit

WEEK-7: **[CO2, CO3]**

Circular Linked List

7. Implement a Program in C for the following operations **on Circular Linked List (CLL)** with header nodes

a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z-4yz^5+3x^3yz+2xy^5z- 2xyz^3$

b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z)

Support the program with appropriate functions for each of the above operations

WEEK 8: **[CO3]**

STACK

8. A and B are playing a game. In this game, both of them are initially provided with a list of n numbers. (Both have the same list but their own copy).

Now, they both have a different strategy to play the game. A picks the element from start of his list. B picks from the end of his list.

You need to generate the result in form of an output list.

Method to be followed at each step to build the output list is:

1. If the number picked by **A is bigger than B** then this step's **output is** 1. B **removes** the number that was picked from their list.
2. If the number picked by **A is smaller than B** then this step's **output is** 2. **A removes** the number that was picked from their list.
3. If both have the **same number** then this step's **output is** 0. **Both** A **and** B **remove** the number that was picked from their list.

This game **ends** when at least one of them has no more elements to be picked i.e. when the **list gets empty**.

Output the built output list.

Input format:

First line consists of a number n, size of the list provided.

Next line consists of n numbers separated by space.

Output format:

Output the required output list.

Constraints:

$1 \le N \le 106$

$1 \le$ number in the list $\le 10^9$

Sample Input	Sample Output
3 1 2 3	2 2 0

WEEK-9: **[CO3]**

QUEUE

9. Your task is to construct a tower in N days by following these conditions:

- Every day you are provided with one disk of distinct size.
- The disk with larger sizes should be placed at the bottom of the tower.
- The disk with smaller sizes should be placed at the top of the tower.

The order in which tower must be constructed is as follows:

- You cannot put a new disk on the top of the tower until all the larger disks that are given to you get placed.

Print N lines denoting the disk sizes that can be put on the tower on the i_{th} day.

Input format

- First line: N denoting the total number of disks that are given to you in the N subsequent days
- Second line: N integers in which the i_{th} integers denote the size of the disks that are given to you on the i_{th} day

Note: All the disk sizes are distinct integers in the range of 1 to N.

Output format

Print N lines. In the i_{th} line, print the size of disks that can be placed on the top of the tower in descending order of the disk sizes.

If on the i_{th} day no disks can be placed, then leave that line empty.

Constraints

$1 \leq N \leq 10^6$

$1 \leq$ size of a Disk $\leq N$

Sample Input	Sample Output
5 4 5 1 2 3	5 4 3 2 1

WEEK-10: **[CO2, CO3]**

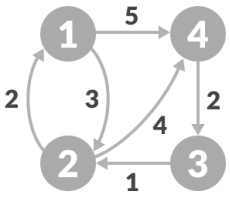
BINARY SEARCH TREE

10. Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers
    a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2
    b. Traverse the BST in Inorder, Preorder and Post Order
    c. Search the BST for a given element (KEY) and report the appropriate message
    d. Exit

WEEK 11: **[CO2, CO3]**

Warshall's algorithm

11. Implement shortest path distance between every pair of vertices using Warshall's algorithm for the below directed weighted graph.



WEEK-12: **[CO2, CO3]**

Dijkstra's algorithm

12. Given an adjacency matrix representation of a graph, compute the shortest path from a source vertex to a goal vertex using Dijkstra's algorithm. In the adjacency matrix, 0 represents absence of edge, while non-zero represents the weight of the edge. All edge weights are integers. In case of a tie, a smaller indexed vertex should be preferable to a larger indexed vertex.

Input: The first line is the number of test cases. Thereafter, for every test case, the first line of input is n, the number of vertices in the graph. Then n lines of inputs have n integers each, separated by a space, denoting the adjacency matrix. The next line of input is the index of source and goal, the indexing starts from 0.

Output: The first line of output is the cost of shortest path from source to goal. The second line of output is the path from source to goal (including both source and goal).

Sample Input 5 0 3 2 0 0 3 0 5 3 0 2 5 0 0 20 0 3 0 0 4 0 0 20 4 0 0 4

Sample Output 10 0 1 3 4

Sample Input	Sample Output
1 5 0 3 2 0 0 3 0 5 3 0 2 5 0 0 20 0 3 0 0 4 0 0 20 4 0 0 4	10 0 1 3 4

Additional Programs:

1. Given an array of positive and negative integers, segregate them in linear time and constant space. The output should print all negative numbers, followed by all positive numbers. [CO1]

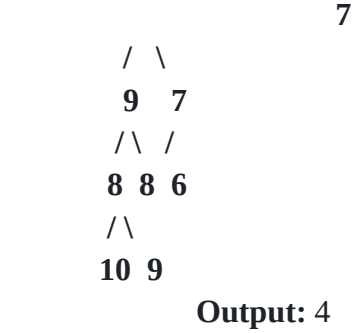
Input: [9, -3, 5, -2, -8, -6, 1, 3]
Output: [-3, -2, -8, -6, 5, 9, 1, 3]

2. Convert the following expression into infix expression into postfix expression[CO3]
Input: str = "a+b*(c^d-e)^(f+g*h)-i"
Output: abcd^e-fgh*+^*+i-

Given a binary tree, find its height. **[CO2, CO3]**

3.

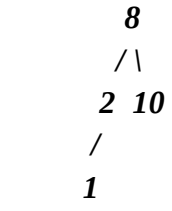
Input:



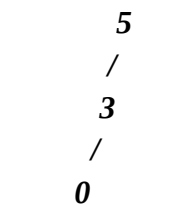
Output: 4

4. Given two Binary Search Trees (BST), print the inorder traversal of merged BSTs.
Input: **[CO2, CO3]**

First BST



Second BST



Output: *0 1 2 3 5 8 10*

5. You are given two four digit prime numbers **Num1** and **Num2.** Find the distance of the shortest path from Num1 to Num2 that can be attained by altering only single digit at a time such that every number that we get after changing a digit is a four digit prime number with no leading zeros. [CO1]

Input:
Num1 = 1033
Num2 = 8179
Output: 6

ENVIRONMENTAL SCIENCE

Mandatory (Non Credit) course for all branches

23MC0102 **Credits: 0**

Instruction: 3 Lectures /Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites: +1 & +2

COURSE OBJECTIVES:

1. Inculcating in students the awareness toward components in environment
2. Understand the importance natural resources, Structure, and functions of an ecosystem
3. Inducing knowledge on Sources, effects, and methods to reduce environmental pollution
4. 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

CO-PO-PSO Mapping

COs/ POs PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						**1**	**2**	**1**		**1**		**1**		
CO2						**1**	**2**	**1**		**1**		**1**		
CO3						**2**	**2**	**1**		**1**		**1**		
CO4						**2**	**3**	**1**		**1**		**1**		
CO5						**2**	**2**	**1**	**3**	**2**		**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	Understand the scope of environmental science. Can Elaborate their knowledge over Natural resources their conservation practices.
2	Apply knowledge of structure and functions of Ecosystem in various applications. Able to gain knowledge over values of biodiversity.
3	Acquire knowledge on sources, effects of various pollutants and also understand the advanced methodologies to reduce contamination
4	Correlate social issues caused due to environmental changes and can plan for solutions for society related problems

UNIT I **8 Periods**

INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES

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 **8 Periods**

ECOSYSTEM & BIO DIVERSITY

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 **8 Periods**

ENVIRONMETAL POLLUTION AND WASTE MANAGEMENT

Pollution: Sources, effects and control measures of Air pollution, Noise Pollution, Water Pollution, Soil Pollution, 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 **8 Periods**

SOCIAL ISSUES AND ENVIRONMENTAL LEGISLATIONS

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 **5 Periods**

HUMAN POPULATION AND THE ENVIRONMENT

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 BOOKS:

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*", universitie Press Commission, 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.