

**ANNA UNIVERSITY, CHENNAI  
UNIVERSITY DEPARTMENTS  
REGULATIONS – 2023  
CHOICE BASED CREDIT SYSTEM**

**B.E. COMPUTER SCIENCE AND ENGINEERING**

**VISION OF THE DEPARTMENT**

The vision of the Department is to create computing professionals, researchers and entrepreneurs with high technical competency and communication skills by setting high standards in academic excellence and meeting the future needs of the society.

**MISSION OF THE DEPARTMENT**

The mission of the Department is to

- Provide motivated faculty and state of the art facilities for education and research, both in foundational aspects and emerging computing trends.
- Develop knowledgeable, industry-ready students with pertinent competencies such as problem solving, leadership, and interpersonal skills.
- Inculcate responsibility through sharing of knowledge and innovative computing solutions that benefit the society-at-large.
- Engage in collaborative research with academia and industry for seamless transfer of knowledge resulting in patents, products and commercialization.
- Generate adequate resources for research activities from sponsored projects and consultancy.



**ANNA UNIVERSITY, CHENNAI  
UNIVERSITY DEPARTMENTS**

**B.E. COMPUTER SCIENCE AND ENGINEERING**

**PROGRAMME EDUCATIONAL OBJECTIVES:**

**The graduates will be able:**

- To comprehend the fundamental concepts in Computer Science and Engineering and apply the interaction between theory and practice for problem solving.
- To critically analyze current systems and trends, and to develop innovative solutions that cater to the dynamic nature of the computer industry, and lead to entrepreneurial initiatives.
- To pursue lifelong multidisciplinary learning as professional engineers, researchers and scientists and effectively communicate technical information, function effectively on teams, and apply computer engineering solutions within a global, societal, and environmental context.

**PROGRAMME OUTCOMES:**

**Students will be able to:**

**PO1. Engineering Knowledge:** Apply mathematical foundations, algorithmic principles, and Computer Science theory in the modelling and design of computer based systems of varying complexity.

**PO2. Problem Analysis:** Critically analyze a problem, identify, formulate and solve problems in the field of Computer Science and Engineering, considering current and future trends.

**PO3. Design/Development of Solutions:** Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, and sustainability in the field of computer engineering.

**PO4. Conduct Investigations of Complex Problems:** Perform experiments and organize, analyze, and interpret data.

**PO5. Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practice.

**PO6. Engineer and Society:** Apply knowledge and reasoning to assess issues related to social, ethical, legal, economical, health and safety and apply them to professional engineering practice.

**PO7. Environment and Sustainability:** Analyze the local and global impact of computing on individuals, organizations, and society and look at sustained development.

**PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

**PO9. Individual and Team Work:** Function effectively on teams to accomplish a common goal.

**PO10. Communication:** Communicate effectively with a range of audiences and prepare technical documents and make effective oral presentations.

**PO11. Project Management and Finance:** Demonstrate knowledge of engineering and management principles to develop innovative solutions and manage projects effectively, both as a member and a leader in a team.

**PO12. Life-long Learning:** Recognize the need for and possess an ability to engage in life-long learning, leading to continuing professional development.

**PROGRAM SPECIFIC OUTCOMES**

1. To use mathematical, algorithmic, and theoretical foundations in the study of computing systems.
2. To analyze problem requirements and develop appropriate solutions.
3. To acquire knowledge and skills in emerging technologies.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES**  
 A broad relation between the programme objectives and the outcomes is given in the following table

| PROGRAMME EDUCATIONAL OBJECTIVES | PROGRAMME OUTCOMES |   |   |   |   |   |   |   |   |    |    |    | PROGRAMME SPECIFIC OUTCOMES |   |   |
|----------------------------------|--------------------|---|---|---|---|---|---|---|---|----|----|----|-----------------------------|---|---|
|                                  | 1                  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                           | 2 | 3 |
| 1.                               | 3                  | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 1  | 2  | 2  | 3                           | 3 | 2 |
| 2.                               | 3                  | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 2  | 3  | 1  | 2                           | 3 | 3 |
| 3.                               |                    |   | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3  | 3  |    | 2                           | 3 | 3 |

1' = Low; '2' = Medium; '3' = High

PROGRESS THROUGH KNOWLEDGE

**ANNA UNIVERSITY, CHENNAI**  
**UNIVERSITY DEPARTMENTS**  
**REGULATIONS 2023**

**B.E. COMPUTER SCIENCE AND ENGINEERING**

**CHOICE BASED CREDIT SYSTEM**  
**CURRICULA AND SYLLABI**  
**SEMESTER I**

| S. NO.            | COURSE CODE | COURSE TITLE   | CATE GORY | PERIODS PER WEEK |          |           | TOTAL CONTACT PERIODS | CREDITS   |
|-------------------|-------------|--|-----------|------------------|----------|-----------|-----------------------|-----------|
|                   |             |  |           | L                | T        | P         |                       |           |
| <b>THEORY</b>     |             |  |           |                  |          |           |                       |           |
| 1.                | HS3151      | English for Communication - I                          | HSMC      | 3                | 0        | 0         | 3                     | 3         |
| 2.                | MA3151      | Matrices and Calculus                                  | BSC       | 3                | 1        | 0         | 4                     | 4         |
| 3.                | PH3151      | Engineering Physics                                    | BSC       | 3                | 0        | 0         | 3                     | 3         |
| 4.                | CY3151      | Engineering Chemistry                                  | BSC       | 3                | 0        | 0         | 3                     | 3         |
| 5.                | EE3152      | Fundamentals of Electrical and Electronics Engineering | ESC       | 3                | 0        | 0         | 3                     | 3         |
| 6.                | GE3153      | Programming in C                                       | ESC       | 2                | 0        | 4         | 6                     | 4         |
| 7.                | GE3154      | தமிழர் மரபு /Heritage of Tamils                        | HSMC      | 1                | 0        | 0         | 1                     | 1         |
| 8.                | CS3101      | Computational Thinking                                 | ESC       | 1                | 0        | 2         | 3                     | 2         |
| <b>PRACTICALS</b> |             |  |           |                  |          |           |                       |           |
| 9.                | PH3161      | Physics Laboratory                                     | BSC       | 0                | 0        | 2         | 2                     | 1         |
| 10.               | GE3162      | English Laboratory - I <sup>§</sup>                    | EEC       | 0                | 0        | 2         | 2                     | 1         |
| <b>TOTAL</b>      |             |  |           | <b>19</b>        | <b>1</b> | <b>10</b> | <b>30</b>             | <b>25</b> |

<sup>§</sup> Skill Based Course

**SEMESTER II**

| S. NO.            | COURSE CODE | COURSE TITLE                                    | CATE GORY | PERIODS PER WEEK |          |           | TOTAL CONTACT PERIODS | CREDITS        |
|-------------------|-------------|---|-----------|------------------|----------|-----------|-----------------------|----------------|
|                   |             |   |           | L                | T        | P         |                       |                |
| <b>THEORY</b>     |             |   |           |                  |          |           |                       |                |
| 1.                | HS3251      | English For Communication – II                  | HSMC      | 3                | 0        | 0         | 3                     | 3              |
| 2.                | MA3252      | Discrete Mathematics                            | BSC       | 3                | 1        | 0         | 4                     | 4              |
| 3.                | PH3252      | Semiconductor Devices and Quantum Technology    | BSC       | 3                | 0        | 0         | 3                     | 3              |
| 4.                | GE3155      | Engineering Drawing                             | ESC       | 2                | 0        | 4         | 6                     | 4              |
| 5.                | GE3251      | தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology | HSMC      | 1                | 0        | 0         | 1                     | 1              |
| 6.                | CS3201      | Object Oriented Programming                     | PCC       | 2                | 0        | 2         | 4                     | 3              |
| 7.                |             | NCC Credit Course Level 1                       | -         | 2                | 0        | 0         | 2                     | 2 <sup>#</sup> |
| <b>PRACTICALS</b> |             |   |           |                  |          |           |                       |                |
| 8.                | GE3161      | Engineering Practices Laboratory                | ESC       | 0                | 0        | 4         | 4                     | 2              |
| 9.                | CY3161      | Chemistry Laboratory                            | BSC       | 0                | 0        | 2         | 2                     | 1              |
| 10.               | GE3261      | English Laboratory - II <sup>§</sup>            | EEC       | 0                | 0        | 2         | 2                     | 1              |
| <b>TOTAL</b>      |             |   |           | <b>16</b>        | <b>1</b> | <b>14</b> | <b>31</b>             | <b>22</b>      |

<sup>#</sup> NCC Credit Course level 1 is offered for NCC students only. Other students may enroll for NSS/NSO/YRC activity. 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.

<sup>§</sup> Skill Based Course.

**UNIT I BASICS OF COMMUNICATION 9**

**Listening** – Telephone conversation & Writing message, gap filling; **Reading** – Telephone message, bio-note; **Writing** – Personal profile; **Grammar** – Simple present tense, Present continuous tense, Asking questions (wh-questions); **Vocabulary** – One word substitution, Synonyms

**UNIT II NARRATION 9**

**Listening** – Travel podcast / Watching a travel documentary; **Reading** – An excerpt from a travelogue, Newspaper Report; **Writing** – Narrative (Event, personal experience etc.); **Grammar** – Subject – verb agreement, Simple past, Past continuous Tenses; **Vocabulary** – Antonyms, Word formation (Prefix and Suffix).

**UNIT III DESCRIPTION 9**

**Listening** – Conversation, Radio/TV advertisement; **Reading** – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature; **Writing** – Definitions, Descriptive writing, Checklists; **Grammar** – Future tense, Perfect tenses, Preposition; **Vocabulary** – Adjectives and Adverbs

**UNIT IV CLASSIFICATION 9**

**Listening** – Announcements and filling a table; **Reading** – An article, social media posts and classifying (channel conversion – text to table); **Writing** – Note making, Note taking and Summarising, a classification paragraph; **Grammar** – Connectives, Transition words; **Vocabulary** – Contextual vocabulary, Words used both as noun and verb, Classification related words.

**UNIT V EXPRESSION OF VIEWS 9**

**Listening** – Debate / Discussion; **Reading** – Formal letters, Letters to Editor, Opinion articles / Blogs; **Writing** – Letter writing/ Email writing (Enquiry / Permission, Letter to Editor); **Grammar** – Question tags, Indirect questions, Yes / No questions; **Vocabulary** – Compound words, Phrasal verbs.

**Assessment**

Two Written Assessments: 35% weightage each

Assignment: 30% weightage

Designing a tourist brochure / Writing an opinion article / Making a travel podcast

**End Semester Exam:** 3-hour written exam

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES**

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

**CO1:**Use grammar and vocabulary suitable for general context.

**CO2:**Comprehend the nuances of spoken and written communication.

**CO3:**Use descriptive and analytical words, phrases, and sentence structures in written communication.

**CO4:**Read different types of texts and comprehend their denotative and connotative meanings.

**CO5:**Write different types of texts using appropriate formats.

**TEXT BOOKS:**

1. "English for Engineers and Technologists" Volume I by Orient Blackswan, 2022
2. "English for Science & Technology - I" by Cambridge University Press, 2023

**REFERENCES**

1. "Interchange" by Jack C.Richards, Fifth Edition, Cambridge University Press, 2017.
2. "English for Academic Correspondence and Socializing" by Adrian Wallwork, Springer, 2011.
3. "The Study Skills Handbook" by Stella Cortrell, Red Globe Press, 2019
4. www.uefap.com

**CO-PO & PSO MAPPING**

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

1-low, 2-medium, 3-high

**MA3151****MATRICES AND CALCULUS**

**L T P C**  
**3 1 0 4**

**UNIT I MATRICES****(9+3)**

Eigen values and Eigen vectors of a real matrix – Properties of Eigen values - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form.

**UNIT II FUNCTIONS OF SEVERAL VARIABLES****(9+3)**

Limit, continuity, partial derivatives – Homogeneous functions and Euler's theorem - Total derivative – Differentiation of implicit functions - Taylor's formula for two variables - Errors and approximations – Maxima and Minima of functions of two variables – Lagrange's method of undermined multipliers.

**UNIT III INTEGRAL CALCULUS****(9+3)**

Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions-Properties – Evaluation of integrals by using Beta and Gamma functions – Error functions.

**UNIT IV MULTIPLE INTEGRALS****(9+3)**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals.

**UNIT V VECTOR CALCULUS****(9+3)**

Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green's theorem, Stoke's and Gauss divergence theorems – Verification and applications in evaluating line, surface and volume integrals.

**TOTAL: 60 PERIODS****COURSE OUTCOMES:****At the end of the course, the students will be able to:****CO1:**Use the matrix algebra methods for solving practical problems.**CO2:**Use differential calculus ideas on several variable functions.**CO3:**Apply different methods of integration in solving practical problems by using Beta and Gamma functions.**CO4:**Apply multiple integral ideas in solving areas and volumes problems.**CO5:**Apply the concept of vectors in solving practical problems.**TEXT BOOKS:**

1. Joel Hass, Christopher Heil, Maurice D.Weir "Thomas' Calculus", Pearson Education., New Delhi, 2018.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
3. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi, 2013.

**REFERENCES:**

1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015.
2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
4. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

**CO-PO Mapping**

| CO   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1  | 3   | 2   | -   | 1   | 1   | 2   | -   | -   | -   | -    | -    | 3    |
| CO2  | 3   | 2   | -   | 1   | 1   | 2   | -   | -   | -   | -    | -    | 3    |
| CO3  | 3   | 2   | -   | 1   | 1   | 2   | -   | -   | -   | -    | -    | 3    |
| CO4  | 3   | 2   | -   | 1   | 1   | 2   | -   | -   | -   | -    | -    | 3    |
| CO5  | 3   | 2   | -   | 1   | 1   | 2   | -   | -   | -   | -    | -    | 3    |
| AVg. | 3   | 2   |     | 1   | 1   | 2   |     |     |     |      |      | 3    |

1' = Low; '2' = Medium; '3' = High

**UNIT I MECHANICS OF MATERIALS****9**

Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke’s law - Poisson’s ratio - stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young’s modulus determination - I shaped girders –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

**UNIT II OSCILLATIONS, SOUND AND THERMAL PHYSICS****9**

Simple harmonic motion - Torsional pendulum – Damped oscillations –Shock Absorber -Forced oscillations and Resonance –Applications of resonance.- Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion – Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

**UNIT III OPTICS AND LASERS****9**

Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer – Diffraction - CD as diffraction grating – Diffraction by crystals -Polarization - polarizers – Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO<sub>2</sub> laser, Semiconductor laser - Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers.

**UNIT IV QUANTUM MECHANICS****9**

Black body radiation (Qualitative) – Planck’s hypothesis – Einstein’s theory of Radiation - Matter waves–de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Meaning and Physical significance of wave function - Normalization - Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope.

**UNIT V CRYSTAL PHYSICS****9**

Crystal Bonding – Ionic – covalent – metallic and van der Waals’s/ molecular bonding. Crystal systems - unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures - crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czochralski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

After completion of this course, the students shall be

**CO1:** Understand the important mechanical properties of materials

**CO2:** Express the knowledge of oscillations, sound and applications of Thermal Physics

**CO3:** Know the basics of optics and lasers and its applications

**CO4:** Understand the basics and importance of quantum physics.

**CO5:** Understand the significance of crystal physics.



**TEXT BOOKS:**

1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013.
2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 10<sup>th</sup> Edition, 2015.
3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer-Verlag, 2012.
4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.

**REFERENCES:**

1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012

**CO-PO & PSO MAPPING**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2   | 1   | 1   | 2   | 1   |     |     |     |     |      |      |      |
| CO2 | 2   | 2   | 1   | 2   | 1   |     |     |     |     |      |      |      |
| CO3 | 2   | 2   | 2   | 2   | 1   |     |     |     |     |      |      |      |
| CO4 | 2   | 1   | 1   | 1   | 1   |     |     |     |     |      |      |      |
| CO5 | 2   | 2   | 2   | 2   | 1   |     |     |     |     |      |      |      |
| Avg | 2   | 2   | 1   | 2   | 1   | -   | -   | -   | -   | -    | -    | -    |

1-low, 2-medium, 3-high

**CY3151****ENGINEERING CHEMISTRY****LT PC  
3 0 3****UNIT I POLYMER CHEMISTRY****9**

Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: T<sub>g</sub>, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index (Problems). Techniques of polymerization: Bulk, emulsion, solution and suspension.

Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendaring

**UNIT II NANO CHEMISTRY****9**

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

**UNIT III CORROSION SCIENCE****9**

Electrochemical cell, redox reaction, electrode potential - oxidation and reduction potential. Measurement and its application Introduction to corrosion - chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-concentration cell corrosion-passivity-soil, pitting, inter-granular, water line, stress and microbiological corrosions-galvanic series-factors influencing corrosion- measurement of corrosion rate. Corrosion control-material selection and design-electrochemical protection- sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions.

**UNIT IV ENERGY SOURCES****9**

Batteries - Characteristics - types of batteries – primary battery (dry cell), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H<sub>2</sub>-O<sub>2</sub> fuel cell - Supercapacitors-Types and Applications, Renewable Energy: Solar- solar cells, DSSC

**UNIT V WATER TECHNOLOGY****9**

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD and heavy metals. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

- CO1:** To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- CO2:** To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- CO3:** To recognize and apply basic knowledge on suitable corrosion protection technique for practical problems.
- CO4:** To recognize different storage devices and apply them for suitable applications in energy sectors.
- CO5:** To demonstrate the knowledge of water and their quality in using at different industries.

**TEXT BOOKS:**

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 17<sup>th</sup> Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Dara S.S., "A Text book of Engineering Chemistry", Chand Publications, 2004.

**REFERENCES:**

1. Schdeva M.V., "Basics of Nano Chemistry", Anmol Publications Pvt Ltd, 2011.
2. Friedrich Emich, "Engineering Chemistry", Medtech, 2014.
3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

**CO - PO Mapping**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 3   | 1   | 2   |     |     |     |     |     |     |      |      |      |
| <b>CO2</b> | 2   | 1   |     | 2   | 2   |     |     |     |     |      |      |      |
| <b>CO3</b> | 2   | 2   | 1   | 1   | 2   |     |     |     |     |      |      |      |
| <b>CO4</b> | 2   |     | 2   |     | 2   |     |     |     |     |      |      |      |
| <b>CO5</b> | 3   | 2   | 2   | 1   | 1   |     |     |     |     |      |      |      |
| <b>Avg</b> | 2   | 1   | 1   | 1   | 2   | -   | -   | -   | -   | -    | -    | -    |

1-low, 2-medium, 3-high

**EE3152 FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**L T P C**  
**3 0 0 3**

**UNIT I BASIC ELECTRICAL CIRCUITS****9**

DC Circuits: Sources, Ohm's Law - Kirchhoff's Laws – Solution of DC circuits with Independent sources only (Steady state)

AC Circuits: AC Fundamentals: Waveforms, Average value, RMS Value, Impedance, Instantaneous Power, Real Power, Reactive Power and Apparent Power, Power Factor – Steady State Analysis of RL, RC and RLC Circuits.

**UNIT II AC and DC MACHINES****9**

Magnetic Circuits fundamentals – DC Machines : Construction, Working Principle, Types and Applications of DC Generator and Motor, EMF and Torque equation.

AC Machines: Construction, Working and Applications of Transformer, Three phase Alternator, Synchronous motor, Single and Three Phase Induction Motor and BLDC motor.

**UNIT III ANALOG AND DIGITAL ELECTRONICS****9**

Operation and Characteristics of electronic devices: PN Junction Diodes, Zener Diode, BJT, JFET and MOSFET– Operational Amplifiers (OPAMPs) : Characteristics and basic application circuits- 555 timer IC based astable and monostable multivibrator.

Basic switching circuits – Gates and Flip-Flops-Sample and hold circuit- R-2R ladder type DAC- Successive approximation based ADC.

**UNIT IV SENSORS AND TRANSDUCERS****9**

Solenoids, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, piezo electric crystals, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

**UNIT V MEASUREMENTS AND INSTRUMENTATION****9**

Functional Elements of an Instrument, Error analysis; Operating Principle - Moving Coil and Moving Iron Instruments, Power Measurement, Energy Meter, Instrument Transformers - CT and PT, Multimeter- DSO - Block Diagram Approach.

**TOTAL: 45 PERIODS****COURSE OUTCOMES**

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

**CO 1:** Compute the electric circuit parameters for simple problems.

- CO 2:** Explain the working principles and characteristics of electrical machines, electronic devices and measuring instruments.
- CO 3:** Identify general applications of electrical machines, electronic devices and measuring instruments.
- CO 4:** Analyze the basic electrical and electronic circuits.
- CO 5:** Explain the types and operating principles of sensors and transducers.

**TEXT BOOKS:**

1. Del Toro 'Electrical Engineering Fundamentals' Pearson Education, New Delhi, 2022.
2. Alan S. Moris, Principles of Measurements and Instruments, Prentice-Hall of India Pvt. Ltd., New Delhi, 1988.
3. Smarjit Ghosh 'Fundamentals of Electrical and Electronics Engineering, 2<sup>nd</sup> Edition 2010.

**REFERENCES:**

1. Rajendra Prasad 'Fundamentals of Electrical Engineering', Third Edition, Prentice Hall of India, 2014.
2. Sanjeev Sharma 'Basics of Electrical Engineering' Wiley, 2019.
3. John Bird, Electrical Circuits theory and Technology, Taylor & Francis Ltd, Seventh Edition, 2022.
4. Doebelin, E.O., Measurements Systems – Application and Design', McGraw Hill Publishing Co, 2019.
5. D.Roy Choudhury, Shail B. Jain, Linear Integrated Circuits, New age international Publishers, 2018.
6. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

| Mapping of COs with POs and PSOs          |          |            |            |          |   |   |   |   |   |    |    |            |      |   |   |
|---|----------|------------|------------|----------|---|---|---|---|---|----|----|------------|------|---|---|
| COs/POs & PSOs                            | POs      |            |            |          |   |   |   |   |   |    |    |            | PSOs |   |   |
|   | 1        | 2          | 3          | 4        | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12         | 1    | 2 | 3 |
| CO1                                       | 3        | 3          | 2          | 2        | - | - | - | - | - | -  | -  | 1          | -    | - | - |
| CO2                                       | 2        | 3          | 2          | 3        | - | - | - | - | - | -  | -  | 1          | -    | - | - |
| CO3                                       | 3        | 2          | 1          | 1        | - | - | - | - | - | -  | -  | 1          | -    | - | - |
| CO4                                       | 1        | 2          | 2          | 2        | - | - | - | - | - | -  | -  | 1          | -    | - | - |
| CO5                                       | 1        | 1          | 2          | 2        | - | - | - | - | - | -  | -  | 2          | -    | - | - |
| <b>CO/PO &amp; PSO Average</b>            | <b>2</b> | <b>2.2</b> | <b>1.8</b> | <b>2</b> | - | - | - | - | - | -  | -  | <b>1.2</b> | -    | - | - |
| 1 – Slight, 2 – Moderate, 3 – Substantial |          |            |            |          |   |   |   |   |   |    |    |            |      |   |   |

**GE3153**

**PROGRAMMING IN C**

**LT PC  
2 0 4 4**

**UNIT I BASICS OF C PROGRAMMING**

**6+12**

Introduction to programming paradigms -- Structure of C program - C programming: Data Types - Constants - Keywords - Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements - Decision making statements - Switch statement.

**PRACTICALS:**

- Designing programs with algorithms/flowchart
- Programs for i/o operations with different data types

- Programs using various operators
- Programs using decision making and branching statements

**UNIT II              LOOP CONTROL STATEMENTS AND ARRAYS**

**6+12**

Iteration statements: For, while, Do-while statements, nested loops, break & continue statements - Introduction to Arrays: Declaration, Initialization - One dimensional array - Two dimensional arrays – Searching and sorting in Arrays – Strings – string handling functions - array of strings

**PRACTICALS:**

- Programs using for, while, do-while loops and nested loops.
- Programs using arrays and operations on arrays.
- Programs implementing searching and sorting using arrays
- Programs implementing string operations on arrays

**UNIT III             FUNCTIONS AND POINTERS**

**6+12**

Modular programming - Function prototype, function definition, function call, Built-in functions – Recursion – Recursive functions - Pointers - Pointer increment, Pointer arithmetic - Parameter passing: Pass by value, Pass by reference, pointer and arrays, dynamic memory allocation with *malloc/calloc*

**PRACTICALS:**

- Programs using functions
- Programs using recursion
- Programs using pointers & strings with pointers
- Programs using Dynamic Memory Allocation

**UNIT IV             STRUCTURES AND UNION**

**6+12**

Storage class, Structure and union, Features of structures, Declaration and initialization of structures, array of structures, Pointer to structure, structure and functions, typedef, bit fields, enumerated data types, Union.

**PRACTICALS:**

- Programs using Structures
- Programs using Unions
- Programs using pointers to structures and self-referential structures.

**UNIT V              MACROS AND FILE PROCESSING**

**6+12**

Preprocessor directives – Simple and Conditional macros with and without parameters - Files - Types of file processing: Sequential and Random access – File operations – read, write & seek.

**PRACTICALS:**

- Programs using pre-processor directives & macros
- Programs to handle file operations
- Programs to handle file with structure

## COURSE OUTCOMES:

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

**CO1:** Write simple C programs using basic constructs.

**CO2:** Design searching and sorting algorithms using arrays and strings.

**CO3:** Implement modular applications using Functions and pointers.

**CO4:** Develop and execute applications using structures and Unions.

**CO5:** Solve real world problem using files.

**Total Hours: 90 (30+60)**

## TEXT BOOKS:

1. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

## REFERENCE BOOKS:

1. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
2. Ashok N Kamthane, Programming in C, Pearson, Third Edition, 2020
3. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
4. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C" McGraw-Hill Education, 1996.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

### CO's-PO's & PSO's MAPPING

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 1   | 3   | 3   | 1   | 2   | 2   | 1   | -   | -   | -   | 2    | -    | 3    |
| 2   | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | -   | -    | -    | -    |
| 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | 3   | -    | -    | -    |
| 4   | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | 3   | -    | 3    | 3    |
| 5   | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -    | 3    | 3    |
| AVG | 3   | 3   | 3   | 3   | 2   | 1   | -   | -   | 3   | 2    | 3    | 3    |

1 - low, 2 - medium, 3 - high

GE3154

தமிழர் மரபு

L T P C

1 0 0 1

**அலகு I மொழி மற்றும் இலக்கியம்:**

3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் -

தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

**அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை -  
சிற்பக் கலை: 3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்: 3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்  
தமிழர்களின் பங்களிப்பு: 3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கல்கள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

**TOTAL : 15 PERIODS**

**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**GE3154**

**HERITAGE OF TAMILS**

**LT P C**

**1 0 0 1**

**UNIT I LANGUAGE AND LITERATURE 3**

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3**

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 3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

**UNIT IV THINAI CONCEPT OF TAMILS 3**

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 3**

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. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).



2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**CS3101**

**COMPUTATIONAL THINKING**

**LT PC  
1 0 2 2**

**UNIT I INTRODUCTION TO COMPUTATIONAL THINKING**

**1+4**

Understanding the concepts: Decomposition, pattern recognition/data representation, generalization, abstraction, and algorithms, Representation, automation, Analysis, visualization. Logical thinking - reasoning

**UNIT II UNDERSTANDING DATA**

**2+6**

Performing analytics on numeric data using any spreadsheet software and representing the data using charts, histograms, scatter plots, graphs etc. Understanding patterns in data sequences, puzzles, and nonograms. Data Encryption – ciphering sentences and Compression.

**UNIT III DECOMPOSITION AND PATTERN RECOGNITION**

**3+8**

The divide and Conquer, pattern recognition, Algorithmic thinking - creating oral algorithms for everyday tasks – visualizing algorithms through sequence of steps, pseudocode, flow charts, selection, iteration, functions, procedures and parameters.

**UNIT IV ABSTRACTIONS AND SCRATCH**

**3+6**

Understanding Abstraction Object Description, Abstraction and Modeling, Objects and Objects based modeling -Repair, Reuse, Recycle, Scratch / equivalent - Motion, events, control

**UNIT V UNDERSTANDING COMPLEXITY****6+6**

Understanding complexity, sorting algorithms, search algorithms, AI and Turing Test, FSA (Finite State Automata), Debugging, Enhancing the clarity of a program - documentation, style, idioms, Automation and Simulation, generalizing a solution.

**TOTAL: 45 PERIODS****TEXT BOOKS**

1. Karl Beecher, Computational Thinking - A Beginner's Guide to Problem-Solving and Programming, BCS Learning, 2017.
2. Venkatesh G, Madhavan Mukund, Computational Thinking, Notion Press, 1<sup>st</sup> Edition, 2021.
3. Hunt, Kenny A.\_ Riley, David D, Computational Thinking for the Modern Problem Solver, CRC Press, 2015

**REFERENCES**

1. David Clark, Computational and Algorithmic Thinking Book 2, AMT Publishing, 2016.
2. Paul Curzon, "Computing Without Computers: A Gentle Introduction to Computer Programming, Data Structures, and Algorithms", 2014.  
(<https://teachinglondoncomputing.files.wordpress.com/2014/02/booklet-cwc-feb2014.pdf>)
3. Wang Paul S, From computing to computational thinking, CRC Press, 2016.
4. Peter J. Denning, Matti Tedre, Computational Thinking, MIT Press, 2019.
5. Paolo Ferragina, Fabrizio Luccio, Computational Thinking\_ First Algorithms, Then Code, Springer International Publishing, 2018.
6. Aman Yadav, Ulf Berthelsen, Computational Thinking in Education\_ A Pedagogical Perspective, Routledge, 2021.
7. Zhiwei Xu, Jialin Zhang, Computational Thinking\_ A Perspective on Computer Science, Springer, 2021.

**Web Sources**

1. <https://edu.google.com/resources/programs/exploring-computational-thinking/>
2. <https://teachinglondoncomputing.org>
3. <https://play2048.co/>
4. <https://scratch.mit.edu>
5. <https://classic.csunplugged.org>

**COURSE OUTCOMES:**

**Upon completion of the course, the students will be able to**

**CO1:**Formulate problems in a way that enables the use of a computer to solve them.

**CO2:**Logically organize and analyze data.

**CO3:**Automate solutions through algorithmic thinking.

**CO4:**Identify, analyse, and implement possible solutions with the goal of achieving the most efficient and effective combination of steps and resources.

**CO5:**Generalize and transfer this problem-solving process to a wide variety of problems

**CO-PO Mapping**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | 1   | 1    | -    | 1    | 3    | 3    | -    |
| <b>CO2</b> | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | 1   | 1    | -    | 1    | 3    | 3    | -    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | 1   | 1    | -    | 1    | 3    | 3    | -    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | 1   | 1    | -    | 1    | 3    | 3    | -    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 1   | 1   | -   | -   | 1   | 1    | -    | 1    | 3    | 3    | -    |

1 - low, 2 - medium, 3 – high

**ANY SEVEN EXPERIMENTS**

1. Torsional Pendulum-Determination of rigidity modulus of wire and moment of inertia of the disc
2. Non-uniform bending -Determination of Young's modulus of the material of the beam.
3. Uniform bending–Determination of Young's modulus of the material of the beam.
4. Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
5. Viscosity of Liquids.
6. Acoustic grating-Determination of the velocity of ultrasonic waves in liquids.
7. Ultrasonic interferometer – determination of sound velocity and liquids compressibility
8. Laser-Determination of the wavelength of the laser using grating
  - Determination of the width of the groove of the compact disc using laser.
  - Estimation of laser parameters.
9. Air wedge -Determination of the thickness of a thin sheet/wire
10. a) Optical fibre -Determination of Numerical Aperture and acceptance angle  
b) Determination of bending loss of fibre.
11. Spectrometer-Determination of the wavelength of light using grating
12. Michelson Interferometer -Determination of wavelength of the monochromatic source of light.
13. Photoelectric effect – Determination of Planck's constant
14. Black body radiation (Demonstration)
15. Melde's string experiment - Standing waves.
16. Forced and Damped Oscillations.
17. Thermistor sensor
18. Thermocouple sensor
19. Hall effect – determination of Hall parameters.
20. Design LCR series and parallel circuit and estimation of the resonant frequency.
21. Magnetic Hysteresis Loop tracer – determination of magnetic parameters.
22. Four Probe Set up – determination of band gap/resistivity of a material.

**TOTAL: 30 PERIODS****COURSE OUTCOMES:**

Upon completion of the course, the students will be able

- CO1:** To determine various moduli of elasticity, thermal properties of materials and viscosity of liquids
- CO2:** To determine the velocity of ultrasonic waves in Liquids.
- CO3:** To calculate and analyze various optical properties.
- CO4:** To build and analyze the characteristics of mechanical vibrations and logic operation.
- CO5:** To determine the desired electric and magnetic parameters of materials, semiconductors devices and sensors.

**CO-PO & PSO MAPPING**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 3   | 3   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |
| <b>CO2</b> | 2   | 2   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |
| <b>CO3</b> | 3   | 3   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |
| <b>CO4</b> | 2   | 1   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |
| <b>CO5</b> | 2   | 2   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |
| <b>Avg</b> | 2   | 2   | 1   | 2   | 1   |     |     |     |     | 1    |      |      |

1-low, 2-medium, 3-high

**UNIT I SELF-INTRODUCTION**

6

Introducing oneself; Telephone conversation, Relaying telephone message – Role play

**UNIT II NARRATION**

6

Narrating one's personal experience in front of a group (formal and informal context)

Ex.: First day in college / vacation / first achievement etc.

**UNIT III CONVERSATION**

6

Making conversation – formal and informal – Turn taking and Turn giving – Small talk

**UNIT IV SHORT SPEECH**

6

Giving short speeches on topics like College Clubs and their activities in the college / Campus Facilities / native place and its major attractions.

**UNIT V DISCUSSION**

6

Taking part in a group discussion on general topics – Debating on topics of interest and relevance.

**Assessment**

Internals – 100%

Short Speeches

Group discussion

**TOTAL : 30 PERIODS****COURSE OUTCOMES**

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

**CO1.** Communicate effectively in formal and informal contexts**CO2.** Converse appropriately and confidently with different people**CO3.** Express their opinions assertively in group discussions**CO-PO & PSO MAPPING**

| CO          | PO |   |   |   |   |   |   |   |   |    |    |    | PSO |   |   |
|-------------|----|---|---|---|---|---|---|---|---|----|----|----|-----|---|---|
|             | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1   | 2 | 3 |
| <b>1</b>    | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 2  | 3  | -   | - | - |
| <b>2</b>    | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 1  | 3  | -   | - | - |
| <b>3</b>    | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 1  | 3  | -   | - | - |
| <b>4</b>    | -  | - | - | - | - | - | - | - | - | -  | -  | -  | -   | - | - |
| <b>5</b>    | -  | - | - | - | - | - | - | - | - | -  | -  | -  | -   | - | - |
| <b>AVg.</b> | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 1  | 3  | -   | - | - |

1-low, 2-medium, 3-high

**UNIT I CAUSE AND EFFECT 9**

**Listening** – Radio / TV / Podcast Interview (survivors tale) and framing a set of instructions/ Do's and Don'ts; **Reading** – Excerpts of Literature (short stories), Journal articles on issues like Global warming; **Writing** - Instructions; Official letter / email (Request for internship / Industrial visit); **Grammar** – If conditionals, Imperatives; **Vocabulary** – Cause and effect expressions, Idiom

**UNIT II COMPARE AND CONTRAST 9**

**Listening** – Product reviews and gap fill exercises, Short Talks (like TED Talks) for specific information; **Reading** – Graphical content (table / chart / graph) and making inferences; **Writing** – Compare and Contrast Essay; **Grammar** – Degrees of Comparison; Mixed Tenses; **Vocabulary** – Order of Adjectives, Transition words.

**UNIT III PROBLEM AND SOLUTION 9**

**Listening** – Group discussion (case study); **Reading** – Visual content (Pictures on social issues / natural disasters) for comprehension; Editorial; **Writing** Picture description; Problem and Solution Essay; **Grammar** – Modal verbs; Relative pronoun; **Vocabulary** – Negative prefixes, Signal words for problem and solution.

**UNIT IV REPORTING 9**

**Listening** – Oral news report; **Reading** – Newspaper report on survey findings – **Writing** – Survey report, Making recommendations; **Grammar** – Active and passive voice, Direct and Indirect speech; **Vocabulary** – Reporting verbs, Numerical adjectives.

**UNIT V PRESENTATION 9**

**Listening** – Job interview, Telephone interview; **Reading** - Job advertisement and company profile and making inferences; **Writing** – Job application (cover letter and CV) **Grammar** – Prepositional phrases; **Vocabulary** – Fixed expressions, Collocations.

**Assessment**

Two Written Assessments : 35% weightage each

Assignment: 30% weightage

Conducting a survey on specific topic and write a final survey report.

**End Semester Exam:** 3-hour written exam

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES**

On completion of the course, the students will be able to:

- CO1.** Listen effectively to various oral forms of conversation, lectures, discussion and understand the main gist of the content.
- CO2.** Communicate effectively in formal and informal context.
- CO3.** Read and comprehend technical texts effortlessly.
- CO4.** Write reports and job application for internship or placement.
- CO5.** Learn to use language effectively in a professional context.

**TEXT BOOKS**

1. "English for Engineers and Technologists" Volume 2 by Orient Blackswan, 2022

2. "English for Science & Technology - II" by Cambridge University Press, 2023.

## REFERENCES

1. "Communicative English for Engineers and Professionals" by Bhatnagar Nitin, Pearson India, 2010.
2. "Take Off – Technical English for Engineering" by David Morgan, Garnet Education, 2008.
3. "Advanced Communication Skills" by Mathew Richardson, Charlie Creative Lab, 2020.
4. [www.uefap.com](http://www.uefap.com)

## CO-PO & PSO MAPPING

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

1-low, 2-medium, 3-high

MA3252

DISCRETE MATHEMATICS

L T P C  
3 1 0 4

### UNIT I LOGIC AND PROOFS (9+3)

Propositional Logic – Propositional Equivalences – Normal Forms – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

### UNIT II COMBINATORICS (9+3)

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

### 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 Hamiltonian Paths.

### UNIT IV ALGEBRAIC STRUCTURES (9+3)

Groups – Subgroups – Homomorphisms – Normal Subgroups and Cosets – Lagrange's Theorem – Rings and Fields (Definitions and Examples).

### UNIT V LATTICES AND BOOLEAN ALGEBRA (9+3)

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices – Lattices as Algebraic Systems – sublattices – Direct Product and Homomorphism – Some Special Lattices – Boolean Algebra.

**TOTAL: 60 PERIODS**

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

- CO1.** Understand the validity of the logical arguments, mathematical proofs and correctness of the algorithm.
- CO2.** Apply Combinatorial counting techniques in solving combinatorial related problems.
- CO3.** Use graph models and their connectivity, traversability in solving real world problems.
- CO4.** Understand the significance of algebraic structural ideas used in coding theory and cryptography.
- CO5.** Apply Boolean laws and Boolean functions in combinatorial circuit designs.

**TEXTBOOKS:**

- Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata Mc Graw Hill Pub. Co. Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.
- Tremblay J. P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013.

**REFERENCES:**

- Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, Boston, 2004.
- Grimaldi R.P., "Discrete and Combinatorial Mathematics", Pearson Education Pvt. Ltd., 5th Edition, Singapore, 2004.

**CO-PO Mapping**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | 3    |
| <b>CO2</b> | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | 3    |
| <b>CO3</b> | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | 3    |
| <b>CO4</b> | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | 3    |
| <b>CO5</b> | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -    | -    | 3    |

1-low, 2-medium, 3-high

**PH3252****SEMICONDUCTOR DEVICES AND QUANTUM TECHNOLOGY****L T P C  
3 0 0 3****UNIT I****ELECTRON THEORY OF MATERIALS****9**

Classical and quantum free electron theory of metals – merits and demerits Fermi-Dirac statistics– density of states: electron concentration and Fermi Level-band theory of solids: energy band formation– electron effective mass- Intrinsic semiconductors: energy band-diagram-direct and indirect band gap semiconductors - carrier concentrations and conductivity - extrinsic semiconductors: n, p-type doping, compensation doping.

**UNIT II****SEMICONDUCTORS AND DISPLAY DEVICES****9**

Degenerate and non-degenerate semiconductors: Hall Effect and devices-Schottky junction - Ohmic contacts–Peltier Coolers – Schottky diode; optical absorption and solar cell. Photoluminescence, injection luminescence – Phosphors – LED construction and working– White LED's – organic LEDs–Laser diode - principles of quantum well laser–liquid crystals and LCD construction and working–numeric displays.

**UNIT III                    MAGNETIC AND OPTICAL DATA STORAGE TECHNIQUES                    9**

Introduction – magnetic material parameters –Ferromagnetic materials – Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Materials for magnetic data storage - Optical data storage capacity of CD in normal use – advantages of CD –DVD – Blu-ray DVD - holographic storage – Phase change recording – Hi-tech involved in system development - magneto-optical data storage.

**UNIT IV                    NANODEVICES                    9**

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots – band gap of nanomaterials -- Nanodevices -An introduction - Classification of nanodevices – Nano-ordered Material systems -Semiconductor nanodevices: - JFET -Nanoscale MOSFET - Tunneling: Single electron phenomena - Coulomb blockade -: Single Electron Transistor (SET) - Resonant Tunnelling Transistor (RTT) - Microelectromechanical systems (MEMS) - Nanoelectromechanical systems (NEMS) - Applications of Nanomachines and Molecular Nanodevices – Spintronics Devices.

**UNIT V                    QUANTUM COMPUTING                    9**

- Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – multiple qubits – Bloch sphere - quantum gates - CNOT gate - Types of Quantum Computer: Quantum Annealer- Analog Quantum- Universal Quantum– Advantages of quantum computing over classical computing - -Silicon-Based Quantum Computer - Quantum cellular automaton.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

Upon completion of this course, the students shall be able to

- CO1:** Express knowledge on the electrical properties of materials.
- CO2:** Have an insight into the semiconductor junction and Display Devices
- CO3:** Explore the magnetic and optical data storage Devices
- CO4:** Implement the essential principles behind digital electronics.
- CO5:** Envisage the basics of quantum structures and their applications to quantum computing

**TEXTBOOKS**

1. S.O.Kasap - Principles of Electronic Materials and Devices, McGraw Hill Education, 2017.
2. Garcia, A. Damask and S.Schwarz - Physics for Computer Science Students, Springer-Verlag, 2012.
3. V.K. Mehta - Principles of Electronics - S.Chand Publications, New Delhi
4. G.J.Mithal - Electronic devices and circuits, Khanna publishers, New Delhi
5. B.L. Theraja - Basic Electronics - S.Chand Publications, New Delhi
6. Dr. Jaysukh Markna, Tulshi Shiyani, Nanodevices: Principle and Applications - 2018 Munich, GRIN Verlag

**REFERENCES**

1. Jasprit Singh, Optoelectronics: An Introduction to Materials and Devices, Tata McGraw Hill,1999
2. Wilson,J and Hawkes, J.F.B, Optoelectronics, Prentice Hall, 2002
3. Bhattacharya.B, Semiconductor optoelectronic devices, Prentice Hall of India, 1995.
4. Kittel C, Introduction to Solid State Physics, JohnWiley,1996



5. Kasap S.O, Principles of Electronic Materials and Devices, Tata McGraw-Hill, 2007.

### CO-PO MAPPING

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 2   | 2   | 1   | 2   | 1   |     |     |     |     |      |      |      |
| <b>CO2</b> | 3   | 1   | 1   | 2   | 1   |     |     |     |     |      |      |      |
| <b>CO3</b> | 3   | 1   | 1   | 2   | 1   |     |     |     |     |      |      |      |
| <b>CO4</b> | 2   | 1   | 1   | 1   | 1   |     |     |     |     |      |      |      |
| <b>CO5</b> | 2   | 1   | 1   | 1   | 1   |     |     |     |     |      |      |      |

1' = Low; '2' = Medium; '3' = High

**GE3155**

**ENGINEERING DRAWING**

**L T P C**

**2 0 4 4**

### **CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)**

**2**

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**

**4 + 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- 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, and cone when the axis is inclined to both the principal planes 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 simple solids like prisms, pyramids, cylinder, and cone in simple vertical position when the cutting plane is inclined to the 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. Development of lateral surfaces of solids with cut-outs and holes. Practicing three dimensional modeling of simple truncated 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, cone and cylinders by visual ray method. Creating isometric model of simple objects from orthographic projections using CAD software (Not for examination).

**TOTAL : 90 PERIODS**

### COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- CO1.** Draw conic curves, cycloids and involutes
- CO2.** Draw orthographic projections of points, lines and planes
- CO3.** Draw orthographic projections and free hand sketches of solids
- CO4.** Draw sectional views of the objects and development of surfaces.
- CO5.** Draw isometric and perspective views of simple solids

### TEXTBOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

### REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

### Publication of Bureau of Indian Standards:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 — 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

### Special points applicable to University Examinations on Engineering Drawing:

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 only in the size of A3.
4. The students will be permitted to use appropriate scale to fit the solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

**CO-PO & PSO MAPPING**

| COs | POs |   |   |   |   |   |   |   |   |    |    |    | PSOs |   |   |
|-----|-----|---|---|---|---|---|---|---|---|----|----|----|------|---|---|
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 |
| 1   | 3   | 1 | 1 | - | - | - | - | 1 | 1 | 3  | -  | 1  | 2    | - | 2 |
| 2   | 3   | 2 | 2 | - | - | - | - | 1 | 1 | 3  | -  | 1  | 2    | - | 2 |
| 3   | 3   | 2 | 2 | - | 3 | - | - | 1 | 1 | 3  | -  | 1  | 2    | 3 | 2 |
| 4   | 3   | 2 | 2 | - | 3 | - | - | 1 | 1 | 3  | -  | 1  | 2    | 3 | 2 |
| 5   | 3   | 2 | 2 | - | 3 | - | - | 1 | 1 | 3  | -  | 1  | 2    | 3 | 2 |
| AVG | 3   | 2 | 2 | - | 3 | - | - | 1 | 1 | 3  | -  | 1  | 2    | 3 | 2 |

1-low, 2-medium, 3-high

**GE3251**

**தமிழரும் தொழில்நுட்பமும்**

**LT PC**

**1 0 0 1**

**அலகு I நெசவு மற்றும் பாணைத் தொழில்நுட்பம்:**

**3**

சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

**அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:**

**3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

**அலகு III உற்பத்தித் தொழில் நுட்பம்:**

**3**

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:**

**3**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

**அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:**

**3**

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

**TOTAL : 15 PERIODS**

**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.

**GE3251**

**TAMILS AND TECHNOLOGY**

**L T P C**

**1 0 0 1**

**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 Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

**UNIT III MANUFACTURING TECHNOLOGY****3**

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel –Copper and gold-Coins as source of history – Minting of Coins – Beads making-industries Stone beads –Glass beads – Terracotta beads –Shell beads/ bone beads – Archeological evidences – Gem stone types described in Silappathikaram.

**UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY****3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoombu 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**

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**TOTAL : 15 PERIODS****TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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.Subatamian, 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**UNIT I INTRODUCTION****6+6**

Object Oriented Programming Concepts – Procedure vs. Object-oriented programming –Tokens - User-defined types – ADT- Static, Inline and Friend Functions-Function Overloading – Pointers - Reference variables.

**UNIT II OVERVIEW OF C++****6+6**

Classes and Objects – Constructors and Destructors - Operator Overloading and Type Conversions -Function object– Dynamic Memory Management.

**UNIT III OBJECT-ORIENTED PROGRAMMING CONCEPTS****6+6**

Inheritance – Constructors and Destructors in Derived Classes – Polymorphism and Virtual Functions.

**UNIT IV TEMPLATES AND EXCEPTION HANDLING****6+6**

Function Template and Class Template – Name spaces- Casting- Exception Handling.

**UNIT V FILES AND ADVANCED FEATURES****6+6**

C++ Stream classes – Formatted IO – File classes and File operations - Standard Template Library – Case Study.

**TOTAL: 60 PERIODS****LIST OF EXPERIMENTS**

1. Programs using Data types, Operators and Control Structures
2. Programs using Arrays and Strings.
3. Programs using Functions and Pointers.
4. Programs using User-defined types.
5. Programs using Classes and Objects.
6. Programs using Constructors and Destructors
7. Programs using Operator Overloading.
8. Programs using Inheritance, Polymorphism and its types.
9. Programs using Dynamic memory allocation.
10. Programs using Templates and Exceptions.
11. Programs using Sequential and Random access files.
12. Programs using STL

**TEXT BOOKS**

1. HM Deitel and PJ Deitel “C++ How to Program”, Seventh Edition, 2014, PrenticeHall.
2. Herbert Schildt, “The Complete Reference in C++”, Fourth Edition, 2017, TataMcGraw Hill.

**REFERENCES**

1. Bjarne Stroustrup, “The C++ Programming language”, Fourth edition, 2013, Pearson Education.
2. Stephen Prata, “C++ Primer Plus”, Sixth Edition, 2012, PearsonEducation
3. E Balagurusamy, “Object oriented Programming with C++”, Eighth edition, 2020, Tata McGraw Hill.
4. Professional C++, 5th Edition by Marc Gregoire, 2021

**COURSE OUTCOMES:**

**Upon completion of the course, the students will be able to**

**CO1:**Impart the skills needed for Object-oriented programming and Console applications development.

**CO2:**Map real-world objects into programming objects.

**CO3:**Implement the concept of reusability and data security.

**CO4:**Write generic programs and handle exceptions

**CO5:**Create and process data in files using file I/O functions

**CO-PO Mapping**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |
| <b>CO2</b> | 3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |

1' = Low; '2' = Medium; '3' = High

**NCC Credit Course Level 1\***

**NX3251**

**(ARMY WING) NCC Credit Course Level - I**

**L T P C**  
**2 0 0 2**

**NCC GENERAL**

**6**

NCC 1 Aims, Objectives & Organization of NCC

1

NCC 2 Incentives

2

NCC 3 Duties of NCC Cadet

1

NCC 4 NCC Camps: Types & Conduct

2

**NATIONAL INTEGRATION AND AWARENESS**

**4**

NI 1 National Integration: Importance & Necessity

1

NI 2 Factors Affecting National Integration

1

NI 3 Unity in Diversity & Role of NCC in Nation Building

1

NI 4 Threats to National Security

1

**PERSONALITY DEVELOPMENT**

**7**

PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving

2

PD 2 Communication Skills

3

PD 3 Group Discussion: Stress & Emotions

2

**LEADERSHIP**

**5**

L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour 'Code

3

|     |                                      |   |
|-----|--------------------------------------|---|
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani | 2 |
|-----|--------------------------------------|---|

|   |          |
|---|----------|
| <b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</b> | <b>8</b> |
|---|----------|

|      |   |   |
|------|---|---|
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth | 3 |
| SS 4 | Protection of Children and Women Safety                           | 1 |
| SS 5 | Road / Rail Travel Safety   | 1 |
| SS 6 | New Initiatives   | 2 |
| SS 7 | Cyber and Mobile Security Awareness                               | 1 |

**TOTAL : 30 PERIODS**

**NCC Credit Course Level 1\***

|               |   |          |          |          |          |
|---------------|---|----------|----------|----------|----------|
| <b>NX3252</b> | <b>(NAVAL WING) NCC Credit Course Level - I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               |   | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

|                    |          |
|--------------------|----------|
| <b>NCC GENERAL</b> | <b>6</b> |
|--------------------|----------|

|       |  |   |
|-------|--|---|
| NCC 1 | Aims, Objectives & Organization of NCC | 1 |
| NCC 2 | Incentives                             | 2 |
| NCC 3 | Duties of NCC Cadet                    | 1 |
| NCC 4 | NCC Camps: Types & Conduct             | 2 |

|   |          |
|---|----------|
| <b>NATIONAL INTEGRATION AND AWARENESS</b> | <b>4</b> |
|---|----------|

|      |   |   |
|------|---|---|
| NI 1 | National Integration: Importance & Necessity        | 1 |
| NI 2 | Factors Affecting National Integration              | 1 |
| NI 3 | Unity in Diversity & Role of NCC in Nation Building | 1 |
| NI 4 | Threats to National Security                        | 1 |

|                                |          |
|--------------------------------|----------|
| <b>PERSONALITY DEVELOPMENT</b> | <b>7</b> |
|--------------------------------|----------|

|      |  |   |
|------|--|---|
| PD 1 | Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving | 2 |
| PD 2 | Communication Skills   | 3 |
| PD 3 | Group Discussion: Stress & Emotions  | 2 |

|                   |          |
|-------------------|----------|
| <b>LEADERSHIP</b> | <b>5</b> |
|-------------------|----------|

|     |   |   |
|-----|---|---|
| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani  | 2 |

|   |          |
|---|----------|
| <b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</b> | <b>8</b> |
|---|----------|

|      |   |   |
|------|---|---|
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth | 3 |
| SS 4 | Protection of Children and Women Safety                           | 1 |
| SS 5 | Road / Rail Travel Safety   | 1 |
| SS 6 | New Initiatives   | 2 |
| SS 7 | Cyber and Mobile Security Awareness                               | 1 |

**TOTAL : 30 PERIODS**



**NCC Credit Course Level 1\***

|               |   |          |          |          |          |
|---------------|---|----------|----------|----------|----------|
| <b>NX3253</b> | <b>(AIR FORCE WING) NCC Credit Course Level - I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               |   | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**NCC GENERAL** **6**

|       |  |  |  |  |   |
|-------|--|--|--|--|---|
| NCC 1 | Aims, Objectives & Organization of NCC |  |  |  | 1 |
| NCC 2 | Incentives                             |  |  |  | 2 |
| NCC 3 | Duties of NCC Cadet                    |  |  |  | 1 |
| NCC 4 | NCC Camps: Types & Conduct             |  |  |  | 2 |

**NATIONAL INTEGRATION AND AWARENESS** **4**

|      |   |  |  |  |   |
|------|---|--|--|--|---|
| NI 1 | National Integration: Importance & Necessity        |  |  |  | 1 |
| NI 2 | Factors Affecting National Integration              |  |  |  | 1 |
| NI 3 | Unity in Diversity & Role of NCC in Nation Building |  |  |  | 1 |
| NI 4 | Threats to National Security                        |  |  |  | 1 |

**PERSONALITY DEVELOPMENT** **7**

|      |  |  |  |  |   |
|------|--|--|--|--|---|
| PD 1 | Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving |  |  |  | 2 |
| PD 2 | Communication Skills   |  |  |  | 3 |
| PD 3 | Group Discussion: Stress & Emotions  |  |  |  | 2 |

**LEADERSHIP** **5**

|     |   |  |  |  |   |
|-----|---|--|--|--|---|
| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code |  |  |  | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani  |  |  |  | 2 |

**SOCIAL SERVICE AND COMMUNITY DEVELOPMENT** **8**

|      |   |  |  |  |   |
|------|---|--|--|--|---|
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth |  |  |  | 3 |
| SS 4 | Protection of Children and Women Safety                           |  |  |  | 1 |
| SS 5 | Road / Rail Travel Safety   |  |  |  | 1 |
| SS 6 | New Initiatives   |  |  |  | 2 |
| SS 7 | Cyber and Mobile Security Awareness                               |  |  |  | 1 |

**TOTAL : 30 PERIODS**

|               |   |          |          |          |          |
|---------------|---|----------|----------|----------|----------|
| <b>GE3161</b> | <b>ENGINEERING PRACTICES LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               |   | <b>0</b> | <b>0</b> | <b>4</b> | <b>2</b> |

**GROUP – A (CIVIL & ELECTRICAL)****1. CIVIL ENGINEERING PRACTICES** **15****PLUMBING:**

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

- Laying pipe connection to the suction side of a pump
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

**STUDY EXCERSISES**

- a) Study of joints in door panels and wooden furniture
- b) Study of common industrial trusses using models.

**2. ELECTRICAL ENGINEERING PRACTICES****15**

- a) Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- b) Stair case light wiring
- c) Tube – light wiring
- d) Preparation of wiring diagrams for a given situation.
- e) Study of Iron-Box, Fan Regulator and Emergency Lamp

**GROUP – B (MECHANICAL AND ELECTRONICS)****3. MECHANICAL ENGINEERING PRACTICES****15****WELDING**

- a) Arc welding of Butt Joints, Lap Joints, and Tee Joints
- b) Gas welding demonstration.
- c) Basic Machining - Simple turning, drilling and tapping operations.
- d) Study and assembling of the following: Centrifugal pump, Mixer, Air-conditioner

**SHEET METAL PRACTICE:** Making of a square tray

**DEMONSTRATION ON FOUNDRY OPERATIONS.**

**4. ELECTRONIC ENGINEERING PRACTICES****15**

- a) Soldering simple electronic circuits and checking continuity.
- b) Assembling electronic components on a small PCB and Testing.
- c) Study of Telephone, FM radio and Low Voltage Power supplies.

**TOTAL: 60 PERIODS****COURSE OUTCOMES:**

- CO1.** Ability to make common joints in carpentry and pipe connections with fittings used in plumbing works.
- CO2.** Ability to do electrical wiring for household applications.
- CO3.** Ability to weld the steel the structures and soldering of electronical connections and testing of PCBs

## CO-PO & PSO MAPPING

| COs | POs |   |   |   |   |   |   |   |   |    |    |    | PSOs |   |   |
|-----|-----|---|---|---|---|---|---|---|---|----|----|----|------|---|---|
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 |
| 1   | 3   | - | - | - | - | - | 2 | - | 3 | -  | 3  | 2  | 3    | - | - |
| 2   | 3   | 3 | - | 2 | - | - | 2 | - | 3 | -  | 3  | 2  | 3    | - | - |
| 3   | 3   | 2 | - | - | - | - | 2 | - | 3 | -  | 3  | 2  | 3    | 2 | - |
| Avg | 3   | 2 | - | 2 | - | - | 2 | - | 3 | -  | 3  | 2  | 3    | 2 | - |

1-low, 2-medium, 3-high

CY3161

CHEMISTRY LABORATORY

L T P C  
0 0 2 1

### LIST OF EXPERIMENTS:

#### (Minimum of 8 experiments to be conducted)

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard
2. Determination of alkalinity in water sample.
3. Determination of 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. Determination of strength of given hydrochloric acid using pH meter.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
12. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
13. Determination of Glass transition temperature of a polymer
14. Phase change in a solid.
15. Corrosion experiment-weight loss method.

TOTAL: 30 PERIODS

### COURSE OUTCOMES:

After completion of the laboratory course, the student will be able to –

**CO1:** analyse the water quality parameters for domestic and industrial purposes.

**CO2:** determine the amount of metal ions by spectroscopic techniques

**CO3:** select a suitable polymer for industrial applications.

**CO4:** quantitatively analyse the impurities in solution by electroanalytical techniques.

**CO5:** predict the choice of metals for industrial purposes using corrosion studies.

### TEXT BOOKS:

1. Laboratory Manual - Department of Chemistry, CEGC, Anna University (2023).
2. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

## CO - PO Mapping

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2   | 2   | 1   | 2   |     |     | 2   |     | 1   |      |      |      |
| CO2 | 2   | 1   | 2   | 1   |     | 2   |     |     | 1   |      |      |      |
| CO3 | 2   | 2   | 2   | 1   | 2   |     |     |     | 1   |      |      |      |
| CO4 | 1   | 1   | 1   | 1   | 1   |     |     |     | 1   |      |      |      |
| CO5 | 2   | 2   | 2   | 2   | 1   | 2   |     |     | 1   |      |      |      |
| Avg | 2   | 2   | 2   | 1   | 1   | 2   | 2   |     | 1   |      |      |      |

1 - low, 2 - medium, 3 - high

GE3261

ENGLISH LABORATORY – II

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**UNIT I INTERVIEW IN SOCIAL CONTEXT 6**

Asking questions and answering - Conducting an interview (of an achiever / survivor) – Role play

**UNIT II PERSUASIVE SKILLS 6**

Speaking about specifications of a product (Eg. Home appliances) – Persuasive Talk – Role play activity.

**UNIT III CASE STUDY 6**

Discussions on Case Study to find solutions for problems in professional contexts – Analytical discussion on various aspects of a given problem.

**UNIT IV VISUAL INTERPRETATION 6**

Describing visual content (Pictures/Table/Chart) using appropriate descriptive language and making appropriate inferences and giving recommendations.

**UNIT V PRESENTATION 6**

Making presentation with visual component (PPT slides) (job interview / project / innovative product presentation)

### Assessment

Internals – 100%

Picture / Graphical description and Interpretation

Formal Presentation with visual tool (like PPT)

**TOTAL : 30 PERIODS**

### COURSE OUTCOMES

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

**CO1:** Comprehend and transcode visual content appropriately.

**CO2:** Participate effectively in formal group discussions.

**CO3:** Make presentation on a given topic in a formal context.

**CO-PO & PSO MAPPING**

| CO         | PO |   |   |   |   |   |   |   |   |    |    |    | PSO |   |   |
|------------|----|---|---|---|---|---|---|---|---|----|----|----|-----|---|---|
|            | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1   | 2 | 3 |
| <b>1</b>   | 2  | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3  | 2  | 3  | -   | - | - |
| <b>2</b>   | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 1  | 3  | -   | - | - |
| <b>3</b>   | 1  | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 2  | 3  | -   | - | - |
| <b>4</b>   | -  | - | - | - | - | - | - | - | - | -  | -  | -  | -   | - | - |
| <b>5</b>   | -  | - | - | - | - | - | - | - | - | -  | -  | -  | -   | - | - |
| <b>Avg</b> | 1. | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3  | 2  | 3  | -   | - | - |

1-low, 2-medium, 3-high

