

K.L.N. COLLEGE OF ENGINEERING

Pottapalayam – 630 612, Sivagangai District

(An Autonomous Institution, Affiliated to Anna University, Chennai)



Estd: 1994

FIRST & SECOND YEAR CURRICULA AND SYLLABI

REGULATIONS 2020

For Under Graduate Program

B.Tech. – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

(For the students admitted from the academic year 2021-2022 onwards)



K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)



VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society.

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry.

VISION OF THE DEPARTMENT

To become a centre of Excellence in producing competent and futuristic professionals in Artificial Intelligence and Data Science through quality Education and Research to the Society and Industry.

MISSION OF THE DEPARTMENT

To produce intellectual, innovative and ethical professionals by imparting technical and industry oriented skills with ethical values in Artificial Intelligence and allied areas to pursue their career in Industry and Research.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To excel in professional career and pursue higher education in the field of artificial intelligence and data science.

PEO 2: To apply their knowledge and skills to develop innovative solutions for real world problem through lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 3: To excel as socially committed engineers or entrepreneurs with good communication and team work skills with high regard to ethical and moral values.

PSO 1: Ability to apply major key algorithms, techniques and theoretical findings in the field of Artificial Intelligence, Machine Learning and Deep Learning.

PSO 2: Ability to incorporate data science theories and methodologies into new research in data management, data visualization, and statistical analysis of data.



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PROGRAM OUTCOMES (POs)

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: 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.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: 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.

PO12: Life-Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



REGULATIONS 2020

For Under Graduate Program

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

- i. **Humanities and Social Sciences (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics and human values, Communication Skills and Management courses.
- ii. **Basic Sciences (BS) Courses** include Mathematics, Physics, and Chemistry.
- iii. **Engineering Sciences (ES) Courses** include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.
- iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.
- v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.
- vi. **Open Elective (OE) Courses** include courses from other departments which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.
- vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.
- viii. **Mandatory Courses (MC)** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc



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REGULATIONS 2020
CHOICE BASED CREDIT SYSTEM
B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CURRICULAM AND SYLLABUS I TO IV SEMESTERS

SEMESTER I

(Common to all B.E/ B.Tech Programmes)

| S. No | Course Code | Course Title | Category | Contact Periods | L | T | P | C |
|------------------|-------------|--|----------|-----------------|-----------|----------|-----------|-----------|
| THEORY | | | | | | | | |
| 1 | 20HS101 | English for Technical Communication | HS | 3 | 3 | 0 | 0 | 3 |
| 2 | 20BS101 | Fundamentals of Engineering Mathematics | BS | 4 | 3 | 1 | 0 | 4 |
| 3 | 20BS102 | Engineering Physics | BS | 3 | 3 | 0 | 0 | 3 |
| 4 | 20BS103 | Engineering Chemistry | BS | 3 | 3 | 0 | 0 | 3 |
| 5 | 20GE101 | Problem Solving using Python Programming | ES | 3 | 3 | 0 | 0 | 3 |
| PRACTICAL | | | | | | | | |
| 6 | 20BS1L1 | Basic Science Laboratory | BS | 3 | 0 | 0 | 3 | 1.5 |
| 7 | 20GE1L1 | Python Programming Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| 8 | 20GE1L2 | Industrial Practices Workshop | ES | 3 | 0 | 0 | 3 | 1.5 |
| TOTAL | | | | 26 | 15 | 1 | 10 | 21 |

SEMESTER II

| S. No | Course Code | Course Title | Category | Contact Periods | L | T | P | C |
|------------------|-------------|--|----------|-----------------|-----------|----------|-----------|-----------|
| THEORY | | | | | | | | |
| 1 | 20HS201 | Advanced Technical Communication (Common to all B.E / B. Tech programmes) | HS | 3 | 3 | 0 | 0 | 3 |
| 2 | 20BS201 | Laplace Transform and Advanced Calculus (Common to all B.E / B. Tech programmes) | BS | 4 | 3 | 1 | 0 | 4 |
| 3 | 20AD201 | Foundation for Data Science | PC | 3 | 3 | 0 | 0 | 3 |
| 4 | 20GE201 | Engineering Graphics (Common to all B.E / B. Tech programmes) | ES | 4 | 2 | 0 | 2 | 3 |
| 5 | 20GE205 | Basic Electrical and Electronics Engineering (Common to B.E CSE , B. Tech IT & B.Tech AIDS programmes) | ES | 3 | 3 | 0 | 0 | 3 |
| 6 | 20CS201 | Programming in C (Common to B.E EEE, B.E EIE, B.E. CSE, B.Tech IT & B.Tech AIDS programmes) | PC | 3 | 3 | 0 | 0 | 3 |
| PRACTICAL | | | | | | | | |
| 7 | 20HS2L1 | Communication Skills Laboratory (Common to B.E CSE, B.Tech IT , B.E MECH, B.E AUE & B.Tech AIDS programmes) | HS | 2 | 0 | 0 | 2 | 1 |
| 8 | 20CS2L1 | C Programming Laboratory (Common to B.E EEE, B.E EIE, B.E CSE ,B.Tech IT & B.Tech AIDS programmes) | PC | 4 | 0 | 0 | 4 | 2 |
| 9 | 20AD2L1 | Foundation for Data Science Laboratory | PC | 4 | 0 | 0 | 4 | 2 |
| TOTAL | | | | 30 | 17 | 1 | 12 | 24 |

SEMESTER III

| SL NO | COURSE CODE | COURSE TITLE | Category | Contact Periods | L | T | P | C |
|-----------------------------|-------------|--|----------|-----------------|-----------|----------|-----------|-----------|
| THEORY | | | | | | | | |
| 1 | 20BS303 | Discrete Mathematics | BS* | 4 | 3 | 1 | 0 | 4 |
| 2 | 20AD301 | Digital Principles and Computer Organization | ES | 4 | 3 | 1 | 0 | 4 |
| 3 | 20CS302 | Data Structures and Algorithms | PC* | 3 | 3 | 0 | 0 | 3 |
| 4 | 20HS301 | Universal Human Values | MC | 3 | 2 | 1 | 0 | 3 |
| THEORY CUM PRACTICAL | | | | | | | | |
| 5 | 20AD302 | Object Oriented Programming using Java | PC | 5 | 3 | 0 | 2 | 4 |
| PRACTICAL | | | | | | | | |
| 6 | 20CS3L1 | Digital Systems Laboratory | ES* | 4 | 0 | 0 | 4 | 2 |
| 7 | 20CS3L2 | Data Structures and Algorithms Laboratory | PC* | 4 | 0 | 0 | 4 | 2 |
| TOTAL | | | | 27 | 14 | 3 | 10 | 22 |

* Common to B.E CSE, B.Tech IT and B.Tech ADS Programme

SEMESTER IV

| SL NO | COURSE CODE | COURSE TITLE | Category | Contact Periods | L | T | P | C |
|-----------------------------|-------------|---|----------|-----------------|-----------|----------|-----------|-----------|
| THEORY | | | | | | | | |
| 1 | 20BS404 | Probability and Statistics | BS* | 4 | 3 | 1 | 0 | 4 |
| 2 | 20CS402 | Database Management Systems | PC* | 3 | 3 | 0 | 0 | 3 |
| 3 | 20AD401 | Embedded System and Internet of Things | PC | 3 | 3 | 0 | 0 | 3 |
| 4 | 20HS401 | Environmental Science and Engineering | HS | 2 | 2 | 0 | 0 | 2 |
| THEORY CUM PRACTICAL | | | | | | | | |
| 5 | 20CS404 | Operating Systems | PC* | 5 | 3 | 0 | 2 | 4 |
| 6 | 20AD402 | Data Visualization | PC | 5 | 3 | 0 | 2 | 4 |
| PRACTICAL | | | | | | | | |
| 7 | 20CS4L1 | Database Management Systems Laboratory | PC* | 4 | 0 | 0 | 4 | 2 |
| 8 | 20AD4L1 | Embedded System and Internet of Things Laboratory | PC | 4 | 0 | 0 | 4 | 2 |
| 9 | 20HS4L2 | Professional Communication Laboratory | EEC | 2 | 0 | 0 | 2 | 1 |
| TOTAL | | | | 32 | 17 | 1 | 14 | 25 |

* Common to B.E CSE, B.Tech IT and B.Tech ADS Programme

| | | | | | |
|----------------|--|----------|----------|----------|----------|
| 20HS101 | ENGLISH FOR TECHNICAL COMMUNICATION | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- This course is designed for entry level Engineering and Technology curriculum enabling the students to learn, acquire and apply for their learning and career.
- The course is aimed at providing effective skills for promoting communication skills through English.
- Students will benefit in conversing with the peers, faculty and fellow professionals.
- The outcome of this course contains refined level of English proficiency by acquiring all four skills, listening, speaking, reading and writing to prepare them for global readiness.

PRE-REQUISITE:NIL

UNIT I FOCUSING LANGUAGE DEVELOPMENT 9

Listening: Listening to TV News, Guest Lecturers, note – taking. **Speaking:** Pronunciation Common Vocabulary – Technical Vocabulary – Answering Peer Questions – Conversation with Teacher. **Reading:** News magazines, Reading for unfamiliar words, Variety of News Items. **Writing:** Word formation – Auxiliary verbs – Modal Verbs – Sentence Types – Affirmative, Negative, Interrogative, Concord – Dialogue Writing, Letter to Principal / Director – Instructions using Auxiliary.

UNIT II GRAMMAR AND TECHNICAL READING 9

Listening: Listening to Peer Conversations – Brief Speeches – Listening for Specific Information – Recap of Speeches. **Speaking:** Wh Questions, Day today conversations, Telephonic enquiries official/formal enquiries. **Reading:** Technical Essays – Identifying Sentence Types – Classifying the verb patterns. **Writing:** Tenses – Simple Present, Present Progressive, Present Perfect, Present Perfect Continuous – Voice – Active & Passive – Précis Writing – Essay Writing

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 9

Listening: TV interviews, Commentaries, Digital Videos for World Information. **Speaking:** Telephonic Conversation – Classroom Activities – Conversing Information. **Reading:** Coherence, Development of Thoughts. **Writing:** Tenses – Simple Past, Past Progressive, Past Perfect, Past perfect continuous – Impersonal Passive-Narrating the past events, Letter to friend/father about Industrial Visit/Functions held – Narrating the past experience using Impersonal Passive voice

UNIT IV READING AND LANGUAGE DEVELOPMENT

9

Listening: Listening to Dialects of English – British & American Regional. **Speaking:** Role Plays, Extempore, Responding to specific questions. **Reading:** Comprehensive passages, Reading for specific points. **Writing:** Tenses – Simple Future, Future progressive, Future Perfect, Future Perfect continuous – Definition – Phrases of Reason – Cause & Effect, Recommendations, Argumentative Essays, Letter to the Editor on Social Issues – Analytical Essays on Social hazards using Cause and Effect.

UNIT V EXTENDED WRITING

9

Listening: Listening to Technical Seminar speeches – Listening to achievers, eminent personalities – Dialects – Australian – African – Asian. **Speaking:** Welcome address, Compeering, Vote of Thanks, Peer debates. **Reading:** Texts on self-confidence, motivation, success path. **Writing:** Contracted forms, Conditionals, Articles, Preposition, Tense – „going to” - Error Spotting, Sequence Words – Rearranging – Writing a Book Review – Summary writing – Rearranging Sentences using Sequence Words, Note Making

TOTAL: 45 PERIODS**OUTCOMES:****On Completion of the course, the students should be able to:**

- Listen, Comprehend and Correspond with others at various contexts
- Speak legibly and fluently under various life-time situations by applying proper communication modules.
- Read and understand a variety of writings and technical text by analyzing the meaning and language.
- Apply clear and legible writing skills in error free style in coherent manner.
- Remember and use various communicative skills in precise and efficient way on technological contexts.
- Form situational conversations and technical writing styles for interpersonal and effective communication

TEXT BOOKS:

1. Board of Editors. Using English “A Course book for Undergraduate Engineers and Technologists”. Orient Black Swan Limited, Hyderabad, 2015
2. Richards, C. Jack. “Interchange Students” Book-2” New Delhi: CUP, 2015

REFERENCES:

1. Murphy, “Raymond English Grammar in Use with Answers: Reference and Practice for Intermediate Students”, Cambridge: CUP, 2004
2. Thomson, A.J. and Martinet, A.V. A Practical English Grammar, OUP, New Delhi:1986
3. Anne Laws, “Writing Skills”, Orient Black Swan, Hyderabad, 2011
4. Board of Editor, “English for Technical Communication”, Great Mind Publication, Chennai, 2018

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|----------------|--|---|---|---|---|
| 20BS101 | FUNDAMENTALS OF ENGINEERING MATHEMATICS | L | T | P | C |
| | | 3 | 1 | 0 | 4 |

OBJECTIVES:

- To relate various methods of Matrix Algebra to handle practical problems arising in the field of engineering.
- The main aim of this course is to achieve conceptual understanding and to retain the best traditions of Calculus.
- The syllabus is designed to provide the basic tools of Calculus of Single and Multivariable, mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.

PRE-REQUISITE :NIL

UNIT I MATRICES 12

Introduction to Matrices-Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a Quadratic form to Canonical form by Orthogonal transformation – Nature of Quadratic forms.

UNIT II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Differentiation of Polynomials, Exponential, Trigonometric, Hyperbolic, Logarithmic and Implicit functions- Maxima and Minima of functions of single variable

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Find the Eigen values and Eigen vectors to diagonalize a matrix, reduce quadratic form to canonical form.
- Apply the concept of limits, continuity and rules of differentiation to differentiate some standard functions and apply the techniques of differentiation to differentiate various types of functions.
- Understand the concepts of Concavity and Convexity by finding the Critical points, point of Inflection and to find Maxima and Minima functions of Single variable.
- Find the derivatives of functions of two variables and apply them to calculate the maxima and minima.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Apply various techniques to solve higher order differential equations with constant and variable coefficients.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan., "Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition, 2018

REFERENCES:

1. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015. [For units II & III].
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2006.
3. Wiley, "Calculus- International Student version", 10th Edition, Wiley India Pvt. Ltd, New Delhi 2017.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 9th Edition, 2014

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|----------------|----------------------------|---|---|---|---|
| 20BS102 | ENGINEERING PHYSICS | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To inculcate the fundamental knowledge in properties of matter and crystal physics.
- To enrich the knowledge on Laser, fiber optics and ultrasonics and their applications relevant to various streams of Engineering and Technology.
- To introduce quantum physics and its applications.

PRE-REQUISITE: NIL

UNIT I PROPERTIES OF MATTER 9

Elasticity – Hooke’s Law – Stress-strain diagram and its uses – Three modulus of elasticity (qualitative) – Poisson’s ratio – factors affecting elastic modulus and tensile strength – twisting couple – torsional pendulum: theory and experiment – bending of beams – bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – I -shaped girders

UNIT II LASER AND FIBER OPTICS 9

Lasers: Interaction of radiation with atomic energy states – Einstein’s A and B coefficients derivation – Population inversion – resonant cavity, optical amplification (qualitative) – solid state lasers – Nd:YAG laser, Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – losses associated with optical fibers – fiber optic sensors: pressure and displacement sensor

UNIT III ULTRASONICS 9

Ultrasonics – classification (qualitative) – properties – generation – magnetostriction and piezoelectric methods – detection of ultrasound – cavitations – velocity measurement – acoustic grating – Industrial applications (Drilling, Welding, Soldering and Cleaning) – SONAR – NDT – Pulse Echo system through Transmission and Reflection modes – A, B and C scan displays - Medical application – sonogram

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck’s theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – wave function and its physical significance – Schrödinger’s wave equation – time independent and time dependent equations – particle in a one- dimensional rigid box – tunneling (qualitative) – scanning tunneling microscope

UNIT V CRYSTAL PHYSICS 9

Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, lattice planes - Miller indices – Inter planar spacing in cubic lattice – coordination number and packing factor for SC, BCC, FCC, HCP structures – growth of single crystals: solution and melt growth techniques – Mechanisms of plastic deformation, slip and twinning

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Demonstrate the properties of elasticity and measure the different moduli of elasticity.
- Examine the characteristics of laser and optical fiber
- Apply the concepts of ultrasonics in engineering
- Explain black body radiation, properties of matter waves and Schrodinger equation
- Classify the Bravais lattices and different types of crystal structures
- Gain information on growth of crystals and deformations

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 2012.
2. B. K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2018.
3. V.Rajendran, "Engineering Physics", Tata McGraw Hill Education Private Limited, 2011.

REFERENCES:

1. D.Halliday, R. Resnick and J. Walker, "Principles of Physics", Wiley publisher, 10th Edition, 2015.
2. R.A.Serway and J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2014.
3. P.A.Tipler and G. Mosca, "Physics for Scientists and Engineers with Modern Physics", W.H.Freeman, 2007.
4. D.K.Bhattacharya and T. Poonam, "Engineering Physics", Oxford University Press, 2017

20BS103

ENGINEERING CHEMISTRY

L T P C
3 0 0 3**OBJECTIVES:**

- To make the students, familiar with boiler feed water requirements, related problems and water treatment techniques.
- To learn the principle of electrochemical cell, types of corrosion and its control.
- To develop an understanding of the basic concepts of phase rule and its applications to one and two component systems and appreciate the purpose and significance of alloys.
- To be familiar with different types of fuel and their characteristics and also functioning of energy storage devices.
- To understand the techniques of spectra and chromatography for analytical purpose

PRE-REQUISITE: NIL**UNIT I WATER AND ITS TREATMENT**

9

Characteristics of water; Hard water, Soft water, difference; Hardness – types of hardness, expression of hardness, units, removal of hardness (boiling, soda lime process), estimation of hardness of water by EDTA method (problems); Boiler feed water – requirements – disadvantages of using hard water in boilers (scale and sludge, priming and foaming, caustic embrittlement, boiler corrosion); Treatment of boiler feed water – internal treatment (carbonate, phosphate, and calgon conditioning) external treatment – ion exchange process, zeolite process; Purification of water - reverse osmosis, electro dialysis, Application of nanomaterials in water purification

UNIT II ELECTROCHEMISTRY AND CORROSION

9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential-oxidation potential- reduction potential, - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method – corrosion inhibitors. Metallic coating – Electroplating – Factors - Electroplating of Copper and Electroless plating of Nickel

UNIT III PHASE RULE AND ALLOYS

9

Phase rule - introduction, definition of terms with examples; One component system - water system; Reduced phase rule - two component system, classification, lead-silver system; Alloys – introduction, definition, properties of alloys, significance of alloying; Functions and effects of alloying elements; Heat treatment of steel - annealing, hardening, tempering, carburizing, nitriding; Ferrous alloys- nichrome and stainless steel (18/8); Non-ferrous alloys – brass and bronze

UNIT IV FUELS AND BATTERIES

9

Fuels – classification, characteristics; Petrol – characteristics, knocking, octane number; Diesel – characteristics, cetane number; Natural gas (CNG), LPG, Power alcohol, Biodiesel, Gasohol; Combustion of fuels – calorific value, GCV and NCV (Problems), calculation of theoretical air for combustion (Problems), Ignition temperature, explosive range, flue gas analysis (Orsat apparatus); Batteries – primary and secondary batteries, lead-acid battery,

lithium ion battery, Fuel cell (hydrogen oxygen fuel cell).

UNIT V ANALYTICAL TECHNIQUES

9

Spectroscopic techniques – UV-visible (Principle and Instrumentation – Block Diagram only and applications), IR (Principle and Instrumentation – Block Diagram only and applications), ^1H NMR ((Principle and Instrumentation – Block Diagram only) – Chromatography – HPLC - Flame photometry – Estimation of sodium by Flame photometry

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Identify the problems of hardness of water in boilers and to treat water by various methods.
- Construct electrochemical cell and apply Nernst equation for an electrochemical cell and identify various methods to control corrosion.
- Analyse the phase diagram of one component and two component system and describe the various methods of heat treatment of steel.
- Categorise the various types of fuels by their characteristics and analyse the flue gas by Orsat's method.
- Illustrate the working of lead acid battery, lithium ion battery and fuel cell.
- Describe the instrumentation and working of UV, IR, ^1H NMR, HPLC, and flame photometry.

TEXT BOOKS:

1. P.C. Jain and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2017
2. S.S Dara and S.S Umare, "A Text Book of Engineering Chemistry", S.Chand & Company Limited, 20th Edition, 2018

REFERENCES:

1. Shashi Chawla, "A Textbook of Engineering Chemistry", Dhanpat Rai & CO. (PVT) LTD, New Delhi, 2012.
2. B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal, "Principles of Physical Chemistry", Vishal Publishing Co., Punjab, 47th Edition, 2017.
3. G Palanna, "Engineering Chemistry", McGraw Hill Education (India) PVT, LTD, Chennai, 2017.
4. Dr. Sunita Rattan, "A Textbook of Engineering Chemistry", S.K.Kataria & Sons Delhi,

| | | | | | |
|----------------|---|---|---|---|---|
| 20GE101 | PROBLEM SOLVING USING PYTHON PROGRAMMING | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To know the basics of Computers and algorithmic problem solving
- To understand Python programs with conditional and looping constructs.
- To define Python functions and strings.
- To use Python data structures – lists, tuples, sets and dictionaries.
- To do input/output with files in Python.

PRE-REQUISITE:NIL

UNIT I COMPUTER FUNDAMENTALS AND PROBLEM SOLVING 9

Introduction to Computer System – Block Diagram of Computer, Types of Memory, I/O Devices, Application Programs, System Programs – Loader, linker, assembler, compiler, interpreter, Programming process – source code to executable code, Problem Solving Strategies – Problem analysis, Algorithms, Flow Charts, Pseudo Code. Illustrative problems: odd or even number, Leap year, Biggest of three numbers, square root of a number, Sum of n numbers, Armstrong number, Palindrome, Fibonacci Series, Prime number, Bubble Sort and Linear Search

UNIT II DATA, EXPRESSIONS, CONTROL FLOW STATEMENTS 9

Python interpreter and interactive mode, values and types – int, float, boolean, string, and list, variables, expressions, statements, tuple assignment, operators and precedence of operators, comments, Control Flow Statements – Conditionals – conditional (if), alternative (if-else), chained conditional (if-elif-else), Iteration – state, while, for, break, continue, pass, Illustrative programs – exchange the values with and without using temporary variables, circulate the values of n variables, distance between two points

UNIT III FUNCTIONS, STRINGS 9

Functions – function definition and use, flow of execution, parameters and arguments, function composition, Fruitful functions – return values, parameters, local and global scope, recursion, Strings – string slices, immutability, string functions and methods, string module, Illustrative programs – square root, GCD, exponentiation, Factorial of a number, linear search, binary search

UNIT IV LISTS, TUPLES, SETS, DICTIONARIES 9

Lists – list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, Lists as arrays, Tuples – tuple assignment, tuple as return value, Sets - Creating a set, Modifying a set, Removing elements from a set, Set operations- Set Union, Set intersection, Set difference, Set membership test, Iterating through a set, Set methods, Built-in functions with set, Frozenset - Dictionaries – operations and methods, Advanced list processing –List comprehension, Illustrative programs – selection sort, insertion sort, Matrix addition and subtraction, sum an array of numbers

UNIT V FILES, MODULES, PACKAGES

9

Files and exception – text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages – Math and Rand, Illustrative programs – word count, copy file, merge two files

TOTAL: 45 PERIODS**OUTCOMES:****On Completion of the course, the students should be able to:**

- Explain Components of a Computer System, types of programming languages, types of software with examples and purpose.
- Perform problem analysis, use algorithms and prepare flow charts, pseudo code for solving simple problems.
- Use Conditional, iteration constructs of python programming and apply to solve simple problems.
- Use Functions, recursive function, String functions in python programming and apply to perform linear and binary search.
- Explain the various operations for manipulating Tuples, Sets, Dictionaries and Use List to perform simple and sorting operations.
- Explain file handling operations, exception handling, modules and packages and illustrate programs for word count, file copy, merge operations and exception handling.

TEXT BOOKS:

1. E. Balagurusamy, “Problem solving and Python Programming”, First edition, McGraw Hill Education (India) Private Limited, 2017.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O.,Reilly Publishers, 2016
3. (<http://greenteapress.com/wp/think-python/>)

REFERENCES:

1. Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, 2nd Edition, BPB Publications, 2020.
2. John V Guttag, “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, 2nd Edition, PHI Publisher, 2017.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3.6”, 3rd edition, Shroff/O” Reilly Publishers, 2018.
6. Dr. A. Kannan, Dr. L. Sai Ramesh, “Problem Solving and Python Programming”, Updated Edition, United Global Publishers Pvt. Ltd., April 2018

| | | | | | |
|---------------------------|---------------------------------|---|---|---|-----|
| 20BS1L1 | BASIC SCIENCE LABORATORY | L | T | P | C |
| | | 0 | 0 | 3 | 1.5 |
| PHYSICS LABORATORY | | | | | |

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in Optics, properties of matter and liquids.

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS

(Any five to be carried out & one demonstration experiment)

1. Determination of Rigidity modulus – Torsional Pendulum.
2. Determination of Young's modulus – Non Uniform Bending.
3.
 - a. Determination of wavelength and particle size using diode laser.
 - b. Determination of acceptance angle in an optical fiber.
4. Determination of velocity of sound and compressibility of liquid using ultrasonic interferometer
5. Determination of band gap of a semiconductor diode
6. Determination of thickness of a thin wire – Air wedge method
7. Determination of dispersive power of a prism – Spectrometer*
8. Determination of wavelength of mercury spectrum – Spectrometer grating.

*Demonstration experiment

OUTCOMES:

On Completion of the course, the students should be able to:

- Evaluate moment of inertia of a disc and rigidity modulus for thin wire using Torsional pendulum.
- Appraise Young's modulus of material of the given beam by Non-Uniform bending method.
- Measure the wavelength of laser light, Particle size and basic parameter of optical fiber using Semiconductor diode LASER.
- Estimate velocity of ultrasound and compressibility of liquid.
- Estimate the wavelength of the prominent spectral lines.
- Utilize experiment kits for useful applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

| S.No. | NAME OF THE EQUIPMENT | Qty. |
|-------|-------------------------------------|------|
| 1 | Torsional pendulum set | 6 |
| 2 | Travelling microscope & accessories | 6 |
| 3 | Laser kit | 6 |
| 4 | Ultrasonic interferometer | 6 |
| 5 | Semiconductor band gap kit | 6 |
| 6 | Air wedge set up | 6 |
| 7 | Spectrometer & prism | 6 |
| 8 | Spectrometer & Grating | 6 |

CHEMISTRY LABORATORY**OBJECTIVES:**

- To make the students to acquire practical skill in the determination of water quality parameters through volumetric analysis.
- To have hands on experience in using instruments like pH meter, conductivity meter, potentiometer.
- To acquaint the students with the determination of molecular weight of polymer by viscometer.

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS
Any Five experiments to be given

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of dissolved oxygen content of water sample by Winkler's method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of iron content of the given solution using potentiometer.
6. Conductometric titration of a strong acid Vs a strong base.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Corrosion Experiment – Weight Loss Method.
10. Estimation of sodium present in water using flame photometer.

TOTAL(Physics & Chemistry): 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Estimate the Chemical quality parameter of a water sample.
- Estimate the strength of acid by conductometric and pH metric titration.
- Estimate the strength of oxidisable material present in given sample by potentiometry.
- Determine the molecular weight of polymer by Ostwald viscometer.
- Demonstrate the rate of corrosion by weight loss method.

REFERENCE:

1. Vogel's "Text book of quantitative chemical analysis" (8th edition, 2014)

LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS

| S.No. | NAME OF THE EQUIPMENT | Qty. |
|-------|-----------------------|------|
| 1 | Burette | 30 |
| 2 | Pipette | 30 |
| 3 | Beaker (100ml) | 30 |
| 4 | Conical Flask (250ml) | 30 |
| 5 | Conductivity meter | 10 |
| 6 | Potentiometer | 10 |
| 7 | pH meter | 10 |
| 8 | Viscometer | 10 |
| 9 | Flame Photometer | 1 |
| 10 | Electronic Balance | 1 |

| | | | | | |
|----------------|--------------------------------------|----------|----------|----------|----------|
| 20GE1L1 | PYTHON PROGRAMMING LABORATORY | L | T | P | C |
| | | 0 | 0 | 4 | 2 |

OBJECTIVES:

- To write, test, and debug simple Python programs using conditional statements.
- To implement Python programs using loops.
- To use functions for structuring Python programs.
- To implement Python programs using lists.
- To write Python programs for implementing file operations.

PRE-REQUISITE : NIL

LIST OF PROGRAMS

1. Biggest of three numbers, odd or even number, Leap year.
2. GCD, Armstrong Number, Palindrome, Fibonacci Series, Prime number
3. Find the square root and exponentiation of a number with and without built-in functions
4. Linear search and Binary search using Recursion.
5. Find the maximum of a list of numbers
6. Selection sort, Insertion sort
7. First n prime numbers
8. Transpose of a Matrix
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Merge two files

TOTAL: 60 PERIODS

PLATFORM NEEDED : Python 3 interpreter for Windows / Linux

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Develop simple Python programs using conditional and iterative constructs.
- Develop simple Python programs using built-in functions and user-defined functions.
- Develop a Python program using recursion to implement linear and binary search.
- Develop a Python program using list to implement selection and insertion sort.
- Develop Python programs to implement matrix operations.
- Develop a Python program to implement file handling

| | | | | | |
|----------------|--------------------------------------|----------|----------|----------|----------|
| 20GE1L2 | INDUSTRIAL PRACTICES WORKSHOP | L | T | P | C |
| | | 0 | 0 | 3 | 1.5 |

OBJECTIVES:

- To provide exposure to the students with Hands on Experience on various Basic Industrial Practices in Civil, Mechanical, Electrical and Electronics Engineering.

PRE-REQUISITE:NIL

**GROUP A (CIVIL & MECHANICAL)
LIST OF EXPERIMENTS**

I. CIVIL ENGINEERING PRACTICE

UNIT I CARPENTRY PRACTICE

1. Study of carpentry tools.
2. Preparation of Cross lap joint
3. Preparation of Dovetail joint
4. Preparation of T joint

UNIT II PLUMBING PRACTICE

1. Study of plumbing tools, pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
2. Exercise on Preparation of plumbing line sketches for water supply and sewage works.
3. Exercise on providing of basic water line connection for a residential house using plumbing components.
4. Exercise on providing Water line pipe connections for household utilities like water heater, wash basin etc.,

II. MECHANICAL ENGINEERING PRACTICE

UNIT III SHEET METAL PRACTICE

1. Study of sheet metal forming tools.
2. Preparation of a Model of rectangular tray.
3. Preparation of a Model of Conical Funnel.

UNIT IV MACHINING PRACTICE

1. Study of machining tools.
2. Exercise on Simple turning, Facing, Chamfering
3. Exercise on Taper turning.
4. Exercise on Drilling and Tapping.

UNIT V METAL JOINING PROCESS

1. Study of welding tools.
2. Exercise to join two metal plates by single butt joint using arc welding.
3. Exercise to join two metal plates by T Fillet joint using arc welding.
4. Exercise to join two metal plates by lap joint using arc welding

DEMONSTRATION

1. Gas welding process.
2. Refrigeration and Air conditioning process.

GROUP B (ELECTRICAL & ELECTRONICS) LIST OF EXPERIMENTS

I. ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter.
2. Measurement of Power consumption for CFL, Fluorescent Lamp, LED Lamp and Incandescent lamp.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

II. ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components – Resistor colour coding, Capacitor, Inductor- Measurement using LCR meter, Transistor & Diode – Terminal identification using Multimeter.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Measurement of AC signal parameter (peak-peak, rms value, period & frequency) using CRO and AFO.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR

TOTAL: 45 PERIODS

| LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS | | |
|---|--|--|
| CIVIL | | |
| S. No | Component Name | No. of Components |
| 1 | Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, coupling, unions, elbows, plugs and other fittings | 15 sets |
| 2 | Carpentry Vice (fitted to work bench) | 15 nos |
| 3 | Standard wood working tools | 15 sets |
| 4 | Models of industrial trusses, door joints, furniture joints | 5 each |
| 5 | Power Tools a. Rotary Hammer b. Demolition Hammer c. Circular Saw d. Planer e. Hand Drilling Machine f. Jigsaw | 2 nos 2 nos 2 nos 2 nos 2 nos 2 nos |
| MECHANICAL | | |
| 1 | Arc welding transformer with cables and holders | 5 nos |
| 2 | Welding booth with exhaust facility | 5 nos |
| 3 | Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 sets |
| 4 | Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 nos |
| 5 | Centre Lathe | 2 nos |
| 6 | Power Tool: Angle Grinder | 2 nos |
| 7 | Study purpose items: Refrigerator and Air Conditioner | One each |
| ELECTRICAL | | |
| 1 | Assorted electrical components for house wiring | 10 sets |
| 2 | Electrical measuring instruments | 10 sets |
| 3 | Study purpose items: Iron box, fan and regulator, emergency lamp | 1 each |
| 4 | Megger (250V/500V) | 1 no. |
| 5 | Power Tools | |

| | | |
|--------------------|--|------------|
| | a. Range Finder | 2 nos |
| | b. Digital Live-wire detector | 2 nos |
| ELECTRONICS | | |
| 1 | Soldering guns | 10 nos |
| 2 | Assorted electronic components for making circuits | 50 nos |
| 3 | Small PCBs | 10 nos |
| 4 | Multimeters | 10 nos |
| 5 | Regulated of power supply, CRO | 1 no. each |

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Prepare different carpentry joints.
- Prepare pipe connections with different joints for domestic applications.
- Make the models using sheet metal works.
- Carry out the basic machining operations.
- Prepare joints using welding equipment"s.
- Demonstrate on gas welding, refrigeration and air conditioning processes.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices

| | | L | T | P | C |
|---------|----------------------------------|---|---|---|---|
| 20HS201 | ADVANCED TECHNICAL COMMUNICATION | 3 | 0 | 0 | 3 |

OBJECTIVES:

- This course is designed for Engineering and Technology curriculum enabling the students to learn, acquire and apply updated elements of English communication.
- The course is aimed at providing effective skills for procuring communication skills for business and advanced technology.
- Students will benefit by learning the four skills – Listening, Speaking, Reading and Writing – to meet the global requirements for their career and higher studies.

PRE-REQUISITE:NIL

UNIT I TECHNICAL WRITING 9

Listening: Listening to audio-visuals on personal Interviews, Speeches from Company CEOs, TV Debates. **Speaking:** Wishing, Greeting, Enquiring Hobbies. **Reading:** Editorials, Letter to the Editor Columns, Technical Papers. **Writing:** Analytical writings, Emphasis Techniques, Letter Writing – Business Correspondence, Abstract Writing, Common Errors, Footnotes, Compound words, Preparation of Agenda

UNIT II BUSINESS ENGLISH AND LANGUAGE DEVELOPMENT 9

Listening: Listening to Audio-Visual documentary, TV Programs of Celebrities Forum. **Speaking:** Self-Expression, Introducing the fellow students, Talking about celebrities, leaders **Reading:** Company Correspondence, Business Correspondence, Technical Text for Vocabulary **Writing:** Bibliography, Sentence Completion, Cloze exercises, Verbal Analogy, Letter – Business enquiry orders, payments, Minutes Preparation

UNIT III VISUAL BASED LANGUAGE DEVELOPMENT 9

Listening: Visuals on Group Discussion-Understanding the nuances of GD – Approach – Content – Methodology. **Speaking:** Discussing main points on burning issues, Social issues – Expressing ideas and suggestions. **Reading:** Etiquettes of Non-Verbal Communication. **Writing:** List of common expressions for specified situations – Sentence linkers – Formal Expressions – Suggestions – Reported Speech - Letter to the Editor on Common Issues – Writing the Points in Indirect Form – Check Lists – Numerical Expressions

UNIT IV EMPLOYABILITY CORRESPONDENCE 9

Listening: Listening to Visuals of Technical Paper presentation – Technical and HR interviews **Speaking:** Peer-to-Peer Interview – Mock Interview – Telephone Conversations. **Reading:** Comparative Analyses – Instructions on Public Spots – Time Management concepts – Email Correspondence. **Writing:** Compare and Contrast – Cause and Effect – Purpose and Function – Job Application Letter – Drafting Resume / CV,– Inferring the graphical / Pictorial representations – Bar chart – Pie chart, Instruction – common and technical instructions for a process or a component

UNIT V TECHNICAL REPORT WRITING

9

Listening: Key note speeches – Annual Reports of institutions / companies. Speaking: Answering to the Mock Panel Interview – Sharing of interview experiences – presenting a Technical Paper. Reading: Annual Reports – Company Reports – Newspaper reports – Comprehension passages. Writing: Homophones – Abbreviations and Acronyms – SI Units – Report Writing with recommendations – Inferring the Graph – Flow Chart – Tables – Technical Papers

TOTAL: 45 PERIODS**OUTCOMES:****On Completion of the course, the students should be able to:**

- Listen, Understand and create technical correspondence at advanced level
- Respond or answer to the contextual questions, interview questions, form instructions, draft reports
- Speak and analyze social issues, come out with effective ideas for discussion, understand the passages for meaning and vocabulary
- Assess error free technical writings, create legible and coherent technical papers, derive ideas of the given texts in a precise form
- Remember the updated elements of communication skills, nuances of non-verbal communication, business communication
- Create technical instructions, process instructions, self-appraisals, Resumes, reports on various situations

TEXT BOOKS:

1. Board of editors. "Fluency in English A Course book for Engineering and Technology". Orient Blackswan, Hyderabad: 2016
2. Raman, Meenakshi and Sharma, Sangeetha "Technical Communication Principles and Practice". Oxford University Press: New Delhi, 2014.

REFERENCES:

1. Booth-L. Diana, "Project Work", Oxford University Press, Oxford: 2014
2. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford: 2007
3. Means, L. Thomas and Elaine Langlois, "English & Communication For Colleges". Cengage Learning, USA: 2007
4. Board of Editor, "Advanced Technical Communication", Great Mind Publication, Chennai : 2019.

| | | | | | |
|----------------|--|---|---|---|---|
| 20BS201 | LAPLACE TRANSFORM AND ADVANCED CALCULUS | L | T | P | C |
| | | 3 | 1 | 0 | 4 |

OBJECTIVES:

- To make the student familiar with topics such as Multiple Integrals, Vector Calculus, Analytic Functions, Complex Integration and Laplace Transform.
- To learn the concept of basic Vector Calculus which can be widely used for Modeling the various laws of Physics.
- To understand the various methods of Complex Analysis and Laplace Transform can be used for efficiently solving the problems that occur in various branches of Engineering disciplines

PRE-REQUISITE:NIL

UNIT I LAPLACE TRANSFORM 12

Existence Conditions – Transforms of Elementary Functions – Transform of Unit Step Function and Unit Impulse Function – Basic Properties – Shifting Theorems -Transforms of Derivatives and Integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of Periodic Functions – Application to Solution of Linear Second Order Ordinary Differential Equations with Constant Coefficients

UNIT II MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in Polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of Variables in Double and Triple integrals

UNIT III VECTOR CALCULUS 12

Gradient and Directional Derivative – Divergence and Curl - Vector Identities – Irrotational and Solenoidal Vector fields – Line Integral over a Plane curve – Surface Integral - Area of a Curved Surface - Volume Integral – Green’s, Gauss divergence and Stoke’s theorems – Verification and Application in evaluating Line, Surface and Volume Integrals.

UNIT IV ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions $w = z+c$, cz , $1/z$, z^2 -Bilinear transformation

UNIT V COMPLEX INTEGRATION 12

Line integral – Cauchy’s Integral Theorem – Cauchy’s Integral Formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue Theorem – Application of Residue Theorem for Evaluation of Real Integrals – Use of Circular Contour

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Understand the properties of Laplace transforms and to find the Laplace transform of some standard functions.
- Apply Laplace transform and inverse transform to solve the initial value problems.
- Solve the multiple integrals and apply the concept to find areas, volumes.
- Evaluation of line, surface and volume integrals using Green's, Gauss and Stokes theorems.
- Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves.
- Evaluation of Contour Integrals using Cauchy's Integral and Residue theorems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan., "Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition 2018

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2006.
2. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 9th Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics II", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Sastry, S.S. "Engineering Mathematics", Vol.I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014

| | | | | | |
|----------------|-------------------------------------|---|---|---|---|
| 20AD201 | FOUNDATIONS FOR DATA SCIENCE | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- Learn the data analysis basics with Python
- Study Data Analysis and interpretation with Numpy on statistical parameters
- Understand various methods of Data Preparation and Manipulation with Pandas
- Learn Data Visualization using matplotlib and seaborn
- Learn Machine learning fundamentals concepts such as Feature Engineering and various techniques

PRE-REQUISITE: NIL

UNIT I INTRODUCTION TO DATA ANALYSIS 9

Data Analysis - Mathematics and Statistics Basic Concepts - The Data Analysis Process - Data Extraction - Data Pre-processing/Cleaning - Data Preparation/Visualization - Data Modelling / Visualization - Quantitative and Qualitative Analysis - Errors and Debugging - Profiling and Timing Code

UNIT II INTRODUCTION TO NUMPY 9

Python data types - NumPy Arrays with Computations - Aggregations: Min, Max, and Everything In Between-Broadcasting - Comparisons, Masks, and Boolean Logic - Sorting Arrays - Structured Data with NumPy's Arrays

UNIT III DATA MANIPULATION WITH PANDAS 9

Introducing Pandas Objects - Data Indexing and Selection - Operating on Data in Pandas - Handling Missing Data - Hierarchical Indexing - Combining Datasets - Vectorized String Operations - Working with Time Series - High-Performance Pandas: eval() and query()

UNIT IV VISUALIZATION WITH MATPLOTLIB 9

Various Plots - Simple Line - Scatter Plots - Error Visualization - Density and Contour Plots - Histograms, Binnings, and Density - Customizing Plots-Multiple Subplots - Three-Dimensional Plotting in Matplotlib - Geographic Data with Basemap - Visualization with Seaborn

UNIT V MACHINE LEARNING FUNDAMENTALS 9

Machine Learning concepts using Scikit-learn- Hyperparameters and Model Validation - Feature Engineering - Basics of Classification, Clustering - Support Vector Machines - Decision Trees and Random Forests- Principal Component Analysis

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Understand the various analysis methods in Numpy and Pandas
- Perform calculations that measure the central tendency and dispersion of data
- Solving the problems based on Time series analysis data
- Visualize various statistical quality control charts
- Apply the concepts of various machine learning techniques to solve problems

TEXT BOOKS:

1. Jake VanderPlas, 2016, Python Data Science Handbook: Essential Tools for Working with Data, 1 sted, O'Reilly Media, Inc

REFERENCES

1. Nelli, F 2015, Python Data Analytics, 1 sted, Apress, USA.
2. McKinney, W 2017, Python for Data Analysis, 2nd ed, O'Reilly Media, Inc.
3. John V Guttag 2013, Introduction to Computation and Programming Using Python, Revised and Expanded Edition, MIT Press.
4. Timothy A. Budd 2015, Exploring Python, Mc-Graw Hill Education Private Ltd. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016

20GE201

ENGINEERING GRAPHICS

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

OBJECTIVES:

- To develop graphic skills for communication of concepts, ideas and design of engineering products.
- To expose national standards related to technical drawings

PRE-REQUISITE:NIL

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PROJECTION OF POINTS AND LINES 6+6

Orthographic projection – Principles - Principal planes - Projection of points in all quadrants - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method

UNIT II PROJECTION OF PLANE SURFACES 6+6

Projection of planes (Polygonal and Circular surfaces) inclined to both the principal planes by rotating object method

UNIT III PROJECTION OF SOLIDS 6+6

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+6

Sectioning of simple solids in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section - Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone

UNIT V ISOMETRIC PROJECTION AND FREEHAND SKETCHING 6+6

Principles of Isometric Projection – Isometric scale – Isometric projections of simple solids - truncated Prisms and Pyramids. Visualization concepts and Free Hand sketching: Principles – Representation of Three-Dimensional objects – Layout of views - Freehand sketching of multiple views from pictorial views of objects

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Familiarize with the fundamentals and standards of Engineering graphics.
- Draw the orthographic projections of points, lines and planes.
- Draw the projections of simple solids like prisms, pyramids, cylinder and cone.
- Draw the projections of sectional views of solids and develop its lateral surfaces.
- Draw the isometric projection of simple objects, truncated prism and pyramids.
- Draw the free hand sketching of simple objects.

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 30th Edition, 2017.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2018.

REFERENCES

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education, 3rd Edition, 2012.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001: Technical drawings - General principles of presentation.
4. IS 11669 – 1986 : General principles of dimensioning on technical drawings.
5. SP 46 (2003): Engineering Drawing Practice for Colleges.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

SPECIAL POINTS APPLICABLE TO EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

| | | | | | |
|----------------|--|--------|--------|--------|--------|
| 20GE205 | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Qualitative Treatment only) | L 3 | T 0 | P 0 | C 3 |
|----------------|--|--------|--------|--------|--------|

OBJECTIVES:

- To learn the fundamental laws, theorems of electrical circuits and also to analyze them.
- To study the basic principles of electrical machines and their performances.
- To study the different energy sources and their utilizations.
- To study the fundamentals of electronic circuits.
- To understand the principles and operations of operational amplifiers

PRE-REQUISITE: NIL

UNIT I ELECTRICAL CIRCUITS ANALYSIS 9

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, -star delta conversion

UNIT II ELECTRICAL MACHINES 9

DC and AC Rotating Machines: Types, Construction, principle, Emf and torque equation, Basics of Stepper Motor- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation

UNIT III UTILIZATION OF ELECTRICAL POWER 9

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator -Electric circuit, construction and working principle. Protection-need for earthing. Energy Tariff calculation for domestic loads

UNIT IV ELECTRONIC CIRCUITS 9

Semi conductors, Types -PN Junction-VI Characteristics of Diode, zener diode, BJT- operations of PNP and NPN transistors- Transistors configurations –Common Base, Common Emitter &Common Collector configurations- Amplifiers

UNIT V OPERATIONAL AMPLIFIERS AND DIGITAL ELECTRONICS 9

Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC, Number Systems, Complements-1's and 2's Complements- Basic Digital Logic gates, Universal gates- NAND and NOR Implementation

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Discuss the essentials of electric circuits and analysis
- Solve the various network theorems using different methodologies.
- Discuss the basic operation of electric machines and transformers.
- Understand the renewable sources and common domestic loads.
- Discuss the basics of semiconductor devices and applications.
- Explain about applications of Op-amps and basics of digital circuits

TEXT BOOKS:

1. D.P. Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, Mc Graw Hill, 2019, Fourth Edition.
2. M.S. Sukhija and T.K. Nagsarkar, “Basic Electrical and Electronic Engineering”, Oxford, 2019.

REFERENCES

1. S.B. Lal Seksena and Kaustuv Dasgupta, “Fundamentals of Electrical Engineering”, Cambridge, 2017
2. B.L Theraja, “Fundamentals of Electrical Engineering and Electronics”. Chand & Co, 2018.
3. S.K.Sahdev, “Basic of Electrical Engineering”, Pearson, 2019.
4. John Bird, “Electrical and Electronic Principles and Technology”, Sixth Edition, Elsevier, 2017.
5. Mittle, Mittal, “Basic Electrical Engineering”, 2nd Edition, Tata McGraw-Hill Edition,2017.
6. C.L.Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy”, New Age international pvt.ltd., Revised 4th Edition 2018

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|----------------|-------------------------|---|---|---|---|
| 20CS201 | PROGRAMMING IN C | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To understand the basic C programming constructs.
- To learn about usage of arrays and strings.
- To understand the concepts of functions, pointers, structures and unions.
- To expose to file handling operations in C

PRE-REQUISITE:NIL

UNIT I BASICS OF C PROGRAMMING

9

Introduction to programming paradigms– Structure of C program– C programming– Data Types, Storage classes, Constants, Enumeration Constants – Keywords, Operators– Precedence and Associativity, Expressions – Input/output statements, Assignment statements –Decision making statements, Switch statement, Looping statements –Pre-processor directives – Compilation process

UNIT II ARRAYS AND STRINGS

9

Introduction to Arrays– Declaration, Initialization –One dimensional array –Example Program– Computing Mean, Median and Mode, Two dimensional arrays –Example Program– Matrix Operations (Addition, Scaling, Determinant and Transpose), String operations– length, compare, concatenate, copy –Selection sort, linear and binary search

UNIT III FUNCTIONS AND POINTERS

9

Introduction to functions– Function prototype, function definition, function call, Built- in functions (string functions, math functions), Recursion, Example Program– Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions –Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers – Array of pointers, Example Program– Sorting of names, Parameter passing– Pass by value, Pass by reference, Example Program– Swapping of two numbers and changing the value of a variable using pass by reference

UNIT IV STRUCTURES AND UNIONS

9

Structure – Nested structures, Pointer and Structures, Array of structures, Example Program – using structures and pointers, typedef, Self referential structures, Union, Dynamic memory allocation, Illustrative programs – allocating block of memory, sum of n numbers using malloc, calloc

UNIT V FILE PROCESSING

9

Files – File operations, Types of file processing– Sequential access, Random access
 Sequential access file - Example Program– Finding average of numbers stored in sequential
 access file, Random access file -Example Program– Transaction processing using random
 access files, Command line arguments

TOTAL: 45 PERIODS**OUTCOMES:**

On Completion of the course, the students should be able to:

- Use basic constructs of C programming to develop simple programs.
- Analyze the one dimensional and two dimensional arrays and develop programs to implement operations such as addition, scaling, Determinant and Transpose.
- Utilize string operations such as length, compare, concatenate and examine sorting and searching algorithm.
- Illustrate simple examples for functions and pointers and develop programs to implement pointer arithmetic, arrays with pointers and advanced concepts of functions.
- Illustrate simple programs for structures and unions and design real time application programs.
- Analyze file operations and develop programs to implement various file access procedures.

TEXT BOOKS:

1. Balagurusamy, E, "Programming in ANSI C", Eighth Edition, Tata Mcgraw-Hill, 2019.
2. Yashavant Kanetkar, "Let Us C", BPB Publications, 17th Edition, 2020.
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015

REFERENCES

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Education India, 2015.
2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt. Ltd., 2011.
3. PradipDey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
4. Byron Gottfried, "Schaum"s outlines- Programming with C", McGraw-Hill Education, Fourth edition, 2018.
5. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016

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|----------------|--|---|---|---|---|
| 20HS2L1 | COMMUNICATION SKILLS LABORATORY | L | T | P | C |
| | | 0 | 0 | 2 | 1 |

OBJECTIVES:

- This course is framed for imparting practical approach in learning and enhancing communication skill to develop in students.
- Students will be able to identify appropriate expressions in speaking and writing.
- They will also be able to understand the style and perfection of language in reading and listening various contexts of engineering and technology.
- The course will benefit to the students to gain confidence for every day communication, aptitude test and interviews.

PRE-REQUISITE:NIL

| | |
|--|---|
| UNIT I LISTENING | 6 |
| Listen and takes notes of Lecture, Listen and Write appropriate word, Talks on Engineering and Technology, Developing effective listening skills, barriers to effective listening | |
| UNIT II SPEAKING | 6 |
| Self-Introduction, Role play of Celebrities, Sharing memorable incidents | |
| UNIT III READING | 6 |
| Reading Online Blogs, Reading Advertisement in Online, Newspaper archives reading | |
| UNIT IV WRITING | 6 |
| Process Description, narrating experiences, Creating Email blogs, Review Writing – Books, Movies, and Journal | |
| UNIT V SUMMARIZED ACTIVITIES | 6 |
| Reading – cloze exercises, Identifying redundant words, Jargon words, Foreign words, Technical terms. Writing – Error free sentences, Sequential paragraphs, Essay writing on various levels – basic, middle, and advanced. Speaking – Face to face conversation on specific topics, interviewing celebrities, getting acquaintance with new people, sharing information with persons from abroad. | |

TOTAL: 30 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Express ideas and concepts on par global communication
- Involve inter-personal communication with flair and error-free verbatim
- Face interviews confidently and respond in proper language ability
- Participate in group discussion and share innovative ideas in technical environments
- Adapt multi-national exposure on employment
- Master all-round competency in delivering apt communication for employability

TEXT BOOKS:

1. E. Suresh Kumar et al. "Communication for Professional Success". Orient Blackswan: Hyderabad, 2015

REFERENCES

1. Butterfield, "Jeff Soft Skills of Everyone". Cengage Learning: New Delhi, 2015
2. "Interact English Lab Manual for Undergraduate Students", Orient BlackSwan: Hyderabad,2016.
3. Raman, Meenakshi and Sangeetha Sharma. "Professional Communication". Oxford University Press: Oxford, 2014.
4. S. Hariharanetal. "Soft Skills". MJP Publishers: Chennai, 2010.

| 20CS2L1 | C PROGRAMMING LABORATORY | L | T | P | C |
|---------|--------------------------|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

PRE-REQUISITE:NIL

LIST OF PROGRAMS

1. Programs using I/O statements, expressions and decision-making constructs.
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction, multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions
 - 5 if it is a perfect cube.
 - 4 if it is a multiple of 4 and divisible by 6.
 - 3 if it is a prime number

Sort the numbers based on the weight in the increasing order as shown below
<10,its weight>,<36,its weight><89,its weight>
5. Matrix addition and subtraction
6. Matrix multiplication and transpose of a matrix
7. Program using string with and without using string functions: string copy and Reverse the String.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. From a given paragraph perform the following using built-in functions
 - a. Find the total number of words.
 - b. Capitalize the first word of each sentence.
 - c. Replace a given word with another word.
10. Program using recursion – factorial and Fibonacci series
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
14. Count the number of account holders whose balance is less than the minimum balance using sequential access file
15. **Mini project (Any one project : Maximum 4 per Team)**
 - Railway reservation system
 - Library Management System
 - University Result Publication System
 - Hospital Management System
 - Student Automation System

- Payroll System
- Banking System
- Inventory System

PLATFORM NEEDED: Turbo C++ Compiler

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop simple programs using decision making and looping statements.
- Utilize array concepts to perform matrix addition, subtraction and multiplication.
- Utilize string operations and develop programs to show string copy and reverse.
- Develop programs using user defined functions, built-in functions and recursion.
- Design applications using sequential and random access files.
- Design simple real time projects using the concepts of structures and union.

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|----------------|--|---|---|---|---|
| 20AD2L1 | FOUNDATIONS FOR DATA SCIENCE LABORATORY | L | T | P | C |
| | | 0 | 0 | 4 | 2 |

OBJECTIVES:

- Learn the data analysis basics with Python
- Study Data Analysis and interpretation with Numpy on statistical parameters
- Understand various methods of Data Preparation and Manipulation with Pandas
- Learn Data Visualization using matplotlib and seaborn
- Learn Machine learning fundamentals concepts such as Feature Engineering and various techniques

PRE-REQUISITE:NIL

Implementation of the following problems using Statistical Packages

1. NumPy Arrays Computations - Aggregations-Sorting -Arrays-Structured Data
2. Pandas Dataframe- Manipulations from CSV
3. Data Acquisition using python web Scraping
4. Classification and tabulation of data and Graphical and diagrammatic presentation of data.
5. Perform calculations that measure the central tendency and dispersion of data and Implementation of measures of Skewness, moments and kurtosis.
6. Determination of point and interval estimates.
7. Solving linear regression, polynomial regression and non-linear regression based problems and solving multiple regression and correlation analysis based problems.
8. Solving the problems based on Time series analysis and forecasting and implementing statistical quality control charts.
9. Apply Classification, Clustering and SVM techniques for Web Scraped Datasets
10. Decision Trees and Random Forests-PCA for Intrusion Detection
11. Mini Project

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Understand the various analysis methods in Numpy and Pandas
- Apply the concept of Classification and tabulation of data
- Perform calculations that measure the central tendency and dispersion of data and Implementation of measures of Skewness, moments and kurtosis
- Solving the problems based on Time series analysis and forecasting and implementing statistical quality control charts.
- Apply the concepts of various machine learning techniques to solve problems.

20BS303

DISCRETE MATHEMATICS

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|----------|----------|----------|----------|
| L | T | P | C |
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OBJECTIVES:

- To understand the basic concepts of Logic, Combinatorics and Graph Theory.
- To make the student familiarize the Applications of Algebraic Structures.
- To understand the concepts and significance of Lattices and Boolean Algebra which are widely used in Computer Science and Engineering.

PRE-REQUISITE:NIL

UNIT I LOGIC AND PROOFS

12

Propositional logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers – Rules of Inference - Introduction to Proofs – Proof methods and strategy.

UNIT II COMBINATORICS

12

Mathematical Induction – Strong Induction and Well ordering – The basics of Counting -The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations – Solving Linear Recurrence Relations – Generating Functions – Inclusion and Exclusion Principle and its Applications.

UNIT III REPRESENTATION OF STANDARD GRAPHS

12

Graphs and Graph Models – Graph Terminology and special types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT IV ALGEBRAIC STRUCTURES

12

Algebraic Systems – Semi Groups and Monoids - Groups – Subgroups – Homomorphism’s – Normal

Subgroup and Cosets – Lagrange’s Theorem – Definitions and Examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA

12

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices - Lattices as Algebraic Systems – Sub Lattices – Direct Product and Homomorphism – Some special Lattices – Boolean Algebra.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Tremblay.J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing company Limited, New Delhi, 30th Reprint, 1997.
2. Veerarajan .T, "Discrete Mathematics with graph theory and combinatorics", Tata Mc Graw – Hill companies, New Delhi, 4th Reprint, 2008.

REFERENCES:

1. Grimaldi. R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education Asia, Delhi, 5th Edition, 2007.
2. Rosen.K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Publishing company Limited, New Delhi, 7th Edition, 2011.
3. Koshy.T. "Discrete Mathematics with Applications", Elsevier Publications, 2011.
4. Venkatraman.M.K., Sridharan.V., Chandrasekaran.C., "Discrete Mathematics", National Publishing company, 1st Edition, 2001.
5. Tamilarasi.A & Natarajan.A.M., "Discrete Mathematics And Its Application", Khanna Publishers, 3rd Edition, 2006.

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply the basic formula to formulate the normal forms and Predicate calculus.
- Solve combinatorial problems using the basic counting techniques
- Solve recurrence relations using generating functions.
- Apply the concepts of graph theory in the computer science and technologies field.
- Apply the concepts and properties of algebraic structures such as groups, rings and fields.
- Determine the partial ordering, lattices as posets and Boolean algebra using logical relation.

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", Sixth Edition, Pearson Education, 2018.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2012
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2018.
3. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", Sixth Edition, CENGAGE Learning, 2013.
4. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply K map technique to simplify the Boolean function.
- Build combinational circuits that perform arithmetic operations.
- Design and Analyze Synchronous sequential circuits such as counters.
- Design and simulate various combinational and sequential circuits using HDL.
- Describe data representation, instruction formats, addressing modes and the operational concept of a digital computer.
- Discuss the implementation schemes of control unit and pipeline performance.

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|----------------|---------------------------------------|----------|----------|----------|----------|
| 20CS302 | DATA STRUCTURES AND ALGORITHMS | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To understand the concepts of ADTs
- To understand the basics of algorithm analysis
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms and their analysis.

PRE-REQUISITE:

Course code: 20CS201

Course Name: Programming in C

UNIT I INTRODUCTION TO DATA STRUCTURES AND ALGORITHM ANALYSIS 10

Introduction: Data Structures, Notion of an algorithm, Algorithm Efficiency and Analysis Framework, Asymptotic Notations and their properties. Linear Data Structures: Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal). Implementation of algorithmic problems.

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 8

Stack ADT – Operations – Applications – Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue – applications of Queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES – GRAPHS 9

Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Divide and Conquer Methodology: Comparison of Searching Techniques: Linear Search – Binary Search , Mathematical analysis of Binary Search. Sorting – Merge Sort, Quick Sort, Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Mark Allen Weiss, — Data Structures and Algorithm Analysis in C, 2nd Edition Reprint, Pearson Education, 2002.

2. Reema Thareja, — Data Structures Using C, Second Edition , Oxford University Press, 2011.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein – Introduction to Algorithms, MIT Press, Third Edition, 2009.

REFERENCES:

1. Stephen G. Kochan, —Programming in C, 3rd edition, Pearson Education,2005.
2. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, — Fundamentals of Data Structures in C, Second Edition, University Press, 2008

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the concept of asymptotic notations and algorithmic efficiency with properties.
- Describe abstract data types and implement various algorithmic problems using arrays and linked list.
- Apply the different linear data structures like stack and queue to various computing problems.
- Build different types of trees and graphs and apply various operations and their applications.
- Analyze different sorting and searching techniques based on time and space complexity of the algorithms designed using divide and conquer methods.
- Develop suitable hashing algorithm for indexing data items into specific locations in a hash table considering collision resolution techniques.

20HS301

UNIVERSAL HUMAN VALUES

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life

PRE-REQUISITE: NIL

UNIT I INTRODUCTION TO VALUE EDUCATION

9

Value Education – Definition - Concept and Need for Value Education - The Evolution of Value Education: Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education- fulfilling human aspirations.

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

UNIT II HARMONY IN THE HUMAN BEING

9

Human being vs Value education - I' and Body synchronization - Understanding Myself as Co-existence of the Self and the Body - Realization - Self, Body needs - Scanning of Karma -Self and Body- Understanding Sanyam and Health.

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

UNIT III Harmony in the Family, Society and Nature

9

Family as a basic unit of Human Interaction-Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love – Harmony in society : Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal- Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

Practice sessions: To discuss on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education. Gratitude as a universal value in relationship. Discuss with scenarios. Elicit examples from students' lives

UNIT IV SOCIAL ETHICS

9

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.Practice sessions: To discuss human being as cause of imbalance in nature, pollution, depletion of resources and role of technology

UNIT V PROFESSIONAL ETHICS

9

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies, Production System and Management Models.

Practice sessions: To discuss the conduct as an engineer or scientist

TOTAL: 30 PERIODS + 15 TUTORIALS

TEXT BOOKS:

- 1 . R.R. Gaur, R. Asthana, G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd revised edition, Excel Books, New Delhi, Re print 2019.
2. A N Tripathy, Human Values, New Age International Publishers, New Delhi,2003.

REFERENCES:

1. E G Seebauer & Robert L.Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
2. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd, Reprint 2011.
Mike Martin and Roland Schinzinger "Ethics in Engineering" McGraw Hill, New York, 4th Edition , Reprint 2017.
5. Charles E. Harries, Michael S. Protchard and Michael J. Rabins, "Engineering Ethics- concepts and Cases", Thomson Learning, 2000.
6. S.K. Chakraborty and Dabangshu Chakraborty, "Human Values and Ethics: Achieving Holistic Excellence", ICFAI University Press, 2006

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the significance of value inputs in a classroom and summarize human aspirations.
- Distinguish between Values & Skills to ensure happiness and prosperity.
- Identify the synchronization between Thyself & the Body to ensure competency of an individual
- Generalize the role of a human being in ensuring harmony in society and nature.
- Distinguish between ethical and unethical practices and analyze harmonious social environment.
- Assess the importance of value based life and evaluate the role of professional ethics.

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|---------|---|----------------|----------------|----------------|----------------|
| 20AD302 | OBJECT ORIENTED PROGRAMMING USING JAVA | L 3 | T 0 | P 2 | C 4 |
|---------|---|----------------|----------------|----------------|----------------|

OBJECTIVES:

- To explain the basic principle of Object-Oriented Programming (OOP)
- To interpret the characteristics of java and basics of java programming tool.
- To know the principles of inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

PRE-REQUISITES:

Course code: 20CS201

Course Name: Programming in C

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Introduction to Object Oriented Programming –Differences between Structure programming and OOPS- Characteristics of Java – The Java Environment -Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods - access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages - JavaDoc comments, finalize method, Automatic Garbage Collection.

Practical 6

1. Write a program to implement the usage of constructors, static members with different data types.
2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

UNIT II INHERITANCE AND INTERFACE 9

Inheritance – the Object class – abstract classes and methods- final methods and classes – Interfaces –differences between classes and interfaces and extending interfaces - Object cloning, Reflection, Proxies -inner classes, Array Lists – Strings.

Practical 6

1. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
2. Design a Java interface for ADT Stack. Implement this interface using array.
3. Write a program to perform string operations using Array List. Write functions for the following
 - Append - add at end
 - Insert – add at particular index
 - Search
 - List all string starts with given letter

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Assertions, logging, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files-Sequential Access file and Random-Access file.

Practical 6

1. Write a Java program to implement user defined exception handling.
2. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
3. Write a Java program to implement the concepts of sequential access file and random-access file.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 9

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Inheritance & Generics – Reflection & Generics-Bounded Types – Restrictions and Limitations.

Practical 6

1. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number. Write a Java program to implement the concepts of sequential access file and random-access file.
2. Write a java program to find the maximum value from the given type of elements using a generic function

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes- Case Study: Design an application for automating the file processing by using the java swing with MySQL database.

Practical 6

1. Write a Java program to implement the usage of colors, fonts and images.
2. Design a calculator using event-driven programming paradigm of Java with the following options.
 - i. Decimal manipulations
 - ii. Scientific manipulations
3. Develop a mini project for any application using Java concepts.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "Java The complete reference", 9th Edition, McGraw Hill Education, 2017.
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
3. E. Balagurusamy, "Programming with Java", 6th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000

OUTCOMES:

On Completion of the course, the students should be able to:

- Realize the Object-Oriented Programming concepts and Basics of Java Programming tool
- Apply the concepts of inheritance and interfaces using java programs
- Implement the concepts of java exceptions and I/O streams
- Illustrate multithread concepts and generics in java
- Develop interactive java application using AWT
- Build interactive java application using Swing

20CS3L1 DIGITAL SYSTEMS LABORATORY

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|----------|----------|----------|----------|
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OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions.
3. Design and implementation of code converters.
4. Design and implement Half/Full Adder and Subtractor.
5. Design and implement combinational circuits using MSI devices:
 - a. Parity generator /checker
 - b. Magnitude Comparator
 - c. Multiplexers
6. Design and implement shift-registers.
7. Design and implement synchronous counters.
8. Design and implement asynchronous counters.
9. Coding combinational circuits using HDL.
10. Coding sequential circuits using HDL.
11. Design and implementation of a simple real time digital system (Mini Project).

TOTAL: 60 PERIODS

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| LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: |
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|--|
| LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS |
|--|

HARDWARE:

- Digital trainer kits -30
- Digital ICs required for the experiments in sufficient numbers

SOFTWARE:

- HDL simulator.

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply Boolean simplification techniques to construct combinational logic circuits.
- Build combinational logic circuits to perform arithmetic operations.
- Construct combinational circuits using MSI devices
- Construct Sequential circuits like registers and counters.
- Develop combinational and sequential circuits using HDL.
- Develop a simple real time application using Digital system.

20CS3L2

DATA STRUCTURES AND ALGORITHM

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LABORATORY

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OBJECTIVES:

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

LIST OF EXPERIMENTS

1. Implementation of List and Stack Using Array
2. Implementation of List and Stack Using Linked list
3. Implementation of Queue Using Linked List
4. Perform polynomial addition using list
5. Perform Infix to postfix conversion using stack
6. Implementation of Binary tree
7. Implementation of Binary Search tree
8. Implementation of AVL Trees
9. Implementation of Heaps using Priority Queues
10. Implementation of Graph Traverses Using Breadth First Search
11. Implementation of Graph Traverses Using Depth First Search
12. Applications of Graph.
13. Case study problem for sorting and searching
14. Case study problem using linked list

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Software Requirement :

Sublime editor / Turbo C

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop the array implementation of stack, Queue and List ADTs
- Develop the Linked list implementation of list, Stack and Queue ADTs
- Construct Binary trees, Binary search Trees and AVL tree and its operations
- Develop various graph traversal algorithms like BFS and DFS.
- Analyze the performance of various searching, sorting and hashing algorithms
- Illustrate any real world problem by implement various techniques of Data structures.

20BS404 PROBABILITY AND STATISTICS

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OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables of one and two dimensions.
- To acquaint the knowledge of testing of hypothesis for small and large samples and to introduce the basic concepts of classifications of design of experiments this plays very important roles in the field of agriculture and statistical quality control.

PRE-REQUISITE: NIL

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability –Discrete and continuous random variables – Moments – Moment generating Functions – Binomial, Poisson, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 12

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 60 PERIODS

TEXT BOOKS :

1. Johnson. R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Veerarajan.T., "Probability, Statistics and Random Processes",Tata McGraw Hill, New Delhi , 2006.

REFERENCES:

1. Papoulis.A. and Unnikrishnapillai.S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, New Delhi, 4th Edition, 2002.
2. Spiegel.M.R.,Schiller.J and Srinivasan.R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics",Tata McGraw Hill, 3rd Edition, 2004.
3. Walpole.R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2011.
4. Kandasamy.P., Thilagvathi.K., Gunavathi.K., "Probability Random Variables & Random Processes", S.Chand & Co. Ltd., 1st Edition.
5. Subramaniam.N, "Probability and Queueing Theory ",SCM Publishers, 1st Edition.

OUTCOMES:

On Completion of the course, the students should be able to:

- Build the parameters of statistical distributions using basic probability theory concepts .
- Calculate the statistical measures for two dimensional random variables.
- Apply the concepts of correlation and regression for two dimensional random variables.
- Apply the concept of random processes in engineering disciplines.
- Solve queueing models using finite and infinite server model.
- Solve advanced queueing models using open network.

OBJECTIVES:

- To learn the fundamentals of data models and to depict a database system using ER diagrams.
- To study relational database and to write SQL queries to store/retrieve data to/from database.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures for real time applications.
- To understand working procedures of query processing and query optimization techniques.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To study concepts of advanced databases.

PRE-REQUISITE:

Course code: 20CS302

Course Name: Data Structures and Algorithms

UNIT I DATABASE FUNDAMENTALS 8

Purpose of Database System – Views of data – Database System Architecture – Introduction to Data Models – Network model – Hierarchical Model – Introduction to Relational Model – Constraints – keys – Entity Relationship Model – Entity Sets – Attributes - Extended E-R features – ER reduction to Relational Schemas

UNIT II RELATIONAL DATABASE 10

Structure of Relational Database – Relational Query Language – Relational Algebra – SQL Fundamentals – Basic Queries – Set Operations – Aggregate Functions – Clauses – Subqueries – Correlated Subqueries – Joins – Views – Authorization – Advanced SQL – Triggers – Cursors – Procedure – Functions – Embedded SQL – Dynamic SQL – Types of advanced Databases – Distributed Database and Object Oriented Database Architectures - XML Databases: XML Hierarchical Model, DTD, XML Schema, X-Query - Introduction to NoSQL.

UNIT III DATABASE DESIGN 9

Need for Database Design – Functional Dependencies – Closure of Functional Dependencies – Attribute Closure – Dependency Preservation – Decomposition – Canonical Cover – First Normal Form – Second Normal Form – Third Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Fourth Normal Form – Join Dependencies – Fifth Normal Form

UNIT IV TRANSACTIONS 9

Transaction Concepts – ACID properties – Transaction States – Serializability – Conflict Serializability – View Serializability – Concurrency Control – Lock Based Protocols – Deadlocks – Time Based Protocols – Stamp Based Protocols – Validation Based Protocols – Recovery System – Failure Classifications – Storage – Recovery and Atomicity – Recovery Algorithms

UNIT V

STORAGE AND QUERY PROCESSING

9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System ConceptsII, Sixth Edition, Tata McGraw Hill, 2011.
2. RamezElmasri, Shamkant B. Navathe, —Fundamentals of Database SystemsII, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database SystemsII, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, —Database Management SystemsII, Fourth Edition, McGraw-Hill College Publications, 2015.

G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011O G Palanna, "Engineering Chemistry", McGraw Hill Education (India) PVT, LTD, Chennai, 2017.

OUTCOMES:

On Completion of the course, the students should be able to:

- Compare File Processing System with Database and summarize the basic concepts of Database, various Data Models and Database System Architecture.
- Identify Entities, Attributes and their Relationships to prepare ER diagram for real time applications.
- Transfer an information model into a relational database schema and use DDL, DML, DQL, DCL, TCL and advanced concepts of SQL to implement the schema.
- Develop simple database using XML and relate advanced databases with relational model.
- Construct a database by identifying dependencies and optimize it with suitable normal forms to reduce redundancy.
- Compare real time applications with respect to transaction, concurrency control, and data object locking protocols and select appropriate storage and recovery techniques.
- Identify the purpose of query processing and query optimization techniques and also demonstrate the query evaluation for given query.

KLNCE UG AI&DS R2020 (AY 2021-2022)

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| 20AD401 | EMBEDDED SYSTEM & INTERNET OF THINGS | L | T | P | C |
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OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.
- To introduce interfacing I/O devices to the processor
- To introduce the evolution of Internet of Things (IoT).
- To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/open platform
- To apply the concept of Internet of Things in real world scenario

PRE-REQUISITES:

Course code: 20CS201

Course Name: Programming in C

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| UNIT I | 8-BIT EMBEDDED PROCESSOR | 9 |
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8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

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| UNIT II | EMBEDDED C PROGRAMMING | 9 |
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Memory and I/O Devices Interfacing – Programming Embedded Systems in C – Need for RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies

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| UNIT III | IOT AND ARDUINO PROGRAMMING | 9 |
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Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino

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| UNIT IV | IOT COMMUNICATION AND OPEN PLATFORMS | 9 |
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IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud

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| UNIT V | APPLICATIONS DEVELOPMENT | 9 |
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Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014.
2. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons, 2014.

REFERENCES:

1. Michael J. Pont, "Embedded C", Pearson Education, 2007.
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
4. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning, IOT Kindle Edition.

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain and compare various embedded processors.
- Illustrate the concepts of timers and interrupts.
- Develop basic embedded C programs.
- Describe about simple embedded applications.
- Discuss about portable IoT using Arduino/Raspberry Pi /open platform.
- Determine applications of IoT in real time scenario

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| 20HS401 | ENVIRONMENTAL SCIENCE AND ENGINEERING | L 2 | T 0 | P 0 | C 2 |
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OBJECTIVES:

- To study the scope and significance of environment
- To understand the interrelationship between living organism and environment
- To get a conceptual knowledge on various types of pollution and its effects
- To gain knowledge on various natural resources and its significances
- To provide knowledge on solid wastes, disposal methods and natural disasters and its management
- To learn social issues such as human welfare, sustainability related to population

PRE-REQUISITE: NIL

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 8

Environment – definition, importance, public awareness Ecosystem – concept, structure and function– producers, consumers and decomposers - characteristic features, structure and function of the forest ecosystem and grassland ecosystem

Biodiversity– definition, types - genetic, species and ecosystem diversity – values - consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India. Assignment on Conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 6

Definition, causes, effects and control measures of (i) Air pollution (ii) Water pollution (iii) Soil pollution (iv) Marine pollution – role of an individual in prevention of pollution – pollution case studies -Climate change - global warming, acid rain, ozone layer depletion.

UNIT III NATURAL RESOURCES 6

Forest resources: Uses, over-exploitation, deforestation, case studies

Water resources: Surface water and ground water - uses, over-utilization, conflicts over water, Conservation of water - rain water harvesting, dams-benefits and problems

Mineral resources: uses, over exploitation, environmental effects of extracting mineral resources, case studies.

UNIT IV SOLID WASTE AND DISASTER MANAGEMENT 6

Solid waste management -Introduction, types, effects on human beings and disposal management.

Disaster management-Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters, case studies– roles and responsibilities of Government and community

UNIT V

HUMAN POPULATION AND SOCIAL ISSUES

6

Population growth, population explosion – family welfare programme –women and child welfare – human rights – value education – sustainable development – resettlement and rehabilitation –waste land reclamation – role of information technology in environment and human health. Debate on women and child welfare.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Anubha Kaushik and Kaushik C.P., Environmental Science and Engineering, New Age International (P) Ltd, Sixth Edition, 2018.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.

REFERENCES:

1. Erach Bharucha, "Text book of Environmental Studies", Universities Press (I) PVT LTD, Hyderabad, 2015
2. G. Tyler Miller and Scott E.Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014
3. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004

OUTCOMES:

On Completion of the course, the students should be able to:

- Describe the environment, ecosystem and their significances.
- Explain the threats to biodiversity.
- Describe the sources, effects, control methods of environmental pollution.
- Explain the knowledge on various natural resources and its effect on environment due to over utilization.
- Describe the disposal techniques of solid waste and record the consequences of natural disasters.
- Outline the social issues as welfare, sustainability etc., and relate with population growth.

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| 20CS404 | OPERATING SYSTEMS | L | T | P | C |
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OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To study various operating systems like Distributed OS, Real-Time OS and basic concepts of virtualization

PRE-REQUISITE: NIL

UNIT I OPERATING SYSTEM OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System, Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Processes - Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication.

LAB COMPONENT 6

1. Basic Linux Commands and Overview
2. Write Shell Script to experiment with system calls like fork, grep, pipe, open, create read, write, etc.

UNIT II PROCESS MANAGEMENT AND CONCURRENCY CONTROL 9

CPU Scheduling - Scheduling criteria, Scheduling algorithms; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Semaphores, Classic problems of synchronization, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock

LAB COMPONENT 6

1. Implementation of FCFS, SJF, Round Robin, Priority Scheduling Algorithms and analyzing their performance
2. Implement semaphore for solving producer-consumer problem using threads.
3. Simulate situations for testing Deadlock avoidance algorithm.

UNIT III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory.

LAB COMPONENT 6

1. Implementation Of FIFO, LRU, Optimal Page Replacement Algorithms

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| 20AD402 | DATA VISUALIZATION | L | T | P | C |
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OBJECTIVES:

- To learn the basics of Data Exploration
- To learn the basic concepts of Data visualization
- To study the linear and non-linear ways of Data visualization
- To explore the data visualization using R language
- To apply various data visualization techniques for a variety of tasks

PRE-REQUISITES: NIL

UNIT I INTRODUCTION TO DATA EXPLORATION 9

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

LAB COMPONENT 7

1. Install standalone R.
2. Use R tool to explore various commands for descriptive data analytics using bench mark

UNIT II INTRODUCING TWO VARIABLE AND THIRD VARIABLE 9

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatter plots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.

LAB COMPONENT 8

1. Explore various variable and row filters in R for cleaning data.
2. Use R commands for probability distributions and probability statistics.

UNIT III BASICS OF DATA VISUALIZATION 9

Context of data visualization – Definition, Methodology The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatter plot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data

LAB COMPONENT 7

1. Formulate real business problems scenarios to hypothesis and solve using R statistical testing features.

UNIT IV DATA VISUALIZATION IN R 9

Introduction to R and RStudio - The Basics of Data Exploration - Loading Data into R - Transforming Data - Creating Tidy Data

LAB COMPONENT 8

1. Write and execute word count, word search and pattern search problems from large text files.
2. Explore various data preprocessing options using bench mark data sets.

UNIT V TECHNIQUES AND APPLICATIONS OF DATA VISUALIZATION IN R 9

Basic Data Exploration Techniques - Basic Data Visualization Techniques - Visualizing Geographic Data with ggmap - R Markdown - Case Study – Wildfire Activity in the Western United States - Case Study – Single Family Residential Home and Rental Values

TEXT BOOKS:

1. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, Second Edition, 2008.
2. Ben Fry, "Visualizing Data: Exploring and Explaining Data with the processing Environment", O'Reilly Publications, 2007

REFERENCES:

1. Eric Pimpler, "Data Visualization and Exploration with R", Geo Spatial Training service, 2017
2. Xiang Zhou, Sean, Yong Rui, Huang, Thomas S., "Exploration of Visual Data", Springer Publications, 2003
3. Claus.O.Wlike, Fundamentals of Data Visualization, A primer on making informative and compelling Figures, O'Reily Publications, 2019

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- R tool, RStudio and MS Excel

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the basics of Data Exploration
- Use Univariate and Multivariate Analysis for Data Exploration
- Explain various Data Visualization methods
- Apply the concept of Data Visualization on various datasets
- Explain the data visualization techniques
- Apply data visualization techniques using R language

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| 20CS4L1 | DATABASE MANAGEMENT SYSTEMS LABORATORY | L 0 | T 0 | P 4 | C 2 |
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OBJECTIVES:

- To write and debug Database commands.
- To implement advanced query in Database tool.
- To use functions and procedures for implementing simple logics in Database.
- To design real time applications using front end tool and Database.
- To implement Database connectivity for real time application.

LIST OF EXPERIMENTS

1. Data Definition and Data Manipulation Language Commands.
2. Data Control and Transaction Control Language Commands.
3. Aggregate Functions and Set Operations.
4. Nested Subqueries and Join Queries.
5. Views, Indexes and Synonyms.
6. Study of PL/SQL programs
7. PL/SQL - procedures
8. PL/SQL - Functions
9. PL/SQL - Triggers
10. PL/SQL - Cursor
11. Front end application development – Create Forms, Menu and Reports.
12. Implementation of Database Connectivity

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

- Oracle/Mysql/Visual Basics/Netbeans IDE

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop simple Database using DDL, DML and TCL commands.
- Construct a Relational Database for real time application through Database constraints.
- Make use of subqueries and join queries to derive and execute complex queries.
- Develop PL/SQL programs to implement simple logics using Stored Procedure, Functions, Triggers and Cursor.
- Develop a frontend application to display forms, menu and reports.
- Model real time applications with Database Connectivity.

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| 20AD4L1 | EMBEDDED SYSTEMS AND INTERNET OF THINGS LABORATORY | L 0 | T 0 | P 4 | C 2 |
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OBJECTIVES:

- To learn tools relevant to Embedded System and IoT development.
- To write simple assembly programs that uses various features of the processor.
- To explore Embedded C Programs for different embedded processors.
- To develop simple applications using Arduino/Raspberry Pi/open platform.
- To design and develop IOT application for real world scenario

LIST OF EXERCISES:

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write assembly language experiments using Kit to test interfaces and interrupts using DAC, ADC, and Stepper Motor.
5. Write Basic and arithmetic Programs Using Embedded C.
6. Write Embedded C program to test interrupt and timers.
7. Develop Real time applications – clock generation, wave form generation, counter – using embedded C.
8. Explore ARM/PIC based controllers using Embedded C.
9. Explore different communication methods with IoT devices.
10. Develop simple application – testing infrared sensor – IoT Applications – using Arduino.
11. Develop simple application – testing temperature, light sensor – IOT Application – using open platform/Raspberry Pi.
12. Deploy IOT applications using platforms such as Bluemix.
13. Miniproject

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

- 8051 microcontroller kits - 5 Numbers
- PIC microcontroller kits - 5 Numbers
- Interfacing Kits - DAC, ADC, and Stepper Motor. – Required for Sufficient Numbers
- ARM 7 development boards – 5 Numbers
- Arduino boards & Raspberry Pi boards – 5 Numbers (Each)

SOFTWARE:

- Computer with Embedded OS, Keil IDE, Python OS, Arduino IDE & Raspberry Pi OS (Raspbian)

OUTCOMES:

On Completion of the course, the students should be able to:

- Write and implement simple assembly programs that use various features of the processor.
- Write an Embedded C Program, debug and interpret the results.
- Develop micro controller-based application.
- Build the real time applications using different sensors.
- Develop IoT applications using Arduino/Raspberry Pi/open platform.
- Explore deployment platforms for IoT applications

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| 20HS4L2 | PROFESSIONAL COMMUNICATION LABORATORY | L 0 | T 0 | P 2 | C 1 |
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OBJECTIVES:

- To imparting practical approach in learning and enhancing communication skill among engineering students.
- To identify appropriate expressions in speaking and writing.
- To understand the style and perfection of language in reading and listening various contexts of engineering and technology.
- To gain confidence for every day communication, technical presentation, aptitude test and interviews.

UNIT I LISTENING 6

Listen and takes notes of Lecture, Talks on Engineering and Technology, Developing Effective listening skills, barriers to effective listening, Listening self-Introduction Videos.

UNIT II SPEAKING 6

Self-Introduction, Introduce oneself to the audience, Sharing memorable incidents, Individual presentation practice, Introduction to Group Discussion, GD strategies activities to improve GD skills

UNIT III READING 6

Reading Online Blogs, Reading Advertisement in Online, Newspaper archives reading, Reading FAQ's related to job Interview, General awareness of current affairs

UNIT IV WRITING 6

Process Description, Narrating experiences, Creating Email blogs, Review Writing – Books, Movies, and Journals, Job Application Letter, Resume Writing

UNIT V SUMMARIZED ACTIVITIES 6

Reading – cloze exercises, Identifying redundant words, Jargon words, Foreign words, Technical terms

Writing – Error free sentences, Essay writing on various levels – basic, middle, and advanced, Preparing Job application letter and Resume

Speaking – Face to face conversation on specific topics, Answering Interview

Questions, Panel Interview, Participating in Group Discussions, Technical Presentation

TOTAL: 30 PERIODS

TEXT BOOK:

1. E. Suresh Kumar et al. Communication for Professional Success. OrientBlackswan: Hyderabad, 2015

REFERENCES:

1. Butterfield, Jeff Soft Skills of Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students,. Orient BlackSwan:Hyderabad,2016.
- 3.Raman, Meenakshi and Sangeetha Sharma. Professional Communication.Oxford UniversityPress: Oxford, 2014.
4. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

OUTCOMES:

On Completion of the course, the students should be able to:

- Listen and Respond global English appropriately
- Participate in group discussions towards placement drive
- Make effective presentations of technical topics
- Communicate with effective technological skills
- Read and Write the context cohesively and coherently and organize ideas logically in workplace situations
- Attend job interviews and be successful in them

