ANNA UNIVERSITY, CHENNAI 600 025
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
REGULATIONS 2021
B. TECH. CHEMICAL ENGINEERING
CHOICE BASED CREDIT SYSTEM
I AND II SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1.</td>
<td>IP3151</td>
<td>Induction Programme</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>HS3151</td>
<td>Professional English – I</td>
<td>HSMC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>MA3151</td>
<td>Matrices and Calculus</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>PH3151</td>
<td>Engineering Physics</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>CY3151</td>
<td>Engineering Chemistry</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>GE3151</td>
<td>Problem Solving and Python Programming</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE3171</td>
<td>Problem Solving and Python Programming Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>BS3171</td>
<td>Physics and Chemistry Laboratory</td>
<td>BSC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>15</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

SEMESTER II

<table>
<thead>
<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1.</td>
<td>HS3251</td>
<td>Professional English – II</td>
<td>HSMC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>MA3251</td>
<td>Statistics and Numerical Methods</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>PH3258</td>
<td>Physics of Materials</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>BE3252</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>GE3251</td>
<td>Engineering Graphics</td>
<td>ESC</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>CH3251</td>
<td>Introduction to Chemical Engineering</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>NCC Credit Course Level 1*</td>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>GE3271</td>
<td>Engineering Practices Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>BE3272</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

**PRACTICALS**

|       |       |                                       |          |      |      |      |             |          |
| 8.    | GE3271 | Engineering Practices Laboratory      | ESC      | 0    | 0    | 4    | 2            | 2        |

**TOTAL** 17 2 12 27 25

*NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

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

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

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

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

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

(i) Physical Activity
This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

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

(iii) Universal Human Values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.
(iv) Literary Activity
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules
This would address some lacunas that students might have, for example, English, computer familiarity etc.

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

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

(viii) Familiarization to Dept./Branch & Innovations
They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

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

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

REFERENCES:
Guide to Induction program from AICTE

HS3151 PROFessional ENGLISH - I

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To build on students’ English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To develop learners’ ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- To use language efficiently in expressing their opinions via various media.
INTRODUCTION TO EFFECTIVE COMMUNICATION

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

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Listening – for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - Self Introduction; Introducing a friend; Conversation - politeness strategies; Telephone conversation; Leave a voicemail; Leave a message with another person; asking for information to fill details in a form. Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION

Listening - Listening to podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing of documentaries / podcasts/ interviews. Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes&suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT

Listening - Listen to a product and process descriptions; a classroom lecture; and advertisements about a products. Speaking – Picture description; giving instruction to use the product; Presenting a product; and summarizing a lecture. Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words)

UNIT IV CLASSIFICATION AND RECOMMENDATIONS

Listening – Listening to TED Talks; Scientific lectures; and educational videos. Speaking – Small Talk; Mini presentations and making recommendations. Reading – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc) Writing – Note-making / Note-taking (*Study skills to be taught, not tested; Writing recommendations; Transferring information from non verbal (chart , graph etc, to verbal mode). Grammar – Articles; Pronouns - Possessive & Relative pronouns .Vocabulary - Collocations; Fixed / Semi fixed expressions.
UNIT V  EXRESSION

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking – group discussions, Debates, and Expressing opinions through Simulations & Role play. Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, learners will be able
CO1 : To listen and comprehend complex academic texts
CO2 : To read and infer the denotative and connotative meanings of technical texts
CO3 : To write definitions, descriptions, narrations and essays on various topics
CO4 : To speak fluently and accurately in formal and informal communicative contexts
CO5 : To express their opinions effectively in both oral and written medium of communication

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

REFERENCES:

MA3151 MATRICES AND CALCULUS

COURSE OBJECTIVES:
• To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
• To familiarize the students with differential calculus.
• To familiarize the student with functions of several variables. This is needed in many branches of engineering.
• To make the students understand various techniques of integration.
• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
UNIT I  MATRICES  9+3

UNIT II  DIFFERENTIAL CALCULUS  9+3

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  9+3

UNIT IV  INTEGRAL CALCULUS  9+3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications : Hydrostatic force and pressure, moments and centres of mass.

UNIT V  MULTIPLE INTEGRALS  9+3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1 : Use the matrix algebra methods for solving practical problems.
CO2 : Apply differential calculus tools in solving various application problems.
CO3 : Able to use differential calculus ideas on several variable functions.
CO4 : Apply different methods of integration in solving practical problems.
CO5 : Apply multiple integral ideas in solving areas, volumes and other practical problems.

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

REFERENCES :
COURSE OBJECTIVES

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

UNIT I MECHANICS


UNIT II ELECTROMAGNETIC WAVES

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

UNIT III OSCILLATIONS, OPTICS AND LASERS


UNIT IV BASIC QUANTUM MECHANICS

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

UNIT V APPLIED QUANTUM MECHANICS

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

TOTAL : 45 PERIODS
COURSE OUTCOMES
After completion of this course, the students should be able to
CO1 : Understand the importance of mechanics.
CO2 : Express their knowledge in electromagnetic waves.
CO3 : Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4 : Understand the importance of quantum physics.
CO5 : Comprehend and apply quantum mechanical principles towards the formation of energy bands.

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

REFERENCES:

CY3151 ENGINEERING CHEMISTRY

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

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

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

UNIT IV  FUELS AND COMBUSTION
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.
Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon foot print.

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

COURSE OUTCOMES
At the end of the course, the students will be able:
CO1 :To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2 :To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3 :To apply the knowledge of phase rule and composites for material selection requirements.
CO4 :To recommend suitable fuels for engineering processes and applications.
CO5 :To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

GE3151 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

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

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING

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

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

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

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

TOTAL : 45 PERIODS
OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and looping for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

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

GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C 0 0 4 2

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

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

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)

5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)

6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)

7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)

8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)

9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)

10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)


12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

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

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/
PHYSICS LABORATORY: (Any Seven Experiments)

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

LIST OF EXPERIMENTS

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

TOTAL: 30 PERIODS

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

CO1: Understand the functioning of various physics laboratory equipment.
CO2: Use graphical models to analyze laboratory data.
CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.
CO4: Access, process and analyze scientific information.
CO5: Solve problems individually and collaboratively.

CHEMISTRY LABORATORY: (Any seven experiments)

OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles.
CHEMISTRY LABORATORY: (Any seven experiments to be conducted)
1. Preparation of Na$_2$CO$_3$ as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
   - Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler’s method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
13. Preparation of nanoparticles (TiO$_2$/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL: 30 PERIODS

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

TEXT BOOK:

HS3251 PROFESSIONAL ENGLISH - II  L T P C
3 1 0 4

COURSE OBJECTIVES:
- To engage learners in meaningful language activities to improve their LSRW skills
- To enhance learners’ awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I MAKING COMPARISONS
12
Listening – Evaluative Listening: Advertisements, Product Descriptions, -Audio / video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison). Speaking – Marketing a product, Persuasive Speech Techniques. Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases. Vocabulary – Contextual meaning of words
UNIT II  EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING  12

UNIT III  PROBLEM SOLVING  12
Listening – Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions. Speaking – Group Discussion (based on case studies), - techniques and Strategies, Reading - Case Studies, excerpts from literary texts, news reports etc., Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay Grammar – Error correction; If conditional sentences. Vocabulary - Compound Words, Sentence Completion.

UNIT IV  REPORTING OF EVENTS AND RESEARCH  12
Listening – Listening Comprehension based on news reports – and documentaries – Precis writing, Summarising, Speaking –Interviewing, Presenting an oral report, Mini presentations on select topics; Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

UNIT V  THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY  12
Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance); Speaking – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids; Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses Vocabulary – Idioms.

TOTAL : 60 PERIODS

COURSE OUTCOMES:
At the end of the course, learners will be able
CO1 : To compare and contrast products and ideas in technical texts.
CO2 : To identify cause and effects in events, industrial processes through technical texts
CO3 : To analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.
CO4 : To report events and the processes of technical and industrial nature.
CO5 : To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS:
2. English for Science & Technology Cambridge University Press 2021.Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:
MA3251  STATISTICS AND NUMERICAL METHODS  

OBJECTIVES:

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

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

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

UNIT III  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  

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

UNIT V  NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  

TOTAL: 60 PERIODS
OUTCOMES:
Upon successful completion of the course, students will be able to:

- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

REFERENCES:

PH3258 PHYSICS OF MATERIALS

L T P C
3 0 0 3

OBJECTIVES:

- To make the students to understand the basics of phase diagrams and various materials preparation techniques
- To equip the students to have a knowledge on different types of electron theory, basics of quantum mechanics and about superconductors
- To introduce the physics of semiconducting materials and applications of semiconductors in device fabrication
- To familiarize the students with the theory and applications of magnetic and dielectric materials
- To provide the students a sound platform towards learning about advanced materials and their applications.

UNIT I PREPARATION OF MATERIALS
UNIT II ELECTRICAL PROPERTIES OF MATERIALS


UNIT III SEMICONDUCTING PROPERTIESMATERIALS


UNIT IV DIELECTRIC AND MAGNETIC MATERIALS


UNIT V NEW MATERIALS AND APPLICATIONS


COURSE OUTCOMES:

On completion of the course, the students should be able to

CO1 : acquire knowledge of phase diagram, and thin film and nanomaterial preparation techniques

CO2 : familiarize with conducting materials, basic quantum mechanics, and properties and applications of superconductors.

CO3 : gain knowledge on semiconducting materials based on energy level diagrams, its types, temperature effect. Also, fabrication methods for semiconductor devices will be understood.

CO4 : realize with theories and applications of dielectric and ferromagnetic materials

CO5 : familiarize with ceramics, composites, metallic glasses, shape memory alloys, biomaterials and their important applications.

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:

BE3252 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION LT P C
ENGINEERING 3 0 0 3

OBJECTIVES:
- To introduce the basics of electric circuits and analysis
- To impart knowledge in domestic wiring
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To introduce the functional elements and working of sensors and transducers.

UNIT I ELECTRICAL CIRCUITS
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems

UNIT II MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS
Magnetic circuits-definitions-MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems.
Domestic wiring , types of wires and cables, earthing ,protective devices- switch fuse unit- Miniature circuit breaker-moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid

UNIT III ELECTRICAL MACHINES

UNIT IV ANALOG ELECTRONICS

UNIT V SENSORS AND TRANSDUCERS
Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors,Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

TOTAL: 45 PERIODS

OUTCOMES:
After completing this course, the students will be able to
CO1: Compute the electric circuit parameters for simple problems
CO2: Explain the concepts of domestics wiring and protective devices
CO3: Explain the working principle and applications of electrical machines
CO4: Analyze the characteristics of analog electronic devices
CO5: Explain the types and operating principles of sensors and transducers
TEXT BOOKS:
3. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
4. James A Svoboda, Richard C. Dorf, Dorf’s Introduction to Electric Circuits, Wiley, 2018

REFERENCES:

GE3251 ENGINEERING GRAPHICS

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
   i. Drawing engineering curves.
   ii. Drawing freehand sketch of simple objects.
   iii. Drawing orthographic projection of solids and section of solids.
   iv. Drawing development of solids
   v. Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

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

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

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

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

TEXT BOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.
OBJECTIVES:
To acquaint the students with the fundamentals of Chemical Engineering and to build their perspective in a wholesome manner.

UNIT I  INTRODUCTION
Chemical Engineering in day to life with examples, Origin and growth of chemical Engineers in chemical process industries, unit operations and unit processes concepts, scaling up or down, units and dimensions, application of mathematics in chemical Engg, recent developments in chemical process industries.

UNIT II  INTRODUCTION TO MATERIAL AND ENERGY BALANCES
Basic concepts of material and energy balances, energy and mass transport, and kinetics of chemical reactions. Introduction to heat and mass transfer. Process flow sheeting and symbols.

UNIT III  FLUID FLOW

UNIT IV  CHEMICAL ENGINEERING COMPUTER SOFTWARE TOOLS AND APPLICATIONS

UNIT V  CAREER DIVERSITIES IN CHEMICAL ENGINEERING
Career Development Leading to Specialization, Chemical Engineering Job Titles/Options, Chemical and Process Engineers, Commissioning Engineer, Process Control/Automation Engineer, Process Safety Engineer, Research & Development Engineer Pharmaceutical Engineer/Pharmaceutical Process Engineer, Pipeline Engineer Chemical Manufacturing Engineer, Environment Engineer.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, student should be able to:
CO1. Correlate day to day like with the principles of chemical Engineering.
CO2. Assess the mass and energy involved in any chemical plant.
CO3. Have an insight into areas where Chemical Engineering plays major role.
CO4. Carry out modelling and simulation using software tools.
CO5. Identify their right future.
CO6: Gain confidence and outline about the programme as a whole.

TEXT BOOKS:

REFERENCES:
NCC Credit Course Level 1*  

NX3251 (ARMY WING) NCC Credit Course Level - I  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCC 1</td>
<td>Aims, Objectives &amp; Organization of NCC</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NCC 2</td>
<td>Incentives</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>NCC 3</td>
<td>Duties of NCC Cadet</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NCC 4</td>
<td>NCC Camps: Types &amp; Conduct</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>NI 1</td>
<td>National Integration: Importance &amp; Necessity</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NI 2</td>
<td>Factors Affecting National Integration</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NI 3</td>
<td>Unity in Diversity &amp; Role of NCC in Nation Building</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NI 4</td>
<td>Threats to National Security</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>PD 1</td>
<td>Self-Awareness, Empathy, Critical &amp; Creative Thinking, Decision Making and Problem Solving</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>PD 2</td>
<td>Communication Skills</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PD 3</td>
<td>Group Discussion: Stress &amp; Emotions</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>L 1</td>
<td>Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>L 2</td>
<td>Case Studies: Shivaji, Jhasi Ki Rani</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>SS 1</td>
<td>Basics, Rural Development Programmes, NGOs, Contribution of Youth</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>SS 4</td>
<td>Protection of Children and Women Safety</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SS 5</td>
<td>Road / Rail Travel Safety</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SS 6</td>
<td>New Initiatives</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>SS 7</td>
<td>Cyber and Mobile Security Awareness</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL: 30 PERIODS
# NCC Credit Course Level 1*

**NX3252 (NAVAL WING) NCC Credit Course Level - I**  
**L T P C**  
**20 0 2**

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

**6**

## NATIONAL INTEGRATION AND AWARENESS
- **NI 1** National Integration: Importance & Necessity  
- **NI 2** Factors Affecting National Integration  
- **NI 3** Unity in Diversity & Role of NCC in Nation Building  
- **NI 4** Threats to National Security  

**4**

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

**7**

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

**5**

## SOCIAL SERVICE AND COMMUNITY DEVELOPMENT
- **SS 1** Basics, Rural Development Programmes, NGOs, Contribution of Youth  
- **SS 4** Protection of Children and Women Safety  
- **SS 5** Road / Rail Travel Safety  
- **SS 6** New Initiatives  
- **SS 7** Cyber and Mobile Security Awareness  

**8**

**TOTAL : 30 PERIODS**
### NCC Credit Course Level 1*

**NX3253** *(AIR FORCE WING) NCC Credit Course Level - I*  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>LT</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCC General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCC 1</td>
<td>Aims, Objectives &amp; Organization of NCC</td>
<td>20</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>NCC 2</td>
<td>Incentives</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NCC 3</td>
<td>Duties of NCC Cadet</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NCC 4</td>
<td>NCC Camps: Types &amp; Conduct</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**National Integration and Awareness**  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>LT</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 1</td>
<td>National Integration: Importance &amp; Necessity</td>
<td>20</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>NI 2</td>
<td>Factors Affecting National Integration</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NI 3</td>
<td>Unity in Diversity &amp; Role of NCC in Nation Building</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NI 4</td>
<td>Threats to National Security</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Personality Development**  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>LT</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD 1</td>
<td>Self-Awareness, Empathy, Critical &amp; Creative Thinking, Decision Making and Problem Solving</td>
<td>20</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>PD 2</td>
<td>Communication Skills</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PD 3</td>
<td>Group Discussion: Stress &amp; Emotions</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Leadership**  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>LT</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 1</td>
<td>Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code</td>
<td>20</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>L 2</td>
<td>Case Studies: Shivaji, Jhasi Ki Rani</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Social Service and Community Development**  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>LT</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS 1</td>
<td>Basics, Rural Development Programmes, NGOs, Contribution of Youth</td>
<td>20</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>SS 4</td>
<td>Protection of Children and Women Safety</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SS 5</td>
<td>Road / Rail Travel Safety</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SS 6</td>
<td>New Initiatives</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>SS 7</td>
<td>Cyber and Mobile Security Awareness</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total:** 30 Periods
OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I  CIVIL ENGINEERING PRACTICES

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.

b) Preparing plumbing line sketches.

c) Laying pipe connection to the suction side of a pump

d) Laying pipe connection to the delivery side of a pump.

e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,

b) Planing and

c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture

b) Studying common industrial trusses using models.

PART II  ELECTRICAL ENGINEERING PRACTICES

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket

b) Staircase wiring

c) Fluorescent Lamp wiring with introduction to CFL and LED types.

d) Energy meter wiring and related calculations/ calibration

e) Study of Iron Box wiring and assembly

f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)

g) Study of emergency lamp wiring/Water heater
GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

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

BASIC MACHINING WORK:
   a) (simple)Turning.
   b) (simple)Drilling.
   c) (simple)Tapping.

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

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:
   a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
   a) Assembling and testing electronic components on a small PCB.

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

TOTAL: 60 PERIODS

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

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

BE3272 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY

OBJECTIVES:
• To train the students in conducting load tests electrical machines
• To gain practical experience in experimentally obtaining the characteristics of electronic devices and rectifiers
• To train the students to measure three phase power and displacement

List of Experiments
1. Verification of ohms and Kirchhoff’s Laws.
2. Three Phase Power Measurement
3. Load test on DC Shunt Motor.
4. Load test on Self Excited DC Generator
5. Load test on Single phase Transformer
6. Load Test on Induction Motor
7. Characteristics of PN and Zener Diodes
8. Characteristics of BJT, SCR and MOSFET
9. Design and analysis of Half wave and Full Wave rectifiers
10. Measurement of displacement of LVDT

TOTAL: 60 PERIODS

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

CO1: Use experimental methods to verify the Ohm’s law and Kirchhoff’s Law and to measure three phase power
CO2: Analyze experimentally the load characteristics of electrical machines
CO3: Analyze the characteristics of basic electronic devices
CO4: Use LVDT to measure displacement