I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics, Computer Science and Business systems for the applications relevant to various streams of Engineering and Technology.

II. To enrich graduates with the core competencies necessary for applying knowledge of computer science and Data analytics tools to store, retrieve, implement and analyze data in the context of business enterprise.

III. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills and leadership qualities to solve real world problems and meet the diversified needs of industry, academia and research.

IV. To equip the graduates with entrepreneurial skills and qualities which help them to perceive the functioning of business, diagnose business problems, explore the entrepreneurial opportunities and prepare them to manage business efficiently.

II. PROGRAM OUTCOMES (POs)

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

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8 **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 **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.

11 **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.

12 **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.

III. **PROGRAM SPECIFIC OUTCOMES (PSOs)**

PSO1: To create, select, and apply appropriate techniques, resources, modern engineering and business tools including prediction and data analytics to complex engineering activities and business solutions

PSO2: To evolve computer science domain specific methodologies for effective decision making in several critical problem domains of the real world.

PSO3: To be able to apply entrepreneurial skills and management tools for identifying, analyzing and creating business opportunities with smart business ideas.

PSO4: To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications
ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS AFFILIATED COLLEGES
REGULATIONS 2021
B.TECH. COMPUTER SCIENCE AND BUSINESS SYSTEMS
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS I TO IV

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$\ddagger$ NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
$\ddagger$ Skill Based Course
### SEMESTER III

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$^\text{a}$ Skill Based Course

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THEORY

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2. CW3501 Fundamentals of Management PCC 3 0 0 3 3
3. CW3551 Data and Information Security PCC 3 0 0 3 3
4. Professional Elective I PEC - - - - 3
5. Professional Elective II PEC - - - - 3
6. Mandatory Course-I* MC 3 0 0 3 0

PRACTICALS

7. CW3511 Summer Internship EEC 0 0 0 0 2

TOTAL - - - - 18

* Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-I)

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THEORY

1. CCW331 Business Analytics PCC 2 0 2 4 3
2. CCS356 Object Oriented Software Engineering PCC 3 0 2 5 4
3. Open Elective – I* OEC 3 0 0 3 3
4. Professional Elective III PEC - - - - 3
5. Professional Elective IV PEC - - - - 3
6. Professional Elective V PEC - - - - 3
7. Professional Elective VI PEC - - - - 3
8. Mandatory Course-II & MC 3 0 0 3 0
9. NCC Credit Course Level 3# 3 0 0 3 3 #

PRACTICALS

10. CW3611 Business Analytics Laboratory PCC 0 0 4 4 2

TOTAL - - - - 24

*Open Elective – I Shall be chosen from the list of open electives offered by other Programmes

& Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-II)

# NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA
### SEMESTER VII / VIII*

<table>
<thead>
<tr>
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

** Open Elective II - IV (Shall be chosen from the list of open electives offered by other Programmes).

* Elective - Management shall be chosen from the Elective Management courses.

### SEMESTER VIII / VII*

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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

** TOTAL CREDITS : 163 **

### ELECTIVE – MANAGEMENT COURSES

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**PROFESSIONAL ELECTIVE COURSES: VERTICALS**

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<td>Data Science</td>
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<td>Augmented Reality/Virtual Reality</td>
<td>Knowledge Engineering</td>
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<td>Cloud Services Management</td>
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<td>Social Text and Media Analytics</td>
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<td>Image and Video Analytics</td>
<td>Software Defined Networks</td>
<td>Cryptocurrency and Blockchain Technologies</td>
<td>Game Theory</td>
<td>Entrepreneurship Development</td>
<td>Marketing Research and Marketing Management</td>
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<tr>
<td>Computer Vision</td>
<td>Stream Processing</td>
<td>Game Development</td>
<td>Cognitive Science</td>
<td>Introduction to Innovation, IP Management and Entrepreneurship</td>
<td>Risk Analytics</td>
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<tr>
<td>Big Data Analytics</td>
<td>Security and Privacy in Cloud</td>
<td>3D Printing and Design</td>
<td>Ethics and AI</td>
<td>Behavioral Economics</td>
<td>Enterprise Security</td>
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**Registration of Professional Elective Courses from Verticals:**

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2021, Clause 4.10.
# PROFESSIONAL ELECTIVE COURSES: VERTICALS

## VERTICAL 1: DATA SCIENCE

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## VERTICAL 2: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

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(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

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### SUMMARY

**Name of the Programme:** B.Tech. Computer Science and Business Systems

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**Total**

|      | 22 | 26 | 25 | 24 | 18 | 24 | 14 | 10 | 163 |

### ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2021.
### VERTICALS FOR MINOR DEGREE
(In addition to all the verticals of other programmes)

<table>
<thead>
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<th>Vertical I \ FinTech and Block Chain</th>
<th>Vertical II \ Entrepreneurship</th>
<th>Vertical III \ Public Administration</th>
<th>Vertical IV \ Business Data Analytics</th>
<th>Vertical V \ Environment and Sustainability</th>
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<td>Constitution of India</td>
<td>Datamining for Business Intelligence</td>
<td>Sustainable Agriculture and Environmental Management</td>
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<td>Banking, Financial Services and Insurance</td>
<td>Creativity &amp; Innovation in Entrepreneurship</td>
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<td>Human Resource Analytics</td>
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<td>Introduction to Blockchain and its Applications</td>
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(choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

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**VERTICAL 4: BUSINESS DATA ANALYTICS**

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This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base.
Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

**Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.**

References:
Guide to Induction program from AICTE
OBJECTIVES:

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners’ ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C’s of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

UNIT 1 INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV CLASSIFICATION AND RECOMMENDATIONS

Reading – Newspaper articles; Journal reports –and Non Verbal Communication ( tables, pie charts etc., ). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart, graph etc, to verbal mode)
Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.

**UNIT V ** EXPRESSION 9
Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

**LEARNING OUTCOMES :**
At the end of the course, learners will be able
- To use appropriate words in a professional context
- To gain understanding of basic grammatic structures and use them in right context.
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics

**TEXT BOOKS :**
1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERENCES:**

**ASSESSMENT PATTERN**
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.

**MA3151 ** MATRICES AND CALCULUS  L   T   P   C
3   1   0   4

**COURSE OBJECTIVES:**
- To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
- To familiarize the students with differential calculus.
To familiarize the student with functions of several variables. This is needed in many branches of engineering.
To make the students understand various techniques of integration.
To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES  9 + 3

UNIT II DIFFERENTIAL CALCULUS  9 + 3

UNIT III FUNCTIONS OF SEVERAL VARIABLES  9 + 3

UNIT IV INTEGRAL CALCULUS  9 + 3
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 - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V MULTIPLE INTEGRALS  9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8 ].

REFERENCES:

PH3151 ENGINEERING PHYSICS

COURSE OBJECTIVES:
- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS
9

UNIT II ELECTROMAGNETIC WAVES
9
The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone
reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS


UNIT IV BASIC QUANTUM MECHANICS

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

COURSE OUTCOMES:

After completion of this course, the students should be able to

- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

REFERENCES:


CY3151 ENGINEERING CHEMISTRY

COURSE OBJECTIVES:
- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT

UNIT II NANOCHEMISTRY
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.
Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV FUELS AND COMBUSTION
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate),
Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles - working principles; Fuel cells: H₂-O₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able:
- To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To apply the knowledge of phase rule and composites for material selection requirements.
- To recommend suitable fuels for engineering processes and applications.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I  COMPUTATIONAL THINKING AND PROBLEM SOLVING

UNIT II  DATA TYPES, EXPRESSIONS, STATEMENTS
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III  CONTROL FLOW, FUNCTIONS, STRINGS
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV  LISTS, TUPLES, DICTIONARIES
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V  FILES, MODULES, PACKAGES
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation (0-100).

COURSE OUTCOMES:
Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

GE3152 HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyiillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.
UNIT IV  THINAI CONCEPT OF TAMILS  
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V  CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE  
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழர் மரபு - மற்றும் பணப்பொடும் கக்ககிலையே கருத்திருப்பிரெத்தியே (தமிழ்நொடு: தின்படுத்தப்பட்டு பராமரிதல் வடிவிலே கருத்திருப்பிரெத்தியே).
2. கல்விகளுக்கு குழுமம் - பராமரிதல் கத்தறு (தின்படுத்தப்பட்டு).
3. குருக்கு - கல்விகளுக்கு குழுமம் கொண்ட பாறத்திற்கு கற்கரையிற்கு (தமிழ்நொடு: குருக்கு குழுமம் கொண்ட பாறத்திற்கு).
4. கல்விகளுக்கு - குழுமக் கொண்ட பாறத்திற்கு (தமிழ்நொடு: குருக்கு குழுமம் கொண்ட பாறத்திற்கு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
தமிழ் கல்விக்கிளியர்கள் - கால சேவேற்றிகள் தமிழ் இலக்கிய வளர்ச்சியில் புதுக்கோட்டை அமை - கிருஷ்ணனின் போதானைகள் கறலகள் - சபக கல்விக்கிளியர், தமிழ்கல் தமிழ் பொச்சிகளில் கூட்டம் - பல்கலை துற்றியம், மாணிக்க மட்டும் பொறியியல் கல்விக்கிளியர் - தமிழ் சுவை தமிழ்கிளியர் அனுப்பி - தமிழ் வரலைப் பொறியியலின் பராமரிப்பு மற்றும் பொழுதும்பாக்கத்தின் சொல்லவிகள் வழக்கம்

அங்கிருக்கும் மாதங்கள் - பொது சுவை தமிழ்கிளியர் பொது சுவை தமிழ்கிளியர் வளர்ச்சிக் காலம்:
3 தொடர்பில் பொது சுவை தமிழ்கிளியர் வளர்ச்சிக் காலம் - பொச்சிகள் விளயல் மற்றும் முன்னெச்சங்களின் கொண்டாட்டம் பற்றிக்காட்டும், பொட்டியால் மற்றும் உடல் செயல் காலம் - தமிழ் குழந்தைகள் - குழந்தைகளின் விளயல் - தினசரி காலம் - பல்கலை பொதுச் செயற்பாடு - காலக் குழந்தைகள் - கூத்துகள், புதுக் கல்வி, வேள், விளங்கும் வேள் - தமிழ் கல்விகள் பாதுகாக்க வழத்தாக மற்றும் செயற்பாட்டில் பாதுகாப்பில்

அங்கிருக்கும் மாதங்கள்: பொது சுவை தமிழ்கிளியர் வளர்ச்சிக் காலம்:
3 கல்வியியல், கருமானம், இன்னொப்புப்புகள், மக்கள் குழுக்கள், சிற்பங்கள், தமிழ் குழுக்கள், ஜோதியின், புதுக் கல்வி, சுவை தமிழ்கிளியர் வழக்கம்

அங்கிருக்கும் மாதங்கள்: குழந்தைகளின் விளயல் காலம்:
3 குழந்தைகள் விளயல் காலம் - பொதுகாட்டுகள் மற்றும் சுவை தமிழ்கிளியர் அனுமதிக்கப்பட்டுள்ள பொதுகாட்டு பொண்டியர் - குழந்தைகள் பாதுகாப்பில் காலத்தை கொண்டாட்டம் - குழந்தைகளின் விளயல் - குழந்தைகள் விளயலும் - ஆந்திர விளற்றில் காலத்தின்

அங்கிருக்கும் மாதங்கள்: குழந்தைகளின் விளயல் காலம்:
3 குழந்தைகள் விளயல் காலங்கள் - குழந்தைகளின் பாதுகாப்பில் குழந்தை பாதுகாப்பில் தமிழ் - குழந்தைகளின் விளயல் - குழந்தைகள் விளயல்கள் - குழந்தைப் பதிங்காலம் மற்றும்

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. சுவை பொதுச் - புதுக்கோட்டை - மி.கில். புல் வைக்கு (வேதராய்: சுவை பொதுச் பாதுகாப்பு கோப்பில் பராமரிப்பு).
GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)

2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
  CO1: Develop algorithmic solutions to simple computational problems
  CO2: Develop and execute simple Python programs.
  CO3: Implement programs in Python using conditionals and loops for solving problems..
  CO4: Deploy functions to decompose a Python program.
  CO5: Process compound data using Python data structures.
  CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

REFERENCES:
BS3171  PHYSICS AND CHEMISTRY LABORATORY  L T P C
0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student an active participant in each part of all lab exercises.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young’s modulus
4. Uniform bending – Determination of Young’s modulus
5. Laser- Determination of the wavelength of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc - Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde’s string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students should be able to

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physical reality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

**CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**

**COURSE OBJECTIVES:**

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

1. Preparation of Na₂CO₃ as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in a water sample.
   - Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler’s method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using a flame photometer.
13. Preparation of nanoparticles (TiO₂/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

**TOTAL : 30 PERIODS**

**COURSE OUTCOMES :**

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles
- To quantitatively analyse the impurities in solution by electroanalytical techniques

**TEXT BOOKS :**

OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I   INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION  6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions( filling out a bank application for example).

UNIT II  NARRATION AND SUMMATION  6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings-engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT  6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.

UNIT IV   CLASSIFICATION AND RECOMMENDATIONS   6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V    EXPRESSION  6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes

TOTAL : 30 PERIODS
LEARNING OUTCOMES:
At the end of the course, learners will be able
- To listen and comprehend complex academic texts
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

ASSESSMENT PATTERN
- One online / app based assessment to test listening /speaking
- End Semester ONLY listening and speaking will be conducted online.
- Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.

HS3251 PROFESSIONAL ENGLISH -II L T P C
2 0 0 2

OBJECTIVES:
- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I MAKING COMPARISONS 6
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases

UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 6
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

UNIT III PROBLEM SOLVING 6
Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences

UNIT IV REPORTING OF EVENTS AND RESEARCH 6
UNIT V  THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

OUTCOMES:
At the end of the course, learners will be able
- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts
- To analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS :
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:

ASSESSMENT PATTERN
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.

MA3251 STATISTICS AND NUMERICAL METHODS

COURSE OBJECTIVES:
- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I - TESTING OF HYPOTHESIS 9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II - DESIGN OF EXPERIMENTS 9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

UNIT III - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

UNIT IV - INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9 + 3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.
TEXT BOOKS:

REFERENCES:

PH3256 PHYSICS FOR INFORMATION SCIENCE L T P C
3 0 0 3

COURSE OBJECTIVES:
- To make the students understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

UNIT II SEMICONDUCTOR PHYSICS 9
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation

UNIT III  MAGNETIC PROPERTIES OF MATERIALS  9

UNIT IV  OPTICAL PROPERTIES OF MATERIALS  9
Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V  NANODEVICES AND QUANTUM COMPUTING  9

TOTAL :45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students should be able to
- gain knowledge on classical and quantum electron theories, and energy band structures
- acquire knowledge on basics of semiconductor physics and its applications in various devices
- get knowledge on magnetic properties of materials and their applications in data storage,
- have the necessary understanding on the functioning of optical materials for optoelectronics
- understand the basics of quantum structures and their applications and basics of quantum computing

TEXT BOOKS:

REFERENCES:

BE3251 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT I ELECTRICAL CIRCUITS

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

UNIT II ELECTRICAL MACHINES


UNIT III ANALOG ELECTRONICS


UNIT IV DIGITAL ELECTRONICS

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).
UNIT V
MEASUREMENTS AND INSTRUMENTATION


TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completing this course, the students will be able to

CO1: Compute the electric circuit parameters for simple problems
CO2: Explain the working principle and applications of electrical machines
CO3: Analyze the characteristics of analog electronic devices
CO4: Explain the basic concepts of digital electronics
CO5: Explain the operating principles of measuring instruments

TEXT BOOKS:

REFERENCES:

GE3251
ENGINEERING GRAPHICS
L T P C
2 0 4 4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

- Drawing engineering curves.
- Drawing a freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.
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 PLANE CURVES 6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. 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 and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING 6+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12
Sectioning of above solids in simple 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 cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12
Principles of isometric projection — isometric scale — isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
• Use BIS conventions and specifications for engineering drawing.
• Construct the conic curves, involutes and cycloid.
• Solve practical problems involving projection of lines.
Draw the orthographic, isometric and perspective projections of simple solids.
Draw the development of simple solids.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University 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 a solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

AD3251 DATA STRUCTURES DESIGN

COURSE OBJECTIVES:
• To understand the concepts of ADTs
• To design linear data structures – lists, stacks, and queues
• To understand sorting, searching and hashing algorithms
To apply Tree and Graph structures

UNIT I  ABSTRACT DATA TYPES  9
Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python –
inheritance – namespaces – shallow and deep copying
Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive
algorithms

UNIT II  LINEAR STRUCTURES  9
List ADT – array-based implementations – linked list implementations – singly linked lists –
circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double
ended queues

UNIT III  SORTING AND SEARCHING  9
search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency

UNIT IV  TREE STRUCTURES  9
Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi-
way search trees

UNIT V  GRAPH STRUCTURES  9
Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest
paths – minimum spanning trees

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student should be able to:
- explain abstract data types
- design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOKS:
1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures and
   2015.
   Careermonk, 2015.

REFERENCES:

GE3252 TAMILS AND TECHNOLOGY L T P C

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakkar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழக வரலை – மக்களும் பண்பொடும் – இசைய பிள்ளள (தவளியீடு: தமிழ்நொடுபொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முளனவர் இசைய பிள்ளள. (விகடன் பிரசுரம்).
3. கீழடி – கல்லறை தறிசைச்சுருளில் கல்லறை தறை தந்ததிகள் (ஒன்றையே கல்லறை தோன்றவுள்ளன)
4. பாறையம் – குறுக்கண்ட தந்ததிகள். (ஒன்றையே கல்லறை தோன்றவுள்ளன)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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அலகு I: கல்லறை மேற்பண்பு பாரசுதை கல்லறைச்சுருளேம்: 3
அலகு II: கல்லறை மேற்பண்பு பாரசுதை கல்லறைச்சுருளேம்: 3
அலகு III: கல்லறை மேற்பண்பு பாரசுதை கல்லறைச்சுருளேம்: 3

அண்டு IV  கவளொணளமற்றும் நீர்ப்பொசனத்துண்டும் மந்தொழிகள் குமுழித்தூம்பின் முக்கியத்துவம்: 3

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பணபொடும் – ககக. ககக. பிள்ளள் (தவளியீடு: கபிலரநாயிக் பாலாநாம் முன்னம் கூட்டிங்கன் பலினொல் குமாரமுன்).
2. கணினித் தமிழ் – முளனவர் இல.சுந்தரம். (பிரசுரம்).
3. கீழடி – பளவளக நதிக்களரயில் சங்ககொல நகர நொகரிகம் (ததொல்லியல் துளற் தவளியீடு).
4. வாயில் - அறிவியல் கல்விக்கழகம். (தகராணிமார் கடல் தவளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
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### NCC Credit Course Level 1*

**ARMY WING**

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<th>Course Area</th>
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<td><strong>NCC GENERAL</strong></td>
<td>6</td>
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<td>NCC 1 Aims, Objectives &amp; Organization of NCC</td>
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<td>NCC 4 NCC Camps: Types &amp; Conduct</td>
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<td><strong>NATIONAL INTEGRATION AND AWARENESS</strong></td>
<td>4</td>
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<td>NI 2 Factors Affecting National Integration</td>
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<td>NI 3 Unity in Diversity &amp; Role of NCC in Nation Building</td>
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<td>NI 4 Threats to National Security</td>
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<td><strong>PERSONALITY DEVELOPMENT</strong></td>
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<td>PD 1 Self-Awareness, Empathy, Critical &amp; Creative Thinking, Decision Making and Problem Solving</td>
<td>2</td>
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<td>PD 2 Communication Skills</td>
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<td>PD 3 Group Discussion: Stress &amp; Emotions</td>
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<td><strong>LEADERSHIP</strong></td>
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<td>L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code</td>
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<td>L 2 Case Studies: Shivaji, Jhasi Ki Rani</td>
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<tr>
<td><strong>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</strong></td>
<td>8</td>
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<td>SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth</td>
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### NATIONAL INTEGRATION AND AWARENESS

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### SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

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**TOTAL : 30 PERIODS**
COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.

2. Wiring various electrical joints in common household electrical wire work.

3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.

4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES

PLUMBING WORK:
   a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
   b) Preparing plumbing line sketches.
   c) Laying pipe connection to the suction side of a pump
   d) Laying pipe connection to the delivery side of a pump.
   e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:
   a) Sawing,
   b) Planing and
   c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
   a) Studying joints in door panels and wooden furniture
   b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple) Turning.
b) (simple) Drilling.
c) (simple) Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop
COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
- Wire various electrical joints in common household electrical wire work.
- Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

AD3271 DATA STRUCTURES DESIGN LABORATORY

COURSE OBJECTIVES:
- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

LIST OF EXPERIMENTS:
Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

COURSE OUTCOMES:
At the end of the course, the student should be able to:
- implement ADTs as Python classes
• design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
• design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
• model problems as graph problems and implement efficient graph algorithms to solve them

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

GE3272 COMMUNICATION LABORATORY

OBJECTIVES
• To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
• To be able to communicate effectively through writing.

UNIT I
Speaking: Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals- talking about experiences- talking about events in life- discussing past events-Writing: writing emails (formal & semi-formal).

UNIT II
Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements- discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.
UNIT III 12
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.

UNIT IV 12
Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules-( example- discussing rental arrangements)- understanding technical instructions-Writing: writing instructions-writing a short article.

UNIT V 12
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application( Cover letter + Curriculum vitae)-writing recommendations. TOTAL: 60 PERIODS

LEARNING OUTCOMES
- Speak effectively in group discussions held in a formal/semi formal contexts.
- Write emails and effective job applications.

Assessment Pattern
- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

MA3354 DISCRETE MATHEMATICS L T P C
3 1 0 4

COURSE OBJECTIVES:
- To extend student’s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To 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.

UNIT I LOGIC AND PROOFS 9 + 3

UNIT II COMBINATORICS 9 + 3
UNIT III  GRAPHS  9 + 3
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  9 + 3

UNIT V  LATTICES AND BOOLEAN ALGEBRA  9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students would:
CO1: Have knowledge of the concepts needed to test the logic of a program.
CO2: Have an understanding in identifying structures on many levels.
CO3: Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
CO4: Be aware of the counting principles.
CO5: Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

REFERENCES:

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OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits.
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I  COMBINATIONAL LOGIC  9

UNIT II  SYNCHRONOUS SEQUENTIAL LOGIC  9
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT III  COMPUTER FUNDAMENTALS  9

UNIT IV  PROCESSOR  9
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V  MEMORY AND I/O  9

PRACTICAL EXERCISES:
1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture
COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1 : Design various combinational digital circuits using logic gates
CO2 : Design sequential circuits and analyze the design procedures
CO3 : State the fundamentals of computer systems and analyze the execution of an instruction
CO4 : Analyze different types of control design and identify hazards
CO5 : Identify the characteristics of various memory systems and I/O communication

TOTAL: 75 PERIODS

TEXT BOOKS

REFERENCES

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CW3301 FUNDAMENTALS OF ECONOMICS

COURSE OBJECTIVES:
- To exemplify the demand curves of households and supply curves of firms with the principles.
- To differentiate Price ceilings, Price floors and compare income effects, substitute effects.
- To Analyze the Keynesian's process of multiplier theory in macro economics.

UNIT I INTRODUCTION TO MICRO ECONOMICS
UNIT II   WELFARE ANALYSIS  9
Consumers and Producers Surplus - Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice - Budget Constraints and Indifference Curves; Consumers Equilibrium Effects of a Price Change, Income and Substitution Effects Derivation of a Demand Curve

UNIT III   PRODUCTION AND COST FUNCTION  9
Theory of Production - Production Function and Isoquants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm under Perfect Competition; Monopoly and Monopolistic Competition

UNIT IV   MACRO ECONOMICS  9
National Income and its Components - GNP, NNP, GDP, NDP Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports; Money - Definitions; Demand for Money Transaction and Speculative Demand; Supply of Money - Banks Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model

UNIT V   BUSINESS CYCLES AND STABILIZATION  9
Monetary and Fiscal Policy - Central Bank and the Government; the Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

COURSE OUTCOMES:
CO1: To analyze the supporting of price, income and substitution effects in the consumers and producers surplus.
CO2: To compare the equilibrium of a firm under perfect competition, monopoly and monopolistic competition.
CO3: To study the concepts of demand for money and supply of money with appropriate model in macro economic analysis.
CO4: To examine and evaluate the problems of voluntary and involuntary unemployment

TOTAL: 45 PERIODS

TEXT BOOKS:

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CS3391  OBJECT ORIENTED PROGRAMMING  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT I  INTRODUCTION TO OOP AND JAVA  9

UNIT II  INHERITANCE, PACKAGES AND INTERFACES  9

UNIT III  EXCEPTION HANDLING AND MULTITHREADING  9

UNIT IV  I/O, GENERICS, STRING HANDLING  9
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class..

UNIT V  JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS  9
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls –

**COURSE OUTCOMES:**
On completion of this course, the students will be able to
**CO1:** Apply the concepts of classes and objects to solve simple problems
**CO2:** Develop programs using inheritance, packages and interfaces
**CO3:** Make use of exception handling mechanisms and multithreaded model to solve real world problems
**CO4:** Build Java applications with I/O packages, string classes, Collections and generics concepts
**CO5:** Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

**TOTAL:45 PERIODS**

**TEXT BOOKS**

**REFERENCES:**

**CO’s- PO’s & PSO’s MAPPING**

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**AD3351 DESIGN AND ANALYSIS OF ALGORITHMS**

**COURSE OBJECTIVES:**
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.
UNIT I INTRODUCTION

UNIT II BRUTE FORCE AND DIVIDE AND CONQUER

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

UNIT IV ITERATIVE IMPROVEMENT

UNIT V LIMITATIONS OF ALGORITHM POWER

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: (30 hrs)
1. Implement recursive and non-recursive algorithms and study the order of growth from log₂n to n!.
2. Divide and Conquer - Strassen’s Matrix Multiplication
3. Decrease and Conquer - Topological Sorting
4. Transform and Conquer - Heap Sort
5. Dynamic programming - Coin change Problem, Warshall’s and Floyd’s algorithms, Knapsack Problem
6. Greedy Technique – Dijkstra’s algorithm, Huffman Trees and codes
7. Iterative improvement - Simplex Method
8. Backtracking – N-Queen problem, Subset Sum Problem
9. Branch and Bound - Assignment problem, Traveling Salesman Problem
COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically
CO2: Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
CO3: Implement and analyze the problems using dynamic programming and greedy algorithmic techniques.
CO4: Solve the problems using iterative improvement techniques for optimization.
CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques.

TOTAL: 75 PERIODS

TEXT BOOKS:

REFERENCES:

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AD3491 FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS

COURSE OBJECTIVES:
- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications
- To understand inferential data analytics
- To analysis and build predictive models from data
UNIT I  INTRODUCTION TO DATA SCIENCE  08
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II  DESCRIPTIVE ANALYTICS  10

UNIT III  INFERENTIAL STATISTICS  09

UNIT IV  ANALYSIS OF VARIANCE  09

UNIT V  PREDICTIVE ANALYTICS  09

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of this course, the students will be able to:

 CO1: Explain the data analytics pipeline 
 CO2: Describe and visualize data 
 CO3: Perform statistical inferences from data 
 CO4: Analyze the variance in the data 
 CO5: Build models for predictive analytics

TEXT BOOKS
REFERENCES

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CW3311 BUSINESS COMMUNICATION LABORATORY I L T P C 0 0 3 1.5

COURSE OBJECTIVES:
- To enhance students’ overall communication and their interpersonal skills by engaging them in group activities so that they could excel in their career pursuits.
- To improve the students’ fluency level in the English language by enriching their diction and articulation so that they could effectively present themselves in their workplaces.

LIST OF EXPERIMENTS:
1. Business terminology
2. Interpersonal Skills: Dialogue & Conversation
3. Job Application
4. Letters & Reports
5. SWOT analysis
6. Team vs Group
7. Conflict management
8. Acquiring Leadership traits
9. Women in all spheres
10. Human values and Corporate culture

TOTAL: 45 PERIODS
COURSE OUTCOMES:

CO1: Speak fluently in English without errors and present themselves as effective communicators.
CO2: Use business vocabulary and take part comfortably in business conversations in English.
CO3: Draft letters and reports with appropriate formats and choice of words.
CO4: Perform well in team and group, resolve conflicts in workplaces and acquire leadership skills.
CO5: Understand women in all spheres and cultural behaviours of the people and approach them with positive human values.

List of Equipments: (30 Students per Batch)

1: Systems with Rosetta stone and Globarena

REFERENCES:

1. Business Communication, Dr. Saroj Hire math
2. English vocabulary in use, Alan McCarthy and O’Dell
3. Strategic Writing by Charles Marsh
4. The Seven Basic Plots by Christopher Booker

CO’s- PO’s & PSO’s MAPPING

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CS3381 OBJECT ORIENTED PROGRAMMING LABORATORY

COURSE OBJECTIVES

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

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an 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 funds. Generate pay slips for the employees with their gross and net salary.

4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.

5. Solve the above problem using an interface.

6. Implement exception handling and creation of user defined exceptions.

7. 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, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

8. Write a program to perform file operations.

9. Develop applications to demonstrate the features of generics classes.

10. Develop applications using JavaFX controls, layouts and menus.

11. Develop a mini project for any application using Java concepts.

**Lab Requirements: for a batch of 30 students**

Operating Systems: Linux / Windows

Front End Tools: Eclipse IDE / Netbeans IDE

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**
On completion of this course, the students will be able to

CO1 : Design and develop java programs using object oriented programming concepts

CO2 : Develop simple applications using object oriented concepts such as package, exceptions

CO4 : Create GUIs and event driven programming applications for real world problems

CO3: Implement multithreading, and generics concepts

CO5: Implement and deploy web applications using Java

**CO’s- PO’s & PSO’s MAPPING**

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OBJECTIVES:

To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.

- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.

- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered.

- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: 10 Hours

Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

MS EXCEL: 10 Hours

Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and Securing the workbook

**MS POWERPOINT:**  
10 Hours
- Select slide templates, layout and themes
- Formatting slide content and using bullets and numbering
- Insert and format images, smart art, tables, charts
- Using Slide master, notes and handout master
- Working with animation and transitions
- Organize and Group slides
- Import or create and use media objects: audio, video, animation
- Perform slideshow recording and Record narration and create presentable videos

**TOTAL: 30 PERIODS**

**OUTCOMES:**
On successful completion the students will be able to

- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.
COURSE 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.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I  PROBABILITY AND RANDOM VARIABLES  9 + 3
Axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  9 + 3
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  ESTIMATION THEORY  9 + 3

UNIT IV  NON-PARAMETRIC TESTS  9 + 3
Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.

UNIT V  STATISTICAL QUALITY CONTROL  9 + 3
Control charts for measurements ( \( \bar{X} \) and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

CO1: Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.

CO2: Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.

CO3: Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO4: Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
CO5: Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

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CS3492 DATABASE MANAGEMENT SYSTEMS L T P C

COUSE OBJECTIVES:
- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To have an introductory knowledge about the Distributed databases, NOSQL and database security
UNIT I RELATIONAL DATABASES

UNIT II DATABASE DESIGN

UNIT III TRANSACTIONS

UNIT IV IMPLEMENTATION TECHNIQUES

UNIT V ADVANCED TOPICS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Construct SQL Queries using relational algebra
CO2: Design database using ER model and normalize the database
CO3: Construct queries to handle transaction processing and maintain consistency of the database
CO4: Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
CO5: Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

TOTAL:45 PERIODS

TEXT BOOKS
REFERENCES:

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AL3452 OPERATING SYSTEMS

COURSE OBJECTIVES:
- To understand the basics and functions of operating systems.
- To understand Processes and Threads.
- To analyze Scheduling algorithms and process synchronization.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and File systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

UNIT I INTRODUCTION

UNIT II PROCESS MANAGEMENT

UNIT III MEMORY MANAGEMENT
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.
UNIT IV  STORAGE MANAGEMENT  10

UNIT V  VIRTUAL MACHINES AND MOBILE OS  7
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

PRACTICAL EXERCISES:  45 PERIODS
1. Installation of Operating system : Windows/ Linux
2. Illustrate UNIX commands and Shell Programming
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphores
7. Write a C program to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Implement the paging Technique using C program
11. Write C programs to implement the following Memory Allocation Methods
   a. First Fit  b. Worst Fit  c. Best Fit
12. Write C programs to implement the various Page Replacement Algorithms
13. Write C programs to Implement the various File Organization Techniques
14. Implement the following File Allocation Strategies using C programs
   a. Sequential  b. Indexed  c. Linked
15. Write C programs for the implementation of various disk scheduling algorithms

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Analyze various scheduling algorithms and process synchronization.
CO2: Explain deadlock, prevention and avoidance algorithms.
CO3: Compare and contrast various memory management schemes.
CO4: Explain the functionality of file systems I/O systems, and Virtualization
CO5: Compare iOS and Android Operating Systems.

TOTAL:75 PERIODS

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CW3401 INTRODUCTION TO BUSINESS SYSTEMS

COURSE OBJECTIVES:
- To develop and strengthen business quality and motivation in students
- To impart basic business skills
- To understanding to run a business efficiently and effectively.

UNIT I OVERVIEW OF BUSINESS SYSTEM

UNIT II OUTLINE OF BUSINESS ORGANIZATION
Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises, Multinational and Global companies. Managing Global environment. Management levels and types.

UNIT III FUNCTIONS OF BUSINESS
Functions and Objectives – Production, Marketing, Finance, Human Resource, quality control and Research & development.

UNIT IV MEASURING BUSINESS PERFORMANCE AND CONTROL PROCESS
Performance - Benchmarking, employee retention. Controlling Techniques - Budgetary and Non-Budgetary control measures

UNIT V  COMPUTER APPLICATIONS IN BUSINESS  9
Introduction to business Software- Enterprise application and Business application. Overview on types of Business software. ERP. Business Intelligence, e-business and e-governance.

COURSE OUTCOMES:
CO1: To demonstrate and strengthen business quality and motivation in students
CO2: Examine basic business skills and measuring business performance
CO3: To demonstrate business Applications using business software
CO4: Apply Enterprise application and Business application
CO5: Use Business Intelligence in e-business for marketing and sales.

TOTAL:45 PERIODS

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AL3451  MACHINE LEARNING  L T P C
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COURSE OBJECTIVES:
- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
• To evaluate the algorithms based on corresponding metrics identified

UNIT I INTRODUCTION TO MACHINE LEARNING
Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

UNIT IV NEURAL NETWORKS
Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS
Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar’s test, K-fold CV paired t test

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Explain the basic concepts of machine learning.
CO2 : Construct supervised learning models.
CO3 : Construct unsupervised learning algorithms.
CO4: Evaluate and compare different models

TOTAL:45 PERIODS

TEXTBOOKS:

REFERENCES

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**GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**

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**UNIT I ENVIRONMENT AND BIODIVERSITY**

**UNIT II ENVIRONMENTAL POLLUTION**

**UNIT III RENEWABLE SOURCES OF ENERGY**
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

**UNIT IV SUSTAINABILITY AND MANAGEMENT**
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

**UNIT V SUSTAINABILITY PRACTICES**

TOTAL: 30 PERIODS

TEXT BOOKS:
5. Bradley, A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCES:

CS3481 DATABASE MANAGEMENT SYSTEMS LABORATORY

COURSE OBJECTIVES:
- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.

LIST OF EXPERIMENTS:
1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different ‘where’ clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
12. Develop a simple GUI based database application and incorporate all the above-mentioned features
13. Case Study using any of the real life database applications from the following list
   a) Inventory Management for an EMart Grocery Shop
   b) Society Financial Management
   c) Cop Friendly App – Eseva
   d) Property Management – eMall
   e) Star Small and Medium Banking and Finance
      • Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
      • Apply Normalization rules in designing the tables in scope.
      • Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
      • Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
• Ability to showcase ACID Properties with sample queries with appropriate settings

List of Equipments:(30 Students per Batch)
MYSQL / SQL : 30 Users

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Create databases with different types of key constraints.
CO2: Construct simple and complex SQL queries using DML and DCL commands.
CO3: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
CO4: Create an XML database and validate with meta-data (XML schema).
CO5: Create and manipulate data using NOSQL database.

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AL3461 MACHINE LEARNING LABORATORY

COURSE OBJECTIVES:

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs.

List of Equipments:(30 Students per Batch)
The programs can be implemented in either Python or R.

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

TOTAL:60 PERIODS
1. Apply suitable algorithms for selecting the appropriate features for analysis.
2. Implement supervised machine learning algorithms on standard datasets and evaluate the performance.
3. Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.
4. Build the graph based learning models for standard data sets.
5. Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

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CW3411 BUSINESS COMMUNICATION LABORATORY II

COURSE OBJECTIVES:
- To augment students overall communication and thus aid in helping them
- To improve their interpersonal skills by engaging them in group activities
- To emerge as professionals.

LIST OF EXPERIMENTS:

1: Writing letters and creating mails
2: Construction of paragraphs and essays
3. Speaking skills and methods of speech
4. Leadership, Communication and Interpersonal skills
5. Being a motivator and role model
6. Corporate Etiquettes
7. Professionalism in the workplace
8. Engineering ethics, rights and responsibilities
9. Managing cultural diversities and global diversities
10. Right use of social media
11. Maintaining the image and pride of the organization
12. Winning formula for a successful manager/leader

List of Equipments:(30 Students per Batch)

1: Systems with Rosetta stone and Globarena
COURSE OUTCOMES:
CO1: Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators.
CO2: Differentiate between vocabularies used as adjectives, verbs.
CO3: Deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.
CO4: Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.
CO5: Set realistic goals in terms of personal and professional growth.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. APAART: Speak Well 1 (English Language and Communication)
3. APAART: Speak Well 2 (Soft Skills)

REFERENCES:

CO’s- PO’s & PSO’s MAPPING

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