Anil Neerukonda Institute of Technology & Sciences (Autonomous)

(Permanent Affiliation by Andhra University & Approved by AICTE
Accredited by NBA (ECE, EEE, CSE, IT, Mech. Civil & Chemical) &
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I-YEAR CURRICULUM
B.Tech CSE(DATA SCIENCE)

Regulation R23

PRAGNANAM BRAHMA
ANITS

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(AI&ML, DS)

ANITS- B.Tech CSE (DS) CURRICULUM - REGULATIONS - R23											
I Year COURSE STRUCTURE - CSE (DS)											
SEMESTER – I											
CODE	**SUBJECT NAME**	**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
23PY1101	APPLIED PHYSICS	BS	3	0	0	0	3	40	60	100	3
23CD3101	COMPUTATIONAL THINKING AND PROBLEM SOLVING	ES	3	0	0	0	3	40	60	100	3
23EC3103	DIGITAL LOGIC DESIGN	ES	3	0	0	0	3	40	60	100	3
23EE3101	BASICS OF ELECTIRICAL & ELECTRONICS ENGINEERING	ES	3	0	0	0	3	40	60	100	3
23PY1201	**APPLIED PHYSICS LAB**	**BS**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD3201	**COMPUTATIONAL THINKING AND PROBLEM SOLVING LAB**	**ES**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD0101	UNIVERSAL HUMAN VALUES & ETHICS	HS	1	0	0	0	1	100	-	100	1
23MC0105	ENVIRONMENTAL SCIENCE	MC	3	0	0	0	3	-	-	-	-
Total			19	0	6	0	25	400	400	800	19
SEMESTER – II											
CODE	**SUBJECT NAME**	**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
23EN2101	COMMUNICATIVE ENGLISH	HS	3	0	0	0	3	40	60	100	3
23CD3102	PROGRAMMING WITH C	ES	3	0	0	0	3	40	60	100	3
23ME3204	DESIGN THINKING	ES	2	0	0	0	2	50	50	100	2
23ME3201	**COMPUTER AIDED ENGINEERING GRAPHICS**	**ES**	**1**	**0**	**4**	**0**	**5**	**50**	**50**	**100**	**3**
23EN2201	**COMMUNICATIVE ENGLISH LAB**	**HS**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD3202	**PROGRAMMING WITH C LAB**	**ES**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23ME3202	**ENGINEERING & IT WORKSHOP**	**ES**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CY1202	**APPLIED CHEMISTRY LAB**	**BS**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
	Total		**12**	**0**	**16**	**0**	**28**	**420**	**480**	**900**	**20**
II Year COURSE STRUCTURE - CSE (DS) (Tentative)											
SEMESTER – I											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23CM4111	DATA STRUCTURES & ALGORITHMS	PC	3	0	0	0	3	40	60	100	3
23CD4112	THEORY OF COMPUTATION	PC	3	0	0	0	3	40	60	100	3
23CD4113	COMPUTER NETWORKS	PC	3	0	0	0	3	40	60	100	3
23CD4114	OPERATING SYSTEM	PC	3	0	0	0	3	40	60	100	3
23MA1103	PROBABILITY , STATISTICS AND QUEUING THEORY	BS	3	0	0	0	3	40	60	100	3
23CD9201	**JAVA PROGRAMMING PRACTICES**	**SC**	**1**	**0**	**3**	**0**	**4**	**50**	**50**	**100**	**2.5**
23CD4211	**DATA STRUCTURES LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD4212	**CN & OS LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CR9101	LOGICAL REASONING & CORPORATE SKILLS	HS	3	0	0	0	3	100	-	100	1
23MC0103	*FINANCIAL LITERACY*	HS	3	0	0	0	3	-	-	-	-
Total			**22**	**0**	**9**	**0**	**31**	**450**	**450**	**900**	**21.5**
SEMESTER – II											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23CD4115	COMPUTER ORGANIZATION AND MICROPROCESSORS	PC	3	0	0	0	3	40	60	100	3
23CD4116	BASICS OF DATA SCIENCE	PC	3	0	0	0	3	40	60	100	3
23CD4117	COMPILER DESIGN	PC	3	0	0	0	3	40	60	100	3
23CD4118	DESIGN AND ANALYSIS OF ALGORITHMS	PC	3	0	0	0	3	40	60	100	3
23CD4119	DATA BASE MANAGEMENT SYSTEMS	PC	3	0	0	0	3	40	60	100	3
23CD9202	PYTHON PROGRAMMING	SC	1	0	3	0	4	50	50	100	2.5
23CD4213	**COMPUTER ORGANIZATION & MICRO PROCESSOR INTERFACING LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD4214	**DATA BASE MANAGEMENT SYSTEMS LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CR9102	NUMERICAL ABILITY & PROFESSIONAL COMMUNICATION SKILLS	HS	3	0	0	0	3	100	-	100	1
23MC0104	ENTERPRENUERSHIP & INTELLECTUAL PROPERTY RIGHTS	HS	3	0	0	0	3	-	-	-	-
Total			**22**	**0**	**9**	**0**	**31**	**450**	**450**	**900**	**21.5**

III Year COURSE STRUCTURE - CSE (DS) (Tentative)											
SEMESTER – I											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23ES6111	OPEN ELECTIVE-I	OE	3	0	0	0	3	40	60	100	3
23CD5111	PROFESSIONAL ELECTIVE-I	PE	3	0	0	0	3	40	60	100	3
23CD4120	MACHINE LEARNING	PC	3	0	0	0	3	40	60	100	3
23CD4121	DATA VISUALIZATION	PC	3	0	0	0	3	40	60	100	3
23CD9203	OBJECT ORIENTED SOFTWARE ENGINEERING	SC	1	0	3	0	4	50	50	100	2.5
23CD9204	COMPETITIVE PROGRAMMING PRACTICES	SC	1	0	3	0	4	50	50	100	2.5
23CD4215	**MACHINE LEARNING LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD9216	**DATA VISUALIZATION LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CR9103	QUANTITATIVE APTITUDE & EFFECTIVE COMMUNICATION SKILLS	HS	3	0	0	0	3	**100**	-	100	1
23CD3401	**SUMMER INTERNSHIP-INDUSTRY-1**	**PR**	**0**	**0**	**0**	**0**	**0**	**100**	-	**100**	**2**
Total			**17**	**0**	**12**	**0**	**29**	**560**	**440**	**1000**	**23**
SEMESTER – II											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23ES6112	OPEN ELECTIVE-II*	OE	3	0	0	0	3	40	60	100	3
23CD5112	PROFESSIONAL ELECTIVE-II	PE	3	0	0	0	3	40	60	100	3
23CD5113	PROFESSIONAL ELECTIVE-III	PE	3	0	0	0	3	40	60	100	3
23CD4122	NATURAL LANGUAGE PROCESSING	PC	3	0	0	0	3	40	60	100	3
23CD4123	NUERAL NETWORKS AND DEEP LEARNING	PC	3	0	0	0	3	40	60	100	3
23CD9205	**WEB TECHNOLOGIES LAB**	***SC***	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**2.5**
23CD4217	**NUERAL NETWORKS AND DEEP LEARNING LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**40**	**60**	**100**	**1.5**
23CR9104	HIGH LEVEL REASONING AND EMPLOYABILITY SKILLS	*MC*	3	0	0	0	3	100	-	100	1
Total			**18**	**0**	**6**	**0**	**24**	**390**	**410**	**800**	**20**
IV Year COURSE STRUCTURE - CSE (DS) (Tentative)											
SEMESTER – I											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23ES6113	OPEN ELECTIVE-III*	OE	3	0	0	0	3	40	60	100	3
23CD5114	PROFESSIONAL ELECTIVE-IV	PE	3	0	0	0	3	40	60	100	3
23CD5115	PROFESSIONAL ELECTIVE-V	PE	3	0	0	0	3	40	60	100	3
23CD4124	DATA ANALYTICS	PC	3	0	0	0	3	40	60	100	3
23CD5211	**PE-IV or PE-V LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD4218	**DATA ANALYTICS LAB**	**PC**	**0**	**0**	**3**	**0**	**3**	**50**	**50**	**100**	**1.5**
23CD3501	**PROJECT PHASE 1**	**PR**	**0**	**0**	**6**	**0**	**6**	**100**	**0**	**100**	**3**
23CD3402	**SUMMER INTERNSHIP-INDUSTRY -2**	**PR**	**3**	**0**	**0**	**0**	**3**	**100**	**0**	**100**	**2**
Total			**15**	**0**	**12**	**0**	**27**	**460**	**340**	**800**	**20**
SEMESTER – II											
CODE	**SUBJECT NAME**	**CATEGORY**	**L**	**T**	**P**	**S**	**Total**	**SESSIONAL MARKS**	**EXTERNAL MARKS**	**TOTAL MARKS**	**CREDITS**
23ES6114	OPEN ELECTIVE-IV* (MOOCS)	OE	0	0	0	3	3	40	60	100	3
23CD4301	DASH BOARD DESIGN USING(POWER BI)	PC	0	0	0	2	2	100	-	100	2
23CD3502	**PROJECT PHASE 2/ INTERNSHIP IN INDUSTRY**	**PR**	**0**	**0**	**20**	**0**	**20**	**100**	**100**	**200**	**10**
Total			**0**	**0**	**20**	**5**	**25**	**240**	**160**	**400**	**15**

TOTAL CREDITS	**160**

Emerging Courses or MOOC. Final decision will be taken by the department.

PROFESSIONAL ELECTIVES			OPEN ELECTIVES	
PE1	• 23CD5111(A) Information Retrieval • 23CD5111(B) Distributed Database systems • 23CD5111(C) No SQL Data Bases • 23CD5111(D) Big Data Analytics		OE 1 3rd Year Sem -1	23ES6111 - AI for Everyone
PE2	• 23CD5112(A) Computer Vision • 23CD5112(B) Mobile Computing • 23CD5112(C) Image and Video Processing • 23CD5112(D) Web & Text Mining		OE2 3rd Year Sem -2	23ES6112- - Introduction to Machine Learning
PE3	•23CD5113(A) Block Chain Technologies • 23CD5113(B) Cryptography & Network Secutiry • 23CD5113(C) Human Computer Interaction • 23CD5113(D) Pattern Recognition		OE3 4th Year Sem -1	23ES6113 - Introduction to DataScience
PE4	• 23CD5114(A) Augmented Reality & Virtual Reality • 23CD5114(B) Bioinformatics • 23CD5114(C) Large Scale Data Processing • 23CD5114(D) AI in Finance		OE4 4th Year Sem -2	23ES6114 - Natural Language Processing
PE5	•23CD5115(A) High Performance Computing •23CD5115(B) Fuzzy Computing • 23CD5115(C) Social Network Analysis • 23CD5115(D) Cloud Computing			

Minors of Data Science

CODE	SUBJECT NAME	CATEGORY	L	T	P	S	Total	SESSIONAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
23CM7101	Basics of Data Science	Minor	3	0	2	0	5	40	60	100	4
23CM7102	Data Visualization	Minor	3	0	2	0	5	40	60	100	4
23CM7103	Large Scale Data Processing	Minor	3	0	2	0	5	40	60	100	4
23CM7104	Data Analytics	Minor	3	0	2	0	5	40	60	100	4
23CM7105	Moocs -I	Minor	0	0	0	2	2	100	-	100	2
23CM7106	Moocs II	Minor	0	0	0	2	2	100	-	100	2

SEM-I

LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS	
Code:23MA1101	**Credits:3**
Instruction : 3 periods	**Sessional Marks:40**
End Exam : 3 Hours	**End Exam Marks:60**

Prerequisites: Matrices, Differentiation, Integration and Functions.

Course Objectives:

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

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

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

CO-PO –PSO Mapping:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
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)

SYLLABUS

UNIT I **10 Periods**

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

Sections: 2.7 and 2.10.

UNIT II **10 Periods**

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

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

UNIT III **10 Periods**

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

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

UNIT IV **10 Periods**

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

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

UNIT V **10 Periods**

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

APPLIED PHYSICS	
Course Code:23PY1101	**Credits:03**
Instruction: L - 3, T- 1 P – 0	**Sessional Marks: 40**
End Exam : 3 Hours	**End Exam Marks:60**

Prerequisites:

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-PO Mapping:

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

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, high temperature 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, frequency dependence of electronic polarization, properties of ferroelectric materials and their applications.

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

Techniques for characterization of materials: Principles of x-ray florescence – X-ray Diffraction– Electron microscopy (SEM and TEM).

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:

Thestudents will beable 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**

COMPUTATIONAL THINKING AND PROBLEM SOLVING	
Code: 23CD3101	**Credits: 3**
Instruction : 3 Periods	**Sessional Marks: 40**
End Exam : 3 Hours	**End Exam Marks: 60**

Prerequisites:

- No prerequisites.

Course Objectives:

- This course aims to provide exposure to computational thinking for problem-solving. It aims to train students to use algorithms, data, and simulations to investigate questions and develop new understandings. This course involves a lab component designed to give students hands-on experience with the flowgorithm tool.

Course Outcomes:

By the end of the course, the student will be able to:	
1	Apply computational thinking concepts and techniques, including iterators, variables, filtering, and datatypes, to develop effective solutions for various problems.
2	Design and implement efficient solutions using dynamic filtering conditions, pseudocode, and procedures with parameters to solve complex problems.
3	Apply sequenced and nested iterations, sorting algorithms, and list manipulations to efficiently and effectively solve complex problems involving datasets and elements.
4	Demonstrate an understanding of dictionary manipulations and apply them to solve problems involving complex data structures.
5	Demonstrate the ability to use recursion to efficiently search through complex data structures, such as graphs and trees, and identify the underlying properties of these structures.

Mapping of Course Outcomes with Program Outcomes:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3	-	2	-	-	-	2	-	-	-	2	-
2	2	3	3	2	2	-	-	-	2	-	-	-	2	-
3	2	3	3	2	2	-	-	-	2	-	-	-	2	-
4	2	3	3	2	2	-	-	-	2	-	-	-	2	-
5	2	3	3	-	2	-	-	-	2	-	-	-	2	-

SYLLABUS

UNIT- I **(10 Periods)**

Introduction: What Is Computational Thinking?
Getting Started with Computational Thinking-I:

Iterators: Going through a dataset, Flowcharts, Iterator flowchart for cards;
Variables: Generic flowchart for iterator with variables, Counting, Sum, Average, Accumulator; **Filtering:** Selecting cards, Examples, Compound conditions, Looking for a data element;
Data Types: Sanity of data, Basic data types, Compound data types, Subtypes, Transforming the data element, Datatypes for the elements in the dataset.

Learning Outcomes:

1. Understand computational thinking, digital data processing, the historical origins of computing, the basics of the modern computer, and Moore's law.
2. Design sequential algorithms, understand the concept of software and program execution, the useof variables and datatypes, and the modularization of algorithms.

UNIT-II **(10 Periods)**

Getting Started with Computational Thinking-II:

Filtering-Dynamic Condition: Maximum, Minimum, Examples using maximum or minimum, Combining static dynamic and state conditions;
Pseudocode: Basic iteration, Filtering, Compound conditions, Filtering with dynamic conditions; **Procedures and Parameters:** Pseudocode for procedures, Parameters, Checking for a single outstanding student.
Learning Outcomes:

1. Develop the ability to filter data in dynamic conditions and apply this skill to real-world problems.
2. Learn to plan and organize complex algorithms using pseudocode and create reusable andmanageable code using procedures and parameters.

UNIT-III **(10 Periods)**

Computational Thinking for Data Science-I:

Element<-->Dataset: Sequenced iterations, Compare with average, Classifying/Ranking the elements;
Element<-->Element: Nested iterations, Reducing the number of comparisons,Examples of nested iterations;
Learning Outcomes:

1. Understand the basic concepts of relationships between elements and datasets.
2. Understand the basic concepts of relationships between elements themselves.

UNIT-IV **(10 Periods)**

Computational Thinking for Data Science-II:

Lists: Pseudocode for lists, Pairs, Triples, Lists of lists;
Sorted Lists: Insertion Sort, Correlating marks in Maths and Physics, Pareto principle for shopping.
Dictionaries: Pseudocode for dictionaries, Examples, Side effects- Deleting a key from a dictionary;

Learning Outcomes:

1. Learn to work with lists and sorted lists and develop proficiency in sorting algorithms such as insertion sort.
2. Understand how to use dictionaries to represent data in problem-solving.

UNIT-V **(10 Periods)**

Higher Level Computational Thinking:
Graphs: Matrices, Applications, Train graphs, Edge Labeled graphs, Rectangle graphs.
Recursion: Iteration over hierarchical structures, Recursion trees, Using recursion to do sorting, Evaluating expressions;

Learning Outcomes:

1. Understand how to use graphs to represent data in problem-solving.
2. Understand the concept of recursion, learn how to use recursion to implement sorting algorithms,to evaluate expressions and traverse data structures such as trees and graphs.

Text Books:

1. Computational Thinking: A primer for programmers and data scientists, G. Venkatesh,Madhavan Mukund, Notion Press, 2021.

Reference Books:

1. Computational Thinking For The Modern Problem Solver, David D. Riley, Kenny A. Hunt,CRC Press, Taylor & Francis Group, 2014

DIGITAL LOGIC DESIGN	
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

Program Matrix

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

SYLLABUS

UNIT –I **[09Periods]**

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 **[09Periods]**

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 **[09Periods]**

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 **[09Periods]**

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 **[09Periods]**

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

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	
Code: 23EE3101	**Credits: 3**
Instruction : 3 Periods	**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	**Program Outcomes (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)

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 center 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.

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

Course Objectives:

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

Course Outcomes:

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

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

CO-PO Mapping:

	Program Outcomes (POs)												**PSOs**	
	Domain Specific POs					**Domain Independent POs**								
COs	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. Evaluation of moment of inertia by using Flywheel
12. Estimation of rigidity modulus and moment of inertia using Torsional pendulum
13. Determination of the particle size of micro particles (lycopodium powder) using laser diffracting grating.
14. Find the Numerical aperture of a given optical fiber
15. Determination of the velocity of ultrasound in liquids by using the phenomenon of diffraction of light by ultrasound
16. Estimation of the wavelength of diode laser using a transmission grating
17. Determination of dielectric constant by variation of temperature method (Piezoelectric crystal)
18. Magnetic Hysteresis curve experiment (B-H curve)
19. V-I characteristics of Semiconductor diode.

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

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.

COMPUTATIONAL THINKING AND PROBLEM SOLVING - LAB	
Code:23CD3201	**Credits: 1.5**
Instruction : 3 Periods	**Sessional Marks: 50**
End Exam : 3 Hours	**End Exam Marks: 50**

Prerequisites:

- No prerequisites.

Course Objectives:

- The course aims at applying computational thinking skills to solve problems logically,systematically, and effectively, and also develop critical thinking skills.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Analyze complex problems and identify patterns and relationships,
2.	Design and implement algorithms using flowcharts to solve problems.
3.	Communicate ideas and solutions effectively through clear and concise flowcharts.
4.	Apply computational thinking skills to solve a wide range of problems.
5.	Evaluate the strengths and weaknesses of different problem-solving approaches.

Mapping of Course Outcomes with Program Outcomes:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	-	3	2	-	-	2	2	-	-	-	-	-
2	2	3	3	-	2	-	-	-	2	-	-	-	-	-
3	2	-	-	-	2	-	-	-	3	3	-	-	-	-
4	2	2	3	-	2	-	-	-	2	-	-	-	-	-
5	2	2	-	-	-	-	-	-	2	-	-	-	-	-

SYLLABUS

Use flowgorithm tool to solve various problems not limiting to the

ones given below.Write the pseudocode and create a flowchart to

1. Calculate the salary of a worker after a 15% pay increase.
2. Classify the angles of a triangle as acute, obtuse, or right.
3. Find the total area of all triangles.
4. Find the sum and average of a given list of numbers.
5. Find the factorial of a given number.
6. Check whether a given year is a leap year.
7. Find the largest and smallest numbers in a given list of numbers.
8. Find the sum of the squares and cubes of the first 50 natural numbers.
9. Find the sum of girls' and boys' marks in the class.
10. Convert the temperature from Fahrenheit to Celsius or vice versa.
11. Check whether a given word or phrase is a palindrome.
12. Generate the first 10 numbers of the Fibonacci sequence.
13. Manipulate a given string, such as reversing it or removing certain characters.
14. Convert a binary number to its decimal equivalent.
15. Solve a quadratic equation given its coefficients.
16. Determine whether a given number is prime or composite.
17. Generate prime numbers within a range.
18. Print the following
    sequences.a.6,8,10,12,. 48
    b. 5,7,9,11,..... 45
    c. The first 50 numbers in the series 1,6,11,16,. ..., and calculate the sum of these terms.
19. Create the following patterns

*********	1 * * * *	1	1	1
*******	1 2 * * *	1 2 1	2 1	1 2 1
*****	1 2 3 * *	1 2 3 2 1	3 2 1	1 2 3 2 1
***	1 2 3 4 *	1 2 3 4 3 2 1	4 3 2 1	1 2 3 4 3 2 1
*	1 2 3 4 5	1 2 3 4 5 4 3 2 1	5 4 3 2 1	1 2 3 4 5 4 3 2 1

20. Calculate the factorial of a positive integer using recursion.
21. Calculate the nth Fibonacci number using recursion.
22. Find all even positive numbers in the first array and copy them to the second array.
23. Find the frequency of n numbers in the array and display the frequency table.

Text Books:

1. Computational Thinking: A primer for programmers and data scientists, G. Venkatesh, Madhavan Mukund, Notion Press, 2021.

Reference Books:

1. Computational Thinking For The Modern Problem Solver, David D. Riley, Kenny A. Hunt, CRC Press, Taylor & Francis Group, 2014

UNIVERSAL HUMAN VALUES & ETHICS	
Code: 23CD0101	**Credits: 1**
Instruction : 1 Period	**Sessional Marks: 100**
End Exam : --	**End Exam Marks: --**

Prerequisites:

- No prerequisites.

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, the student will be able to:	
1	Articulate Basic human aspirations and requirements for their fulfilment and identify the Role and process of Value education
2	Articulate the needs and activities of the self and body and frame program for self-regulation and health for harmony of the self.
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 Nature.
5	Identify the nature of existence and the role of human being for harmony in existence.

Mapping of Course Outcomes with Program Outcomes:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	2	2	3	-	-	-	2	2	2
2	-	-	-	-	-	-	-	3	-	-	-	2	-	-
3	-	-	-	-	-	-	-	3	-	-	-	2	-	-
4	-	-	-	-	-	2	3	3	2	-	-	2	2	2
5	-	-	-	-	-	-	2	3	-	-	-	2	2	-

SYLLABUS

UNIT – I 3 Periods

Introduction – Fulfillment of Basic Human Aspirations: Need for value education – Process of Value Education – Self-Exploration – Its content and process – Natural Acceptance and Experiential Validation – Basic Human Aspirations – Basic requirements for fulfillment of aspirations.

UNIT – II 3 Periods

Harmony in the Self: Human being as co-existence of Self and Body - Needs of Self and Body – Distinguishing Self and Body –Imaginations and its sources – Self-organized /Enslaved behavior - Harmony of the Self and body.

UNIT – III 3 Periods

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

UNIT – IV 3 Periods

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

UNIT – V 3 Periods

Universal Human Values and Ethical Human Conduct: Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Humanistic Constitution and Humanistic Universal Order.

TEXT BOOKS

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

REFERENCES

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

ENVIRONMENTAL SCIENCE	
CODE: **23MC0105**	**Credits: 0**
Instruction : 3 per week	**Sessional Marks : -**
End Exam : -	**End Exam Marks :-**

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

Prerequisites: +1 & +2

COURSE OBJECTIVES:

Inculcating in students the awareness towards importance about Environmental science Understand the importance natural resources, Structure, and functions of an ecosystem Inducing knowledge on Sources, effects, and methods to reduce environmental pollution Able to know the meaning of sustainable development and correlate social issues related to environment.

Course Outcomes:

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

CO.No.	Statement
CO-1	Identify the characteristics of various natural resourcesand can implement the conservation practices
CO-2	Realize the importance of Ecosystem and Biodiversityfor maintaining ecological balance
CO-3	Classify, analyze various pollutants and can developmethodsforsolvingproblemsrelatedtoenvironment
CO-4	Implement the environmental laws or defend issuesby getting awareness on legal aspects related toenvironmental issues
CO-5	Promote awareness on local environmental issues byparticipating in group activities, seminars, takingproject work

CO-PO-PSOMapping

PO/CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**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

UNI
T I
INTRODUCTION TO ENVIRONMENT ANDNATURALRESOURCES

8Periods

Introduction: Definition,Multidisciplinarynatureofenvironmentalstudies,ScopeandImportanceofEnvironmental Sciences, Need for public awareness.

NaturalResources: RenewableandNon-Renewableresources-Forestresources-useandoverexploitation,deforestation, Water resources- aquifers, dams and benefits, conflicts over water; Food resources- effects ofmodern 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 Conflicts (Case studies).

UNIT- II
ECOSYSTEM &BIODIVERSITY

8Periods

Ecosystem: Conceptofanecosystem-structureandfunctionofanecosystemFoodchains,foodwebsandecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession.

Biodiversity: Definition,types,IndiaasaMegadiversityNation,Valuesofbiodiversity,Hotspotsofbiodiversity, Threats to biodiversity, Endangered and endemic species, Conservation of biodiversity.

Activities:

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

UNIT -III
ENVIRONMETAL POLLUTION ANDWASTEMANAGEMENT

8Periods

Pollution: Sources,effectsandcontrolmeasuresofAirpollution,NoisePollution,WaterPollution,SoilPollution, Radio Active Pollution; Climate Change, Ozone depletion, Acid rains –causes and adverseeffects.

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 Chemistryconcepts,

Activities:

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

UNIT- IV

SOCIALISSUESANDENVIRONMENTALLEGISLATIONS **8Periods**

Social Issues and the Environment: Sustainable development, Environmental Impact Assessment, Rain waterharvesting, 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 presentations), Environmental Legislation (Awareness Campaign).

UNIT- V

HUMAN POPULATION ANDTHEENVIRONMENT

5Periods

Human population and environment- Population growth, Population explosion; Family Welfare Programme;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. Prepare a record or presentation and to be discussed in classroom. Certificate soft copy will be provided to student.

Activities:

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

Prescribed Book

1. **Anubha Kaushik &C.P.Kaushik**, "*Perspertives of Environmental Studies"* by 5thedition New AgeInternational Publications,2015.
2. **Palaniswamy**- "*Environmental Studies"*, 2ndedition, Pearson education2015.

Reference Books

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

SEM-II

ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	
CODE: **23MA1102**	**Credits: 3**
Instruction : 3 Periods	**Sessional Marks : 40**
End Exam : 3 Hours	**End Exam Marks : 60**

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

Course Objectives:

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

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

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

CO-PO –PSO Mapping:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
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)

SYLLABUS

UNIT I **10 Periods**

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

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

UNIT II **10 Periods**

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

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

UNIT III **10 Periods**

Numerical solutions of algebraic and transcendental equations :

Solution of algebraic and transcendental equations: Bisection method - Regula-Falsi method - Newton-Raphson method.

Solution of linear simultaneous equations: Gauss elimination - Gauss Jordan - Gauss Seidel.

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

UNIT IV **10 Periods**

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

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

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

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

UNIT V **10 Periods**

Laplace Transforms and its applications : Introduction - Definitions - Transforms of elementary functions - properties of Laplace transforms - Transforms of periodic functions - Transforms of derivatives - Transforms of integrals - Multiplication by t^n - Division by t - Evaluation of integrals by Laplace transforms.

Inverse transforms – method of partial fractions - Other methods of finding inverse transforms -

Convolution theorem (without proof) - Application's to differential equations - Unit step function and unit impulsive functions.

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COMMUNICATIVE ENGLISH	
CODE: 23EN2101	**Credits: 3**
Instruction : 3 Periods	**Sessional Marks : 40**
End Exam : 3 Hours	**End Exam Marks : 60**

Prerequisites: Basic English grammar

Course Objectives:

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

Course Outcomes:

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

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
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)

SYLLABUS

UNIT I **10 Periods**

Listening: Motivational Speech (Martin Luther King, Jr. Dr. Abdul Kalam, Sundar Pitchai)
Speaking: Self Introduction – Introducing others
Reading: Motivational Speech or Essays (H G Wells, Stephen Hawking)
Writing: Paragraph Writing - Letter Writing – Profile Building
Grammar: Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory - Phrases & Clauses - Verb Forms
Vocabulary: Root words – Foreign words and Phrases **CO1**

UNIT II **10 Periods**

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

UNIT III **10 Periods**

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

UNIT IV **10 Periods**

Listening: Role-plays
Speaking: Debate
Reading: Skimming and Scanning - Failure to Success Stories (KFC, J K Rowling, Walt Disney)
Writing: Summary
Grammar: Direct and Indirect Speech – Degrees of Comparison
Vocabulary: Homonyms & Homophones – Collocations – Etymology **CO4**

UNIT V **10 Periods**

Listening: News Bulletins- Recycle for Life: Karaikal's success in battling waste
Speaking: Mock Press, Floor Crossing
Reading: The role of Social Media analytics in new-age Digital Market-
Writing: Resume Writing – Dialogue Writing
Grammar: Quantifiers, Prescribed Phrases – Correction of Sentences
Vocabulary: Affixation – Paronyms – Acronyms – Word Building **CO5**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-Resources

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

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

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

PROGRAMMING WITH C	
Code:23CD3102	**Credits: 3**
Instruction : 2 Periods & 1 Tutorial /Week	**Sessional Marks : 40**
End Exam : 3 Hours	**End Exam Marks : 60**

Prerequisite: No specific prerequisites are needed

Course Objectives:

- This course aims to provide exposure to problem-solving through programming in C.
- It aims to train the student, the concepts of C-Programming Language.

Course Outcomes:

After completion of this course, a student will be able to:	
CO 1	Gain knowledge in problem solving and steps in Program development.
CO 2	Apply the basic concepts of C.
CO 3	Create user defined functions and implement string operations.
CO 4	Implement different operations on arrays and Demonstrate pointers.
CO 5	Apply structures and unions and Implement file Operations in C programming for any given application

Mapping of Course Outcomes with Program Outcomes:

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	1	2	3	2	1	-	-	-	-	-	-	1	-	-
2	2	3	3	2	1	-	-	-	-	-	-	1	-	-
3	2	3	2	2	1	-	-	-	-	-	-	1	-	-
4	2	3	2	2	1	-	-	-	-	-	-	1	-	-
5	1	2	3	2	1	-	-	-	-	-	-	1	-	-

SYLLABUS

UNIT- I **12 Periods**

Electronic Computers Then and Now, Computer Hardware, Computer Software, Professional Ethics for Computer Programmers.**(Text Book 2 Page 1-39)**

Computer Languages, Writing Editing compiling and linking programs, Program Execution, Introduction to C Language – Background, Structure of a C program, Identifiers, Types, Variables, Constants, Coding Constants, Formatted Input / Output. **(Text Book 1)**

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

- To gain knowledge in the concepts of problem solving
- Identify the steps in Program development

UNIT-II: **12 Periods**

Program-expressions, precedence and Associativity, Side effects, evaluating expressions, mixed type expressions, statements. Selection –Making Decisions – Logical data and operators, Bitwise Operators- logical bitwise operators, shift operators, bitwise use, Two way selection, Multi way selection Repetition – concept of a loop, pretest and posttest loops, initialization and updating, event controlled and counter controlled loops, loops in C, loop examples, other statements related to looping, looping applications **(Text Book 1)**

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

- Apply decision making in c programming for problem solving
- Apply controlled structures in c programming for problem solving

UNIT-III: **12 Periods**

Functions-Designing Structured Programs, Functions in C, user defined functions, standard libraryfunctions, scope, Recursion

Storage classes-auto, register, static, extern

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions **(Text Book 1)**

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

- Implement User defined functions.
- Use string functions and Apply string manipulation operations for problem solving.

UNIT-IV: **12 Periods**

Arrays – Concepts, using arrays in C, array applications, linear search, and Bubble sort, two – dimensionalarrays, multidimensional arrays.

Pointers – Pointer Applications – Arrays and Pointers, pointer arithmetic and arrays, passing an array to a function, understandingcomplex declarations, memory allocation functions, array of pointers. **(Text Book 1)**

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

- Implement Arrys with different dimensions
- Work with pointers and apply pointer to other data types and function

UNIT-V: **12 Periods**

Derived Types Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures, accessing structures, Complex structures, arrays of structures, structures and functions, unions

Text Files – Concept of a file, files and streams, input / output functions, formatting input/output functions,character input/output functions, character input/output examples **(Text Book 1)**

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

- Create derived data types using structure and union
- Store and retrieve data using files

Text Books:

1. **B. A. Forouzan and R. F. Gilberg** –*Cengage Learning , Computer Science: A Structured Programming Approach Using C*‖ Third Edition.
2. **Jeri R. Hanly , Elliot B .Koffman** , –*Problem solving and program Design in C*‖ , 7th Edition
3. **R.G.Dromey** , –*How to solve it by computer, Prentice-Hall International Series in Computer Science*‖ C.A.R. Hoare Series Editor

Reference Books:

1. **"Dietal & Deital**‖ , –*C How to Program 7/E"* ,PHI Publications
2. **Yashavant Kanetkar** , –*Let Us C"*, 16th Edition
3. **Brian W. Kernighan and Dennis M.Ritchie**, –*The C ProgrammingLanguage"*, Prentice Hall of India

DESIGN THINKING	
CODE: 23ME3204	**Credits: 2**
Instruction : 2 Periods	**Sessional Marks : 50**
End Exam : 3 Hours	**End Exam Marks : 50**

Prerequisite: Branch specific

Course Objectives:

1. To familiarize students with design thinking concepts and principles
2. To ensure students can practice the methods, processes and tools of design thinking.
3. To ensure students can apply the design thinking approach and have ability to model real world situations.
4. To enable students to analyze primary and secondary research in the introduction to design thinking

Course Outcomes: At the end of the course the student will be able to:	
CO-1	**Explain** the design thinking principles & **Identify** an opportunity and scope of the project and **prepare** the problem statement
CO-2	**Apply** the empathy tools to study the user and **summarize** finding related to problem for define phase.
CO-3	**Describe** and **define** the problem specific to the user group and **apply** Ideation tools to **generate** Ideas to **solve** the problem
CO-4	**Develop** prototypes for test phase.
CO-5	**Test** the ideas and **demonstrate** Storytelling ability to present the Ideas.

Mapping of Course Outcomes with Program Outcomes:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3	-	2	-	-	-	2	-	-	-	2	-
2	2	3	3	2	2	-	-	-	2	-	-	-	2	-
3	2	3	3	2	2	-	-	-	2	-	-	-	2	-
4	2	3	3	2	2	-	-	-	2	-	-	-	2	-
5	2	3	3	-	2	-	-	-	2	-	-	-	2	-

CO- Course Outcome; PO- Program Outcome; PSO-Program Specific Outcome;

Level- 1: Low, 2: Medium, 3: High

SYLLABUS

Week 1: Introduction to Design Thinking, Need of design thinking, 7 characteristics of design thinking, comparison of design thinking to other ways of thinking, tools and resources, 5 actions phases of Design thinking, 5 characteristics of action plan. Double Diamond Technique for Design thinking.
Activity: Case Studies related to application of Design Thinking in General, engineering and service areas
Home Task: Identify an opportunity and scope of the project for providing solution through design thinking.

Week 2: Problem statement (5W+H & HMW) tool for defining the identified problem. Innovation in Design thinking, Definition of Innovation, Types of Innovations
Activity:
1. Prepare the initial Problem statement for the identified problem applying design thinking
[Initial Statements – 1:1, final statement 1: Team.]

Week 3: Product innovation, Process Innovation and Organizational Innovation. Characteristics of Innovation, Levels of Innovation, Innovation Towards Design**,** Design principles tool.
Activity:
2. Develop a chart with the design principles that will guide your design thinking process.
[Design Principles sheet 1: Team]

Week 4: Human Centric Design Process. Tools for Empathy Phase, Interview for empathy, Ask 5x why, Stakeholder map
Activity:
3. Prepare the Questionnaire for doing Interview for empathy [Min 20 Questions]
4. Prepare the Stake Holder Map [1: Team.]
5. Apply Ask 5x why tool for identifying the cause identification of the problem[1:1]
Home Task: Prepare the google form to collect the basic information of interviewee and the responses for empathy questionnaire / conduct the interview to the stake holders and record the responses.

Week 5: Persona/User profile, Emotional response cards, Empathy map and Customer journey map.
Activity:
6. Prepare the Persona based on the responses received from the Stake holders. [3: Team]
7. Prepare the Empathy Map/ Customer Journey Map for summarizing pains & gains of stakeholders and insights [1: Team.]
Home Task: Use Jam Board as the extension activity for preparing multiple Empathy Map/ Customer Journey Maps

Week 6: Define point of view, Prepare "How might we…" tool for redefine the problem statement
Activity:
8. Define the Point of view from the insights of Empathy Map/ Customer Journey Map. [1:1]
9. Prepare HMW questions based on POV [10 questions]
10. Re-define the problem statement using HMW tool [1: Team.]

Week 7: Ideate Phase tools: Brainstorming, 6-3-5 Method, Special brainstorming, Analogies & benchmarking as inspiration.
Activity:
11. Conduct Brainstorming Session/ Special Brainstorming Session/ 6-3-5 Method [Generate lots of Ideas]

Home Task: Use Jam Board as the extension activity for shortlisting Ideas
Week 8: Ideate Phase tools: Dot voting, 2x2 Matrix **Activity:** 12. List out the Ideas and shortlist using dot voting, 2x2 Matrix [Minimum 3] **Home Task:** Use Jam Board as the extension activity for shortlisting Ideas
Week 9: Prototyping Phase: Methods and Tools, Low fidelity and High Fidelity prototypes, Low fidelity Prototype techniques **Activity:** 13. Prepare the Low fidelity prototypes of the sort listed ideas (Sketches, Paper Models etc.) [1: 1]
Week 10: High fidelity prototype techniques. Exploration map **Activity:** 14. Finalize the Prototype by Exploration Map. [1: Team] 15. Preparation of High fidelity prototype (3D Model) [1: Team]
Week 11: Prototype to test. **Activity:** 16. Prepare Final prototype and prepare it for testing[1: Team]
Week 12: Test Phase: Methods and Tools, Testing sheet, Feedback capture grid **Activity:** 17. Test the prototype and collect the feedback [3: Team] **Home Task:** Test the porotype with external stakeholders if necessary
Week 13: Guide lines for Project report Preparation **Activity:** 18. Iterate any phase based on the feedback received from stakeholders, modify the prototype
Week 14: Road map for implementation, Storytelling as a presentation tool **Activity:** 19. Prepare a road Map for the implementation. [1: Team]
Week 15: **Activity:** 20. Project Presentation by Storytelling and Project report Submission

Note: 1. All iterative activities prior to the testing phase must be completed as home task.

2. Before starting the empathy Phase, the faculty/HoD must approve and finalise the initial problem statement, which can be domain specific or general.

TEXT BOOKS:	
1.	Daniel Ling "*Complete Design Thinking Guide for Successful Professionals*", Emerge Creatives Group LLP, Print ISBN: 978-981-09-5564-9.
2.	Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, HarperCollins e-books, 2009.
3.	Jeanne Liedtka, Andrew King, And Kevin Bennett, "*Solving Problems with Design Thinking"* , Columbia University Press Publishers, E-ISBN 978-0-231-53605-9
4.	Michael Lewrick, Patrick Link, Larry Leifer, *The Design Thinking Toolbox,* John Wiley & Sons, 2020.
REFERENCE BOOKS:	
1.	Idris Mootee, *"Design Thinking for Strategic Innovation"* , 2013 John Wiley & Sons
2.	Michael G. Luchs, Scott Swan, Abbie Griffin , *"Design Thinking: New Product Development Essentials from the PDMA"*, ISBN-13 : 978-1118971802
3.	Beverly Rudkin Ingle, *"Design Thinking for Entrepreneurs and Small Businesses"*, Apress, ISBN: 9781430261827
4.	Jose Betancur *"The Art of Design Thinking: Make More of Your Design Thinking Workshops",* ISBN: 9781522095378
5.	Michael Lewrick, Patrick Link, Larry Leifer, The Design Thinking Playbook, John Wiley & Sons, 2018
WEB RESOURCES:	
1.	https://dschool.stanford.edu/resources/design-thinking-bootleg
2.	https://www.ideo.com/post/design-thinking-for-educators
3.	https://static1.squarespace.com/static/57c6b79629687fde090a0fdd/t/58890239db29d6cc6c3338f7/1485374014340/METHODCARDS-v3-slim.pdf.
4.	https://www.intel.com/content/dam/www/program/education/us/en/documents/K12/design-and-discovery/student-guide-full-curriculum-session1-18.pdf

S. No	Performance Expectation	Applicability in Design thinking Lab
1	Computing Systems (CS)	Expected to use computer and Computational tools for minimizing the tedious tasks.
2	Networks and the Internet (NI)	Use of internet for Surveying through google forms, Jam Board & Teams for Collaborative Work among the Stakeholders
3	Impacts of Computing (IC)	May not be applicable , Can be used for Persona Character design
4	Data & Analysis (DA)	Collecting the Date in Google Forms and expected analyze the data using Excel or google sheet to create persona and
5	Algorithms & Programming (AP)	Expected to breakdown the DT tasks and prepare a small algorithms for writing simple program in C / Python to Calculate/Test/Automate tasks wherever applicable.
6	Engineering Design (ED)	Expected while preparing Prototypes
7	Interaction of Technology and Humans (ITH)	Expected at Hi-fidelity Prototyping and Testing Phase
8	Nature of Technology (NT)	Expected at Ideate stage for providing creative and Innovative ideas
9	Effects of Technology on the Natural World (ETW)	Must be verified before prototyping
10	Ethics & Culture (EC)	The technology / product developed must be verified with economic, political, social, and cultural issues globally.

Design Thinking Lab Performance Expectation

Activity	Performance Expectation
1. Prepare the initial Problem statement for the identified problem applying design thinking	NI
2. Develop a chart with the design principles that will guide your design thinking process.	NI
3. Prepare the Questionnaire for doing Interview for empathy [Min 20 Questions]	NI

4. Prepare the Stake Holder Map [1: Team.]	CS, NI
5. Apply Ask 5x why tool for identifying the cause identification of the problem[1:1]	AP, CS
6. Prepare the Persona based on the responses received from the Stake holders. [3: Team]	IC, DA, CS
7. Prepare the Empathy Map/ Customer Journey Map for summarizing pains & gains of stakeholders and insights [1: Team.]	NI
8. Define the Point of view from the insights of Empathy Map/ Customer Journey Map. [1:1]	NI
9. Prepare HMW questions based on POV [10 questions]	NI
10. Re-define the problem statement using HMW tool [1: Team.]	NI
11. Conduct Brainstorming Session/ Special Brainstorming Session/ 6-3-5 Method [Generate lots of Ideas]	NI,AP, NT, ETW, EC
12. List out the Ideas and shortlist using dot voting, 2x2 Matrix [Minimum 3]	NI
13. Prepare the Low fidelity prototypes of the sort listed ideas (Sketches, Paper Models etc.) [1: 1]	ED
14. Finalize the Prototype by Exploration Map. [1: Team]	NI
15. Preparation of High fidelity prototype (3D Model) [1: Team]	CS, ED, NT
16. Prepare Final prototype and prepare it for testing[1: Team]	ED,ITH
17. Test the prototype and collect the feedback [3: Team]	NI, NT
18. Iterate any phase based on the feedback received from stakeholders, modify the prototype	-
19. Prepare a road Map for the implementation. [1: Team]	-
20. Project Presentation by Storytelling and Project report Submission	-

Proposed Design Thinking Lab Evaluation – 100M

Internal Evaluation: 50 M

Continues Assessment: 40 Marks [2 marks/ Activity]

Objective/ Written test [Average of 2 Tests]: 10M

External Evaluation: 50M

Prototype Validation: 20 M

Report: 10M

Presentation: 10M

Viva: 10M

COMPUTER AIDED ENGINERING GRAPHICS	
CODE: 23ME3201	**Credits: 3**
Instruction : 1 periods & 4 Practical/Week	**Sessional Marks : 50**
End Exam : 3 Hours	**End Exam Marks : 50**

(CHEM, CIVIL,CSD, CSM, EEE, ECE,IT)

Prerequisites: Nil

Course Objectives:

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

Course Outcomes:

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

1.	**Draft** simple 2D drawings with dimensions using CAD software.
2.	**Project** orthographically points and lines in various positions using CAD software.
3.	**Produce** orthographic projections of plane surfaces using CAD software.
4.	**Draw** orthographic projections of solids in various orientations using CAD software.
5.	**Construct** isometric views and isometric projections of simple Machine parts using CAD software.

CO-PO –PSO Mapping

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

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

SYLLABUS

UNIT I : COMPUTER AIDED DRAFTING

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

Weekly Exercises:

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

b) Draw lines using dynamic input, Ortho & Polar, Line divide, construction line.
c) Drawings using coordinate system, arbitrary coordinate system.
d) Selection & Modify commands – offset, move, copy, rotate, trim, Scale.

Week 2: **a)** Layers, Match property, line types
b) Arcs and Circles
c) Fillet and Chamfer
d) Annotations and Dimensioning

Week 3: **a)** Symmetrical drawings using mirror
b) Rectangular Array
c) Polar and Path Array
d) Annotations and Dimensioning

Week 4: **a)** polygons
b) hatching
c) block, wblock, group, ungroup, explode
d) iso planes

UNIT II: ORTHOGRAPHIC PROJECTIONS – POINTS & LINES

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

Weekly Exercises:

Week 5: a) Projection of points

b) Shortest distance of points from principle plane

Week 6: a) A line parallel to both the planes

b) A line inclined one plane

c) A line inclined to both the planes

UNIT III: ORTHOGRAPHIC PROJECTIONS – PLANES

Projections of regular polygon planes – inclined to one plane, inclined to both the planes.

Weekly Exercises:

Week 7: Projection of plane inclined to one plane.

Week 8: Projection of planes inclined to both planes

UNIT IV: ORTHOGRAPHIC PROJECTIONS – SOLIDS

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

Weekly Exercises:

Week 9: Projection of solids in simple positions.

Week 10: Projection of solids inclined to one plane.

UNIT V: ISOMETRIC PROJECTIONS

Isometric projections –Isometric scale, Isometric view & projection of prisms, pyramids, cone, cylinder,sphere, and their combination, conversion of orthographic projection into isometric projection and vice-versa of simple machine parts.

Weekly Exercises:

Week 11: Iso-Ortho conversions of simple machine parts.

Week 12: Ortho-Iso conversions of simple machine parts.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. **K. L. Narayana & P. Kanniah** "*Engineering Drawing"*
2. **R. B. Choudary** "*Engineering Graphics* with Auto CAD"
3. **TrymbakaMurty** "*Computer Aided Engineering Drawing"*
4. **B.V.R. Gupta and M.Raja Roy** *"Engineering Drawing with Auto CAD"* ISBN-13 978-9384588960 I K International Publishing House 3rd Edition : 2016

COMMUNICATIVE ENGLISH LAB	
Code: 23EN2201	**Credits: 1.5**
Instruction : 3 Periods	**Sessional Marks : 50**
End Exam : 3 Hours	**End Exam Marks : 50**

Prerequisites: Basic English Grammar

Course Objectives:

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

Course Outcomes:

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

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

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
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)

SYLLABUS

UNIT I **12 Periods**

Introduction to Phonetics – IPA – RP – Phonetic Transcription – Word stress or accent

UNIT II **9 Periods**

Functional English – JAM – Debate – Situational Dialogues or Role Plays

UNIT III **12 Periods**

Presentations on various topics from academic contexts and on international issues

UNIT IV **9 Periods**

Discussing specific topics and practising exercises and short structural talks

REFERENCE BOOKS:

Reference Books

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

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

PROGRAMMING WITH C LAB	
CODE:23CD3202	**Credits:**1.5
Instruction : 3 Periods /Week	**Sessional Marks : 50**
End Exam : 3 Hours	**End Exam Marks : 50**

Pre requisite: Concepts of Problem Solving & Computer Programming in C

Course Objective:

- The course aims at translating given algorithms to a working and valid program

Course Outcomes:

After completion of this course, a student will be able to:	
CO1	Develop C programs using operators
CO2	Implement C programs using conditional structures
CO3	Implement C programs using iterative structure arrays and strings
CO4	Inscribe C programs that use Pointers to and functions
CO5	Develop a c program for implementing user defined types and file processing

SYLLABUS

MINIMUM SET OF SAMPLE PROGRAMS

1. CONVERTING MILES TO KILOMETERS

PROBLEMSTATEMENT: Your summer surveying job requires you to study some maps that give distances in kilometers and some that use miles. You and your coworkers prefer to deal in metric measurements. Write a program that performs the necessary conversion.

Problem Input: miles /* the distance in miles*/
Problem Output: kms /* the distance in kilometers */
Relevant Formula: *1 mile = 1.609 kilometers*

Design algorithm , flow chart ,program using the above data requirements for the given problem. Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	10	16.09
Test case 2	2	3.218

2. SUPERMARKET COIN PROCESSOR

PROBLEM STATEMENT: You are drafting software for the machines placed at the front of supermarkets to convert change to personalized credit slips. In this draft, the user will manually

enter the number of each kind of coin in the collection, but in the final version, these counts will be provided by code that interfaces with the counting devices in the machine.

Problem Inputs

char first, middle, last /* a customer's initials */ int
dollars /* number of dollars */
int quarters /* number of quarters */ int
dimes /* number of dimes */
int nickels /* number of nickels */
int pennies /* number of pennies */

Problem Outputs

inttotal_dollars /* total dollar value */
int change /* leftover change */

Additional Program Variables inttotal_cents
/* total value in cents */

Design algorithm, flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

TESTING TIP :

To test this program, try running it with a combination of coins that yield an exact dollar amount with no leftover change. For example, 1 dollar, 8 quarters, 0 dimes,35 nickels, and 25 pennies should yield a value of 5 dollars and 0 cents. Then increase and decrease the quantity of pennies by 1 (26 and 24 pennies) to make sure that these cases are also handled properly.

SAMPLE TEST CASES	**INPUT**	**OUPUT**
Test case 1	Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of $ coins > 2 Number of quarters> 14 Number of dimes > 12 Number of nickels > 25 Number of pennies > 131	JRH Coin Credit Dollars: 9 Change: 26 cents
Test case 2	Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of $ coins > 3 Number of quarters> 12 Number of dimes > 14 Number of nickels > 50 Number of pennies > 175	JRH Coin Credit Dollars: 11 Change: 26 cents

3. WATER BILL PROBLEM

PROBLEM STATEMENT : Write a program that computes a customer's water bill. The bill includes a $35 water demand charge plus a consumption (use) charge of $1.10 for every thousand gallons used. Consumption is figured from meter readings (in thousands of gallons) taken recently and at the end of the previous quarter. If the customer's unpaid balance is greater than zero, a $2 late charge is assessed as well.

Problem Constants

DEMAND_CHG 35.00 /* basic water demand charge */
PER_1000_CHG 1.10 /* charge per thousand gallons used*/
LATE_CHG 2.00 /* surcharge on an unpaid balance */

Problem Inputs

int previous /* meter reading from previous quarter in thousands of gallons */
int current /* meter reading fromcurrent quarter */
double unpaid /* unpaid balance ofprevious bill */

Problem Outputs

double bill /* water bill */
doubleuse_charge /* charge for actual water use */
doublelate_charge /* charge for nonpayment of part ofprevious balance */

Relevant Formulas

water bill = demand charge + use charge + unpaid balance+ applicable late charge

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	**INPUT**	**OUPUT**
Test case 1	This program figures a water bill based on the demand charge ($35.00) and a $1.10 per 1000 gallons use charge. A $2.00 surcharge is added to accounts with an unpaid balance. Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number. Enter unpaid balance> $71.50 Enter previous meter reading> 4198 Enter current meter reading> 4238	Bill includes $2.00 late charge on unpaid balance of $71.50 Total due = $152.50
Test case 2	This program figures a water bill based on the demand charge ($35.00) and a $1.10 per 1000 gallons use charge. A $2.00 surcharge is added to accounts with an unpaid balance. Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number. Enter unpaid balance> $51 Enter previous meter reading> 4198 Enter current meter reading> 4137	Bill includes $2.00 late charge on unpaid balance of $71.50 Total due = $102.00

4. PRIME NUMBER

PROBLEM STATEMENT: Given a positive integer **N**, calculate the sum of all prime numbers between **1** and
N(inclusive).

Input:

The first line of input contains an integer **T** denoting the number of test cases. T test cases follow.
Each test case contains one line of input containing **N**.

Output:

For each test case, in a new line, print the sum of all prime numbers between 1 and N.

Constraints:

$1 \leq T \leq 100$

$1 \leq N \leq 10^6$

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 10	10 17
Test case 2	2 7 10	17 17

5. BUBBLE SORT

PROBLEM STATEMENT : The task is to complete bubble function which is used to implement Bubble Sort

Input:

First line of the input denotes the number of test cases 'T'. First line of the test case is the size of array and second line consists of array elements.

Output:

Sorted array in increasing order is displayed to the user.

Constraints:

1 <=T<= 100
1 <=N<= 1000
1 <=arr[i]<= 1000

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 4 1 3 9 7 10 10 9 8 7 6 5 4 3 2 1	1 3 4 7 9 1 2 3 4 5 6 7 8 9 10
Test case 2	1 5 8 9 3 2 0	0 2 3 8 9

6. TEXT EDITOR

PROBLEM STATEMENT: Design and implement a program to perform editing operations on a line of text. Your editor should be able to locate a specified target substring, delete a substring, and insert a substring at a specified location. The editor should expect source strings of lessthan 80 characters.

Problem Constant MAX_LEN 100 /* maximum size of a string */

Problem Inputs

char source[MAX_LEN] /* source string */
char command /* edit command */

Problem Output

char source[MAX_LEN] /* modified source string */

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TESTCASES	INPUT	OUPUT
Test case 1	Enter the source string: > Internet use is growing rapidly. Enter D(Delete), I(Insert), F(Find), or Q(Quit)> d String to delete> growing	New source: Internet use is rapidly
Test case 2	Enter D(Delete), I(Insert), F(Find), or Q(Quit)> F String to find>**.**	'.' found at position 23

7. ARITHMETIC WITH COMMON FRACTIONS

PROBLEM STATEMENT: You are working problems in which you must display your results as integer ratios; therefore, you need to be able to perform computations with common fractions and get results that are common fractions in reduced form. You want to write a program thatwill allow you to add, subtract, multiply, and divide several pairs of common fractions.

Design algorithm, flow chart, program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TESTCASES	INPUT 1	OUPUT
Test case 1	Enter a common fraction as two integers separated by a slash> 3/-4	Input invalid—denominator must be positive
Test case 2	Enter a common fraction as two integers separated by a slash> 3/4 Enter an arithmetic operator (+,-,*, or /) > + Enter a common fraction as two integers separated by a slash> 5/8 Entering find_gcd with n1 = 44, n2 = 32 Do another problem? (y/n)>n	gcd of 44 and 32?> 4 find_gcd returning 4 3/4 + 5/8 = 11/8

8. FACTORIAL OF A NUMBER

PROBLEM STATEMENT: Find factorial of a given number n.

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TESTCASES	INPUT 1	OUPUT
Test case 1	Enter a number to find factorial>2	Factorial of 2 is 4
Test case 2	Enter a number to find factorial>3	Factorial of 3 is 6

9. COLLECTING AREA FOR SOLAR-HEATED HOUSE – FILES AND FUNCTIONS

PROBLEM STATEMENT : An architect needs a program that can estimate the appropriate size for the collecting area of a solar-heated house. Determining collecting area size requires consideration of several factors, including the average number of heating degree days for the coldest month of a year (the product of the average difference between inside and outside temperatures and the number of days in the month), the heating requirement per square foot of floor space, the floor space, and the efficiency of the collection method. The program will have access to two data files. File hdd.txt contains numbers representing the average heating degree days in the construction location for each of 12 months. File solar.txt contains the average solar insolation(rate in BTU/day at which solar radiation falls on one square foot of a given location)for each month. The first entry in each file represents data for January, the second, data for February, and so on.

Problem Inputs

Average heating degree days file Average
solar insolation file
heat_deg_days /* average heating degree days for coldest month */
coldest_mon /* coldest month (number 1 .. 12) */
solar_insol /* average daily solar insolation (BTU/ft^2)for coldest month */
heating_req /* BTU/degree day ft^2 for planned type construction*/
efficiency /* % of solar insolation converted to usable heat */
floor_space /* square feet */

Program Variables

energy_resrc /* usable solar energy available in coldest month (BTUs obtained from 1 ft^2 of collecting area) */

Problem Outputs

heat_loss /* BTUs of heat lost by structure in coldest month */
collect_area /* approximate size (ft^2) of collecting area needed*/
The formula for approximating the desired collecting area (A) is:

A= heat loss / energy resource

Design algorithm , flow chart ,program using the above data requirements for the given problem Try

the sample test cases given below :

SAMPLE TESTCASES	INPUT	OUPUT
Test case 1	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction?	To replace heat loss of11350800 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an

	=>9 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	efficiency of 60 percent, use a solar collecting area of 1221 ft^2.
Test case 2	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction? =>10 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	To replace heat loss of 12612000 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an efficiency of 60 percent, use a solar collecting area of 1221 ft^2.

Q10. UNIVERSAL MEASUREMENT CONVERSION

PROBLEM STATEMENT: Design a program that takes a measurement in one unit (e.g., 4.5 quarts) and converts it to another unit (e.g., liters). For example, this conversion request 450 km miles would result in this program output Attempting conversion of 450.0000 km to miles 450.0000km = 279.6247 miles .
The program should produce an error message if a conversion between two units of different classes (e.g., liquid volume to distance) is requested. The program should take a database of conversion information from an input file before accepting conversion problems entered interactively by the user. The user should be able to specify units either by name (e.g., kilograms) or by abbreviation (e.g., kg).

Structured Data Type

unit_tmembers :

name /* character string such as "milligrams" */
abbrev /* shorter character string such as "mg" */
class /* character string "liquid_volume", "distance", or "mass" */
standard /* number of standard units that are equivalent to this unit */

Problem Constants

NAME_LEN 30 /* storage allocated for a unit name */
ABBREV_LEN 15 /*
storage allocated for a unit abbreviation */ CLASS_LEN 20 /*
storage allocated for a measurement class */
MAX_UNITS 20 /* maximum number of different units handled */

Problem Inputs

unit_t units[MAX_UNITS] /* array representing unit conversionfactors database */
double quantity /* value to convert */
charold_units[NAME_LEN] /* name or abbreviation of units tobe converted */
charnew_units[NAME_LEN] /* name or abbreviation of units to convert to */

Problem Output

Message giving conversion.

***Data file* units.txt:**

```
miles          mi          distance        1609.3
kilometers     km          distance        1000
yards          yd          distance        0.9144
meters         m           distance        1
quartsqtliquid_volume  0.94635
liters         l           liquid_volume   1
gallons        gal         liquid_volume   3.7854
milliliters    ml          liquid_volume   0.001
kilograms      kg          mass            1
grams          g           mass            0.001
slugsslugs     mass        0.14594
poundslb       mass        0.43592
```

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	**INPUT 1**	**OUPUT**
Test case 1	Enter a conversion problem or q to quit. To convert 25 kilometers to miles, you would enter > 25 kilometers miles or, alternatively, > 25 km mi	>450 km miles Attempting conversion of 450.0000 km to miles . . . 450.0000km = 279.6247 miles
Test case 2	Enter a conversion problem or q to quit. > 2.5 qt l Attempting conversion of 2.5000 qt to l . . . 2.5000qt = 2.3659 l Enter a conversion problem or q to quit.	> 100 meters gallons Attempting conversion of 100.0000 meters to gallons . . . Cannot convert meters (distance) to gallons (liquid_volume)

ADDITIONAL PROGRAMS

Problem solving programs:

1. **Chocolate feast :** Little Bob loves chocolates, and goes to a store with $N in his pocket. The price of each chocolate is $C. The store offers a discount: for every M wrappers he gives to the store, he gets one chocolate for free. How many chocolates does Bob get to eat? Note : Evaluate the number of wraps after each step. Do this until you have enough wraps to buy new chocolates.
2. **Angry Professor :**The professor is. Given the arrival time of each student, your task is to find out if the class gets cancelled or conducting a course on Discrete Mathematics to a class of N students. He is

angry at the lack of their discipline, and he decides to cancel the class if there are less than K students present after the class startsnot.

3. **Divisible Sum Pairs :** You are given an array of n integers and a positive integer, k. Find and print the number of (i,j) pairs where i< j and ai + aj is evenly divisible by k.
4. **Sherlock And Valid String:** A ―valid‖ string is a string S such that for all distinct characters in S each such
character occurs the same number of times in S. Note :The logic of the solution is as follows: count the character counts for each character. Note : if they are all equal – it means that all characters occur exactly N times and there is no removal needed .if 2 or more have less or more characters – there is no way to fix the string in just 1 removal . if exactly 1 char has a different count than all other characters – remove this char completely and S is fixed.
5. **Ice Cream Parlor :**Sunny and Johnny together have M dollars they want to spend on ice cream. The parlor offers N flavors, and they want to choose two flavors so that they end up spending the whole amount. You are given the cost of these flavors. The cost of the ith flavor is denoted by ci. You have to display the indices of the two flavors whose sum is M.
6. **'Missing Numbers' :**Numeros, the Artist, had two lists A and B, such that B was a permutation of A. Numeros was very proud of these lists. Unfortunately, while transporting them from one exhibition to another, some numbers from A got left out. Can you find the numbers missing?
7. **Alternating Characters:** John likes strings in which consecutive characters are different. For example, he likes ABABA, while he doesn't like ABAA. Given a string containing characters A and B only, he wants to change it into a string he likes. To do this, he is allowed to delete the characters in the string.
8. **Game Of Thrones :** I : Dothraki are planning an attack to usurp King Robert's throne. King Robert learns of this conspiracy from Raven and plans to lock the single door through which the enemy can enter his kingdom door. But, to lock the door he needs a key that is an anagram of a palindrome. He starts to go through his box of strings, checking to see if they can be rearranged into a palindrome.For example, given the string ,s=[aabbccdd] one way it can be arranged into a palindrome is abcddcba .
9. **Life and everything :** Your program is to use the brute-force approach in order to find the Answer to Life, the Universe, and Everything. More precisely... rewrite small numbers from input to output. Stop processing input after reading in the number 42. All numbers at input are integers of one or two digits.

input: 1 2 23 22 42

output: 1 2 23 22

10. **Filling Jars :**Animesh has N empty candy jars, numbered from 1 to N, with infinite capacity. He performs M operations. Each operation is described by 3 integers a, b and k. Here, a and b are indices of the jars, and k is the number of candies to be added inside each jar whose index lies betweena and b (both inclusive). Can you tell the average number of candies after M operations?

Reference Books:

(4) Jeri R. Hanly , Elliot B .Koffman , Problem solving and program Design in C , 7th Edition
(5) Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
(6) Dietal&Deital , C How to Program 7/E ,PHI Publications

Web References :

- https://www.spoj.com/
- https://projecteuler.net/
- https://www.hackerearth.com/practice/

- https://www.codechef.com/
- https://onlinecourses.nptel.ac.in/

Instructions to the instructor:

This lab course consists of two set of programs
1) Minimum set of sample programs
2) Additional set of programs

Minimum set of sample programs are designed unit wise covering all the topics in the theory. Additional set of programs are designed basing on problem solving

Sessional marks : 50 marks

1) Daily Evaluation (Includes Record, Observation & regular performance) – 30 marks
2) Attendance – 5 marks
3) Internal Exam – 10 marks
4) Viva Voce – 5 marks

Daily Evaluation (30 marks)

- Every Student must execute minimum set of sample programs to secure 60% of marks in Daily Evaluation i.e. 18 Marks and to appear in external examination.
- In addition to that if a student finishes the minimum set and 5 programs from additional set of programs would secure 80% of marks in Daily Evaluation i.e. 24 Marks.
- If a student finishes all the programs in both the set s will secure 100% of marks in Daily Evaluation

Internal Exam (10 marks)

- Every student is given 4 questions in the internal exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 20% of marks and difficulty level question carries30% of marks

External Exam (50 marks)

- Viva voce – 10 marks
- Write up + Execution – 40 marks

Write up + Execution (40 marks)

- Every student is given 4 questions in the external exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 30% of marks and difficulty level question carries20% of marks.

Engineering and IT Workshop	
CODE: 23ME3202	**Credits: 1.5**
Instruction : 3 Practical/Week	**Sessional Marks : 50**
End Exam : 3 Hours	**End Exam Marks : 50**

(CHEM, CSD, CSM, EEE, IT)

Prerequisites: Nil

Course Objectives:

1. To provide training and hands on experience to the students on basic Engineering relatedskills 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.

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

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
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)

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 **CO3**

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: **CO3**

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: **CO3**

Task 1: 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.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers.

Week 4: MS word & PowerPoint Presentation **CO4**

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: **CO4**
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

APPLIED CHEMISTRY LAB	
CODE: **23CY1202**	**Credits: 1.5**
Instruction : 3 Periods	**Sessional Marks :50**
End Exam : 3 Hours	**End Exam Marks :50**

Prerequisites: Chemistry at +1 and +2 level

Course Objectives

1. In make them understand on various methods of analyzing samples (Soil,food,water)
2. To create knowledge on handling advanced instrumentation.

Course Outcomes
At the end of the course

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

CO-PO Mapping

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

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

1. Preparation of Standard solutions and Standardisation of acid by using Strong base.
2. Determination of Hardness, pH, TDS in ground water sample.
3. Estimation of Zinc in food samples by Complexometric method.
4. Estimation ofcopper content in industrial wastewaters.
5. Estimation of available chlorine content in potable water using Iodometric method.
6. Estimation of Iron in biological samples using potassium thiocyanate by Spectrophotometric method.

7. Determination of electrolytic Strength of Lead acid battery by pH metric method
8. Estimate the strength of acids in an acid mixture by using Conductometric method.
9. Estimation of Chromium in Dichromate by using Potentiometric method.
10. Determination of Viscosity of various liquid fuels using Ostwald's Viscometer.

Demonstration Experiments

11. Determination of Dissolved Oxygen in a water sample using Iodometric method.
12. Microwave assisted organic synthesis.

Learning Outcomes

Acquire knowledge and skills in using chemical apparatus/equipment for analyzing various sample solutions.
Will get awareness on the amount of chemical content existing in the sample and can distinguish the output with world health organization limits.
Can explore this knowledge in solving society related problems.

Prescribed Text books

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