SCHEME OF INSTRUCTION AND SYLLABI (R-22A)
OF

B.E. I to VIII SEMESTERS of FOUR YEAR DEGREE COURSE

IN

COMPUTER SCIENCE AND ENGINEERING

(Inline with AICTE Model Curriculum with effect from AY **2024-25**)

(R-22A Regulation)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

OUR MOTTO: SWAYAM TEJASWIN BHAVA

Institute Vision	To be a Centre of excellence in technical education and research
Institute Mission	To address the emerging needs through quality technical education and advanced research.
Department Vision	To be in the frontiers of Computer Science and Engineering with academic excellence and Research.
Department Mission	M1 To be in the frontiers of Computer Science and Engineering with academic excellence and Research. M2 Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering M3 Facilitate the development of academia-industry collaboration and societal outreach programs M4 Prepare students for full and ethical participation in a diverse society and encourage lifelong learning
PEO 1	Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs.
PEO 2	Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values.
PEO 3	Graduates will apply principles and practices of Computer Science, mathematics and Science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research.
PSO 1	Able to acquire knowledge and practical competency for providing solutions to the problems related to Computer Science and Engineering.
PSO 2	Able to design and develop innovative solutions for complex problems by applying the concepts of emerging domains including AI, ML, IoT, Data Science, security and cloud .
PSO 3	Able to gain knowledge and skills to develop, deploy and maintain software using modern Software Engineering principles and practices.

Program Outcomes of BE (CSE) Program

Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems
Problem analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
Communication	Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Life-long learning	Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTIONS AND EXAMINATION
(Inline with AICTE Model Curriculum with effect from AY 2024-25)
(R22A Regulation)

B.E. (Computer Science and Engineering)

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC01	Linear Algebra and Calculus	3	1	-	3	40	60	4
2	22PYC01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
3	22CSC01N	Problem Solving and Programming using C	2	1	-	3	40	60	3
4	22EGC01N	English	2	-	-	3	40	60	2
PRACTICAL									
5	22PYC03	Optics and Semiconductor Physics Lab	-	-	3	3	50	50	1.5
6	22EGC02N	English lab	-	-	2	3	50	50	1
7	22CSC02N	Problem Solving and Programming using C Lab	-	-	3	3	50	50	1.5
8	22MEC01N	Engineering Graphics	-	1	3	3	50	50	2.5
9	22MEC38N	Digital Fabrication Workshop	-	-	3	3	50	50	1.5
TOTAL			**10**	**3**	**14**	**-**	**410**	**490**	**20**

L: Lecture T: Tutorial P: Practical D: Drawing CIE: Continuous Internal Evaluation SEE-Semester End Examination

22MTC01

LINEAR ALGEBRA AND CALCULUS

Instruction	3 L + 1 T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to
1. Explain the Partial Derivatives and the extreme values of functions of two variables.
2. Discuss Physical interpretations of scalar and vector functions.
3. Discuss line, surface and volume integrals.
4. Explain the concepts of basis, dimension of vector space and matrix representation of a linear transformation.
5. Explain the solution of system of linear equations by Matrix Methods.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Determine the extreme values of functions of two variables.
2. Apply the vector differential operator to scalar and vector functions
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Determine the basis and dimension of a vector space, compute linear transformation.
5. Apply the Matrix Methods to solve the system of linear equations.

CO-PO Articulation Matrix

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

UNIT-I

Partial Differentiation and Its Applications: Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-II

Vector Differential Calculus and multiple Integrals: Scalar and Vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities), Irrotational fields and Solenoidal fields, Double integral, Change of order of Integration and Triple integrals.

UNIT-III

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Verification of Green's theorem in a plane (without proof), verification of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

UNIT-IV

Vector space: Vector space, Subspace, linear combination of vectors, linear span, row and column spaces, linear dependent, independent vectors, basis, dimension, linear transformation, invertible transformation, matrix of linear transformation, kernel and range of LT, rank and nullity of LT-rank nullity theorem(without proof), change of basis.

UNIT-V

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. Seymour Lipschutz, "Schaum's Outline of Linear Algebra", 5th Edition, McGraw Hill, 2013.
4. Gilbert Strang, "Introduction to linear algebra", 5th Edition, Wellesley - Cambridge press, 2016.

SUGGESTED READING:

1. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw- Hill, New Delhi, 2008.
2. R.K. Jain, S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, 2016.
3. D. Poole, "Linear Algebra: A Modern Introduction, 2nd Edition", Brooks/ Cole, 2005.
4. Kuldeep Singh, "Linear algebra: step by step". OUP Oxford, 2013.

22PYC01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), CSE (IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to
1. Understand the fundamentals of wave nature of light.
2. Acquire knowledge of lasers, holography and fiber optics.
3. Familiarize with quantum mechanics.
4. Learn the fundamental concepts of solids.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics.
3. Find the applications of quantum mechanics.
4. Classify the solids depending upon electrical conductivity.
5. Identify different types of semiconductors.

CO-PO Articulation Matrix

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

UNIT-I

Wave Optics: Huygen's principle –Super position of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser – Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction – Construction – Principle – Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiberlosses--Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction – Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ – Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle – Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors – Charge carrier concentration in intrinsic semiconductors – Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) – Carrier generation and recombination – Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED – Solar cell.

TEXT BOOKS:

1. B. K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Publications, 2012.
2. M. N. Avadhanulu and P. G. Kshirsagar, "A Text Book of Engineering Physics", S. Chand Publications, 2014.
3. M. Arumugam, "Materials Science", Anuradha Publications, 2015.
4. S. L. Gupta and Sanjeev Gupta, "Modern Engineering Physics", Dhanpat Rai Publications, 2011.

SUGGESTED READING:

1. R. Murugeshan and Kiruthiga Sivaprasath, "Modern Physics", S. Chand Publications, 2014.
2. V. Rajendran, "Engineering Physics", Mc Graw-Hill Education Publications, 2013.
3. P. K. Palanisamy, "Engineering Physics", Scitech Publications, 2012.
4. V. Raghavan, "Materials Science and Engineering", Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

22CSC01N

PROBLEM SOLVING AND PROGRAMMING USING C

Instruction	2 L + 1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Understanding the steps in problem solving and formulation of algorithms to problems.
2. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
3. Develop intuition to enable students to come up with creative approaches to problems.

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

1. Formulate solutions to problems and represent those using algorithms/ Flowcharts.
2. Choose proper control statements and data structures to implement the algorithms
3. Decompose a problem into modules and use functions to implement the modules.
4. Develop programs using arrays, pointers and structures.
5. Develop applications using file I/O.

CO-PO Articulation Matrix

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

UNIT-I

Introduction: Introduction to Programming, Idea of Algorithm, Representation of Algorithm, Flowchart, from algorithms to programs, source code.

Basics of C: Background, Structure of a C Program, Datatypes, Tokens, Operators and Expressions-Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions, Input and Output Functions.

UNIT-II

Control Statements: Conditional Execution -Selection Statements, Conditional Operator, Switch statement**.** Iteration Execution - While Construct, For Construct, do-while Construct Goto Statement, Special Control Statements, Nested Loops.

Arrays: One-Dimensional Arrays-Declaration, Initialization, internal representation. Multidimensional Arrays.

UNIT–III

Strings: Strings: One-dimensional Character Arrays, Arrays of Strings: Two-dimensional Character Array.

Functions: Concept, Uses, Prototype, Declaration, Parameter passing techniques, Passing Arrays to Functions, Storage Classes, Recursion.

UNIT-IV

Search and Sorting: searching algorithms-linear, binary .sorting algorithms-bubble sort, selection sort.

Pointers: Declaring a Pointer, Initializing Pointers, Indirection Operator and Dereferencing, Arrays and

Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointers to an Array, Two-dimensional Arrays and Pointers, Pointers to Functions and Dynamic Memory Allocation.

UNIT–V

Userdefined Datatypes: Structures- Declaring Structures and Structure Variables, Accessing the Members of a Structure, Initialization of Structures, Typedef, Nesting of Structures, Arrays and Structures, Structures and Pointers, Structures and Functions, Union, Enumeration Types.

Files: Using Files in C, Declaration of File Pointer, Working with Text Files, Character Input and Output, Working with Binary Files, Sequential Versus Random File Access, File Record.

TEXT BOOKS:

1. Pradip Dey and Manas Ghosh "Programming in C 2/e", 2nd Edition Oxford University Press, 2012.

SUGGESTED READING:

1. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language" Prentice Hall India, 2nd Edition. 1990.
2. B.A.Forouzan and R.F. Gilberg "A Structured Programming Approach in C", Cengage Learning,2007.
3. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw- Hill.
4. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

22EGC01N

ENGLISH

(BE/B.Tech - Common to all Branches)

Instruction	2 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

PREREQUISITE: Basic knowledge of English grammar and vocabulary.

COURSE OBJECTIVES: This course aims to

1. Improve their understanding of communication skills while developing their usage of English for correct use of grammar and vocabulary.
2. Equip themselves with Reading Comprehension strategies and techniques.
3. Enhance their writing skills through paragraphs, précis and essays by using devices of cohesion and coherence.
4. Build appropriate, longer meaningful sentences for professional writing through formal letters and e-mails.
5. Demonstrate knowledge of drafting formal reports to define, describe and classify the processes by following a proper structure.

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

1. Step-up the awareness of correct usage of English grammar and vocabulary by speaking fluently and comprehensively with a grip on communication skills.
2. Apply effective reading techniques through critical reading exercises to enhance quality of life and to support lifelong learning.
3. Develop their ability to write paragraphs independently on any context with cohesion, edit essays coherently while realizing brevity through précis writing.
4. Construct sentences clearly and comprehensively to write effective business letters and draft emails for a better professional communication.
5. Advance efficiency in writing, distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.

CO-PO Articulation Matrix

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

UNIT-I Communication Skills:

Introduction, nature and importance of communication; Process of communication; Types of communication: verbal and non-verbal; Barriers to communication; Intrapersonal, Interpersonal communication; Understanding Johari Window.

Vocabulary & Grammar: The concept of Word Formation - Root words, Use of prefixes and suffixes to form derivatives, Standard abbreviations. Basic Sentences.

Reading Task I.

UNIT-II Reading Skills:
The Reading process, purpose, different kinds of texts; Reading Comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions. Practice in Critical Reading passages
Vocabulary and Grammar: Determiners. Use of Synonyms and Antonyms, Construction of Sentences.
Reading Task II.

UNIT-III Writing Skills II:
Paragraph Writing. – Structure and features of a paragraph; Essay writing, Cohesion and coherence. Techniques of writing précis.
Vocabulary & Grammar: Use of connectors and linkers, Tenses, Punctuation.
Reading Task III.

UNIT-IV Professional Writing Skills-1:
Letter Writing – Structure, format of a formal letter; Letter of Request and Response, Drafting Emails, Email and Mobile etiquette.
Vocabulary and Grammar: Phrasal verbs, Misplaced modifiers, Subject-verb agreement.
Reading Task IV
UNIT-V Professional Writing Skills-2:
Report writing – Importance, structure, elements & style of formal reports; Writing a formal report. Writing for Blogs.
Vocabulary and Grammar: Words often Confused, Common Errors. Avoiding Ambiguity & Redundancy.
Reading Task V.

TEXT BOOKS:
1. Sanjay Kumar & Pushp Lata, "English Language and Communication Skills for Engineers", Oxford University Press,2018.
2. "Language and Life: A Skills Approach", Board of Editors, 2018th Edition, Orient Black Swan, 2018.

SUGGESTED READINGS:
1. Ashraf, M Rizvi, "Effective Technical Communication", Tata McGraw-Hill, 2006.
2. Michael Swan, "Practical English Usage", Oxford University Press, 4th Edition,2016.
3. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice" 3rd Edition, Oxford University Press, 2015.

22PYC03

OPTICS AND SEMICONDUCTOR PHYSICS LAB

(CSE, IT, CSE (AI&ML), CSE (IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Apply theoretical physics knowledge in doing experiments.
2. Understand the behaviour of the light experimentally.
3. Analyze the conduction behaviour of semiconductor materials and opto electronic devices.

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

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally.
3. Make use of lasers and optical fibers for engineering applications.
4. Explain the V-I characteristics of some optoelectronic and semi conductor devices.
5. Find the applications of thermistor.

CO-PO Articulation Matrix

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

EXPERIMENTS:

1. Error Analysis : Estimation of errors in the determination of time period of a torsional Pendulum
2. Fresnel's Biprism : Determination of wavelength of given monochromatic source
3. Newton's Rings : Determination of radius of curvature of a given plano-convex lens using Na vapor lamp
4. Single Slit Diffraction : Determination of wavelength of given monochromatic source
5. Diffraction Grating : Determination of wavelengths of two yellow lines of light of Mercury lamp
6. Laser : Determination of wavelength of given semiconductor laser
7. Holography : Recording and reconstruction of a hologram
8. Optical Fiber : Determination of numerical aperture and power losses of given optical fiber
9. Energy Gap : Determination of energy gap of given semiconductor
10. P-N Junction Diode : Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11. Thermistor : Determination of temperature coefficient of resistance of given thermistor
12. Hall Effect : Determination of Hall coefficient, carrier concentration and mobility ofcharge carriers of given semiconductor specimen
13. LED : Study of I-V characteristics of given LED

14. Solar Cell : Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15. Planck's Constant : Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be done.

22EGC02N

ENGLISH LAB

(BE/B.Tech - Common to all Branches)

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

PREREQUISITE: Basic Knowledge of English Communication.

COURSE OBJECTIVES: This course aims to

1. Nuances of Phonetics and give them sufficient practice in correct pronunciation through computer-aided multi-media instruction.
2. The significance and application of word and sentence stress and intonation.
3. Sufficient practice in listening to English spoken by educated English speakers in different socio-cultural and professional settings.
4. Reading and speaking activities enabling them to critically interpret and respond to different texts and contexts, and produce speech with clarity and confidence.
5. Team work, role behaviour while developing their ability to use language appropriately, to discuss in groups and make presentations.

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

1. Define the speech sounds in English and understand the nuances of pronunciation in English.
2. Produce speech with clarity and confidence using correct word and sentence stress, and intonation.
3. Achieve improved ability to listen, understand, analyse, and respond to English spoken in various settings.
4. Read, interpret, and review a variety of written texts, contexts, and perform appropriately in different situations.
5. Design effective posters collaboratively through creative decisions, give presentations, and efficiently participate in Group discussions.

CO-PO Articulation Matrix

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

Exercises

Computer-Aided Language Learning Lab

1. **Introduction to English Phonetics**: Introduction to English Phonetics and organs of speech.
2. **Sound system of English**: Speech sounds- Vowels and Consonants- structure of syllables (Introduction to syllables) - Basic phonetic transcription practice.
3. **Word and Sentence stress**: Rules of word stress -Primary stress, Secondary stress; Sentence stress (word emphasis in sentences) -Practice.
4. **Intonation**: Types of Intonation, Practice in Articulation – MTI-Errors in pronunciation.
5. **Listening skills**: understanding Listening- Practice in Listening comprehension texts.

Interactive Communication Skills Lab

1. **JAM-** Ice Breaking, Speaking Activity**.**

2. **Role play/Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
3. **Group Discussions -** Dynamics of a Group Discussion, Group Discussion Techniques, Non-Verbal Communication.
4. **Read and Review** - Preparation for active reading and instructing the students to cultivate effective reading habits to read select texts, review and write their responses.
5. **Poster presentation –** Theme, poster preparation, team work and presentation.

TEXT BOOKS:

1. T Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan, 2nd Edition, 2012.
2. J Sethi et al., "A Practical Course in English Pronunciation (with CD)", Prentice Hall India, 2005.
3. Priyadarshi Patnaik, "Group Discussions and Interview Skills", Cambridge University Press Pvt. Ltd., 2nd Edition, 2015.
4. Aruna Koneru, "Professional Speaking Skills", Oxford University Press, 2018.

SUGGESTED READING:

1. "English Language Communication Skills – Lab Manual cum Workbook", Cengage Learning India Pvt. Ltd., 2022.
2. KN Shoba& J. Lourdes Javani Rayen."Communicative English – A workbook", Cambridge University Press, 2019.
3. Sanjay Kumar& Pushp. Lata. "Communication Skills: A Workbook. Oxford University Press", 2019.
4. Veerendra Mishra et al. "English Language Skills: A Practical Approach", Cambridge University Press, 2020.

SUGGESTED SOFTWARE:

1. K-VAN Multi-Media Language Lab
2. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
3. Digital All
4. Orell Digital Language Lab (Licensed Version).

22CSC02N

PROBLEM SOLVING AND PROGRAMMING USING C LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Identify and setup program development environment.
2. Implement the algorithms using C programming language constructs.
3. Develop programs using arrays, structures and pointers.
4. Solve problems in a modular approach using functions.
5. Implement file operations with simple text data.

CO-PO Articulation Matrix

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

LABORATORY / PRACTICAL EXPERIMENTS:
1. Familiarization with programming environment.
2. Draw flowcharts using Raptor or Drakon Tool.
3. Simple computational problems using arithmetic expressions.
4. Problems involving if-then-else structures.
5. Iterative problems e.g., sum of series, generating patterns.
6. Iterative and Recursive functions.
7. 1D Arrays, 2D arrays and strings.
8. Sorting and Searching, Matrix problems.
9. Pointers and structures.
10. Dynamic memory allocation.
11. File Handling.

TEXT BOOKS:
1. Pradip Dey and Manas Ghosh "Programming in C 2/e", 2nd Edition, Oxford University Press, 2012.

SUGGESTED READING:
1. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language", 2nd Edition. Prentice Hall India, 1990.
2. B.A.Forouzan and R.F. Gilberg, "A Structured Programming Approach in C", Cengage Learning,2007.
3. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw- Hill.
4. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

22MEC01N

ENGINEERING GRAPHICS

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

PREREQUISITE: Nil

COURSE OBJECTIVES: This course aims to
1. Get exposure to a cad package and its utility.
2. Understand orthographic projections.
3. Visualize different solids and their sections in orthographic projection.
4. Prepare the student to communicate effectively by using isometric projection.
5. Prepare the student to use the techniques, skills, and modern tools necessary for practice.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Become conversant with appropriate use of CAD software for drafting and able to draw conic sections.
2. Understand orthographic projections of points and straight lines.
3. Draw the projections of planes.
4. Draw and analyze the internal details of solids through sectional views.
5. Create an isometric projections and views.

CO-PO Articulation Matrix

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

LIST OF EXERCISES:
1. Introduction to CAD package: Settings, draw, modify tools, dimensioning, documentation and practice exercises using Auto CAD software.
2. Construction of Conic Sections by General method.
3. Orthographic projection: Principles, conventions, Projection of points.
4. Projection of straight lines: Simple position, inclined to one plane & inclined to both the planes (without traces and mid-point)
5. Projection of planes: Perpendicular planes.
6. Projection of planes: Oblique planes.
7. Projection of solids: Simple position.
8. Projection of solids: Inclined to one plane.
9. Sections of solids: Prism, pyramid in simple position.
10. Sections of solids: Cone and Cylinder in simple position.
11. Isometric projections and views.
12. Conversion of isometric views to orthographic projections and vice-versa.

TEXT BOOKS:
1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd, 2011.

3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

SUGGESTED READING:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

22MEC38N

DIGITAL FABRICATION WORKSHOP

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

PREREQUISITE: Nil

COURSE OBJECTIVES: This course aims to

1. Give a feel of Engineering Practices and develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive and team work attitude to get things right the first time.
3. Provide basic knowledge of steel, plastic, composite, and other materials for suitable applications.
4. Study of principle and hands on practice on techniques of fabrication, manufacturing, and allied skills.
5. Advance important, hard and pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

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

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in carpentry, house wiring and plumbing.
3. Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3D modeling using solid works software for Additive Manufacturing.
4. Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO Articulation Matrix

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

LAB EXPERIMENTS:

Group 1: Workshop Practice

1. To make a lap joint on the given wooden piece according to the given dimensions.
2. To make a dovetail joint on the given wooden piece according to the given dimensions.
3. (a)Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single switch.
   (b)Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket.
4. Stair case wiring of one light point controlled from two different places independently using two 2way switches.
5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram

using taps, couplings, and bends.

6. To connect the GI pipes as per the given diagram using, Coupling, Unions, reducers, and bends. To connect the GI pipes as per the given diagram using shower, tap, and valves and demonstrate by giving water connection.

Group 2: Additive Manufacturing /3D Printing

1. To Study the methods of Additive manufacturing process using a 3D printer.
2. To create a 3D CAD model of a door bracket using a modelling software.
3. To print a door bracket using an extruder type 3D printer.
4. To create a 3D CAD model using Reverse engineering.
5. Engraving, Drilling and Cutting operations on printed circuit boards using CNC PCB Mate.
6. To design an innovative component using the CAD software./print the selected innovative component by the student using a 3D printer.

TEXT BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, Media promoters and publishers private limited, Mumbai, 2010.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th Edition, Pearson Education India Edition, 2002.

SUGGESTED READING:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology.
2. Oliver Bothmann, 3D Printers: A Beginner's Guide, January 1, 2015.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTIONS AND EXAMINATION
(Inline with AICTE Model Curriculum with effect from AY 2024-25)
(R22A Regulation)

B.E. (Computer Science and Engineering)

SEMESTER-II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC04	Differential Equations and Numerical Methods	3	1	-	3	40	60	4
2	22CYC01	Chemistry	3	-	-	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	-	3	40	60	3
4	22ITC20N	Data Structures using C ++	3	-	-	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	-	-	3	3	50	50	1.5
6	22MBC02N	Community Engagement	-	-	2	-	50	-	1
7	22ITC21N	Data Structures using C++ Lab	-	-	2	3	50	50	1
8	22MEC37N	Robotics and Drones Lab	-	1	3	-	100	-	2.5
9	22EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
TOTAL			**11**	**3**	**12**	**-**	**460**	**390**	**20**

L: Lecture T: Tutorial P: Practical CIE: Continuous Internal Evaluation
SEE-Semester End Examination

22MTC04

DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

Instruction	3 L + 1 T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. Explain the relevant methods to solve first order differential equations.
2. Explain the relevant methods to solve higher order differential equations.
3. Discuss numerical methods to solve algebraic and transcendental equations.
4. Discuss the interpolation and numerical differentiation.
5. Discuss convergence and divergence of Infinite series.

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

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Solve the algebraic, transcendental and system of equations.
4. Apply interpolation and numerical differentiation techniques for given data.
5. Test the convergence and divergence of Infinite series.

CO-PO Articulation Matrix

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

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible to Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories, Rate of decay of radio-active materials.

UNIT-II

Higher Order Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of Variation of Parameters, solution of Cauchy- Euler equation. LR and LCR circuits.

UNIT-III

Numerical solution of equations: Numerical solutions of algebraic and transcendental equations by Bisection method, Regula-falsi method and Newton-Raphson's method, Solution of system of linear equations by LU decomposition methods, Crout's method, Jacobi's method, Gauss Seidel method.

UNIT-IV

Interpolation and Numerical Differentiation: Forward, Backward and Central differences, Newton's forward and backward interpolation formulae, Gauss's forward and backward interpolation formulae, Lagrange's interpolation, Numerical differentiation at the tabulated points with forward, backward and central differences**.**

UNIT-V

Infinite Series: Convergence of sequence and series. Series of positive terms, Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, Alternating series, Leibnitz's rule, absolutely and conditionally convergence.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, 2011.
3. M.K. Jain, S.R.K Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering and Computation", New age International Publications, 2008.

SUGGESTED READING:

1. R.K.Jain, S.R.K. Iyengar, "Advanced Engineering Mathematics", 5th Edition, Narosa Publications, 2016.
2. Ramana B.V, "Higher Engineering Mathematics", 11th Reprint, Tata McGraw Hill New Delhi, 2010.
3. A.R.Vasishtha and R.K.Guptha, "Integral Transforms", Reprint, Krishna's Educational Publishers, 2014.

22CYC01

CHEMISTRY

(Common to CSE, CSE-AIML, AIML, CSE-IOT, AIDS)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

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

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

CO-PO Articulation Matrix

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

UNIT-I

Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2, He_2^+, N_2, O_2, O_2 , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II

Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, and – Reference

electrodes (NHE, SCE) electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

UNIT-III

Stereochemistry and Organic reactions:

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism -Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) &Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)

Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides), Cyclization (Diels - Alder reaction)

UNIT–IV

Water Chemistry:

Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process), ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V

Engineering Materials and Drugs:

Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography

Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).

Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

TEXT BOOKS:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat 16th Edition Rai Publishing Company Ltd., New Delhi, (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", 7th Edition Pearson, Delhi, (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla ,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

SUGGESTED READINGS:

1. B. H. Mahan, "University Chemistry", 3rd Edition Narosa Publishing house, New Delhi, (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", 46th Edition S. Nagin Chand & Company Ltd., (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", 12th Edition Wiley, (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", 8th Edition Oxford, (2006).

22EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	2 L +1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis.
2. Comprehend the basic principle of operation of AC and DC machines.
3. Infer about different types of electrical wires and cables, domestic and industrial wiring, safety rules and methods of earthing.

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

1. Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
2. Predict the steady state response of RLC circuits with AC single phase/three phase supply.
3. Infer the basics of single phase transformer.
4. Describe the construction, working principle of DC machine and 3-phase Induction motor.
5. Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations.

CO-PO Articulation Matrix

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

UNIT-I

DC Circuits: Electrical circuit elements (R,L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin's and Norton's Theorems.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, series RL and RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Single Phase Transformer: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt generators. DC Motors: Classification, Torque Equation,

Characteristics and Speed control of DC Shunt and Series Motors, Losses and efficiency Three - Phase Induction Motors: Principle of operation, Applications

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, and first aid for electric shock, safety rules. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

TEXT BOOKS:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

SUGGESTED READING:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

22ITC20N

DATA STRUCTURES USING C++

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

PREREQUISITES: Problem Solving and Programming using C (22CSC01N), Problem Solving and Programming using C Lab (22CSC02N)

COURSE OBJECTIVES: This course aims to
1. Acquaint with OOP concepts.
2. Familiarize with the asymptotic analysis of Algorithms.
3. Learn sorting techniques.
4. Explore linear and nonlinear data structures.
5. Introduce pattern-matching algorithms and hashing.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Understand the concepts of OOPs.
2. Analyse the time complexity of operations on data structures.
3. Apply sorting techniques, pattern-matching algorithms, and hashing.
4. Demonstrate operations on linear and nonlinear data structures.
5. Develop solutions to the problems using linear and nonlinear data structures.

CO-PO Articulation Matrix

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

UNIT-I

Object Oriented Design: Object-Oriented Design Goals, Object-Oriented Design Principles.

Classes: Class Structure, Constructors and Destructor, Classes and Memory Allocation, Class Friends and Class Members, Standard Template Library.

Inheritance: Inheritance in C++, Examples, Multiple Inheritance, Interfaces and Abstract Classes, Templates: Class Templates

UNIT-II

Algorithm Analysis: Experimental Studies, Primitive Operations, Asymptotic notation, Asymptotic Analysis, Seven functions.

Sorting: Selection Sort, Insertion Sort, Merge-Sort: Divide-and-Conquer, Quick-Sort: Randomized Quick-Sort, Linear-Time Sorting: Bucket-Sort and Radix-Sort, Comparing Sorting Algorithms.

UNIT-III

Linked Lists: Singly Linked Lists, Implementing a Singly Linked List, Insertion to the Front of a Singly Linked List, Removal from the Front of a Singly Linked List, Implementing a Generic Singly Linked List, Doubly Linked Lists, Insertion into a Doubly Linked List, Removal from a Doubly Linked List, Circularly Linked Lists, Reversing a Linked List.

Stacks: The Stack Abstract Data Type, a C++ Stack Interface, a Simple Array-Based Stack

Implementation, Reversing a Vector Using a Stack, Matching Parentheses.
Queues: The Queue Abstract Data Type, a C++ Queue Interface, a Simple Array-Based Implementation, Implementing a Queue with a Circularly Linked List.

UNIT-IV
Trees: General Tree Definitions and Properties, Binary Trees, The Binary Tree ADT, Properties of Binary Trees, A Linked Structure for Binary Trees, A Vector-Based Structure for Binary Trees, Traversals of a Binary Tree, Representing General Trees with Binary Trees.
Binary Search Trees: Searching, Update Operations, AVL Trees: Insertion; **Heaps:** The Heap Data Structure, Complete Binary Trees, Heap Sort.

UNIT-V
Strings: Pattern Matching Algorithms: Brute Force, the Boyer-Moore Algorithm, the Knuth-Morris-Pratt Algorithm
Graphs: Graphs, Data Structures for Graph, Graph Traversals
Hash Tables: Hash Tables, Bucket Arrays, Hash Functions, Hash Codes, Compression functions, Collision-Handling Schemes, Load Factors and Rehashing

TEXT BOOKS:
1. Michael T.Goodrich, Roberto Tamassia, David M.Mount, "Data Structure and Algorithms in C++", 2nd Edition, John Wiley, 2011.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5th Edition, Career Monk Publications, 2017.
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++" 2nd Edition, Universities Press, 2007.

SUGGESTED READING:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Addison-Wesley, 2007.
2. Narasimha Karumanchi, "Data Structures and Algorithms for GATE", Career Monk Publications, 2011.
3. D. Samantha, "Classic Data Structures", 2nd Edition, Prentice Hall India, 2013.

ONLINE RESOURCES:
1. NPTEL Videos: Introduction to data structures and algorithms - http://nptel.ac.in/courses/106102064/1
2. https://takeuforward.org/strivers-a2z-dsa-course/strivers-a2z-dsa-course-sheet-2/
3. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
5. https://visualgo.net/en

22CYC02

CHEMISTRY LAB

(Common to CSE, CSE-AIML, AIML CSE-IOT, AIDS)

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. Provide the knowledge in both qualitative and quantitative chemical analysis.
3. Student should be conversant with the principles of volumetric analysis.
4. Apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. Interpret the theorical concepts in the preparation of new materials like drugs and polymers.

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

1. Identify the basic chemical methods to analyse the substances quantitatively and qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2} & Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution.
4. Determination of Alkalinity of water.
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order).
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (Second order).
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

TEXT BOOKS:

1. J. Mendham and Thomas, "Vogel's text book of quantitative chemical analysis", 6th Edition, Pearson education Pvt.Ltd. New Delhi, 2002.
2. B.D.Khosla, V.C.Garg & A.Gulati,; R., "Senior practical physical chemistry", Chand & Co. : New Delhi (2011).

SUGGESTED READING:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", 9th revised edition, S.Chand and Company, 2015.

22MBC02N

COMMUNITY ENGAGEMENT

Instruction	2 P Hours per Week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to
1. Develop an appreciation of rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Gain an understanding of rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

CO-PO Articulation Matrix

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

Module I Appreciation of Rural Society:
Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources. Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood:
Agriculture, Farming, Landownership, Water management, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions:
Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees.

Module IV Rural Development Programmes:
History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India. NRLM, MNREGA etc.

TEXT BOOKS:
1. Singh, Katar, "Rural Development: Principles, Policies and Management", Sage Publications, New Delhi, 2015.
2. "A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies", 2002.
3. "United Nations, Sustainable Development Goals", 2015, un.org/sdgs

4. M.P Boraia, "Best Practices in Rural Development", Shanlax Publishers, 2016.

JOURNALS:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

22ITC21N

DATA STRUCTURES USING C++ LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

PREREQUISITES: Problem Solving and Programming using C (22CSC01N), Problem Solving and Programming using C Lab (22CSC02N).

COURSE OBJECTIVES: This course aims to
1. Acquaint with OOP concepts.
2. Learn sorting techniques.
3. Explore linear and nonlinear data structures.
4. Introduce pattern-matching algorithms
5. Explain hashing and Collision handling.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Practice the concepts of OOPs.
2. Define ADT for linear and nonlinear Data Structures.
3. Apply sorting techniques, pattern matching algorithm, and hashing.
4. Demonstrate standard operations on linear and nonlinear data structures.
5. Develop solutions to the problems using linear and nonlinear data structures.

CO-PO Articulation Matrix

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

LIST OF PROGRAMS:
1. Practice problems on Inheritance and Polymorphism.
2. Implement the following sorting techniques: Insertion Sort, Selection Sort, Merge Sort, Quick Sort.
3. Define Linked List ADT and implement its operations.
4. Implement Stack ADT and perform arithmetic expression evaluation.
5. Implement Queues, Circular Queues.
6. Implement Heap sort.
7. Construct a Binary Search Tree and implement Tree Traversals.
8. Define String ADT and implement the Boyer Moore pattern matching algorithm.
9. Implement Hashing with chaining.
10. Implement Graph Traversals.

TEXT BOOKS:
1. Michael T.Goodrich, Roberto Tamassia, David M.Mount, "Data Structure and Algorithms in C++", 2nd Edition, John Wiley, 2011.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5th Edition, Career Monk Publications, 2017.
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++" 2nd Edition, Universities Press, 2007

SUGGESTED READING:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Addison-Wesley, 2007.
2. D.Samantha, "Classic Data Structures", 2nd Edition, Prentice Hall India, 2013.

ONLINE RESOURCES:

1. https://takeuforward.org/strivers-a2z-dsa-course/strivers-a2z-dsa-course-sheet-2/
2. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

22MEC37N

ROBOTICS AND DRONES LAB

Instruction	1 T + 3 P Hours per Week
Duration of SEE	-
SEE	-
CIE	100 Marks
Credits	2.5

PREREQUISITE: Nil

COURSE OBJECTIVES: This course aims to

1. Develop a thorough understanding of various autonomous robot structures.
2. Gain expertise in working with various sensors and gain the ability to interface sensors with microcontrollers, read data, and seamlessly integrate them into robotics applications.
3. Acquire proficiency in understanding different types of motors, motor drivers, develop the skills to interface motors with microcontrollers, motors and construct two-wheel robots with controlled movements.
4. Attain proficiency in utilizing OpenCV for advanced image processing tasks master techniques such as RGB value extraction, creating colored shapes, and extracting Regions of Interest (ROI) from images.
5. Develop a thorough understanding of various drone structures/develop autonomous systems.

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

1. Understand mechanical structures, motors, sensors, and circuits essential for constructing robots.
2. Demonstrate the utilization of sensors (Ultrasonic, IR, Rotary Encoder) for Arduino interfacing, reading data, and integrating them seamlessly into robotics applications.
3. Demonstrate expertise in operating robot controllers, applying theory to precisely control servo and stepper motors, 2 wheel robots ensuring desired motion.
4. Able to apply Python and OpenCV for image processing, including RGB extraction and ROI tasks.
5. Proficiently assemble a quadcopter drone, showcasing understanding of its classification, parts, and operational principles/ Proficiency to develop autonomous systems fostering creativity and practical application.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	0	0	1	3	3	1	2	-	-	-
CO 2	1	2	2	1	1	0	0	1	3	3	1	2	-	-	-
CO 3	1	2	2	1	1	0	0	1	3	3	1	2	-	-	-
CO 4	2	2	2	1	1	0	0	1	3	3	1	2	-	-	-
CO 5	2	2	2	1	1	0	0	1	3	3	1	2	-	-	-

Lab Experiments:

Experiment No	Title	CO
1.	Introduction to Robotics, Definition and scope of robotics, Robot configurations- Cartesian, cylinder, polar and articulate. Uses and Significance of Robots, Parts of a Robot, Current applications and future trends. Introduction to Arduino, C++, Arduino Programming Environment. Interfacing Arduino with Electronic Devices such as LEDs/Piezo Buzzer.	1
2.	Interfacing Arduino with Electronic Devices such as Push Button/Potentiometer.	1

3.	Introduction to Sensors, Types of Sensors, Reading Data from Sensors, Interfacing Sensors with Microcontrollers. Interfacing Arduino with Ultrasonic Distance Sensor and Reading Sensor Data on Serial Monitor.	2
4.	Interfacing Arduino with IR Sensor and Reading Sensor Data on Serial Monitor.	2
5.	Interfacing Arduino with Rotary Encoder and Reading Sensor Data on Serial Monitor.	2
6.	Introduction to motors, Types of motors, Motor drivers, Interfacing motors with Microcontrollers, Introduction to Li-ion, LIPO batteries, uses and safety precaution. Implement a system that utilizes an Arduino microcontroller to control the precise movement of a servo motor.	3
7.	Implement a system that utilizes an Arduino microcontroller to control the precise and sequential movements of a stepper motor.	3
8.	Construct a two-wheel robot using DC motors controlled by an Arduino microcontroller. Implement a program that allows the robot to execute specific movements. The robot should: i. Move forward with controlled acceleration. ii. Move backward with controlled deceleration.	3
9.	Construct an Obstacle avoidance robot.	3
10.	Construct a Pick and place robot.	3
11.	OpenCv for image processing: i. Extraction of RGB values of a pixel ii. Create colored shapes and save image iii. Extraction of ROI	4
12.	Assembly of quad copter drone.	5

Open-Ended Project on Autonomous System

Note:

- Mandatory Open-Ended Project (20 marks) in CIE.
- Any 10 experiments the students must do among the 12 experiments.

SUGGESTED READING:

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf
3. https://www.idtechex.com/en/research-report/new-robotics-and-drones-2018-2038-technologies-forecasts-players/584
4. https://dronebotworkshop.com/

22EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. Acquire the knowledge on different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. Determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. Determine the characteristics of Transformers, dc, ac machines and switch gear components.

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

1. Comprehend the circuit analysis techniques using various circuital laws and theorems.
2. Analyse the parameters of the given coil and measurement of power and energy in AC circuits
3. Determine the turns ration/performance parameters of single-phase transformer.
4. Infer the characteristics of DC shunt motor different tests.
5. Illustrate different parts and their function of electrical components, equipment and machines.

CO-PO Articulation Matrix

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

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS:

1. Verification of KCL and KVL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Charging and discharging of Capacitor.
5. Determination of parameters of a choke or coil by Wattmeter Method.
6. Power factor improvement of single-phase AC System.
7. Active and Reactive Power measurement of a single-phase system using
   (i) 3-Ammeter method (ii) 3-Voltmeter method
8. Measurement of 3-Phase Power in a balanced system.
9. Calibration of single-phase energy meter.
10. Verification of Turns/voltage ratio of single-phase Transformer.
11. Open Circuit and Short Circuit tests on a given single phase Transformer.
12. Brake test on DC Shunt Motor.
13. Speed control of DC Shunt Motor.
14. Demonstration of Measuring Instruments and Electrical Lab components.
15. Demonstration of Low-Tension Switchgear Equipment/Components
16. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted to cover all five Course Outcomes.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTIONS AND EXAMINATION
(Inline with AICTE Model Curriculum with effect from AY 2025-26)
(R22A Regulation)

B.E. (Computer Science and Engineering)

SEMESTER – III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1.	22ITC02N	Java Programming	3	-	-	3	40	60	3
2.	22CSC06	Discrete Structures	3	1	-	3	40	60	4
3.	22CSC07	Digital Logic Design	2	1	-	3	40	60	3
4.	22CSC14N	Design and Analysis of Algorithms	3	-	-	3	40	60	3
5.	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	Non Credit
PRACTICAL									
6.	22ITC03N	Java Programming Lab	-	-	2	3	50	50	1
7.	22CSC09N	Latex Workshop	-	-	2	3	50	50	1
8.	22CSI01	Moocs / Training / Internship	3 to 4 weeks / 90 Hours			-	50	-	2
9.	22CSC47	Python Programming Workshop	-	-	3	3	50	50	1.5
		TOTAL	**13**	**2**	**07**	**-**	**360**	**440**	**18.5**

L: Lecture T: Tutorial P: Practical CIE: Continuous Internal Evaluation SEE-Semester End Examination

22ITC02N

JAVA PROGRAMMING
(Common to CSE, IT, AI&DS, CET and allied branches)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to
1. Deliver the object-oriented programming features and principles for code development.
2. Explore the reusability of the code, coupling and cohesion.
3. Handle the exceptions and multiple flow of the execution.
4. Understand the collection framework.
5. Develop the IO and database applications.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Apply the concept of OOP to design, implement and execute programs.
2. Use the strings, interfaces, packages and inner classes for application development.
3. Apply the exception handling mechanisms and multithreading for the development.
4. Develop applications using collection framework.
5. Develop database applications using SQL package.

CO-PO Articulation Matrix

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

UNIT-I

Introduction to Java: Procedural and object-oriented programming paradigms, Principles, Features, Basic structure a java program, Java Primitive Data Types, Basic Operators, Flow-control statements. Defining Classes, Adding Instance Fields and Methods, Object Creation, Constructors, Access Modifiers, Method Overloading and Constructor Overloading, Use of static and final keyword, Arrays, Strings and String Tokenizer.

UNIT-II

Inheritances and Packages: Types of Inheritance, super keyword, preventing inheritance, the Object class, method overriding and dynamic method dispatch, abstract classes and methods. Interfaces, Interfaces vs. Abstract classes, Inner classes and types, Packages, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-III

Exception Handling and Threading: What are exceptions, Error vs. Exception, usage of try, catch, throw, throws and finally clauses, Multithreading in Java, Life cycle of Thread, how to create threads, Thread class in java, Thread priorities, Thread Synchronization. Introduction to Generics, Advantages of Generics, Generic class, Type Parameters, Generic Methods.

UNIT-IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Collection classes – Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map, Iteration over Collections – Iterator and List Iterator, Enumeration interfaces, differentiate Comparable and Comparator interface, Introduction to Java 8 Features, Lambda Expressions, Functional Interfaces.

UNIT-V

Streams: FileStream, ObjectStream, Serialization, **Servlets:** Introduction to Servlets, Servlet Life cycle, Database: Connecting to Database - JDBC, Drivers, Connection, Statement and its types, Result set, CRUD operations, Databases using JSP.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram "Advanced Programming in Java2" Jaico Publishing House, 2008.
3. Bruce W.perry "Java Servlet and JSP Cookbook", O'reilly Media Inc., 2004.

SUGGESTED READING:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", 2nd Edition, Oxford University Press, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", 4th Edition, TataMcGraw-Hill, 2010.
3. E Balaguruswamy, "Programming with Java", 6th Edition, TataMcGraw-Hill, 2019.
4. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I-Fundamentals", 8th Edition, Prentice Hall, 2008.
5. K Somasundaram, "Introduction to Java Programming", Jaico Publishing House, 2016.
6. Paul Deitel and Harvey Deitel, "Java How to Program, Early Objects ", 11th Edition., 2018.

ONLINE RESOURCES:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

22CSC06

DISCRETE STRUCTURES

Instruction	3 L + 1 T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to
1. Introduce Propositional and Predicate Logic.
2. Introduce various proof techniques for validation of arguments.
3. Develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, and functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems

CO-PO Articulation Matrix

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

UNIT – I

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference.

Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

UNIT – II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams.

Relations and Functions: Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

Functions: Types of Functions, Composition of functions and Inverse of functions

UNIT – III

Fundamental Principles of counting: The Rules of Sum and Product, Permutations, Combinations, Binomial Theorem;

Generating Functions: Generating Functions, Calculating Coefficient of generating functions;

Recurrence Relations: The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT – IV

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, Planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications.

Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: Algorithms of Kruskal and Prim.

UNIT - V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. **Groups:** Definitions and Examples, Subgroups, Homomorphisms and cyclic groups

TEXT BOOKS:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 5th edition, Pearson Education, 2016.
2. Rosen, K. H., "Discrete Mathematics and Its Applications", 8th Edition, ISBN10: 125967651X ISBN13: 9781259676512, 2019
3. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.

SUGGESTED READING:

1. Singh, S.B., "Discrete Mathematics", Khanna Book Publishing Company, New Delhi., 3rd Edition, 2019
2. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

22CSC07

DIGITAL LOGIC DESIGN

Instruction	2 L + 1 T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to
1. Understand the basic building blocks of digital hardware and various minimization techniques.
2. Analyse and design the Combinational and Sequential circuits.
3. Design the circuits using verilog HDL.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and Standard forms.
3. Analyze and simplify Boolean expressions using Karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits using Verilog HDL.
5. Design different applications using registers and counters by applying state reduction methods.

CO-PO Articulation Matrix

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

UNIT - I

Digital and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes.

Boolean Algebra and logic Gates: Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT – II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart.

NAND and NOR Gates: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. Exclusive OR Gates: Odd Function, Parity Generation and Checking.

UNIT- III

Combinational Logic Design: Combinational Circuits; Analysis **Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation.

Design Procedure: Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT – V

Sequence Detection and State Reduction Methods: Moore and Mealy state graphs for sequence detection, Methods for reduction of state tables, Methods for state assignment.

Registers: Registers, Shift registers.

Counters: Ripple counters, synchronous counters, and other counters.

TEXT BOOKS:

1. Morris Mano M. and Michael D. Ciletti, "Digital Design, With an Introduction to Verilog HDL", 5th Edition, Pearson 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2nd Edition, Tata McGraw Hill, 1995.
3. Roth, Jr., Charles H., et al. "Fundamentals of Logic Design", Enhanced Edition, Singapore, Cengage Learning, 2020.

SUGGESTED READING:

1. Ronald J Tocci, Neal Widmer, Greg Moss, "Digital Systems: Principles and Applications", 11th Edition, Pearson 2011.
2. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design, 2nd Edition, McGraw Hill, 2009.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice-Hall, 2003.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee39/preview

22CSC14N

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

PRE-REQUISITES: Basics of Data structures and algorithms.

COURSE OBJECTIVES: This course aims to

1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

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

1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Formulate approximate solutions to NP problem.

CO-PO Articulation Matrix

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

UNIT-I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method, Minimum and Maximum Problem, Strassen's algorithm for matrix multiplication.

Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT-II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT-III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, and Hamiltonian Cycle.

Branch-and-Bound: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT-IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting.

Shortest Path Algorithms: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms.

UNIT-V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility.

Standard NP-Complete Problems and Reduction Techniques: The Clique Problem, vertex-cover and Subset Sum Problem.

TEXT BOOKS:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press/McGraw-Hill, 2022.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

SUGGESTED READING:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley Second Edition.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106101060/

22EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	Non Credit

PREREQUISITE: Basic awareness of Indian Constitution and Government.

COURSE OBJECTIVES: This course aims to
1. Understand the history of framing of the Indian Constitution.
2. Awareness on Fundamental Rights, Duties and Directive Principles of State Policy.
3. Explore the organization of Union Government, and functions of President and Prime Minister.
4. Gain an insight into the inter-functionality of Union Legislature and Judiciary.
5. Educate on the local governance and problems in development of rural and urban areas.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Understand the history of framing of the Indian Constitution and its features.
2. Assess the realization of Fundamental Rights and Directive Principles of State Policy.
3. Analyze the challenges to federal system and position of the President and the Prime Minister in the Union Government.
4. Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
5. Evolve the development of the local governments in India and assess the role of Collector in district administration.

CO-PO Articulation Matrix

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

UNIT-I

Constitutional History and Framing of Indian Constitution:

East India Company rule (1757-1857): Social, Economic, Political and Administrative impact of Company rule in India. British Rule (1858-1947): Indian National Movement, Government of India Acts 1909, 1919 and 1935, and Indian Independence Act 1947. Framing of the Indian Constitution: Constituent Assembly, Preamble and Salient Features.

UNIT-II

Fundamental Rights, Duties and Directive Principles of State Policy:

The Fundamental Rights**:** Features and significance of Rights. Fundamental Duties: Importance and the legal status of Duties. Directive Principles of State Policy: Socialist, Gandhian and Liberal-intellectual principles, importance and relevance.

UNIT-III

Union Government and its Administration:

Federalism: Division of legislative and financial powers between the Union and the State. Union Executive: Role and position of President, Prime Minister and Council of Ministers. Emergency Provisions: National Emergency, Constitutional Emergency and Financial Emergency.

UNIT-IV

Union Legislature and Judiciary:

Union Legislature: Parliament of India-Composition and functions of Parliament, and Parliamentary Committees. Union Judiciary: Supreme Court of India-Composition and Functions.

Unit-V

Local Self Governments:

Rural Local Governments: Zilla Parishad- CEO and functions of Zilla Parishad, Mandal Parishad- Role of Elected and Officials, Gram Panchayat- Sarpanch, Secretary and Gram Sabha. Urban Local Governments: Structure and functions of Municipalities and Municipal Corporations. District Collector: Powers and functions of Collector.

TEXT BOOKS:

1. Sastry Ravindra, (Ed), "Indian Government & Politics", 2nd Edition, Telugu Akademy, 2018.
2. "Indian Constitution at Work", 1st Edition 2006, NCERT, reprinted in 2022.

SUGGESTED READING:

1. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, "Framing of Indian Constitution", 1st Edition, 2015.
3. Granville Austin, "The Indian Constitution: The Cornerstone of a Nation", 2nd Edition, OUP, 1999.
4. M.V. Pylee, "India's Constitution", 16th Edition, S. Chand Publishing, 2017.
5. Rajeev Bhargava (ed), "Politics and Ethics of the Indian Constitution", OUP, 2008.

ONLINE RESOURCES:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

22ITC03N

JAVA PROGRAMMING LAB

(Common to CSE, IT, AI&DS , CET and allied branches)

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. Deliver the basic principles of OOP.
2. Explore the object-orientation process in creating classes, object, etc.,
3. Demonstrate the inheritances and polymorphism.
4. Handle the exceptions in runtime and multithreading.
5. Develop the database applications.

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

1. Practice the basics of OOPs to develop java applications.
2. Use the inheritance and interfaces for application development.
3. Apply the exception handling and multithreading to handle multiple flows of execution.
4. Develop applications using collection framework.
5. Apply the SQL concepts for application development.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:

1. Implement the program(s) to handle the various data types, operators, expressions, control-flow, and strings.
2. Develop a java program(s) for constructors.
3. Develop a java program to demonstrate the dynamic method dispatch.
4. Develop a java program(s) to deal with different types of inheritances and interfaces.
5. Implement the program(s) to demonstrate the packages.
6. Develop a java program(s) to handle user defined exceptions with multiple catch blocks.
7. Implement program(s) to demonstrate Multithreading and thread synchronization.
8. Implement program(s) to demonstrate generics.
9. Implement the collection framework classes with Iterator/List Iterator/Enum Interface.
10. Develop a java program(s) to implement the features of JDK8.
11. Implement a java program(s) to implement the concept of Servlets and JSP.
12. Create a web application to implement CRUD operations using Servlets, JSP and Databases.

TEXT BOOKS:

1. Herbert Schildt, “Java: The Complete Reference”, 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram “Advanced Programming in Java2” Jaico Publishing House, 2008.
3. Bruce W.perry “Java Servlet and JSP Cookbook”, O’reilly Media Inc., 2004.

SUGGESTED READING:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", 2nd Edition, Oxford University Press, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", 4th Edition, Tata McGraw-Hill, 2010.
3. E Balaguruswamy, "Programming with Java", 6th Edition, Tata McGraw-Hill, 2019.
4. Cay S. Horstmann, Gary Cornell,"Core Java, Volume I- Fundamentals", 8th Edition, Prentice Hall, 2008.
5. K Somasundaram "Introduction to Java Programming", Jaico Publishing House, 2016.
6. Paul Deitel and Harvey Deitel "Java How to Program, Early Objects", 11th Edition, 2018.

ONLINE RESOURCES:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

22CSC09N

LATEX WORKSHOP

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to
1. Familiarize the students with documentation and visualization tools like LaTeX.
2. Develop proficiency in documentation for presentation and report writing.
3. Explore the utilities in LaTeX.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Understand the need of documentation tools.
2. Install the documentation tools.
3. Generate templates for generation report using LaTeX
4. Generate templates for presentation reports using Beamer.
5. Explore the utilities of LaTeX.

CO-PO Articulation Matrix

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

LAB EXPERIMENTS:
1. Exploring various environments and Installation of LaTeX.
2. Understanding LaTeX compilation, basic syntax.
3. Create a LaTeX document with various formatting styles.
4. Understand Page Layout –Titles, abstract, chapters, sections, references, equation, references, citation, table of contents, generating new commands.
5. Create a LaTeX document with following mathematical equations along with equation numbers in Italic format: Ex-summation (represent in sigma symbol), integration, integral of summation.
6. Create a LaTeX documents with images and image caption at centre alignment, table with thick border and table caption with centre alignment, row height, content with cell centre alignment.
7. Create a LaTeX document to write an algorithm using algpseudocode and algorithm packages. Use the lstlisting package in LaTeX to write source code in any programming language.
8. Work on basic power point utilities and tools in LaTeX which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows Beamer, slides preparation.
9. Create a Resume, Lab Report, Article.
10. Create a technical report according to IEEE format includes title of the paper, authors name and affiliations, abstract and keywords, introduction section, background section, and other sections, references.

TEXT BOOKS:
1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education India,2005
2. LaTeX Companion – Leslie Lamport, PHI/Pearson,2004.

ONLINE RESOURCES:

1. https://www.latex-project.org/help/documentation/
2. https://spoken-tutorial.org/tutorial ef,search?search_foss=LaTeX& search_language=English

22CSI01

MOOCS / TRAINING / INTERNSHIP

Instruction	3 to 4 Weeks / 90 Hours
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	2

COURSE OBJECTIVES: This course aims to

1. Exposing the students to the industrial environment and technologies
2. Provide possible opportunities to learn, make them to understand and sharpen them to the real time technical/ managerial skills required at the job
3. Expose with the current technological developments relevant to program domain
4. Understand Engineer's responsibilities and ethics
5. Opportunity to interact with the people of industry/society to understand the real conditions.

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

1. Learn new technologies and solve real time projects.
2. Expose to the industrial environment problems and technologies
3. Gain knowledge on contemporary technologies industrial requirements.
4. Identify , Design and Develop solutions for real world problems
5. Communicate their ideas and learning experiences through reports and presentation.

CO-PO Articulation Matrix

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

PROCESS TO BE FOLLOWED FOR CARRYING OUT INSTRUCTIONS TO STUDENTS:

1. Students may apply for internships through the AICTE Portal or through CDC of the institute by filling the application form IAP-101.
2. Industry shall scrutinize the students based on their criteria and communicate a provisional offer or confirmation letter to the student.
3. If students apply through CDC, then CDC shall nominate the students for various opportunities accordingly by issuing NOC (IAP-104).
4. The respective head of the department shall assign a faculty mentor.
5. Student shall undergo internship/industrial training at the concerned Industry/Organization by submitting the form, IAP-103.
6. During the internship, Faculty Mentor will evaluate the performance of students twice either by visiting the Industry/Organization or through obtaining periodic reports from students.
7. Student shall submit internship report to the industry/organization at the end of internship program.
8. On successful completion of the Internship, Industry/Organization shall issue Internship Certificate to the students
9. All the students should maintain discipline, professional ethics and follow the health and safety precautions during internship

Student shall maintain diary during the internship and submit the internship report at the end of the internship. The report will be evaluated by the supervisor on the basis of the following criteria:

- Originality
- Adequacy and purposeful write-up
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience
- Practical applications, relationships with basic theory and concepts taught in the course

Evaluation of Internship: The internship of the students will be evaluated in three stages:

1. Evaluation by the Industry (in the scale of 1 to **10** where 1-Unsatisfactory; 10-Excellent)
2. Evaluation by faculty Mentor on the basis of site visit(s) or periodic communication (**15** marks)
3. Evaluation through seminar presentation/Viva-Voce at the Institute(This can be reflected through marks assigned by Faculty Mentor **(25 marks**)

For further details regarding templates, assessment guidelines please refer to the document from page number 16 onwards available at: https://www.cbit.ac.in/wp-content/uploads/2019/04/R22-Rules-with-internship-guidelines-10-11-2022..pdf.

22CSC47

PYTHON PROGRAMMING WORKSHOP

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

PREREQUISITE: Programming for Problem Solving.

COURSE OBJECTIVES: This course aims to
1. Familiarize with Python variables, flow controls structures, and functions.
2. Enable students to implement appropriate data structures to efficiently organize and manipulate data.
3. Enable students to confidently read data from external files, process it, write results back to files for storage and perform analysis.
4. Apply suitable algorithmic approaches for solving real time problems.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Demonstrate a solid understanding of basic Python syntax, variables, data types and operators.
2. Construct programs that effectively utilize conditional statements and looping structures to control program execution.
3. Write modular and well-structured code by defining and using functions with appropriate parameters and return values.
4. Choose and manipulate suitable data structures and files to effectively store, organize, and manage data.
5. Implement greedy approach, dynamic programming and backtracking with modular Python code using packages.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:
1. Write Python programs to work with different data types (integer, float, string, boolean and complex) and use operators to perform calculations and manipulate text.
2. Demonstrate decision control statements and iterative control statements.
3. Define functions with parameters and return values to break down code into manageable and reusable blocks.
4. Demonstrate array and collection data types(list, tuple, set)
5. Leverage dictionaries to store and retrieve data efficiently using key-value associations.
6. Write programs to open, read from, and write to text files in Python for persistent data storage.
7. Implement problems on Divide and Conquer-Minimum-Maximum Problem
8. Implement Fractional Knapsack using greedy approach
9. Implement Longest Common subsequence using dynamic programming
10. Implement n-queens problem using backtracking
11. Implement Dijkstra's, Bellman-Ford, Floyd-Warshall

TEXT BOOKS:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.
2. Jeeva Jose, "Taming Python by Programming", Revised Edition, Khanna Book Publishing Co., Delhi.
3. R.S. Salaria, "Programming in Python", Khanna Book Publishing Co., Delhi.

SUGGESTED READING:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press/McGraw-Hill, 2022.
2. Mark Lutz, "Learning Python", 5th Edition, , O'Reilly Media, Inc.,

ONLINE RESOURCES:

1. https://docs.python.org/3/tutorial/index.html
2. https://realpython.com/
3. https://nptel.ac.in/courses/106101060/

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTIONS AND EXAMINATION
(Inline with AICTE Model Curriculum with effect from AY 2025-26)
(R22A Regulation)

B.E. (Computer Science and Engineering)

SEMESTER – IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1.	22CSC10	Computer Organization and Architecture	3	1	-	3	40	60	4
2.	22CSC11N	Database Management Systems	3	-	-	3	40	60	3
3.	22ITC12	Formal Language and Automata Theory	3	-	-	3	40	60	3
4.	22MTC12	Probability and Statistics	3	1	-	3	40	60	4
5.	22CSC42	Web Programming	2	1	-	3	40	60	3
6.	22ECC39	Systems and Signal Processing	2	1	-	3	40	60	3
PRACTICAL									
7.	22CSC43	Web Programming Lab	-	-	3	3	50	50	1.5
8.	22CSC13N	Database Systems Lab	-	-	3	3	50	50	1.5
9.	22CSU01	Up Skill Certification Course-I	-			-	25	-	0.5
		TOTAL	**16**	**4**	**6**	**-**	**365**	**460**	**23.5**

L: Lecture T: Tutorial P: Practical CIE: Continuous Internal Evaluation SEE-Semester End Examination

22CSC10

COMPUTER ORGANIZATION AND ARCHITECTURE

Instruction	3 L+1 T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

PRE-REQUISITES: Digital Logic Design.

COURSE OBJECTIVES: This course aims to

1. The course aims to introduce principles of computer organization and basic architectural concepts.
2. It begins with the basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and I/O systems, and multiprocessors

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

1. Understand the basics of instructions sets and their impact on processor design
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor
4. Design a pipeline for consistent execution of instructions with minimum hazards
5. Understand how to perform computer arithmetic operations, pipeline procedures, and multiprocessors

CO-PO Articulation Matrix

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

UNIT–I

Introduction to Computer Architecture: Introduction to Computer Architecture, Flynn's Classification of Computers, Performance Metrics (like Latency, throughput), Fundamental Blocks of Computer (like CPU, I/O subsystems, memory, control unit).

UNIT–II

Instruction Set Architecture (ISA): Introduction to Instruction Set, Types of ISA; RISC, CISC., Registers, Common bus structure, Instruction Execution Cycle, Addressing Modes, Register Transfer Language (RTL), 8086 Architecture, ARM Architecture.

UNIT–III

Data Representation: Data Type Representation, Floating-point Addition, Multiplication, Division.

UNIT–IV

Pipelining: Pipelining (Basics, Types, stalling, and forwarding), Throughput and Speedup of Pipelining, Pipelining Hazards

UNIT–V

Data Level parallelism: Data Level Parallelism (DLP) (Introduction, Loop Level Parallelism), Vector Architecture, SIMD Instruction Set: Used for Multimedia, Graphics Processing Unit (GPU) (Introduction, GPU Memory Hierarchy), CUDA Programming (Introduction, Code samples of PDA and FPGA)

TEXT BOOKS:

1. J.L. Hennessy and D.A. Patterson, "Computer Architecture: A Quantitative Approach", 5th edition, Morgan Kauffmann Publishers, 2012.
2. M. Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Publication, 2017.
3. Jon Stokes, "Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture", 1st Edition, No Starch Press, 2015.
4. Noam Nisan and Shimon Schocken, "The Elements of Computing Systems: Building a Modern Computer from First Principles", 2nd Edition, The MIT Press, 2021.

SUGGESTED READING:

1. Car Hamacher, Zvonks Vranesic, Safea Zaky, "Computer Organization", 5th Edition, McGraw Hill, 2011.
2. William Stallings, "Computer Organization and Architecture", 6th Edition, Pearson/PHI, 2007.
3. Andrew S. Tanenbaum, "Structured Computer Organization", 6th Edition, PHI/Pearson, 2013.

ONLINE RESOURCES:

1. http://www.geeksforgeeks.org/computer-organization-and-architecture-gq/
2. https://www.cs.virginia.edu/c++programdesign/slides/pdf/bw01.pdf
3. ttps://www.tutorialspoint.com/computer_organization/index.asp
4. https://sites.google.com/site/uopcog/

22CSC11N

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

PRE-REQUISITES: Programming and Data Structures.

COURSE OBJECTIVES: This course aims to
1. Familiarize students with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. Understand about data storage techniques and indexing.
3. Impart knowledge in transaction management, concurrency control techniques and recovery procedures.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Understand fundamental concepts of database and design database schema for an application.
2. Write SQL queries for tasks of various complexities.
3. Build applications using the database system as the backend.
4. Understand internal working of a DBMS including data storage, indexing, query processing, transaction processing, and concurrency control and recovery mechanisms.
5. Analyze query processing, transaction processing, concurrency control and recovery mechanisms.

CO-PO ARTICULATION MATRIX

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

UNIT-I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators, Database System Architecture, Data Models, **E-R Model**: Introduction, Constraints, E-R Diagrams, E-R Design Issues, Mapping from ER to relational model, Extended E-R Features.

UNIT-II

Relational Algebra Operations and SQL: Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Simple Queries (select/project/join/ aggregate queries), Complex queries (With Clause, Nested Subqueries, Views)

UNIT-III

Functional Dependency: Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Attribute closure, Irreducible Set of Functional Dependencies, lossless decomposition, **Normalization**–1NF, 2NF, 3NF and BCNF, Dependency preserved decomposition, Comparison of BCNF and 3NF.

UNIT–IV

Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files, Hash indices, creation of indices, Bitmap indices.

Transaction Processing: Concept of transactions and schedules, ACID properties, Conflict-serializability

UNIT-V

Concurrency control: Lock-Based Protocols, Dead lock handling, Timestamp-Based Protocols, Validation-Based Protocols. **Recovery system:** Failure classification, Log based recovery, recovery algorithm, ARIES.

TEXT BOOKS:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill, 2021.
2. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Pubs, 2017.
3. Lemahieu, Broucke and Baesens, "Principles of Database Management", Cambridge University Press, 2018.
4. RP Mahapatra, "Database Management Systems", Khanna Publishing House, 2020.
5. Krishnan, "Database Management Systems", McGraw Hill.

SUGGESTED READING:

1. MySQL Explained: Your Step By Step Guide To Database Design.
2. Pro SQL Server 2008 Relational Database Design and Implementation (Expert's Voice in SQL Server) 1st Edition.

ONLINE RESOURCES:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html.

22ITC12

FORMAL LANGUAGES AND AUTOMATA THEORY

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

PRE-REQUISITES: Discrete Mathematics, Data Structures, Design and analysis of algorithms.

COURSE OBJECTIVES: This course aims to

1. To study abstract computing models namely Finite Automata, Pushdown Automata, and Turning Machines.
2. To introduce various grammars, formal languages and equivalence between various languages and their corresponding recognizers.
3. To familiarize with decidability and undecidability of computational problems.

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

1. Build Deterministic, Nondeterministic Finite automata for Languages and show the acceptance of strings using Formal Machines.
2. Develop regular expressions and their equivalent finite automata for various languages.
3. Demonstrate context-free grammar, check the ambiguity of grammar and Test for Closure Properties and Decision Properties of CFL's.
4. Construct pushdown automata for languages and Analyze Equivalence of PDA's, CFG's.
5. Design Turing Machines, Analyze and distinguish between decidable and undecidable problems.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	0	1	0	0	0	0	1	0	0	1	-	-
CO 2	2	1	1	0	1	0	0	0	0	0	0	0	1	-	-
CO 3	2	1	1	0	1	0	0	0	0	0	0	0	1	-	-
CO 4	2	1	1	0	1	0	0	0	0	0	0	0	2	-	-
CO 5	2	1	1	0	1	0	0	0	0	1	0	0	2	-	-

UNIT-I

Automata: Introduction to Finite Automata, the Central Concepts of Automata Theory: Alphabets, Strings and Languages.

Finite Automata: Deterministic Finite Automata, Nondeterministic Finite Automata, Equivalence of NFA and DFA, Finite Automata with Epsilon -Transitions, Minimization of DFA's.

UNIT-II

Regular Expression and languages: Regular Expressions, Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting Regular Expressions to Automata, Applications of Regular Expressions, Algebraic Laws for Regular Expressions.

Properties of Regular Languages: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages.

UNIT-III

Context Free Grammars and Languages: Context-Free Grammars, Leftmost and Rightmost Derivations, The language of a Grammar, Constructing Parse Trees, The Yield of a Parse Tree, Applications of CFGs, Ambiguous Grammars, Removing Ambiguity From Grammars.

Properties of Context Free Languages: Normal Forms for Context-Free Grammars: Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, Chomsky Normal Form, Greibach Normal form, Pumping Lemma for CFL's, Applications of Pumping Lemma for CFL's, Closure Properties of CFL's, Decision Properties of CFL's.

UNIT-IV

Pushdown Automata: The Formal Definition of PDA, Graphical Notation for PDA's, Instantaneous Description of a PDA, The Language of a PDA: Acceptance by Final State, Acceptance by Empty Stack, Equivalence of PDA's and CFG's: From Grammars to PDA's, From PDA's to Grammars, Deterministic Pushdown Automata.

Context-sensitive Languages: Context-sensitive grammars (CSG), linear bounded automata and equivalence with CSG.

UNIT-V

Introduction to Turing Machines: Notation for the TM, Instantaneous Descriptions for TM's, The Language of a TM, Turing Machines and Halting, Extensions to the Basic Turing machine, Restricted Turing machines, Turing Machines and computers.

Undecidability: Codes for Turing Machines, The Diagonalization Language, The Universal Language, Undecidablity of the Universal Language, Undecidable problems about Turing Machines: Rice's Theorem and Properties of RE languages, Post's Correspondence Problem: Definition of PCP, The Modified PCP, Other Undecidable Problems.

TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2015.

SUGGESTED READING:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rd Edition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2nd Edition, Wiley Publications, 2007.
3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition, Prentice Hall of India 2008.
4. ShyamalendraKandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.

ONLINE RESOURCES:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. http://online.stanford.edu/course/automata-theory

22MTC12

PROBABILITY AND STATISTICS

Instruction	3 L + 1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to
1. Learn and analyzing data in Linear and Non-Linear form.
2. Learn methods to solve bivariate probability functions.
3. Explain hypothetical data using probability distribution.
4. Discuss the testing of hypothesis of sample data.
5. Formulate and get the solution of real world problem.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods.
2. Estimate the marginal probabilities of statistical averages.
3. Use the basic probability for fitting the Random phenomenon.
4. Apply various tests for testing the significance of sample data.
5. Analyze the random phenomena of real world data.

CO-PO Articulation Matrix

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

UNIT-I: Basic Statistics

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines and Exponential curve.

UNIT-II: Univariate and Bivariate Distribution.

Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Two-dimensional or Joint Probability Mass Function, Two-dimensional Distribution Function, , Joint Density Function, Marginal Density Function, The Conditional Distribution Function, and Conditional Probability Density Function, Stochastic Independence.

UNIT-III: Probability Distributions

Discrete probability distribution: Poisson distribution, Mean, Variance, MGF, CGF, fitting of Poisson distribution. Continuous probability distributions: Normal distribution, Standard Normal random variable Expectation, Variance, MGF (without proof), CGF, Properties of Normal Curve and Areas under Normal curve. Exponential distribution, Expectation, Variance, MGF, CGF.

UNIT-IV: Testing of Hypotheses
Test of significance, null and alternative hypotheses, Errors in sampling, level of significance. Large sample test: Test of significance for single proportion, difference of proportions, single mean and difference of means. Small Sample Tests: T-Test for single mean, differences of Means. F-Test for equality of two population variances. Chi-Square test of Goodness of fit.

UNIT-V: Analysis of Variance and Time Series
One way classification-Assumptions for ANOVA Test-ANOVA for fixed effect model-Two way classification-ANOVA for fixed effect model-Components of Time series-Measurement of Trend-Method of semi Averages- Moving Averages Method (3 Years and 5 Years).

TEXT BOOKS:
1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

SUGGESTED READING:
1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. 2. S.C.Gupta, V.K.Kapoor, "Fundamentals of Applied Statistics", Sultan Chand and Sons, 2014.

ONLINE RESOURCES:
1. https://www.youtube.com/watch?v=z7AE2kUoZYU&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE&index=2
2. https://www.youtube.com/watch?v=EYRPpw2BI1s&list=PLp6ek2hDcoNCSeG01wrtcT9eE6S7YULtR
3. https://www.youtube.com/watch?v=YtLmLPI-7sE
4. NPTEL :: Mathematics - NOC:Applied Multivariate Statistical Modeling

22CSC42

WEB PROGRAMMING

Instruction	2 L + 1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to
1. Understand how HTML, CSS, javascript and Bootstrap work together.
2. Explore various features of JS and its functionality.
3. Comprehend the new features of JS, role of React JS in responsive web application development.
4. Familiarize with configuration of NPM and backend integration with NODE JS and Express JS.
5. Understand the basics of mongodb and its Data Model.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Create web pages with good aesthetic sense of design using HTML CSS3, Bootstrap and popular themes.
2. Use JS in Validations and DOM manipulation.
3. Become an agile practitioner with the ability to quickly complete projects using ReactJS.
4. Design Schema and perform CRUD operations from UI components.
5. Build an end-to-end application from scratch using React JS, NODE JS, Express JS and Mongo DB.

CO-PO Articulation Matrix

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

UNIT-I

Introduction: Web Fundamentals, **HTML 5.0:** basic tags, Images, Tables, Lists, Forms, Layout, Graphics, spanand div tags. Grid, **Introduction to Cascading Style Sheets:** Types of CSS**,** text and font, color**,** CSS Selectors, CSS BOX Model.

Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Grid.

UNIT-II

Java Script: Introduction, data types, control structures, functions, arrays, objects, regular expressions, working with events, form validation, DOM Elements, Accessing and modifying Elements using DOM, Dynamic documentwith Java script.

.

UNIT-III

ReactJS: ES5 vs Es6, Scoping - var vs let vs const, Arrow functions, Use of this keyword (lexical scoping), Spread& rest parameter, Array & object destructure, module import and export, State, Props, Components, Lifecycle, Stateful and stateless components, Events, Router, Forms, Tables, CSS, HookS.

UNIT-IV

NodeJS: Creating Web Server, Functions, Buffer, Node Modules, Creating Web Server, Handling HTTP requests;**ExpressJS:** API methods - GET, POST, PUT, DELETE, Request & response objects,

URL and Query parameters,Routing, Templates, middleware and the model-view-controller pattern.

UNIT-V

MongoDB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations, Basic cursor methods: map, to Array, pretty, for each, limit, count, sort, Columnar Databases, Indexing and Aggregation, MongoDB Node JS Drivers and CAP theorem.

TEXT BOOKS:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React,and Node", 2nd Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge – "MongoDB Basics", Apress, 2014.

SUGGESTED READING:

1. Ethan Brown, "Web Development with Node and Express", 1st Edition, Oreilly Publishers, 2014.
2. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O"REILLY, 2016.
3. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", 2nd Edition, Manning Publications, 2019
4. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-WesleyProfessional, 2017.

ONLINE RESOURCES:

1. https://web.stanford.edu/class/cs142/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20 Edition.pdf

22ECC39

SYSTEMS AND SIGNAL PROCESSING

(Common to CSE, AI&DS, AI & ML)

Instruction	2 L + 1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

PREREQUISITE: Knowledge of Differential and Integral Calculus.

COURSE OBJECTIVES: This course aims to

1. Know Signals and systems representation/classification and also the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. Understand Sampling, time and frequency domain analysis of discrete time signals with DTFT, DFT and Z-Transforms.
3. Understand concepts of convolution integrals.

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

1. Classify signals, analyse the signals using Transform techniques.
2. Evaluate signal characteristics in frequency domain.
3. Assess the system stability and causality using ROC and Pole-Zero Plot.
4. Classify systems and analyse the signals using Transform techniques.
5. Describe and analyse the DT Signal/systems using DFT, DCT, DWT, FFT and Z-Transform.

CO-PO Articulation Matrix

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

UNIT-I

Continuous Time Signals: Introduction to signals, signal representations and classification.
Fourier Series: Exponential Fourier series, Amplitude and Phase spectra. Power Spectral Density.

UNIT-II

Fourier Transforms: Direct Fourier transforms, Inverse Fourier transforms, Existence, Frequency spectrum and properties of Fourier Transforms, FT of basic signals, Energy Spectral Density.

UNIT-III

Laplace Transforms: Laplace transforms. Region of convergence and its properties. Properties of Laplace transform, Inverse Laplace transform, Laplace transform of periodic signals.

UNIT-IV

Z–Transform: Direct Z-Transform, Region of convergence and its properties. Z–Transform properties. Inverse Z–Transform, Discrete Fourier Transform, Properties of Discrete Fourier Transform, FFT, DCT and DWT.

UNIT-V

Continuous & Discrete Systems: Introduction to systems, System classifications-Linear, Causal, Stable, Time- invariant, Impulse response, System transfer function, Distortion less system, Non-linear systems- Filters.

TEXT BOOKS:

1. B. P. Lathi, "Signals, Systems and Communications", 3rd Edition, BS Publications, 2008.
2. Simon Haykin, "Signals and Systems", 5th Edition, Wiley India, 2009.

SUGGESTED READING:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawad, "Signals and Systems", 2nd Edition, PHI, 2015.
2. M. J. Robert, "Fundamentals of signals and systems", McGraw Hill, 2008.

22CSC43

WEB PROGRAMMING LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. To build Strong expertise to develop front end application using HTML5 and CSS3.
2. To become proficient in Bootstrap concepts.
3. To comprehend NoSQL Databases and MongoDB.
4. To understand core features of JavaScript and React JS.
5. To learn Express JS and Node JS frameworks to develop responsive web applications.

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

1. Build interactive and user-friendly static frontend UI applications using HTML, CSS and JavaScript.
2. Develop a web page based on Bootstrap.
3. Create Single Page and multi-page Applications using React, Node JS, Express JS and MongoDB.
4. Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone.
5. Use MongoDB concepts in Web Application Development using React JS.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:

(Note: Setup a Node JS server in Visual Studio to run the following experiments applications)

1. Build a basic static website using HTML5, CSS3 and bootstrap components.
2. Navigate to a particular element using DOM (Document Object Model) and modify it. Also understand thedifference between a real DOM and Virtual DOM.
3. Explore the new features introduced in ES5 to recent.
4. Write React Class and functional Components and pass props.
5. Write code to illustrate the lifecycle of React JS.
6. Write code to understand different hooks in React JS.
7. Implement Routing in React JS.
8. Develop a CRUD Application using MERN.
9. Design a college admission enquiry form and store details in mongoDB using states and events as a ReactFunctional Component.
10. Develop an Attendance Management Module for student attendance entry and Verifying attendance bystudents using MongoDB, Express JS, React JS and Node JS (MERN).

TEXTBOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and React JS Web Development", 2nd Edition, Perason Education, 2018.
2. Alex Banks, Eve Porcello, "Learning React Modern Patterns for Developing React Apps", 2nd Edition, Oreilly Media Inc, 2020.

SUGGESTED READING:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React,and Node", 2nd Edition, Apress Publications, 2019.

ONLINE RESOURCES:

1. https://github.com/eggheadio/illustrated-dev/blob/master/content/explainers/react-vdom/index.mdx
2. https://legacy.reactjs.org/docs/jsx-in-depth.html#props-default-to-true
3. https://react.dev/learn/tutorial-tic-tac-toe

22CSC13N

DATABASE SYSTEMS LAB

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to
1. Become familiar with the concepts of structured query language.
2. Understand about programming language / structured query language (PL/SQL).
3. Learn database constraints, DCL, TCL and advanced SQL commands.
4. Familiarize with cursors, triggers, exceptions, procedures and functions in PL/SQL.

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Outline the built-in functions of SQL and Create, Alter and Drop table.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct
   Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, savepoint commands and formulate the Queries for Creating Views and constraints.
4. Develop queries using Joins, Sub-Queries.
5. Develop PL/SQL code to create stored procedures, functions, cursors and exceptions.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:
1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using DDL and DML statements.
3. Queries using Group By, Order By, Having Clauses and set operations.
4. Queries on Controlling Data: Commit, Rollback and Save point.
5. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
6. Queries using Joins, views and Sub-Queries.
7. Write PL/SQL code using Basic Variables, bind and substitution variables.
8. Write PL/SQL code using Control Structures.
9. Write PL/SQL code using Procedures, Functions.
10. Write PL/SQL code using Cursors, Triggers and Exceptions.

TEXT BOOKS:
1. "Oracle: The complete Reference", Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
4. Steven Feuerstein, "Oracle PL/SQL Programming", 6th Edition, O'reilly publications, 2014.

SUGGESTED READING:
1. "The Language of SQL (Learning)" by Larry Rockoff.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs91/preview