



**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

(A State Government University)

**B. Tech- 2024**

**FIRST YEAR SYLLABUS  
(GROUP A)**



# **SEMESTER 1**

## **GROUP A**



**SEMESTER S1**  
**MATHEMATICS FOR INFORMATION SCIENCE – 1**  
**(Group A)**

|                                        |                                             |                    |                |
|----------------------------------------|---------------------------------------------|--------------------|----------------|
| <b>Course Code</b>                     | <b>GAMAT101</b>                             | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week (L: T:P: R)</b> | 3:0:0:0                                     | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                         | 3                                           | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>          | Basic knowledge in single variable calculus | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. To provide students with essential skills in analyzing functions of several variables, identifying extrema, and optimizing processes to preparing them to address diverse engineering applications and challenges.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Contact Hours</b> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Limits of Function Values, Continuity at a point, Continuous Functions, Rates of Change: Derivative at a Point, Derivative as a Function, Second- and Higher-Order Derivatives, Instantaneous Rates of Change, Chain Rule, Implicit Differentiation, Tangents and Normal Lines, Linearization, Concavity: The Second Derivative Test for Concavity.<br>[ Relevant topics from: Text 1- sections 2.2, 2.5, 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.9, 4.4 ]     | <b>9</b>             |
| <b>2</b>          | Functions of Several Variables: Domains and Ranges, Level curves of two variables, Limits for functions of two variables, Continuity for functions of two variables, Partial derivatives of a functions of more than two variables, Partial derivatives and continuity, Second- Order partial derivatives, The mixed derivative theorem, The Chain Rule: Functions of two variables<br>[Relevant topics from: Text 1- sections 14.1, 14.2, 14.3, 14.4] | <b>9</b>             |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3</b> | <p>The Chain Rule: Functions of three Variables, Directional Derivatives in the Plane, Interpretation of the Directional Derivative, Gradient, Properties of the Directional Derivative, Local Extreme Values for Functions of Two Variables: Relative extrema, First derivative theorem for local extreme values, Critical point, saddle point, Second Derivative Test for Local Extreme Values, Absolute Maxima and Minima on Closed Bounded Regions.</p> <p><b>[Relevant topics from: Text 1- sections 14.4, 14.5, 14.7]</b></p> | <b>9</b> |
| <b>4</b> | <p>Constrained Maxima and Minima, The Method of Lagrange Multipliers with one constraint, The Method of Lagrange Multipliers with two constraints, Method of Steepest Descent (only two variables), LPP-Formation, Solution of LPP using graphic method.</p> <p><b>[Relevant topics from: Text-1 section 14.8, Text-2 sections 22.1, 22.2]</b></p>                                                                                                                                                                                  | <b>9</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Assignment/<br/>Microproject</b> | <b>Internal<br/>Examination-1<br/>(Written)</b> | <b>Internal<br/>Examination- 2<br/>(Written)</b> | <b>Total</b> |
|-------------------|-------------------------------------|-------------------------------------------------|--------------------------------------------------|--------------|
| <b>5</b>          | <b>15</b>                           | <b>10</b>                                       | <b>10</b>                                        | <b>40</b>    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                            | Part B                                                                                                                                                                                                                                                                           | Total     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                                         | Bloom's Knowledge Level (KL) |
|----------------|---------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Apply various concepts in calculus to linearize functions and to analyze concavity.                     | <b>K3</b>                    |
| <b>CO2</b>     | Calculate the limits for functions of two variables and partial derivatives of multivariable functions. | <b>K3</b>                    |
| <b>CO3</b>     | Interpret directional derivative and solve maxima and minima of multivariable functions.                | <b>K3</b>                    |
| <b>CO4</b>     | Solve constrained maxima and minima, LPP and understand the method of Steepest Descent.                 | <b>K3</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

| <b>Text Books</b> |                                  |                                                                  |                              |                                |
|-------------------|----------------------------------|------------------------------------------------------------------|------------------------------|--------------------------------|
| <b>Sl. No</b>     | <b>Title of the Book</b>         | <b>Name of the Author/s</b>                                      | <b>Name of the Publisher</b> | <b>Edition and Year</b>        |
| <b>1</b>          | Thomas' Calculus                 | Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki | Pearson                      | 15 <sup>th</sup> edition, 2023 |
| <b>2</b>          | Advanced Engineering Mathematics | Erwin Kreyszig                                                   | John Wiley & Sons            | 10 <sup>th</sup> edition, 2016 |

| <b>Reference Books</b> |                                           |                                          |                               |                                |
|------------------------|-------------------------------------------|------------------------------------------|-------------------------------|--------------------------------|
| <b>Sl. No</b>          | <b>Title of the Book</b>                  | <b>Name of the Author/s</b>              | <b>Name of the Publisher</b>  | <b>Edition and Year</b>        |
| <b>1</b>               | Calculus                                  | Howard Anton, Irl Bivens, Stephens Davis | Wiley                         | 10 <sup>th</sup> edition, 2012 |
| <b>2</b>               | Optimization: Algorithms and Applications | Rajesh Kumar Arora                       | CRC Press                     | 1 <sup>st</sup> edition, 2015  |
| <b>3</b>               | Multivariable Calculus                    | Ron Larson, Bruce Edwards                | Brooks/Cole, Cengage Learning | 10 <sup>th</sup> edition, 2014 |
| <b>4</b>               | Calculus & Its Applications               | Goldstein, Schneider, Lay, Asmar         | Pearson                       | 14 <sup>th</sup> edition, 2018 |
| <b>5</b>               | Bird's Higher Engineering Mathematics     | John Bird                                | Taylor & Francis              | 9 <sup>th</sup> edition, 2021  |
| <b>6</b>               | Higher Engineering Mathematics            | B. V. Ramana                             | McGraw-Hill Education         | 39 <sup>th</sup> edition, 2023 |

| Video Links (NPTEL, SWAYAM...) |                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                   |
| 1                              | <a href="https://nptel.ac.in/courses/111106146">https://nptel.ac.in/courses/111106146</a> |
| 2                              | <a href="https://nptel.ac.in/courses/111107108">https://nptel.ac.in/courses/111107108</a> |
| 3                              | <a href="https://nptel.ac.in/courses/111107108">https://nptel.ac.in/courses/111107108</a> |
| 4                              | <a href="https://nptel.ac.in/courses/111107108">https://nptel.ac.in/courses/111107108</a> |

**SEMESTER 1 / 2**  
**PHYSICS FOR INFORMATION SCIENCE**  
**(Common To Group A)**

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GAPHT121</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:2:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory + Lab   |

**Course Objectives:**

1. To equip students with a strong foundation in the fundamentals of Physics, impart this knowledge within the context of Information Science disciplines, cultivate scientific attitudes and critical thinking skills, and enable students to integrate Physics concepts with their core Information Science programs.
2. To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Electrical conductivity</b></p> <p>Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands, Classification of materials into conductor, semiconductor and insulator.</p> <p>Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors. BCS Theory, Applications of superconductors.</p> | <b>9</b>             |



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 2 | <p><b>Quantum Mechanics</b></p> <p>Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (Qualitative)</p>                                                              | 9 |
| 3 | <p><b>Semiconductor Physics</b></p> <p>Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band, Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative)</p> <p>Formation of p-n junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction - Forward and reverse biased p-n junctions, Diode equation (Derivation), I-V Characteristics of p-n junction</p> | 9 |
| 4 | <p><b>Semiconductor Devices</b></p> <p>Semiconductor devices- Rectifiers- Full wave and Half wave. Zener diode- VI characteristics, Tunnel diode-VI characteristics, Semiconductor Laser (Construction and working), Applications</p> <p>Photonic devices (Qualitative treatment only) - Photo detectors (Junction and PIN photodiodes), Solar cells- IV Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications</p>                                                                                                                                          | 9 |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Continuous Assessment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Lab Examination) | Total |
|------------|-----------------------|----------------------------------|----------------------------------|------------------------------------------|-------|
| 5          | 10                    | 10                               | 10                               | 5                                        | 40    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                                             | Part B                                                                                                                                                                                                                                                                                          | Total     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p align="center"><b>(8x3 = 24 marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p align="center"><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                                                | Bloom's Knowledge Level (KL) |
|----------------|----------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Explain electrical conductivity and Superconductivity.                                                         | <b>K2</b>                    |
| <b>CO2</b>     | Explain the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics. | <b>K2</b>                    |
| <b>CO3</b>     | Apply the fundamentals of Semiconductor Physics in engineering.                                                | <b>K3</b>                    |
| <b>CO4</b>     | Describe the behaviour of semiconductor materials in semiconductor devices.                                    | <b>K2</b>                    |
| <b>CO5</b>     | Apply basic knowledge of principles and theories in physics to conduct experiments.                            | <b>K3</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

| Text Books |                                   |                                                |                               |                                |
|------------|-----------------------------------|------------------------------------------------|-------------------------------|--------------------------------|
| Sl. No     | Title of the Book                 | Name of the Author/s                           | Name of the Publisher         | Edition and Year               |
| 1          | Engineering Physics               | H K Malik and A K Singh                        | McGraw Hill                   | 2 <sup>nd</sup> Edition, 2017  |
| 2          | Concepts of Modern Physics        | Arthur Beiser                                  | Tata McGraw Hill Publications | 6 <sup>th</sup> Edition, 2003  |
| 3          | A Textbook of Engineering Physics | MN Avadhanulu, P G Kshirsagar, TVS Arun murthy | S. Chand                      | 11 <sup>th</sup> Edition, 2018 |

| Reference Books |                                     |                                           |                                  |                                |
|-----------------|-------------------------------------|-------------------------------------------|----------------------------------|--------------------------------|
| Sl. No          | Title of the Book                   | Name of the Author/s                      | Name of the Publisher            | Edition and Year               |
| 1               | Semiconductor Devices Fundamentals  | Robert F Pierret                          | Pearson Education                | 1995                           |
| 2               | Advanced Semiconductor Fundamental  | Robert F Pierret                          | Pearson Education                | 2 <sup>nd</sup> Edition, 2002  |
| 3               | Solid State Electronic Devices      | Ben G Streetman and Sanjay Kumar Banerjee | Pearson Education 6/e            | 2010                           |
| 4               | Solid State Physics                 | S.O. Pillai                               | New age international publishers | 10 <sup>th</sup> Edition, 2022 |
| 5               | Introduction to Solid State Physics | Charles Kittel                            | Wiley India Edition              | 2019                           |
| 6               | Advanced Engineering Physics        | Premlet B                                 | Phasor Books                     | 10 <sup>th</sup> Edition, 2017 |
| 7               | A Text Book of Engineering Physics  | I. Dominic and. A. Nahari,                | Owl Books Publishers             | Revised Edition, 2016          |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                                                                                |
| 1                              | <a href="https://nptel.ac.in/courses/115103108">https://nptel.ac.in/courses/115103108</a>                                                                                              |
| 2                              | <a href="https://nptel.ac.in/courses/115101107">https://nptel.ac.in/courses/115101107</a><br><a href="https://nptel.ac.in/courses/115102023">https://nptel.ac.in/courses/115102023</a> |
| 3                              | <a href="https://nptel.ac.in/courses/108106181">https://nptel.ac.in/courses/108106181</a>                                                                                              |
| 4                              | <a href="https://nptel.ac.in/courses/108108112">https://nptel.ac.in/courses/108108112</a>                                                                                              |

### **Continuous Assessment (10 Marks)**

#### **i. Preparation and Pre-Lab Work (2 Marks)**

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

#### **ii. Conduct of Experiments (2 Marks)**

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### **iii. Lab Reports and Record Keeping (3 Marks)**

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

**iv. Viva Voce (3 Marks)**

- Oral Examination: Ability to explain the experiment, results and underlying principles during viva voce session.

**Final Marks Averaging:** The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

**1. Evaluation Pattern for Lab Examination (5 Marks)****1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

Setup and Execution: Proper setup and accurate execution of the experiment or programming task

**2. Result (2 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.

**3. Viva Voce (1 Marks)**

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

**Experiment List****(Minimum 10 Experiments)**

| Experiment No. | Experiment                                          |
|----------------|-----------------------------------------------------|
| 1              | Diode characteristics                               |
| 2              | Zener diode- V-I characteristics                    |
| 3              | Tunnel diode –V-I characteristics                   |
| 4              | Half wave rectifier                                 |
| 5              | Full wave rectifier                                 |
| 6              | Hall effect in semiconductors                       |
| 7              | Determination of band gap energy of a semiconductor |

|           |                                                                                                                |
|-----------|----------------------------------------------------------------------------------------------------------------|
| <b>8</b>  | Characteristics of LED                                                                                         |
| <b>9</b>  | Solar Cell- V-I and Intensity Characteristics                                                                  |
| <b>10</b> | Laser – Determination of wavelength using diffraction grating                                                  |
| <b>11</b> | Laser- To measure the wavelength using a millimetre scale as a grating                                         |
| <b>12</b> | Compare the variation of current with potential difference, for a metal, filamentbulb and semiconductor diode. |
| <b>13</b> | Determination of dielectric constant                                                                           |
| <b>14</b> | CRO -Measurement of frequency and amplitude of wave forms                                                      |
| <b>15</b> | Photo diode - V-I Characteristics                                                                              |
| <b>16</b> | Numerical aperture of optical fiber                                                                            |



**SEMESTER S1/S2**  
**CHEMISTRY FOR INFORMATION SCIENCE AND ELECTRICAL**  
**SCIENCE**

(Common to Group A & B)

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GXCYT122</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:2:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory + Lab   |

**Course Objectives:**

1. To equip students with a comprehensive understanding of chemistry concepts that are relevant to engineering applications.
2. To familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues, including climate change, pollution, and waste management, and their impact on the quality of life.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Contact Hours</b> |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Electrochemistry and Corrosion Science (9 Hours)</b></p> <p><b>Electrochemical Cell-</b> Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE &amp; Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode &amp; pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery &amp; H<sub>2</sub>-O<sub>2</sub> fuel cell (acid electrolyte only) construction and working.</p> <p><b>Corrosion</b> –Electrochemical corrosion mechanism (acidic &amp; alkaline</p> | <b>9</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | medium) - Galvanic series - Corrosion control methods - Cathodic Protection<br>- Sacrificial anodic protection and impressed current cathodic protection –<br>Electroplating of copper - Electroless plating of copper.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |
| 2 | <b>Materials for Electronic Applications (9 Hrs)</b><br><b>Nanomaterials</b> - Classification based on Dimension & Materials- Synthesis<br>– Sol gel & Chemical Reduction - Applications of nanomaterials<br>– Carbon Nanotubes, Fullerenes, Graphene & Carbon Quantum Dots –<br>structure, properties & application.<br><b>Polymers</b> - Fire Retardant Polymers- Halogenated & Non-halogenated<br>polymers (Examples only)- Conducting Polymers-Classification-<br>Polyaniline & Polypyrrole-synthesis, properties and applications.<br><b>Organic electronic materials and devices</b> - construction, working and<br>applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized<br>Solar Cells (DSSC)<br>Materials used in Quantum computing Technology, Super capacitors,<br>Spintronics | 9 |
| 3 | <b>Molecular Spectroscopy and Analytical Techniques (9 Hours)</b><br><b>Spectroscopy</b> -Types of spectra- Molecular energy levels - Beer Lambert's<br>law – Numerical problems - Electronic Spectroscopy – Principle, Types of<br>electronic transitions –Role of conjugation in absorption maxima-<br>Instrumentation-Applications – Vibrational spectroscopy – Principle-<br>Number of vibrational modes - Vibrational modes of CO <sub>2</sub> and H <sub>2</sub> O –<br>Applications<br><b>Thermal Analysis</b> : Dielectric Thermal Analysis (DETA) of Polymers-<br>Working and Application.<br><b>Electron Microscopic Techniques</b> : SEM - Principle, instrumentation and<br>Applications.                                                                                                    | 9 |
| 4 | <b>Environmental Chemistry (9Hrs)</b><br><b>Water characteristics</b> - Hardness - Types of hardness- Temporary and<br>Permanent - Disadvantages of hard water -Degree of hardness (Numericals)<br>Water softening methods-Ion exchange process- Principle, procedure and<br>advantages. Reverse osmosis – principle, process and advantages. – Water                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 9 |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition &amp; Significance.</p> <p><b>Waste Management:</b> Sewage water treatment- Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process. E Waste, Methods of disposal – recycle, recovery and reuse. Chemistry of climate change- Greenhouse Gases- Ozone Depletion-Sustainable Development- an introduction to Sustainable Development Goals.</p> |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Self-Study Topics (NOT TO BE INCLUDED FOR END SEMESTER EXAMINATION):**

Construction, working and applications of Lead acid battery, Nickel cadmium battery and Nickel metal hybrid battery.

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Continuous Assessment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Lab Examination) | Total |
|------------|-----------------------|----------------------------------|----------------------------------|------------------------------------------|-------|
| 5          | 10                    | 10                               | 10                               | 5                                        | 40    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                            | Part B                                                                                                                                                                                                                                                                           | Total     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                 | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Explain the Basic Concepts of Electrochemistry and Corrosion to explore the possible applications in various engineering fields | <b>K2</b>                           |
| <b>CO2</b>            | Describe the use of various engineering materials in different industries                                                       | <b>K2</b>                           |
| <b>CO3</b>            | Apply appropriate analytical techniques for the synthesis and characterization of various engineering materials.                | <b>K3</b>                           |
| <b>CO4</b>            | Outline various water treatment and waste management methods                                                                    | <b>K2</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

| <b>Text Books</b> |                                  |                                         |                                 |                                 |
|-------------------|----------------------------------|-----------------------------------------|---------------------------------|---------------------------------|
| <b>Sl. No</b>     | <b>Title of the Book</b>         | <b>Name of the Author/s</b>             | <b>Name of the Publisher</b>    | <b>Edition and Year</b>         |
| <b>1</b>          | Engineering Chemistry            | B. L. Tembe, Kamaluddin, M. S. Krishnan | NPTEL Web-book                  | 2018                            |
| <b>2</b>          | Physical Chemistry               | P. W. Atkins                            | Oxford University Press         | International Edition- 2018     |
| <b>3</b>          | Instrumental Methods of Analysis | H. H. Willard, L. L. Merritt            | CBS Publishers                  | 7th Edition- 2005               |
| <b>4</b>          | Engineering Chemistry            | Jain & Jain                             | Dhanpath Rai Publishing Company | 17 <sup>th</sup> Edition - 2015 |

| Reference Books |                                                                        |                                                                                     |                                  |                            |
|-----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------|----------------------------|
| Sl. No          | Title of the Book                                                      | Name of the Author/s                                                                | Name of the Publisher            | Edition and Year           |
| 1               | Fundamentals of Molecular Spectroscopy                                 | C. N. Banwell                                                                       | McGraw-Hill                      | 4 <sup>th</sup> edn., 1995 |
| 2               | Principles of Physical Chemistry                                       | B. R. Puri, L. R. Sharma, M. S. Pathania                                            | Vishal Publishing Co             | 47th Edition, 2017         |
| 3               | Introduction to Spectroscopy                                           | Donald L. Pavia                                                                     | Cengage Learning India Pvt. Ltd  | 2015                       |
| 4               | Polymer Chemistry: An Introduction                                     | Raymond B. Seymour, Charles E. Carraher                                             | Marcel Dekker Inc                | 4th Revised Edition, 1996  |
| 5               | The Chemistry of Nanomaterials: Synthesis, Properties and Applications | Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham | Wiley-VCH Verlag GmbH & Co. KGaA | 2014                       |
| 6               | Organic Electronics Materials and Devices                              | Shuichiro Ogawa                                                                     | Springer Tokyo                   | 2024                       |
| 7               | Principles and Applications of Thermal Analysis                        | Gabbot, P                                                                           | Oxford: Blackwell Publishing     | 2008                       |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1                              | <a href="https://archive.nptel.ac.in/courses/104/106/104106137/">https://archive.nptel.ac.in/courses/104/106/104106137/</a><br><a href="https://archive.nptel.ac.in/courses/113/105/113105102/">https://archive.nptel.ac.in/courses/113/105/113105102/</a><br><a href="https://archive.nptel.ac.in/courses/113/104/113104082/">https://archive.nptel.ac.in/courses/113/104/113104082/</a><br><a href="https://www.youtube.com/watch?v=BeSxFLvk1h0">https://www.youtube.com/watch?v=BeSxFLvk1h0</a> |
| 2                              | <a href="https://archive.nptel.ac.in/courses/113/104/113104102/">https://archive.nptel.ac.in/courses/113/104/113104102/</a><br><a href="https://archive.nptel.ac.in/courses/104/105/104105124/">https://archive.nptel.ac.in/courses/104/105/104105124/</a><br><a href="https://archive.nptel.ac.in/courses/105/104/105104157/">https://archive.nptel.ac.in/courses/105/104/105104157/</a>                                                                                                          |

## Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

### Mark distribution

#### 1. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

#### 2. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### 3. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

#### 4. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

**Final Marks Averaging:** The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

## Evaluation Pattern for Lab Examination (5 Marks)

### 1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

### 2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

### 3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

## List of Experiments

**\*Any 10 Experiments Mandatory**

| Expt. Nos. | Experiment                                                                                                    |
|------------|---------------------------------------------------------------------------------------------------------------|
| 1          | Estimation of iron in iron ore                                                                                |
| 2          | Estimation of copper in brass                                                                                 |
| 3          | Determination of cell constant and conductance of solutions                                                   |
| 4          | Calibration of pH meter and determination of pH of a solution                                                 |
| 5          | Synthesis of polymers<br>(a) Urea-formaldehyde resin<br>(b) Phenol-formaldehyde resin                         |
| 6          | Determination of wavelength of absorption maximum and colorimetric estimation of $\text{Fe}^{3+}$ in solution |
| 7          | Determination of molar absorptivity of a compound ( $\text{KMnO}_4$ or any water-soluble food colorant)       |
| 8          | Analysis of IR spectra                                                                                        |

|           |                                                                |
|-----------|----------------------------------------------------------------|
| <b>9</b>  | Identification of drugs using TLC                              |
| <b>10</b> | Estimation of total hardness of water-EDTA method              |
| <b>11</b> | Estimation of dissolved oxygen by Winkler's method             |
| <b>12</b> | Determination of calorific value using Bomb calorimeter        |
| <b>13</b> | Determination of saponification value of a given vegetable oil |
| <b>14</b> | Determination of acid value of a given vegetable oil           |
| <b>15</b> | Verification of Nernst equation for electrochemical cell.      |



**SEMESTER S1**  
**ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING**  
**(Common to A, B & D)**

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GMEST103</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 2-0-2-0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 3               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory & Lab   |

**Course Objectives:**

1. To learn the principles and techniques of dimensioning and preparing engineering drawings.
2. To develop the ability to accurately interpret and understand engineering drawings.
3. To learn the features of CAD software

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Introduction: Relevance of technical drawing in engineering field.Types of lines, Dimensioning, BIS code of practice for technical drawing. (No questions for the end semester examination)<br><br>Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Trace of a line. Inclination of lines with reference planes. True length and true inclinations of line inclined to both the reference planes. | <b>9</b>             |
| <b>2</b>          | Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone and Cylinder only.<br>Projection of solids in simple position including profile view.                                                                                                                                                                                                                                                                      | <b>9</b>             |

|          |                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|          | Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.                                                                                                                                                                                                                                                                             |          |
| <b>3</b> | <p>Sections of Solids: Sections of Prisms, Pyramids, Cone and Cylinder only, with axis in vertical position and cut by different section planes. True shape of the sections. (Exclude true shape given problems)</p> <p>Development of Surfaces: Development of surfaces of the solids and solids cut by different section planes. (Exclude problems with through holes)</p>                        | <b>9</b> |
| <b>4</b> | <p>Isometric Projection: Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Sphere, Hemisphere and their combinations.</p> <p>Computer Aided Drawing (CAD): Introduction, Role of CAD in design and development of new products, Advantages of CAD. Creating two-dimensional drawing with dimensions using suitable software. (CAD, only internal evaluation)</p> | <b>9</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Assignment+<br/>Lab Exam</b> | <b>Internal<br/>Examination-1</b> | <b>Internal<br/>Examination- 2</b> | <b>Total</b> |
|-------------------|---------------------------------|-----------------------------------|------------------------------------|--------------|
| <b>5</b>          | <b>10+5</b>                     | <b>10</b>                         | <b>10</b>                          | <b>40</b>    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

|                                                                                                                       |              |
|-----------------------------------------------------------------------------------------------------------------------|--------------|
| <b>2 Questions from one module</b><br>Total 8 Questions, each question carries 15 marks<br><br><b>(15x4 =60marks)</b> | <b>Total</b> |
|                                                                                                                       | <b>60</b>    |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                  | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|--------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Understand the projection of points and lines located in different quadrants                     | <b>K2</b>                           |
| <b>CO2</b>            | Prepare multiview orthographic projections of objects by visualizing them in different positions | <b>K3</b>                           |
| <b>CO3</b>            | Plot sectional views and develop surfaces of a given object                                      | <b>K3</b>                           |
| <b>CO4</b>            | Prepare pictorial drawings using the principles of isometric projection                          | <b>K3</b>                           |
| <b>CO5</b>            | Sketch simple drawing using CAD tools.                                                           | <b>K3</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

| Text Books |                       |                      |                                    |                  |
|------------|-----------------------|----------------------|------------------------------------|------------------|
| Sl. No     | Title of the Book     | Name of the Author/s | Name of the Publisher              | Edition and Year |
| 1          | Engineering Graphics  | Varghese, P. I.      | V I P Publishers                   | 2018 edn         |
| 2          | Engineering Graphics, | Benjamin, J.         | Pentex Publishers                  | 2016 edn         |
| 3          | Engineering Graphics  | John, K. C.          | Prentice Hall India Publishers     | 2017 edn         |
| 4          | Engineering Drawing,  | Bhatt, N., D.        | Charotar Publishing House Pvt Ltd. | 60th edn<br>2019 |
| 5          | Engineering Graphics, | Anilkumar, K. N.     | Adhyuth Narayan Publishers         | 2022 edn         |

| Reference Books |                                    |                                                    |                                  |                  |
|-----------------|------------------------------------|----------------------------------------------------|----------------------------------|------------------|
| Sl. No          | Title of the Book                  | Name of the Author/s                               | Name of the Publisher            | Edition and Year |
| 1               | Engineering Graphics with AutoCAD, | Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K., | Prentice Hall India Publishers   | 2020 edn         |
| 2               | Engineering Drawing & Graphics     | Venugopal, K.                                      | New Age International Publishers | 5th edn 2011     |
| 3               | Engineering Drawing                | Parthasarathy, N. S., and Murali, V.               | Oxford University Press          | 2015 edn         |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                     |
| 1                              | <a href="https://archive.nptel.ac.in/courses/112/102/112102304/">https://archive.nptel.ac.in/courses/112/102/112102304/</a> |
| 2                              | <a href="https://archive.nptel.ac.in/courses/112/102/112102304/">https://archive.nptel.ac.in/courses/112/102/112102304/</a> |
| 3                              | <a href="https://archive.nptel.ac.in/courses/112/102/112102304/">https://archive.nptel.ac.in/courses/112/102/112102304/</a> |
| 4                              | <a href="https://archive.nptel.ac.in/courses/112/102/112102304/">https://archive.nptel.ac.in/courses/112/102/112102304/</a> |

**SEMESTER S1**  
**INTRODUCTION TO ELECTRICAL AND ELECTRONICS**  
**ENGINEERING**

**(Common to Group A & B)**

|                                            |                 |                    |                   |
|--------------------------------------------|-----------------|--------------------|-------------------|
| <b>Course Code</b>                         | <b>GXEST104</b> | <b>CIE Marks</b>   | 40                |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 4:0:0:0         | <b>ESE Marks</b>   | 60                |
| <b>Credits</b>                             | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min.    |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Group Core-Theory |

**Course Objectives:**

1. To provide an understanding of the fundamental principles of electrical engineering
2. To introduce the working principles of fundamental electronic devices and circuits
3. To provide an overview of the basic concepts in different types of communication.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Contact Hours</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Elementary concepts of DC electric circuits:</b></p> <p>Current and Voltage Division Rule - Relative potential</p> <p>Capacitors &amp; Inductors: V-I relations and Energy stored. Ohms</p> <p>Law and Kirchhoff's laws - numerical problems.</p> <p>Star-delta conversion (<i>resistive networks only - derivation not required</i>) - numerical problems.</p> <p><b>Analysis of DC Electric circuits:</b> Mesh current method - matrix representation - Solution of network equations.</p> | <b>11</b>            |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|   | <p>Node voltage methods-matrix representation-solution of network equations by matrix methods - numerical problems.</p> <p><b>Elementary Concepts of Magnetic circuits:</b></p> <p>Magnetic Circuits: Basic Terminology: MMF, field strength, fluxdensity, reluctance - Comparison between electric and magnetic circuits - Series and parallel magnetic circuits with composite materials (<i>numerical problems not needed</i>)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| 2 | <p><b>Electromagnetic Induction:</b></p> <p>Faraday's laws, Lenz's law- statically induced and dynamically induced emf – Self-inductance and mutual inductance, coefficient of coupling (<i>numerical problems not needed</i>)</p> <p><b>Alternating Current fundamentals:</b></p> <p>Generation of alternating voltages - Representation of sinusoidal waveforms: frequency, period, average value, RMS value and form factor - numerical problems</p> <p>AC Circuits: Phasor representation of sinusoidal quantities, Trigonometric, Rectangular, Polar and complex forms.</p> <p><b>Analysis of simple AC circuits:</b> Purely resistive, inductive &amp; capacitive circuits; Inductive and capacitive reactance, concept of impedance - numerical problems.</p> <p>RL, RC and RLC series circuits- power factor, active, reactive and apparent power. Simple numerical problems.</p> <p>Three phase AC systems: Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents- numerical problems</p> | 11 |
| 3 | <p><b>Introduction to Electronic devices:</b></p> <p>Passive and active components in electronics</p> <p>Working of PN junction diode, V-I characteristics of PN Junction diode</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 13 |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | <p>Zener diode and avalanche breakdown. Basics of Zener voltage regulator</p> <p>Block diagram of DC power supply, circuit and working of half wave, full wave and bridge rectifiers, ripple factor (with and without capacitor filters)</p> <p>Construction, working and V-I Characteristics of BJT, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations</p> <p>Concept of biasing and load line</p> <p>Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working)</p> <p>RC coupled amplifier - Circuit diagram and frequency response</p> <p>Introduction to FET, Construction and working of N-channel and P- Channel MOSFETs</p>      |   |
| 4 | <p><b>Modern Electronics and its applications:</b></p> <p>General block diagram of a Communication system, Block diagram of Fiber optic Communication system</p> <p>Concept of AM and FM (No derivation required), Block diagram of AM and FM super-heterodyne receiver</p> <p>Basic concepts of Wired and Wireless communication, Block diagram of GSM</p> <p>Comparison of 3G, 4G, 5G and 6G communication technologies</p> <p>Block diagrams of Electronic instrumentation system, Digital Multimeter, Function generator</p> <p>Introduction to CRO and Lissajous patterns</p> <p>Applications of modern electronics – IoT based smart homes, healthcare and agriculture (<i>Case study only</i>)</p> | 9 |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/<br>Microproject | Internal<br>Examination-1<br>(Written) | Internal<br>Examination- 2<br>(Written) | Total     |
|------------|-----------------------------|----------------------------------------|-----------------------------------------|-----------|
| <b>5</b>   | <b>15</b>                   | <b>10</b>                              | <b>10</b>                               | <b>40</b> |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one fullquestion out of two questions*

| Part A                                                                                                                                                                           | Part B                                                                                                                                                                                                                                                                                          | Total     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p align="center"><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p align="center"><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                     | Bloom's<br>Knowledge<br>Level (KL) |
|----------------|-------------------------------------------------------------------------------------|------------------------------------|
| <b>CO1</b>     | Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits | <b>K2</b>                          |
| <b>CO2</b>     | Classify series and parallel magnetic circuits                                      | <b>K2</b>                          |
| <b>CO3</b>     | Understand three phase AC systems                                                   | <b>K2</b>                          |
| <b>CO4</b>     | Explain the fundamental concepts of electronic components and devices               | <b>K2</b>                          |
| <b>CO5</b>     | Outline the principles of communication systems                                     | <b>K2</b>                          |
| <b>CO6</b>     | Identify various applications of modern electronics in the contemporary world       | <b>K2</b>                          |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create



**CO-PO Mapping Table:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   |     |     |     |     |     |     |     |      |      | 2    |
| CO2 | 2   |     |     |     |     |     |     |     |     |      |      | 2    |
| CO3 | 3   | 2   |     |     |     |     |     |     |     |      |      | 2    |
| CO4 | 2   | 1   |     |     |     |     |     |     |     |      |      | 2    |
| CO5 | 2   |     |     |     |     |     |     |     |     |      |      | 2    |
| CO6 | 3   |     | 1   |     |     | 3   | 1   |     |     |      |      | 2    |

| Text Books |                                                                                                         |                                                    |                            |                  |
|------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------|------------------|
| Sl. No     | Title of the Book                                                                                       | Name of the Author/s                               | Name of the Publisher      | Edition and Year |
| 1          | Basic Electrical Engineering                                                                            | D P Kothari and I J Nagrath                        | Tata McGraw Hill           | 4/e 2019         |
| 2          | Schaum's Outline of Basic Electrical Engineering                                                        | J.J.Cathey and Syed A Nasar                        | Tata McGraw Hill           | 3/e 2010         |
| 3          | Basic Electronics: Principles and Applications                                                          | Chinmoy Saha, Arindham Halder and Debarati Ganguly | Cambridge University Press | 1/e 2018         |
| 4          | Basic Electrical and Electronics Engineering                                                            | D. P. Kothari and I. J. Nagrath                    | McGraw Hill                | 2/e 2020         |
| 5          | The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World | Michael Miller                                     | QUE                        | 1/e 2015         |
| 6          | Basic Electronics and Linear Circuits                                                                   | N N Bhargava D C Kulshreshtha and S. C. Gupta      | McGraw Hill                | 2/e 2017         |
| 7          | Electronic Communication Systems                                                                        | Kennedy and Davis                                  | McGraw Hill                | 6/e 2017         |

| Reference Books |                                                        |                                         |                         |                  |
|-----------------|--------------------------------------------------------|-----------------------------------------|-------------------------|------------------|
| Sl. No          | Title of the Book                                      | Name of the Author/s                    | Name of the Publisher   | Edition and Year |
| 1               | Basic Electrical Engineering                           | D C Kulshreshtha                        | Tata McGraw Hill        | 2/e 2019         |
| 2               | Electrical Engineering Fundamentals                    | Del Toro V                              | Pearson Education       | 2/e 2019         |
| 3               | Basic Electrical Engineering                           | T. K. Nagsarkar, M. S. Sukhija          | Oxford Higher Education | 3/e 2017         |
| 4               | Electronics: A Systems Approach                        | Neil Storey                             | Pearson                 | 6e 2017          |
| 5               | Electronic Devices and Circuit Theory                  | Robert L. Boylestad and Louis Nashelsky | Pearson                 | 11e 2015         |
| 6               | Principles of Electronic Communication Systems         | Frenzel, L. E                           | MGH                     | 4e 2016          |
| 7               | Internet of Things: Architecture and Design Principles | Raj Kamal                               | McGraw Hill             | 1/e 2017         |
| 8               | Electronic Communication                               | Dennis Roddy and John Coolen            | Pearson                 | 4/e 2008         |

**SEMESTER S1****ALGORITHMIC THINKING WITH PYTHON****(Common to All Branches)**

|                                       |                 |                    |                      |
|---------------------------------------|-----------------|--------------------|----------------------|
| <b>Course Code</b>                    | <b>UCEST105</b> | <b>CIE Marks</b>   | <b>40</b>            |
| <b>Teaching Hours/Week(L: T:P: R)</b> | <b>3:0:2:0</b>  | <b>ESE Marks</b>   | <b>60</b>            |
| <b>Credits</b>                        | <b>4</b>        | <b>Exam Hours</b>  | <b>2 Hrs. 30 Min</b> |
| <b>Prerequisites (if any)</b>         | <b>None</b>     | <b>Course Type</b> | <b>Theory</b>        |

**Course Objectives:**

1. To provide students with a thorough understanding of algorithmic thinking and its practical applications in solving real-world problems.
2. To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamic programming, and heuristics, in addressing and solving complex problems.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>PROBLEM-SOLVING STRATEGIES:-</b> Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies, Trial and Error, Heuristics, Means-Ends Analysis, and Backtracking (Working backward).</p> <p><b>THE PROBLEM-SOLVING PROCESS:-</b> Computer as a model of computation, Understanding the problem, Formulating a model, Developing an algorithm, Writing the program, Testing the program, and Evaluating the solution.</p> <p><b>ESSENTIALS OF PYTHON PROGRAMMING:-</b> Creating and using variables in Python, Numeric and String data types in Python, Using the math module, Using the Python Standard Library for handling basic I/O - print, input, Python operators and their precedence.</p> | <b>7</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | <p>ALGORITHM AND PSEUDOCODE REPRESENTATION:- Meaning and</p> <p>Definition of Pseudocode, Reasons for using pseudocode, The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and repetition(for, while, repeat-until loops), Sample problems *</p> <p>FLOWCHARTS** :- Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector.</p> <hr/> <p>* - Evaluate an expression, <math>d=a+b*c</math>, find simple interest, determine the larger of two numbers, determine the smallest of three numbers, determine the grade earned by a student based on KTU grade scale (using if-else and case structures), print the numbers from 1 to 50 in descending order, find the sum of n numbers input by the user (using all the three loop variants), factorial of a number, largest of n numbers (<b>Not to be limited to these exercises. More can be worked out if time permits</b>).</p> <p>** <b>Only for visualizing the control flow of Algorithms. The use of tools like RAPTOR (<a href="https://raptor.martincarlisle.com/">https://raptor.martincarlisle.com/</a>) is suggested. Flowcharts for the sample problems listed earlier may be discussed</b></p> | 9  |
| 3 | <p>SELECTION AND ITERATION USING PYTHON:- if-else, elif, for loop, range, while loop.</p> <p>Sequence data types in Python - list, tuple, set, strings, dictionary, Creating and using Arrays in Python (using <i>Numpy</i> library).</p> <p>DECOMPOSITION AND MODULARIZATION* :- Problem decomposition as a strategy for solving complex problems, Modularization, Motivation for modularization, Defining and using functions in Python, Functions with multiple return values</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10 |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|   | <p>RECURSION:- Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, <i>Sample problems - Finding the <math>n</math>th Fibonacci number, greatest common divisor of two positive integers, the factorial of a positive integer, adding two positive integers, the sum of digits of a positive number</i> **.</p> <hr/> <p>* <i>The idea should be introduced and demonstrated using Merge sort, the problem of returning the top three integers from a list of <math>n \geq 3</math> integers as examples. (Not to be limited to these two exercises. More can be worked out if time permits).</i></p> <p>** <i>Not to be limited to these exercises. More can be worked out if time permits.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| 4 | <p>COMPUTATIONAL APPROACHES TO PROBLEM-SOLVING<br/>(Introductory diagrammatic/algorithmic explanations only. Analysis not required) :-</p> <p>Brute-force Approach -</p> <ul style="list-style-type: none"> <li>- Example: Padlock, Password guessing</li> </ul> <p>Divide-and-conquer Approach -</p> <ul style="list-style-type: none"> <li>- Example: The Merge Sort Algorithm</li> <li>- Advantages of Divide and Conquer Approach</li> <li>- Disadvantages of Divide and Conquer Approach</li> </ul> <p>Dynamic Programming Approach</p> <ul style="list-style-type: none"> <li>- Example: Fibonacci series</li> <li>- Recursion vs Dynamic Programming</li> </ul> <p>Greedy Algorithm Approach</p> <ul style="list-style-type: none"> <li>- Example: Given an array of positive integers each indicating the completion time for a task, find the maximum number of tasks that can be completed in the limited amount of time that you have.</li> <li>- Motivations for the Greedy Approach</li> <li>- Characteristics of the Greedy Algorithm</li> <li>- Greedy Algorithms vs Dynamic Programming</li> </ul> <p>Randomized Approach</p> <ul style="list-style-type: none"> <li>- Example 1: A company selling jeans gives a coupon for each pair of jeans. There are <math>n</math> different coupons. Collecting <math>n</math> different coupons would give you free jeans. How many jeans do you expect to buy before getting a free one?</li> </ul> | 10 |

|  |                                                                                                                                                                                                                                                                                                                                                          |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>- Example 2: <math>n</math> people go to a party and drop off their hats to a hat-check person. When the party is over, a different hat-check person is on duty and returns the <math>n</math> hats randomly back to each person. What is the expected number of people who get back their hats?</p> <p>- Motivations for the Randomized Approach</p> |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Continuous Assessment (Accurate Execution of Programming Tasks) | Internal Examination-1 (Written Examination) | Internal Examination-2 (Written Examination) | Internal Examination- 3 (Lab Examination) | Total |
|------------|-----------------------------------------------------------------|----------------------------------------------|----------------------------------------------|-------------------------------------------|-------|
| 5          | 5                                                               | 10                                           | 10                                           | 10                                        | 40    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                            | Part B                                                                                                                                                                                                                                                                           | Total     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

### Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome |                                                                                                                                            | Bloom's Knowledge Level (KL) |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Utilize computing as a model for solving real-world problems.                                                                              | <b>K2</b>                    |
| <b>CO2</b>     | Articulate a problem before attempting to solve it and prepare a clear and accurate model to represent the problem.                        | <b>K3</b>                    |
| <b>CO3</b>     | Utilize effective algorithms to solve the formulated models and translate algorithms into executable programs.                             | <b>K3</b>                    |
| <b>CO4</b>     | Interpret the problem-solving strategies, a systematic approach to solving computational problems, and essential Python programming skills | <b>K3</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

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

| Reference Books |                                                                      |                                                                                    |                                    |                  |
|-----------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------|------------------|
| Sl. No          | Title of the Book                                                    | Name of the Author/s                                                               | Name of the Publisher              | Edition and Year |
| 1               | Problem solving & programming concepts                               | Maureen Sprankle, Jim Hubbard                                                      | Pearson                            | 9/e, 2011        |
| 2               | How to Solve It: A New Aspect of Mathematical Method                 | George Pólya                                                                       | Princeton University Press         | 2/e, 2015        |
| 3               | Creative Problem Solving: An Introduction                            | Donald Treffinger., Scott Isaksen, Brian Stead-Doval                               | Prufrock Press                     | 4/e, 2005        |
| 4               | Psychology (Sec. Problem Solving.)                                   | Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M | H5P Edition                        | 1/e, 2021        |
| 5               | Computational Thinking: A Primer for Programmers and Data Scientists | G Venkatesh Madhavan Mukund                                                        | Mylspot Education Services Pvt Ltd | 1/e, 2020        |
| 6               | Computer Arithmetic Algorithms                                       | Koren, Israel                                                                      | AK Peters/CRC Press                | 2/e, 2001        |
| 7               | Python for Everyone                                                  | Cay S. Horstmann, Rance D. Necaise                                                 | Wiley                              | 3/e, 2024        |
| 8               | Introduction to Computation and Programming using Python             | Gutttag John V                                                                     | PHI                                | 2/e., 2016       |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                                   |
| 1                              | <a href="https://opentextbc.ca/h5pppsychology/chapter/problem-solving/">https://opentextbc.ca/h5pppsychology/chapter/problem-solving/</a> |
| 2                              | <a href="https://onlinecourses.nptel.ac.in/noc21_cs32/preview">https://onlinecourses.nptel.ac.in/noc21_cs32/preview</a>                   |



## **1. Continuous Assessment (5 Marks)**

### *Accurate Execution of Programming Tasks*

- Correctness and completeness of the program
- Efficient use of programming constructs
- Handling of errors
- Proper testing and debugging

## **2. Evaluation Pattern for Lab Examination (10 Marks)**

### **1. Algorithm (2 Marks)**

Algorithm Development: Correctness and efficiency of the algorithm related to the question.

### **2. Programming (3 Marks)**

Execution: Accurate execution of the programming task.

### **3. Result (3 Marks)**

Accuracy of Results: Precision and correctness of the obtained results.

### **4. Viva Voce (2 Marks)**

Proficiency in answering questions related to theoretical and practical aspects of the subject.

**Sample Classroom Exercises:**

1. Identify three ill-defined problems and well-defined problems
2. Identify five use cases for Trial and error, Heuristics, backtracking, and Means-ends analysis.
3. Use a diagram to solve the Tower of Hanoi for three pegs with the minimum number of moves.
4. Evaluate different algorithms discussed earlier based on their efficiency by counting the number of steps.
5. A recursive function that takes a number and returns the sum of all the numbers from zero to that number.
6. A recursive function that takes a number as an input and returns the factorial of that number.
7. A recursive function that takes a number 'n' and returns the nth Fibonacci number.
8. A recursive function that takes an array of numbers as input and returns the product of all the numbers in the array.
9. A program to reverse the contents of an **1D** array without using a second array.
10. To register for the end-semester examination, you need to log into the University portal with your credentials. Write a program to validate the credentials. Assume that the usernames are stored in an array of strings called **USERNAME** and the corresponding passwords are stored in another array of strings called **PASSWORD** such that **password[i]** is the password for the user **username[i]**.
11. You are given a list and your task is to divide it to make two smaller lists. The sublists should be made from alternate elements in the original list. So if the original list is {**5,1,4,12,6**}, then one sublist should be {**5,4,6**} and the other should be {**1,12**}.
12. A program that takes three points in a 2D plane and determines whether they are collinear. Two pairs of points are collinear if they have the same slope.

**LAB Experiments:**

1. Simple desktop calculator using Python. *Only the five basic arithmetic operators.*
2. Create, concatenate, and print a string and access a sub-string from a given string.
3. Familiarize time and date in various formats (Eg. “Thu Jul 11 10:26:23 IST 2024”).
4. Write a program to create, append, and remove lists in Python using NumPy.
5. Program to find the largest of three numbers.
6. Convert temperature values back and forth between Celsius (c), and Fahrenheit (f). [Formula:  $c/5 = f-32/9$ ]
7. Program to construct patterns of stars (\*), using a nested for loop.
8. A program that prints prime numbers less than *N*.

9. Program to find the factorial of a number using Recursion.
10. Recursive function to add two positive numbers.
11. Recursive function to multiply two positive numbers.
12. Recursive function to find the greatest common divisor of two positive numbers.
13. A program that accepts the lengths of three sides of a triangle as inputs. The program should output whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides). Implement using functions.
14. Program to define a module to find Fibonacci Numbers and import the module to another program.
15. Program to check whether the given number is a valid mobile number or not using functions.

Rules:

1. Every number should contain exactly 10 digits.
  2. The first digit should be 7 or 8 or 9
16. Input two lists from the user. Merge these lists into a third list such that in the merged list, all even numbers occur first followed by odd numbers. Both the even numbers and odd numbers should be in sorted order.
  17. Write a program to play a sticks game in which there are 16 sticks. Two players take turns to play the game. Each player picks one set of sticks (needn't be adjacent) during his turn. A set contains 1, 2, or 3 sticks. The player who takes the last stick is the loser. The number of sticks in the set is to be input.
  18. Suppose you're on a game show, and you are given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what is behind the doors, opens another door, say No. 3, which has a goat. He then asks, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice?

(source:[https://en.wikipedia.org/wiki/Monty\\_Hall\\_problem#:~:text=The%20Monty%20Hall%20problem%20is,the%20American%20Statistician%20in%201975.](https://en.wikipedia.org/wiki/Monty_Hall_problem#:~:text=The%20Monty%20Hall%20problem%20is,the%20American%20Statistician%20in%201975.))

**SEMESTER S1**  
**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**  
**WORKSHOP**

(Common to All Groups except for Civil Engineering Branch)

|                                            |                 |                                      |                |
|--------------------------------------------|-----------------|--------------------------------------|----------------|
| <b>Course Code</b>                         | <b>GXESL106</b> | <b>CIE Marks</b>                     | 50             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 0:0:2:0         | <b>ESE Marks<br/>(Internal only)</b> | 50             |
| <b>Credits</b>                             | 1               | <b>Exam Hours</b>                    | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b>                   | Lab            |

**Course Objectives:**

1. To create awareness and familiarity with electrical wiring and safety measures to be taken.
2. To Identify various electronic components and to operate various measuring instruments
3. Learn to setup simple electronic circuits on breadboard and PCB

| <b>Expt.<br/>No.</b>                                                 | <b>Experiments</b>                                                                                                                                                                                         |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical Workshop<br/>(Minimum of 7 Experiments to be done)</b> |                                                                                                                                                                                                            |
| <b>1</b>                                                             | a) Demonstrate the precautionary steps adopted in case of Electrical shocks.<br>b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings. |
| <b>2</b>                                                             | Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.                                                                                   |
| <b>3</b>                                                             | Wiring of light/fan circuit using two-way switches. (Staircase wiring)                                                                                                                                     |
| <b>4</b>                                                             | Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch.                                                                                                                           |
| <b>5</b>                                                             | Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.                                                                                |
| <b>6</b>                                                             | Familiarisation of step up and step-down transformers, (use low voltage transformers)<br>Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO               |
| <b>7</b>                                                             | Familiarisation of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.                                                    |

|                                                                                                                      |                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8</b>                                                                                                             | <p>a) Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd etc.)</p> <p>b) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM).</p>                                                                           |
| <p align="center"><b>ELECTRONICS WORKSHOP</b></p> <p align="center"><b>(Minimum of 7 Experiments to be done)</b></p> |                                                                                                                                                                                                                                                                                                                    |
| <b>1</b>                                                                                                             | Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol and cost of -Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.) |
| <b>2</b>                                                                                                             | Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's                                                                                                                                                                                            |
| <b>3</b>                                                                                                             | <p>Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO.</p> <p>Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station</p>         |
| <b>4</b>                                                                                                             | Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.                                                                                                                                                                                                               |
| <b>5</b>                                                                                                             | <p>Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods.</p> <p>Design and fabrication of a single sided PCB for a simple circuit.</p>                                                                                                                                        |
| <b>6</b>                                                                                                             | <p>Inter-connection methods and soldering practice.</p> <p>Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions.</p> <p>Soldering practice in connectors and general-purpose PCB, Crimping.</p>                                                                      |

|          |                                                                                                                                                                                                                                                                                                                                             |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7</b> | Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)-<br>Fixed voltage power supply with transformer <ul style="list-style-type: none"> <li>• Rectifier diode</li> <li>• Capacitor filter</li> <li>• Zener/IC regulator</li> </ul> Square wave generation using IC 555 timer in IC base. |
| <b>8</b> | Assembling of electronic circuits using SMT (Surface Mount Technology) stations.                                                                                                                                                                                                                                                            |
| <b>9</b> | Introduction to EDA tools (such as KiCad or Xcircuit)                                                                                                                                                                                                                                                                                       |

**Course Assessment Method**  
(CIE: 50 marks, ESE: 50 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)</b> | <b>Total</b> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>5</b>          | <b>45</b>                                                                                                                | <b>50</b>    |

**End Semester Examination Marks (ESE): (Internal evaluation only)**

| <b>Procedure/ Preparatory work/Design/ Algorithm</b> | <b>Conduct of experiment/ Execution of work/ troubleshooting/ Programming</b> | <b>Result with valid inference/ Quality of Output</b> | <b>Viva voce</b> | <b>Record</b> | <b>Total</b> |
|------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------|------------------|---------------|--------------|
| <b>10</b>                                            | <b>15</b>                                                                     | <b>10</b>                                             | <b>10</b>        | <b>5</b>      | <b>50</b>    |

*Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified Lab record.*

*Pass Criteria:*

- A student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE).
- In addition, the student must secure at least 40% in the End Semester Examination (ESE).

*The ESE shall be conducted internally, with evaluation carried out by a panel of faculty members. This panel must include at least one faculty member who was not involved in the Continuous Internal Evaluation (CIE) of the lab course.*

### Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome |                                                                                                                       | Bloom's Knowledge Level (KL) |
|----------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Demonstrate safety measures against electrical shocks                                                                 | K2                           |
| <b>CO2</b>     | Familiarise with transformers, rheostats, batteries and earthing schemes                                              | K2                           |
| <b>CO3</b>     | Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits | K3                           |
| <b>CO4</b>     | Identify various electronic components                                                                                | K2                           |
| <b>CO5</b>     | Operate various measuring instruments                                                                                 | K3                           |
| <b>CO6</b>     | Apply the design procedure of simple electronic circuits on breadboard and PCB                                        | K3                           |
| <b>CO7</b>     | Build the ability to work in a team with good interpersonal skills                                                    | K3                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> |     |     |     |     |     | 3   |     |     |     |      |      | 2    |
| <b>CO2</b> | 1   |     |     |     |     | 2   | 1   |     |     |      |      | 2    |
| <b>CO3</b> | 2   |     |     |     |     | 1   |     |     |     |      |      | 2    |
| <b>CO4</b> | 3   |     |     |     |     | 2   |     |     |     |      |      | 3    |
| <b>CO5</b> | 3   |     |     |     | 3   | 2   |     |     | 2   |      |      | 3    |
| <b>CO6</b> | 3   |     | 3   | 1   | 3   | 2   | 1   |     | 2   |      |      | 3    |
| <b>CO7</b> |     |     |     |     |     |     |     |     | 3   | 2    |      | 2    |

| Text Books |                                          |                                             |                                             |                  |
|------------|------------------------------------------|---------------------------------------------|---------------------------------------------|------------------|
| Sl. No     | Title of the Book                        | Name of the Author/s                        | Name of the Publisher                       | Edition and Year |
| 1          | Electrical Design Estimating and Costing | K B Raina and S KBhattacharya               | New Age International Publishers            | 2/e 2024         |
| 2          | Electrical Systems Design                | M K Giridharan                              | I K International Publishing House Pvt. Ltd | 3/e 2022         |
| 3          | Basic Electrical Engineering             | D P Kothari and I J Nagrath                 | Tata McGraw Hill                            | 4/e 2019         |
| 4          | Basic Electronics and Linear Circuits    | NN Bhargava, D C Kulshreshtha and S C Gupta | Mc Graw Hill                                | 2/e 2017         |

### Continuous Assessment with equal weightage for both specializations (45 Marks)

#### 1. Preparation and Pre-Lab Work (10 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### 2. Lab Reports and Record Keeping (10 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

#### 3. Viva Voce (10 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.



**Evaluation Pattern for End Semester Examination with equal weightage in both specializations (50 Marks)**

**1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

**2. Conduct of Experiment/Execution of Work/Programming (15 Marks)**

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

**3. Result with Valid Inference/Quality of Output (10 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

**4. Viva Voce (10 Marks)**

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

**5. Record (5 Marks)**

- Completeness, clarity, and accuracy of the lab record submitted

**SEMESTER S1/S2**  
**HEALTH AND WELLNESS**  
**(Common to all Groups)**

|                                            |                 |                    |                      |
|--------------------------------------------|-----------------|--------------------|----------------------|
| <b>Course Code</b>                         | <b>UCHWT127</b> | <b>CIE Marks</b>   | 50                   |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 1:0:1:0         | <b>ESE Marks</b>   | 0                    |
| <b>Credits</b>                             | 1               | <b>Exam Hours</b>  | Nil                  |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory and Practical |

**Course Objectives:**

1. To provide essential knowledge on physical activity, health, and wellness.
2. To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
3. To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills.
4. To equip students with the ability to lead healthier lifestyles.
5. To enable students to design effective and personalized exercise programs.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Contact Hours</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Human Body Systems related to Physical activity and its functions:<br>Respiratory System - Cardiovascular System.<br>Musculoskeletal System and the Major Muscle groups of the HumanBody.<br>Quantifying Physical Activity Energy Expenditure and Metabolicequivalent of task (MET)<br>Exercise Continuum: Light-intensity physical activity, Moderate -intensity physical activity, Vigorous -intensity physical activity.<br>Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. | <b>4</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | <p>FITT principle to design an Exercise programme</p> <p>Components of Health related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| 2 | <p>Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health.</p> <p>Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports</p> <p>Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet</p> <p>Carbohydrate &amp; the Glycemic Index</p> <p>Animal &amp; Plant - based Proteins and their Effects on Human Health</p> <p>Dietary Fats &amp; their Effects on Human Health</p> <p>Essential Vitamins and Minerals</p>                                                                                                                                                                          | 2 |
| 3 | <p>Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - Cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis , flat foot, Knock knee )</p> <p>Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga</p> <p>Understanding on substance abuse and addiction - Psychoactive substances &amp; its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.</p> | 4 |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4</b> | <p>First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider</p> <p>First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds.</p> <p>First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling</p> <p>Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain &amp; Strain)</p> | <b>2</b> |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|

### Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile
- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

### Course Assessment Method(CIE: 50 marks)

#### Continuous Internal Evaluation Marks (CIE):

| <b>Attendance</b> | <b>Case Study/Micro project/Presentation</b> | <b>Activity evaluation</b> | <b>Total</b> |
|-------------------|----------------------------------------------|----------------------------|--------------|
| <b>10</b>         | <b>20</b>                                    | <b>20</b>                  | <b>50</b>    |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                                                                                             | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities.                                                     | <b>K2</b>                           |
| <b>CO2</b>            | Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.                                                                              | <b>K2</b>                           |
| <b>CO3</b>            | Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leading a healthy lifestyle through the practice of yoga and abstaining from addictive substances. | <b>K2</b>                           |
| <b>CO4</b>            | Explain the basics of first aid and describe common sports injuries                                                                                                                                         | <b>K2</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

|            | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PO12</b> |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| <b>CO1</b> |            |            |            | 2          |            | 3          |            | 3          | 3          | 2           |             | 2           |
| <b>CO2</b> |            |            |            | 2          |            | 3          |            | 2          | 2          |             |             | 2           |
| <b>CO3</b> |            |            |            | 0          |            | 3          |            | 3          |            |             |             | 2           |
| <b>CO4</b> |            |            |            | 2          |            | 3          |            |            |            |             |             | 2           |

| Text Books |                                               |                      |                         |                  |
|------------|-----------------------------------------------|----------------------|-------------------------|------------------|
| Sl. No     | Title of the Book                             | Name of the Author/s | Name of the Publisher   | Edition and Year |
| 1          | Foundations of Nutrition                      | Bhavana Sabarwal     | Commonwealth Publishers | 1999             |
| 2          | Anatomy and physiology in health and illness. | Ross and Wilson      | Waugh, A., & Grant, A.  | 2022             |

| Reference Books |                                                                                                                         |                                                        |                                                      |                  |
|-----------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------|------------------|
| Sl. No          | Title of the Book                                                                                                       | Name of the Author/s                                   | Name of the Publisher                                | Edition and Year |
| 1               | Fit to be Well Essential Concept                                                                                        | Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S. | Jones & Bartlett Learning.                           | 2018             |
| 2               | Introduction to physical education, fitness, and sport.                                                                 | Siedentop, D., & Van der Mars, H.                      | Human kinetics.                                      | 2022             |
| 3               | Substance Use Disorders. Manual for Physicians.                                                                         | Lal, R., & Ambekar, A. (2005).                         | National Drug Dependence Treatment Centre, New Delhi | 2005             |
| 4               | The exercise health connection-how to reduce your risk of disease and other illnesses by making exercise your medicine. | Nieman, D. C., & White, J. A                           | Public Health                                        | 1998             |
| 5               | ACSM's resource manual for guidelines for exercise testing and prescription.                                            | Lippincott Williams & Wilkins.                         | American College of Sports Medicine.                 | 2012             |
| 6               | Exercise Physiology: energy, nutrition and human performance.                                                           | Katch, F. I., Katch, V. L., & McArdle, W. D.           | Lippincott Williams & Wilkins                        | 2010             |

**Continuous Internal Evaluation Marks (CIE): for the Health and wellness course**

Students will be evaluated as follows.

| <b>Title</b>                                              | <b>Method of Evaluation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Attendance</b>                                         | <p>Students must attend at least 75% of both theory and practical classes. They will receive 10 marks based on their class attendance.</p> <p>Students who do not meet the minimum attendance requirement for a course, as specified in the B. Tech regulations, will not be eligible to proceed to the next criteria.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Assignment / Presentation</b>                          | <p>Assignments will be given to students to assess their understanding of the subjects taught. Students will be required to make presentations on the subjects taught in class, and their understanding of the subjects will be assessed.</p> <p>Based on the Assignments and Presentations the students will be awarded marks out of 20</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Activity Evaluation</b>                                | <p>The Assignment / Presentation faculty handling the class will use the tests from the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests:</p> <ol style="list-style-type: none"> <li>1. V Sit Reach Test</li> <li>2. Partial Curl Up - 30 seconds</li> <li>3. Push Ups (Male) and Modified Push Up (Female)</li> <li>4. Two (2) Km Run/Walk</li> </ol> <p>Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be awarded pass marks for activity evaluation. Students who score better will be awarded a maximum mark of 20.</p> |
| <b>Activity Evaluation - Special Circumstances</b>        | <p>Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be awarded marks out of 20.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Activity Evaluation - Special Considerations - NCC</b> | <p>Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be awarded pass marks for activity evaluation. Students who attend more parades will be eligible for a maximum mark of 20 based on their parade attendance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Tests to evaluated as per Criterion - 2 and Benchmark Scores**

**V Sit Reach Test**

**How to Perform:**

1. The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.
2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.
3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.
4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

**Infrastructure/Equipment Required:**

1. A tape for marking the ground, marker pen, and ruler.
2. With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.
3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.
4. Scoring: The score is recorded in centimeters and millimeters as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position.



**Scoring for V Sit Reach Test for Males**

| Level | Benchmark Score | Measurement (cm) |
|-------|-----------------|------------------|
| 1     | 2               | <11              |
| 2     | 4               | 12-13            |
| 3     | 6               | 14-17            |
| 4     | 7               | 18-19            |
| 5     | 8               | 20-21            |
| 6     | 9               | 22               |
| 7     | 10              | >22              |

**Scoring for V Sit Reach Test for Females**

| Level | Benchmark Score | Measurement (cm) |
|-------|-----------------|------------------|
| 1     | 2               | <14              |
| 2     | 4               | 15-16            |
| 3     | 6               | 17-19            |
| 4     | 7               | 20-21            |
| 5     | 8               | 22               |
| 6     | 9               | 23               |
| 7     | 10              | >23              |

**Partial Curl Up - 30 seconds****How to Perform:**

1. The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
2. The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).
3. The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

**Infrastructure/Equipment Required:**

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch

Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

**Scoring for Partial Curl Up - 30 seconds Test for Males**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <25     |
| 2     | 4               | 25-30   |
| 3     | 6               | 31-34   |
| 4     | 7               | 35-38   |
| 5     | 8               | 39-43   |
| 6     | 9               | 44-49   |
| 7     | 10              | >49     |

**Scoring for Partial Curl Up - 30 seconds Test for Females**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <18     |
| 2     | 4               | 18-24   |
| 3     | 6               | 25-28   |
| 4     | 7               | 29-32   |
| 5     | 8               | 33-36   |
| 6     | 9               | 37-43   |
| 7     | 10              | >43     |

**Push Ups for Male/Modified Push Ups for Female****How to Perform:**

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
3. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
4. For Female: push-up technique is with the knees resting on the ground.

**Infrastructure/Equipment Required:**

Flat clean cushioned surface/Gym mat

Scoring: Record number of correctly completed pushups.

**Scoring for Push Ups for Male**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <4      |
| 2     | 4               | 04- 10  |
| 3     | 6               | 11 -18  |
| 4     | 7               | 19-34   |
| 5     | 8               | 35-46   |
| 6     | 9               | 47-56   |
| 7     | 10              | >56     |

**Scoring for Modified Push Ups for Female**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | 0-1     |
| 2     | 4               | 2 - 5   |
| 3     | 6               | 6 -10   |
| 4     | 7               | 11 - 20 |
| 5     | 8               | 21-27   |
| 6     | 9               | 27-35   |
| 7     | 10              | >35     |

**2 Km Run/Walk****How to Perform:**

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.
2. The participants begin on signal (Starting point)- “ready, start”. As they cross the finish line, elapsed time should be announced to the participants.
3. Walking is permitted but the objective is to cover the distance in the shortest possible time.

**Infrastructure/Equipment Required:**

Stopwatch, whistle, marker cone, lime powder,

measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.

Scoring: Time taken for completion (Run or Walk) in min, sec.

**Scoring for 2Km Run/walk for Male**

| Level | Benchmark Score | Minutes : Seconds |
|-------|-----------------|-------------------|
| 1     | 2               | > 11:50           |
| 2     | 4               | 10:42             |
| 3     | 6               | 09:44             |
| 4     | 7               | 08:59             |
| 5     | 8               | 08:33             |
| 6     | 9               | 07:37             |
| 7     | 10              | >07:37            |

**Scoring for 2Km Run/walk for Female**

| Level | Benchmark Score | Minutes : Seconds |
|-------|-----------------|-------------------|
| 1     | 2               | >13:47            |
| 2     | 4               | 12:51             |
| 3     | 6               | 12:00             |
| 4     | 7               | 11:34             |
| 5     | 8               | 10:42             |
| 6     | 9               | 09:45             |
| 7     | 10              | >09:45            |

**SEMESTER - S1/S2**  
**LIFE SKILLS AND PROFESSIONAL COMMUNICATION**

**(Common to all Branches)**

|                                            |                 |                    |                         |
|--------------------------------------------|-----------------|--------------------|-------------------------|
| <b>Course Code</b>                         | <b>UCHUT128</b> | <b>CIE Marks</b>   | 100                     |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 2:0:1:0         | <b>ESE Marks</b>   | 0                       |
| <b>Credits</b>                             | 1               | <b>Exam Hours</b>  | -                       |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Activity-based learning |

**Course objectives:**

1. To foster self-awareness and personal growth, enhance communication and interpersonal connection skills, promote effective participation in groups and teams, develop critical thinking, problem-solving, and decision-making skills, and cultivate the ability to exercise emotional intelligence.
2. To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise
3. To equip students to build their profile in line with the professional requirements and standards.

**Continuous Internal Evaluation Marks (CIE):**

- Continuous internal evaluation is based on the individual and group activities as detailed in the activity table given below.
- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. They should use online collaboration tools for group activities, report/presentation making and work management.
- Activities are to be distributed between 3 class hours (2L+1P) and 3.5 Self-study hours.
- Marks given against each activity should be awarded fully if the students successfully complete the activity.
- Students should maintain a portfolio file with all the reports and other textual materials

generated from the activities. Students should also keep a journal related to the activities undertaken.

- Portfolio and journal are mandatory requirements for passing the course, in addition to the minimum marks required.
- The portfolio and journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through the HMC courses and Mini project course.
- Self-reflection questionnaire shall be given at the beginning of the semester, in between and at the end of the semester based on the guidelines in the manual of the course.

| Sl. No. | Activity                                                                                                                                                                                                                                                                                                                                                                 | Class room (L) / Self Study (SS) | Week of completion | Group / Individual (G/I) | Marks | Skills                                                                                                                                                         | CO  |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|--------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1     | Group formation and self-introduction among the group members                                                                                                                                                                                                                                                                                                            | L                                | 1                  | G                        | -     | • Connecting with group members<br>• Time management - Gantt Chart                                                                                             |     |
| 1.2     | Familiarizing the activities and preparation of the time plan for the activities                                                                                                                                                                                                                                                                                         | L                                | 1                  | G                        | -     |                                                                                                                                                                |     |
| 1.3     | Preparation of Gantt chart based on the time plan                                                                                                                                                                                                                                                                                                                        | SS                               | 1                  | G                        | 2     |                                                                                                                                                                |     |
|         |                                                                                                                                                                                                                                                                                                                                                                          |                                  |                    |                          |       |                                                                                                                                                                |     |
| 2.1     | Take an online personality development test, self-reflect and report                                                                                                                                                                                                                                                                                                     | SS                               | 1                  | I                        | 2     | • Self-awareness Writing                                                                                                                                       | CO1 |
| 2.2     | Role-storming exercise 1:<br>Students assume 2 different roles given below and write about their<br>• Strengths,<br>• Areas for improvement,<br>• Concerns,<br>• Areas in which he/she hesitates to take advice,<br>• Goals/Expectations,<br>from the point of view of the following assumed roles<br>i) their parent/guardian/mentor<br>ii) their friend/sibling/cousin | L                                | 1                  | I                        | 2     | • Goal setting - Identification of skills and setting goal<br>• Self-awareness<br>• Discussion in groups<br>• Group work- Compiling of ideas<br>• Mind mapping | CO1 |
| 2.3     | Role-storming exercise 2:<br>Students assume the role of their teacher and write about the                                                                                                                                                                                                                                                                               | SS                               | 1                  | I                        | 2     |                                                                                                                                                                | CO1 |

|     |                                                                                                                                                                                                                                                                                                                                                                                               |    |        |   |   |                                                                                                                                                                                             |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|     | <ul style="list-style-type: none"> <li>•Skills required as a B.Tech graduate</li> <li>•Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set goals</li> </ul>                                                                                                                                                          |    |        |   |   |                                                                                                                                                                                             |     |
| 2.4 | Discuss the skills identified through rolestorming exercise by each one within their own group and improvise the list of skills                                                                                                                                                                                                                                                               | L  | 1      | G | 2 |                                                                                                                                                                                             | CO1 |
| 2.5 | Prepare a mind map based on the rolestorming exercise and exhibit/present it in class                                                                                                                                                                                                                                                                                                         | SS | 2      | G | 2 |                                                                                                                                                                                             | CO1 |
|     |                                                                                                                                                                                                                                                                                                                                                                                               |    |        |   |   |                                                                                                                                                                                             |     |
| 3   | Prepare a presentation on instances of empathy they have observed in their own life or in other's life                                                                                                                                                                                                                                                                                        | L  | 2 to 4 | I | 2 | • Empathy                                                                                                                                                                                   | CO2 |
| 4.1 | Each student connects and networks with a minimum of 3 professionals from industry/public sector organizations/other agencies/NGOs /academia (atleast 1 through LinkedIn)                                                                                                                                                                                                                     | SS | 3      | I | 2 | <ul style="list-style-type: none"> <li>• Workplace awareness</li> <li>• Listening</li> <li>• Communication - interacting with people</li> </ul>                                             |     |
| 4.2 | Interact with them to understand their workplace details including <ul style="list-style-type: none"> <li>•workplace skills required</li> <li>•their work experience</li> <li>•activities they have done to enhance their employability during their B.Tech years</li> <li>•suggestions on the different activities to be done during B.Tech years</li> </ul> Prepare a documentation of this | SS | 3      | I | 4 | <ul style="list-style-type: none"> <li>• Networking through various media including LinkedIn</li> <li>• Discussion in groups</li> <li>• Report preparation</li> <li>• Creativity</li> </ul> | CO2 |
| 4.3 | Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals<br>Prepare the Minutes of the discussions                                                                                                                                                             | SS | 3      | G | 2 | Goal setting - Preparation of action plan                                                                                                                                                   | CO2 |
| 4.4 | Report preparation based on the discussions                                                                                                                                                                                                                                                                                                                                                   | SS | 4      | G | 3 |                                                                                                                                                                                             | CO4 |
| 4.5 | Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions                                                                                                                                                                                                                                                                                    | L  | 5      | G | 4 |                                                                                                                                                                                             | CO3 |

|      |                                                                                                                                                                              |    |    |     |   |                                                                                                                                                                                                       |          |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 4.6  | Identify their own goal and prepare an action plan for their undergraduate journey to achieve the goal                                                                       | SS | 5  | I   | 2 |                                                                                                                                                                                                       | CO1      |
|      |                                                                                                                                                                              |    |    |     |   |                                                                                                                                                                                                       |          |
| 5.1  | Select a real-life problem that requires a technical solution and list the study materials needed                                                                            | L  | 6  | G   | 2 |                                                                                                                                                                                                       | CO3      |
| 5.2  | Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource) | SS | 6  | I   | 2 |                                                                                                                                                                                                       | CO4      |
| 5.3  | Use any online tech forum to gather ideas for solving the problem chosen                                                                                                     | SS | 6  | G   | 2 |                                                                                                                                                                                                       | CO5      |
| 5.4  | Arrive at a possible solution using six thinking hat exercise                                                                                                                | L  | 7  | G   | 3 |                                                                                                                                                                                                       | CO3      |
| 5.5  | Prepare a report based on the problem-solving experience                                                                                                                     | SS | 7  | G   | 2 |                                                                                                                                                                                                       | CO4      |
|      |                                                                                                                                                                              |    |    |     |   |                                                                                                                                                                                                       |          |
| 6.1  | Linkedin profile creation                                                                                                                                                    | SS | 1  | I   | 2 |                                                                                                                                                                                                       | CO6      |
| 6.2  | Resume preparation                                                                                                                                                           | SS | 8  | I   | 2 | Profile-building                                                                                                                                                                                      | CO6      |
| 6.3  | Self-introduction video                                                                                                                                                      | SS | 8  | I   | 3 |                                                                                                                                                                                                       | CO6      |
| 7    | Prepare a presentation on instances of demonstration of emotional intelligence                                                                                               | SS | 9  | I   | 2 | Emotional intelligence                                                                                                                                                                                | CO2      |
| 8    | Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)                                                                             | SS | 10 | G   | 3 | Diversity                                                                                                                                                                                             | CO2, CO5 |
| 9    | Take online Interview skills development sessions like robotic interviews; self-reflect and report                                                                           | SS | 10 | I   | 2 | • Interview skills                                                                                                                                                                                    | CO6      |
| 10   | Take an online listening test, self-reflect and report                                                                                                                       | SS | 11 | I   | 2 | Listening skills                                                                                                                                                                                      | CO6      |
| 11.1 | Activities to improve English vocabulary of students                                                                                                                         | L  | 8  | I/G | 4 | <ul style="list-style-type: none"> <li>• English vocabulary</li> <li>• English language skills</li> <li>• Writing</li> <li>• Presentation</li> <li>• Group work</li> <li>• Self-reflection</li> </ul> | CO4      |
| 11.2 | Activities to help students identify errors in English language usage                                                                                                        | L  | 9  | I/G | 2 |                                                                                                                                                                                                       | CO4      |
| 11.3 | Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words                                                               | L  | 10 | I/G | 2 |                                                                                                                                                                                                       | CO4      |
| 11.4 | Write a self-reflection report on the                                                                                                                                        | SS | 12 | I   | 2 |                                                                                                                                                                                                       | CO4      |



|      |                                                                                                                                                                                                                                            |    |          |   |   |                                                                                                                                                                                                          |               |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|      | improvement in English language communication through this course                                                                                                                                                                          |    |          |   |   |                                                                                                                                                                                                          |               |
| 11.5 | Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared                                                                    | L  | 11 to 12 | G | 2 |                                                                                                                                                                                                          | CO4, CO5      |
| 12.1 | Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies | SS | 12       | G | 4 | <ul style="list-style-type: none"> <li>• Audio-visual presentations creations with the use of technology tools</li> <li>• Effective use of social media platforms</li> <li>• Profile building</li> </ul> | CO2, CO4, CO5 |
| 12.2 | Upload the video content to podcasting platforms or YouTube                                                                                                                                                                                | SS | 12       | G | 1 |                                                                                                                                                                                                          | CO5           |
| 12.3 | Add the link of the podcast in their LinkedIn profile                                                                                                                                                                                      | SS | 12       | G | 1 |                                                                                                                                                                                                          | CO5           |

**Table 2. Lab hour Activities (P): 24 Marks**

| Sl No    | Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks     | Skill                              | CO       |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------|----------|
| <b>1</b> | <p>Hands-on sessions on day-to-day engineering skills and a self-reflection report on the experience gained:</p> <ol style="list-style-type: none"> <li>1. Drilling practice using electric hand drilling machines.</li> <li>2. Cutting of MS rod and flat using electric hand cutters.</li> <li>3. Filing, finishing and smoothening using electrically operated hand grinders.</li> <li>4. MS rod cutting using Hack saw by holding the work in bench wise.</li> <li>5. Study and handling different types of measuring instruments.</li> <li>6. Welding of MS, SS work pieces.</li> <li>7. Pipe bending practice (PVC and GI).</li> <li>8. Water tap fitting.</li> <li>9. Water taps rubber seal changing practice.</li> <li>10. Union and valves connection practice in pipes.</li> <li>11. Foot valve fitting practice.</li> <li>12. Water pump seal and bearing changing practice.</li> </ol> | <b>24</b> | Basic practical engineering skills | <b>3</b> |
| <b>2</b> | Language Lab sessions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -         | Language Skills                    | <b>4</b> |

| Course Outcome |                                                                                                                                                                                                                             | Bloom's Knowledge Level (KL) |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks                                                                        | <b>K5</b>                    |
| <b>CO2</b>     | Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence                            | <b>K5</b>                    |
| <b>CO3</b>     | Develop thinking skills, problem-solving and decision-making skills                                                                                                                                                         | <b>K5</b>                    |
| <b>CO4</b>     | Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyze, interpret & effectively summarize textual, audio & visual content                      | <b>K6</b>                    |
| <b>CO5</b>     | Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions | <b>K6</b>                    |
| <b>CO6</b>     | Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians                                                                                        | <b>K6</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> |     |     |     |     |     |     |     |     |     | 1    |      | 3    |
| <b>CO2</b> |     |     |     |     | 1   |     |     | 3   |     | 3    |      | 3    |
| <b>CO3</b> |     | 1   | 1   |     | 1   |     |     |     |     | 1    |      | 1    |
| <b>CO4</b> |     |     |     |     | 1   |     |     |     |     | 1    |      | 2    |
| <b>CO5</b> |     |     |     |     | 1   | 1   |     |     |     | 1    |      | 2    |
| <b>CO6</b> |     |     |     |     | 1   |     |     |     |     | 1    |      |      |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

| Text Books |                                                                                    |                                                     |                            |                                        |
|------------|------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------|----------------------------------------|
| Sl. No     | Title of the Book                                                                  | Name of the Author/s                                | Name of the Publisher      | Edition and Year                       |
| 1          | Life Skills & Personality Development                                              | Maithry Shinde et.al.                               | Cambridge University Press | First Edition, 2022                    |
| 2          | Emotional Intelligence: Why it can matter more than IQ                             | Daniel Goleman                                      | Bloomsbury, Publishing PLC | 25th Anniversary Edition December 2020 |
| 3          | Think Faster, Talk Smarter: How to speak successfully when you are put on the spot | Matt Abrahams                                       | Macmillan Business         | September 2023                         |
| 4          | Deep Work: Rules for focused success in a distracted world                         | Cal Newport                                         | PIATKUS                    | January 2016                           |
| 5          | Effective Technical Communication                                                  | Ashraf Rizvi                                        | McGraw Hill Education      | 2nd Edition 2017                       |
| 6          | Interchange                                                                        | Jack C. Richards, With Jonathan Hull, Susan Proctor | Cambridge publishers       | 5 <sup>th</sup> Edition                |

| Reference Books |                                    |                                  |                                          |                     |
|-----------------|------------------------------------|----------------------------------|------------------------------------------|---------------------|
| Sl. No          | Title of the Book                  | Name of the Author/s             | Name of the Publisher                    | Edition and Year    |
| 1               | Life Skills for Engineers          | Remesh S., Vishnu R.G.           | Ridhima Publications                     | First Edition, 2016 |
| 2               | Soft Skills & Employability Skills | Sabina Pillai and Agna Fernandez | Cambridge University Press               | First Edition, 2018 |
| 3               | Effective Technical Communication  | Ashraf Rizvi                     | McGraw Hill Education                    | 2nd Edition 2017    |
| 4               | English Grammar in Use             | Raymond Murphy,                  | Cambridge University Press India PVT LTD | 5th Edition 2023    |
| 5               | Guide to writing as an Engineer    | David F. Beer and David McMurrey | John Willey. New York                    | 2004                |

# **SEMESTER 2**

## **GROUP A**

**SEMESTER S2**  
**MATHEMATICS FOR INFORMATION SCIENCE – 2**  
**(Group A)**

|                                            |                              |                    |                |
|--------------------------------------------|------------------------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GAMAT201</b>              | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:0:0                      | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 3                            | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | Elementary matrix operations | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. To provide a comprehensive understanding of linear algebra focusing on fundamental concepts and applications, and to develop necessary skills to effectively utilize linear algebra in advanced studies and professional practice.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Linear systems of equations, Solution by Gauss elimination, Row echelon form and rank of a matrix, Fundamental theorem for linear systems - homogeneous and non-homogeneous (without proof), Eigen values and Eigen vectors of matrices, Diagonalization of matrices.<br><br>[Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4]                                                                                                                                        | <b>9</b>             |
| <b>2</b>          | Vector Spaces, Examples of vector space – $R^n$ and $M_{m \times n}$ only, Subspaces, Examples as subspaces of $R^n$ and $M_{m \times n}$ , Linear combinations of vectors in a vector space, Spanning sets, Linear dependence and independence, Basis for a vector space, The dimension of vector space, Coordinate representation in $R^n$ , Change of basis in $R^n$ : Transition Matrix (without proof).<br><br>[Text 2: Relevant topics from sections 4.2, 4.3, 4.4, 4.5, 4.7] | <b>9</b>             |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3</b> | <p>Vector length and unit vector, Dot product and angle between two vectors, The Cauchy- Schwarz Inequality, Inner product, Examples as <math>R^n</math> and <math>M_{2 \times 2}</math>, Properties of inner products, Definitions of length, distance and angle, Orthogonal projections in inner product spaces, Orthogonal and orthonormal sets, Orthogonal and orthonormal basis, Gram-Schmidt orthonormalization process (without proof), The least squares problem, Projection onto a Subspace, Solving the least square problems.</p> <p><b>[Text 2: Relevant topics from sections 5.1, 5.2, 5.3, 5.4]</b></p> | <b>9</b> |
| <b>4</b> | <p>Linear Transformations, Properties of linear transformations, Linear Transformation given by a matrix, Rotation in <math>R^2</math>, Projection in <math>R^3</math>, Kernel of a Linear Transformation and its basis, Range of a Linear Transformation and its basis, Rank and Nullity of a Linear Transformation, Sum of Rank and Nullity (without proof), Matrices for Linear Transformations.</p> <p><b>[Text 2: Relevant topics from sections 6.1, 6.2, 6.3]</b></p>                                                                                                                                           | <b>9</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Assignment/<br/>Microproject</b> | <b>Internal<br/>Examination-1<br/>(Written)</b> | <b>Internal<br/>Examination- 2<br/>(Written)</b> | <b>Total</b> |
|-------------------|-------------------------------------|-------------------------------------------------|--------------------------------------------------|--------------|
| <b>5</b>          | <b>15</b>                           | <b>10</b>                                       | <b>10</b>                                        | <b>40</b>    |

**End Semester Examination Marks (ESE)**

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

| <b>Part A</b>                                                                                                                                                     | <b>Part B</b>                                                                                                                                                                                                                                                                    | <b>Total</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b>    |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                                                                          | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Solve system of linear equations, to evaluate eigen values and eigen vectors of matrices and to diagonalize matrices.                                                                    | <b>K3</b>                           |
| <b>CO2</b>            | Understand the concepts of vector spaces and subspaces and to apply their properties.                                                                                                    | <b>K3</b>                           |
| <b>CO3</b>            | Describe inner product spaces and their properties, to apply orthonormalization process and to solve least square problems.                                                              | <b>K3</b>                           |
| <b>CO4</b>            | Understand the concept of linear transformation and to apply its properties, to find the rank and nullity of a linear transformation and to find the matrices of linear transformations. | <b>K3</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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



| Text Books |                                  |                      |                       |                                |
|------------|----------------------------------|----------------------|-----------------------|--------------------------------|
| Sl. No     | Title of the Book                | Name of the Author/s | Name of the Publisher | Edition and Year               |
| 1          | Advanced Engineering Mathematics | Erwin Kreyszig       | John Wiley & Sons     | 10 <sup>th</sup> edition, 2016 |
| 2          | Elementary Linear Algebra        | Ron Larson           | Cengage Learning      | 8 <sup>th</sup> edition, 2017  |

| Reference Books |                                       |                                                       |                            |                                |
|-----------------|---------------------------------------|-------------------------------------------------------|----------------------------|--------------------------------|
| Sl. No          | Title of the Book                     | Name of the Author/s                                  | Name of the Publisher      | Edition and Year               |
| 1               | Mathematics for Machine Learning      | Marc Peter Deisenroth, A. Aldo Faisal & Cheng SoonOng | Cambridge University Press | 1 <sup>st</sup> edition, 2020  |
| 2               | Linear algebra and learning from data | Gilbert Strang                                        | Wellesley-Cambridge Press  | 1 <sup>st</sup> edition, 2019  |
| 3               | Elementary Linear Algebra             | Stephen Andrilli & David Hecker                       | Academic Press Inc.        | 4 <sup>th</sup> edition, 2010  |
| 4               | Elementary Linear Algebra             | Howard Anton, Chris Rorres                            | Wiley                      | 11 <sup>th</sup> edition, 2019 |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                     |
| 1                              | <a href="https://archive.nptel.ac.in/courses/111/107/111107164/">https://archive.nptel.ac.in/courses/111/107/111107164/</a> |
| 2                              | <a href="https://archive.nptel.ac.in/courses/111/107/111107164/">https://archive.nptel.ac.in/courses/111/107/111107164/</a> |
| 3                              | <a href="https://archive.nptel.ac.in/courses/111/107/111107164/">https://archive.nptel.ac.in/courses/111/107/111107164/</a> |
| 4                              | <a href="https://archive.nptel.ac.in/courses/111/107/111107164/">https://archive.nptel.ac.in/courses/111/107/111107164/</a> |

**SEMESTER S1 /S2**  
**PHYSICS FOR INFORMATION SCIENCE**  
**(Common to Group A)**

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GAPHT121</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:2:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory + Lab   |

**Course Objectives:**

1. To equip students with a strong foundation in the fundamentals of Physics, impart this knowledge within the context of Information Science disciplines, cultivate scientific attitudes and critical thinking skills, and enable students to integrate Physics concepts with their core Information Science programs.
2. To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Electrical conductivity</b></p> <p>Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands, Classification of materials into conductor, semiconductor and insulator.</p> <p>Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors. BCS Theory, Applications of superconductors.</p> | <b>9</b>             |
| <b>2</b>          | <p><b>Quantum Mechanics</b></p> <p>Introduction, Concept of uncertainty and conjugate observables</p>                                                                                                                                                                                                                                                                                                                                                             | <b>9</b>             |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|          | (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (Qualitative)                                                                                                                                                                    |          |
| <b>3</b> | <p><b>Semiconductor Physics</b></p> <p>Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band, Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative)</p> <p>Formation of p-n junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction - Forward and reverse biased p-n junctions, Diode equation (Derivation), I-V Characteristics of p-n junction</p> | <b>9</b> |
| <b>4</b> | <p><b>Semiconductor Devices</b></p> <p>Semiconductor devices- Rectifiers- Full wave and Half wave. Zener diode- VI characteristics, Tunnel diode-VI characteristics, Semiconductor Laser (Construction and working), Applications</p> <p>Photonic devices (Qualitative treatment only) - Photo detectors (Junction and PIN photodiodes), Solar cells- IV Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications</p>                                                                                                                                          | <b>9</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Continuous Assessment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Lab Examination) | Total |
|------------|-----------------------|----------------------------------|----------------------------------|------------------------------------------|-------|
| 5          | 10                    | 10                               | 10                               | 5                                        | 40    |

**End Semester Examination Marks (ESE)**

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

| Part A                                                                                                                                                                           | Part B                                                                                                                                                                                                                                                                                          | Total     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p align="center"><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p align="center"><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                                                | Bloom's Knowledge Level (KL) |
|----------------|----------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Explain electrical conductivity and Superconductivity.                                                         | <b>K2</b>                    |
| <b>CO2</b>     | Explain the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics. | <b>K2</b>                    |
| <b>CO3</b>     | Apply the fundamentals of Semiconductor Physics in engineering.                                                | <b>K3</b>                    |
| <b>CO4</b>     | Describe the behaviour of semiconductor materials in semiconductor devices.                                    | <b>K2</b>                    |
| <b>CO5</b>     | Apply basic knowledge of principles and theories in physics to conduct experiments.                            | <b>K3</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

| Text Books      |                                     |                                                |                                  |                                |
|-----------------|-------------------------------------|------------------------------------------------|----------------------------------|--------------------------------|
| Sl. No          | Title of the Book                   | Name of the Author/s                           | Name of the Publisher            | Edition and Year               |
| 1               | Engineering Physics                 | H K Malik and A K Singh                        | McGraw Hill                      | 2 <sup>nd</sup> Edition, 2017  |
| 2               | Concepts of Modern Physics          | Arthur Beiser                                  | Tata McGraw Hill Publications    | 6 <sup>th</sup> Edition, 2003  |
| 3               | A Textbook of Engineering Physics   | MN Avadhanulu, P G Kshirsagar, TVS Arun murthy | S. Chand                         | 11 <sup>th</sup> Edition, 2018 |
| Reference Books |                                     |                                                |                                  |                                |
| Sl. No          | Title of the Book                   | Name of the Author/s                           | Name of the Publisher            | Edition and Year               |
| 1               | Semiconductor Devices Fundamentals  | Robert F Pierret                               | Pearson Education                | 1995                           |
| 2               | Advanced Semiconductor Fundamental  | Robert F Pierret                               | Pearson Education                | 2 <sup>nd</sup> Edition, 2002  |
| 3               | Solid State Electronic Devices      | Ben G Streetman and Sanjay Kumar Banerjee      | Pearson Education 6/e            | 2010                           |
| 4               | Solid State Physics                 | S.O. Pillai                                    | New age international publishers | 10 <sup>th</sup> Edition, 2022 |
| 5               | Introduction to Solid State Physics | Charles Kittel                                 | Wiley India Edition              | 2019                           |
| 6               | Advanced Engineering Physics        | Premlet B                                      | Phasor Books                     | 10 <sup>th</sup> Edition, 2017 |
| 7               | A Text Book of Engineering Physics  | I. Dominic and. A. Nahari,                     | Owl Books Publishers             | Revised Edition, 2016          |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                                                                                |
| 1                              | <a href="https://nptel.ac.in/courses/115103108">https://nptel.ac.in/courses/115103108</a>                                                                                              |
| 2                              | <a href="https://nptel.ac.in/courses/115101107">https://nptel.ac.in/courses/115101107</a><br><a href="https://nptel.ac.in/courses/115102023">https://nptel.ac.in/courses/115102023</a> |
| 3                              | <a href="https://nptel.ac.in/courses/108106181">https://nptel.ac.in/courses/108106181</a>                                                                                              |
| 4                              | <a href="https://nptel.ac.in/courses/108108112">https://nptel.ac.in/courses/108108112</a>                                                                                              |

### **Continuous Assessment (10 Marks)**

#### **i. Preparation and Pre-Lab Work (2 Marks)**

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

#### **ii. Conduct of Experiments (2 Marks)**

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### **iii. Lab Reports and Record Keeping (3 Marks)**

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

#### **iv. Viva Voce (3 Marks)**

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

**Final Marks Averaging:** The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

### **Evaluation Pattern for Lab Examination (5 Marks)**

#### **1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task

#### **2. Result (2 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.

#### **3. Viva Voce (1 Marks)**

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

### **Experiment List**

#### **(Minimum 10 Experiments)**

| <b>Experiment No.</b> | <b>Experiment</b>                                                      |
|-----------------------|------------------------------------------------------------------------|
| <b>1</b>              | Diode characteristics                                                  |
| <b>2</b>              | Zener diode- V-I characteristics                                       |
| <b>3</b>              | Tunnel diode –V-I characteristics                                      |
| <b>4</b>              | Half wave rectifier                                                    |
| <b>5</b>              | Full wave rectifier                                                    |
| <b>6</b>              | Hall effect in semiconductors                                          |
| <b>7</b>              | Determination of band gap energy of a semiconductor                    |
| <b>8</b>              | Characteristics of LED                                                 |
| <b>9</b>              | Solar Cell- V-I and Intensity Characteristics                          |
| <b>10</b>             | Laser – Determination of wavelength using diffraction grating          |
| <b>11</b>             | Laser- To measure the wavelength using a millimeter scale as a grating |

|           |                                                                                                                 |
|-----------|-----------------------------------------------------------------------------------------------------------------|
| <b>12</b> | Compare the variation of current with potential difference, for a metal, filament bulb and semiconductor diode. |
| <b>13</b> | Determination of dielectric constant                                                                            |
| <b>14</b> | CRO -Measurement of frequency and amplitude of wave forms                                                       |
| <b>15</b> | Photo diode - V-I Characteristics                                                                               |
| <b>16</b> | Numerical aperture of optical fiber                                                                             |



**SEMESTER S1/S2**  
**CHEMISTRY FOR INFORMATION SCIENCE AND ELECTRICAL SCIENCE**

(Common to Group A & B)

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>GXCYT122</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:2:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                             | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory + Lab   |

**Course Objectives:**

1. To equip students with a comprehensive understanding of chemistry concepts that are relevant to engineering applications.
2. To familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues, including climate change, pollution, and waste management, and their impact on the quality of life.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Contact Hours</b> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Electrochemistry and Corrosion Science</b></p> <p><b>Electrochemical Cell-</b> Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE &amp; Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode &amp; pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery &amp; H<sub>2</sub>-O<sub>2</sub> fuel cell (acid electrolyte only) construction and working.</p> <p><b>Corrosion</b> –Electrochemical corrosion mechanism (acidic &amp; alkaline medium) - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of copper - Electroless plating of copper.</p> | <b>9</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 2 | <p><b>Materials for Electronic Applications</b></p> <p><b>Nanomaterials</b> - Classification based on Dimension &amp; Materials- Synthesis – Sol gel &amp; Chemical Reduction - Applications of nanomaterials – Carbon Nanotubes, Fullerenes, Graphene &amp; Carbon Quantum Dots – structure, properties &amp; application.</p> <p><b>Polymers</b> - Fire Retardant Polymers- Halogenated &amp; Non-halogenated polymers (Examples only)- Conducting Polymers-Classification- Polyaniline &amp; Polypyrrole-synthesis, properties and applications.</p> <p><b>Organic electronic materials and devices</b>- construction, working and applications of Organic Light Emitting Diode (OLED) &amp; Dye-Sensitized Solar Cells (DSSC)</p> <p>Materials used in Quantum computing Technology, Super capacitors, Spintronics</p> | 9 |
| 3 | <p><b>Molecular Spectroscopy and Analytical Techniques</b></p> <p><b>Spectroscopy</b>-Types of spectra- Molecular energy levels - Beer Lambert's law – Numerical problems - Electronic Spectroscopy – Principle, Types of electronic transitions –Role of conjugation in absorption maxima-Instrumentation-Applications – Vibrational spectroscopy – Principle- Number of vibrational modes - Vibrational modes of CO<sub>2</sub> and H<sub>2</sub>O – Applications</p> <p><b>Thermal Analysis:</b> Dielectric Thermal Analysis (DETA) of Polymers- Working and Application.</p> <p><b>Electron Microscopic Techniques:</b> SEM - Principle, instrumentation and Applications.</p>                                                                                                                                         | 9 |
| 4 | <p><b>Environmental Chemistry (9Hrs)</b></p> <p><b>Water characteristics</b> - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Degree of hardness (Numericals) Water softening methods-Ion exchange process- Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition &amp; Significance.</p> <p><b>Waste Management:</b> Sewage water treatment- Primary, Secondary and</p>                                                                                                                                                                                                                          | 9 |

|  |                                                                                                                                                                                                                                                                   |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | Tertiary - Flow diagram -Trickling filter and UASB process. E Waste, Methods of disposal – recycle, recovery and reuse. Chemistry of climate change- Greenhouse Gases- Ozone Depletion-Sustainable Development- an introduction to Sustainable Development Goals. |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Self-Study Topics (NOT TO BE INCLUDED FOR END SEMESTER EXAMINATION):**

Construction, working and applications of Lead acid battery, Nickel cadmium battery and Nickel metal hydrid battery.

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Continuous Assessment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Lab Examination) | Total |
|------------|-----------------------|----------------------------------|----------------------------------|------------------------------------------|-------|
| 5          | 10                    | 10                               | 10                               | 5                                        | 40    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                            | Part B                                                                                                                                                                                                                                                                           | Total     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                 | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Explain the Basic Concepts of Electrochemistry and Corrosion to explore the possible applications in various engineering fields | <b>K2</b>                           |
| <b>CO2</b>            | Describe the use of various engineering materials in different industries                                                       | <b>K2</b>                           |
| <b>CO3</b>            | Apply appropriate analytical techniques for the synthesis and characterization of various engineering materials.                | <b>K3</b>                           |
| <b>CO4</b>            | Outline various water treatment and waste management methods                                                                    | <b>K2</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

| <b>Text Books</b> |                                  |                                        |                                 |                                 |
|-------------------|----------------------------------|----------------------------------------|---------------------------------|---------------------------------|
| <b>Sl. No</b>     | <b>Title of the Book</b>         | <b>Name of the Author/s</b>            | <b>Name of the Publisher</b>    | <b>Edition and Year</b>         |
| 1                 | Engineering Chemistry            | B. L. Tembe, Kamaluddin, M. S.Krishnan | NPTEL Web-book                  | 2018                            |
| 2                 | Physical Chemistry               | P. W. Atkins                           | Oxford University Press         | International Edition- 2018     |
| 3                 | Instrumental Methods of Analysis | H. H. Willard, L. L.Merritt            | CBS Publishers                  | 7th Edition-2005                |
| 4                 | Engineering Chemistry            | Jain & Jain                            | Dhanpath Rai Publishing Company | 17 <sup>th</sup> Edition - 2015 |

| Reference Books |                                                                        |                                                                                     |                                  |                            |
|-----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------|----------------------------|
| Sl. No          | Title of the Book                                                      | Name of the Author/s                                                                | Name of the Publisher            | Edition and Year           |
| 1               | Fundamentals of Molecular Spectroscopy                                 | C. N. Banwell                                                                       | McGraw-Hill                      | 4 <sup>th</sup> edn., 1995 |
| 2               | Principles of Physical Chemistry                                       | B. R. Puri, L. R. Sharma, M. S. Pathania                                            | Vishal Publishing Co             | 47th Edition, 2017         |
| 3               | Introduction to Spectroscopy                                           | Donald L. Pavia                                                                     | Cengage Learning India Pvt. Ltd  | 2015                       |
| 4               | Polymer Chemistry: An Introduction                                     | Raymond B. Seymour, Charles E. Carraher                                             | Marcel Dekker Inc                | 4th Revised Edition, 1996  |
| 5               | The Chemistry of Nanomaterials: Synthesis, Properties and Applications | Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham | Wiley-VCH Verlag GmbH & Co. KGaA | 2014                       |
| 6               | Organic Electronics Materials and Devices                              | Shuichiro Ogawa                                                                     | Springer Tokyo                   | 2024                       |
| 7               | Principles and Applications of Thermal Analysis                        | Gabbot, P                                                                           | Oxford: Blackwell Publishing     | 2008                       |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1                              | <a href="https://archive.nptel.ac.in/courses/104/106/104106137/">https://archive.nptel.ac.in/courses/104/106/104106137/</a><br><a href="https://archive.nptel.ac.in/courses/113/105/113105102/">https://archive.nptel.ac.in/courses/113/105/113105102/</a><br><a href="https://archive.nptel.ac.in/courses/113/104/113104082/">https://archive.nptel.ac.in/courses/113/104/113104082/</a><br><a href="https://www.youtube.com/watch?v=BeSxFLvk1h0">https://www.youtube.com/watch?v=BeSxFLvk1h0</a> |
| 2                              | <a href="https://archive.nptel.ac.in/courses/113/104/113104102/">https://archive.nptel.ac.in/courses/113/104/113104102/</a><br><a href="https://archive.nptel.ac.in/courses/104/105/104105124/">https://archive.nptel.ac.in/courses/104/105/104105124/</a><br><a href="https://archive.nptel.ac.in/courses/105/104/105104157/">https://archive.nptel.ac.in/courses/105/104/105104157/</a>                                                                                                          |

## Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

### Mark distribution

#### 1. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

#### 2. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### 3. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

#### 4. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

**Final Marks Averaging:** The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

## Evaluation Pattern for Lab Examination (5 Marks)

#### 1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

#### 2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

**3. Viva Voce (1 Marks)**

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

**List of Experiments****\*Any 10 Experiments Mandatory**

| <b>Expt. Nos.</b> | <b>Experiment</b>                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------|
| <b>1</b>          | Estimation of iron in iron ore                                                                                |
| <b>2</b>          | Estimation of copper in brass                                                                                 |
| <b>3</b>          | Determination of cell constant and conductance of solutions                                                   |
| <b>4</b>          | Calibration of pH meter and determination of pH of a solution                                                 |
| <b>5</b>          | Synthesis of polymers<br>(a) Urea-formaldehyde resin<br>(b) Phenol-formaldehyde resin                         |
| <b>6</b>          | Determination of wavelength of absorption maximum and colorimetric estimation of $\text{Fe}^{3+}$ in solution |
| <b>7</b>          | Determination of molar absorptivity of a compound ( $\text{KMnO}_4$ or any water-soluble food colorant)       |
| <b>8</b>          | Analysis of IR spectra                                                                                        |
| <b>9</b>          | Identification of drugs using TLC                                                                             |
| <b>10</b>         | Estimation of total hardness of water-EDTA method                                                             |
| <b>11</b>         | Estimation of dissolved oxygen by Winkler's method                                                            |
| <b>12</b>         | Determination of calorific value using Bomb calorimeter                                                       |
| <b>13</b>         | Determination of saponification value of a given vegetable oil                                                |
| <b>14</b>         | Determination of acid value of a given vegetable oil                                                          |
| <b>15</b>         | Verification of Nernst equation for electrochemical cell.                                                     |

**SEMESTER S2**  
**FOUNDATIONS OF COMPUTING: FROM HARDWARE**  
**ESSENTIALS TO WEB DESIGN**  
**(Common to Group A & B)**

|                                       |                 |                    |                |
|---------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                    | <b>GXEST203</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week(L: T:P: R)</b> | 3:0:0:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                        | 3               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>         | None            | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. To introduce the students to the fundamental building blocks of an IT infrastructure including the computing systems, its peripherals, Operating Systems and Networking.
2. To make the learners capable of developing and deploying simple and dynamic websites.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                           | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Computer Hardware – CPU, Memory - Memory hierarchy: registers, cache, RAM, virtual memory, Motherboard - Computer Peripherals - I/O devices, Storage devices- HDDs, SSDs, optical drives, I/O communication and device management, Interface cards – Buses – Firmware - Boot process                                                                  | <b>9</b>             |
| <b>2</b>          | Binary representation of data and numbers, Integer Representation, Data storage units - bits, bytes, kilobytes, etc., ASCII and Unicode, CPU Architecture and Instruction Set: Basic CPU architecture - ALU, registers, control unit, Instruction format and assembly language (basics only) Fetch-execute cycle and instruction execution.           | <b>9</b>             |
| <b>3</b>          | Computer System Software - Operating Systems, Basic commands in Linux / Windows, Shell scripting (bash). Computer Communications – LAN, MAN, WAN, Client/Server networks, Peer-to-Peer networks, Topologies. Basics of IP addresses, DHCP, NAT, Network Security (Desktop & Perimeter), DNS, VPN, Routers, Client-Server, Internet, WWW, Web servers. | <b>9</b>             |



|          |                                                                                                                                                                                                     |          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4</b> | Web Design (Basics of HTML, CSS, and JavaScript) – Understanding the web content delivery, Understanding HTML and XHTML Connections, Understanding Cascading Style Sheets, Understanding JavaScript | <b>9</b> |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|

**Course Assessment Method**  
(CIE: 40 marks, ESE:60)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/<br>Microproject | Internal<br>Examination-1<br>(Written) | Internal<br>Examination- 2<br>(Written) | Total     |
|------------|-----------------------------|----------------------------------------|-----------------------------------------|-----------|
| <b>5</b>   | <b>15</b>                   | <b>10</b>                              | <b>10</b>                               | <b>40</b> |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                            | Part B                                                                                                                                                                                                                                                                                          | Total     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p align="center"><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                               | Bloom's<br>Knowledge<br>Level (KL) |
|----------------|-----------------------------------------------------------------------------------------------|------------------------------------|
| <b>CO1</b>     | Identify the fundamental components and the working of an IT environment.                     | <b>K2</b>                          |
| <b>CO2</b>     | Explain the data representations, CPU architectures, and the basic functioning of a computer. | <b>K2</b>                          |
| <b>CO3</b>     | Explain the operating systems, computer network architecture, and necessary protocols used.   | <b>K2</b>                          |
| <b>CO4</b>     | Develop simple interactive web pages and validate the inputs.                                 | <b>K3</b>                          |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 3   |     |     |     |     |     |     |     |      |      | 3    |
| CO2 | 3   | 3   |     |     |     |     |     |     |     |      |      | 3    |
| CO3 | 3   | 3   |     |     |     |     |     |     |     |      |      | 3    |
| CO4 | 3   | 3   | 3   |     | 3   |     |     |     |     |      |      | 3    |

| Text Books |                                                                                                                 |                                         |                       |                  |
|------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------|------------------|
| Sl. No     | Title of the Book                                                                                               | Name of the Author/s                    | Name of the Publisher | Edition and Year |
| 1          | Invitation to Computer Science                                                                                  | G.Michael Schneider,<br>Judith Gersting | Cengage               | 2/e , 2020       |
| 2          | The Architecture of Computer Hardware,<br>Systems Software, & Networking: An<br>Information Technology Approach | Irv Englander                           | Wiley                 | 5/e, 2014        |
| 3          | HTML, CSS, and JavaScript<br>All in One, Sams Teach Yourself                                                    | Julie C. Meloni<br>Jennifer Kyrnin      | Pearson               | 1/e, 2020        |

| Reference Books |                                                                                                              |                                   |                       |                  |
|-----------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------|------------------|
| Sl. No          | Title of the Book                                                                                            | Name of the Author/s              | Name of the Publisher | Edition and Year |
| 1               | The Elements of Computing<br>Systems, second edition:<br>Building a Modern Computer<br>from First Principles | Noam Nisan and Shimon<br>Schocken | The MIT Press         | 2/e, 2021        |
| 2               | Peter Norton's Introduction to<br>Computers                                                                  | Peter Notron                      | McGrawHill            | 6/e, 2010        |
| 3               | Web Design with HTML, CSS,<br>JavaScript and JQuery                                                          | Jon Duckett                       | Wiley                 | 1/e, 2014        |

| Video Links (NPTEL, SWAYAM...) |                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                                                     |
| 1                              | <a href="https://www.nand2tetris.org/">https://www.nand2tetris.org/</a>                                                     |
| 2                              | <a href="https://onlinecourses.swayam2.ac.in/nou20_cs05/preview">https://onlinecourses.swayam2.ac.in/nou20_cs05/preview</a> |

**SEMESTER S2****PROGRAMMING IN C****(Common to Group A & B)**

|                                       |                 |                    |                |
|---------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                    | <b>GXEST204</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week(L: T:P: R)</b> | 3:0:2:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                        | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>         | None            | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. To prepare learner to write versatile C programs for solving computational problems that they come across in their professional life.
2. To equip the learner to write efficient C programs using suitable language constructs to solve real world computational problems.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Contact Hours</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <b>C Fundamentals</b> - Character Set, Constants, Identifiers, Keywords, Basic Data types, Variables, Operators and its precedence, Bit-wise operators, Expressions; Statements - Input and Output statements; Structure of a C program; Simple programs.<br><b>Control Statements</b> - if, if-else, nested if, switch, while, do-while, for, break & continue, nested loops.                                                                 | <b>9</b>             |
| <b>2</b>          | <b>Arrays</b> - Single dimensional arrays, Defining an array, Array initialization, Accessing array elements; Enumerated data type; Type Definition; Two-dimensional arrays – Defining a two-dimensional array; Programs for matrix processing; Programs for sequential search; Bubble sort;<br><b>Strings</b> - Declaring a string variable, Reading and displaying strings, String related library functions – Programs for string matching. | <b>9</b>             |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3</b> | <b>Functions</b> - Function definition, Function call, Function prototype, Parameter passing; Recursion; Passing array to function; Macros - Defining and calling macros; Command line Arguments.<br><b>Structures</b> - Defining a Structure variable, Accessing members, Array of structures, Passing structure to function; Union.<br><b>Storage Class</b> - Storage Classes associated with variables: automatic, static, external and register.                                     | <b>9</b> |
| <b>4</b> | <b>Pointers</b> - Declaration, Operations on pointers, Passing pointer to a function, Accessing array elements using pointers, Processing strings using pointers, Pointer to pointer, Array of pointers, Pointer to function, Pointer to structure, Dynamic Memory Allocation.<br><b>Files</b> - Different types of files in C, Opening & Closing a file, Writing to and Reading from a file, Processing files, Library functions related to file – fseek(), ftell(), fread(), fwrite(). | <b>9</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Continuous Assessment (Lab)</b> | <b>Internal Examination-1 (Written Examination)</b> | <b>Internal Examination-2 (Written Examination)</b> | <b>Internal Examination- 3 (Lab Examination)</b> | <b>Total</b> |
|-------------------|------------------------------------|-----------------------------------------------------|-----------------------------------------------------|--------------------------------------------------|--------------|
| <b>5</b>          | <b>5</b>                           | <b>10</b>                                           | <b>10</b>                                           | <b>10</b>                                        | <b>40</b>    |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| <b>Part A</b>                                                                                                                                                     | <b>Part B</b>                                                                                                                                                                                                                                                                    | <b>Total</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b>    |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                       | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Infer a computational problem and develop C programs from them using basic constructs of C language including the control statements. | <b>K2</b>                           |
| <b>CO2</b>            | Develop C programs using arrays, matrices, and strings.                                                                               | <b>K3</b>                           |
| <b>CO3</b>            | Utilize functions to find solution to the computational problems by dividing it into a number of modules and abstract data types.     | <b>K3</b>                           |
| <b>CO4</b>            | Develop C programs using pointers for dynamic data handling.                                                                          | <b>K3</b>                           |
| <b>CO5</b>            | Use files in C to permanently store and manipulate data.                                                                              | <b>K3</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

| <b>Text Books</b> |                                         |                                     |                              |                         |
|-------------------|-----------------------------------------|-------------------------------------|------------------------------|-------------------------|
| <b>Sl. No</b>     | <b>Title of the Book</b>                | <b>Name of the Author/s</b>         | <b>Name of the Publisher</b> | <b>Edition and Year</b> |
| <b>1</b>          | Programming with C                      | Byron S Gottfried                   | Mc Graw Hill                 | 4/e, 2018               |
| <b>2</b>          | Problem Solving and Program Design in C | Jeri R. Hanly,<br>Elliot B. Koffman | Pearson                      | 8/e, 2016               |

| Reference Books |                            |                                       |                       |                  |
|-----------------|----------------------------|---------------------------------------|-----------------------|------------------|
| Sl. No          | Title of the Book          | Name of the Author/s                  | Name of the Publisher | Edition and Year |
| 1               | The C Programming Language | Brian W. Kernighan and Dennis Ritchie | Pearson               | 2/e, 2015        |
| 2               | C The Complete Reference   | Herbert Schildt                       | Mc Graw Hill          | 4/e, 2017        |
| 3               | Let us C                   | Yashavant Kanetkar                    | BPB Publishers        | 19/e, 2022       |
| 4               | Programming in ANSI C      | E Balagurusamy                        | Mc Graw Hill          | 9/e, 2024        |

**SEMESTER S2**  
**ENGINEERING ENTREPRENEURSHIP AND IPR**

**(Common to all Branches)**

|                                            |                 |                    |                |
|--------------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                         | <b>UCEST206</b> | <b>CIE Marks</b>   | 60             |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 3:0:0:0         | <b>ESE Marks</b>   | 40             |
| <b>Credits</b>                             | 3               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. Develop a framework for identifying, curating and validating engineering-based business ideas.
2. Learn essential tools for understanding product-market fit and customer needs.
3. Create a comprehensive business plan for a new venture.
4. Gain foundational knowledge of Intellectual Property Rights (IPR) and their importance for startups.
5. Develop skills for prototyping, stakeholder engagement, and team collaboration.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Contact Hours</b> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Introduction to Ideation, Innovation &amp; Entrepreneurship</b></p> <ul style="list-style-type: none"> <li>• What is Ideation?</li> <li>• Understanding Innovation</li> <li>• Frameworks for Innovation</li> <li>• The Entrepreneurial Mindset</li> <li>• Starting a Business, types formation statutory compliances.</li> <li>• Resources for Aspiring Entrepreneurs</li> </ul> <p><b>Introduction to Intellectual Property Rights (IPR)</b></p> <ul style="list-style-type: none"> <li>• Types of IPR: Patents, trademarks, copyrights, trade secrets</li> </ul> <p>Strategies for protecting intellectual property based on the type of innovation</p> | <b>9</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | <ul style="list-style-type: none"> <li>● Role of IPR in securing funding and competitive advantage</li> </ul> <p><b>Importance of building a strong team</b></p> <ul style="list-style-type: none"> <li>● Identifying roles</li> <li>● Skill sets</li> <li>● Team dynamics</li> </ul> <p><b>Identifying Pain Points and problem statement</b></p> <ul style="list-style-type: none"> <li>● Idea Generation Techniques</li> <li>● Developing and Refining Ideas</li> <li>● Develop strategies for bringing your innovation to life</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                          |   |
| 2 | <p><b>Problem and solution canvas preparation</b></p> <ul style="list-style-type: none"> <li>● Orientation and canvas introduction</li> <li>● Customer needs assessment</li> <li>● Market segmentation</li> <li>● Value proposition</li> <li>● Competitive analysis</li> <li>● Market entry strategy</li> <li>● Market validation</li> <li>● Regulatory and legal considerations</li> </ul> <p><b>Customer profiling</b></p> <ul style="list-style-type: none"> <li>● Review of market research</li> <li>● Customer segmentation</li> <li>● Customer profiling</li> <li>● Persona development</li> <li>● Validation and feedback</li> <li>● Prioritization and selection</li> <li>● Communication and messaging</li> </ul> <p><b>Competitor analysis</b></p> <ul style="list-style-type: none"> <li>● Identify competitors</li> <li>● Competitor profiling</li> <li>● SWOT analysis</li> <li>● Market positioning</li> <li>● Customer feedback and reviews</li> </ul> | 9 |



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | <ul style="list-style-type: none"> <li>● Pricing analysis</li> <li>● Differentiation strategy</li> <li>● Benchmarking and improvement</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| 3 | <p><b>Business plan preparation</b></p> <ul style="list-style-type: none"> <li>● Business plan framework</li> <li>● Market analysis</li> <li>● Product/ service description</li> <li>● Marketing and sales strategy</li> <li>● Operations plan</li> <li>● Financial projections</li> <li>● Risk management</li> </ul> <p><b>Prototype development plan preparation</b></p> <ul style="list-style-type: none"> <li>● Prototype requirements analysis</li> <li>● Technical specifications</li> <li>● Development approach</li> <li>● Development timeline</li> <li>● Resource allocation</li> <li>● Testing and quality assurance</li> <li>● Iterative development and feedback loop</li> <li>● Documentation and version control</li> </ul> | 9 |
| 4 | <p><b>Prototype development</b></p> <p><b>Stakeholder engagement strategies</b></p> <ul style="list-style-type: none"> <li>● Investors</li> <li>● Partners</li> <li>● Customers</li> <li>● Advisors &amp; Mentors</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 9 |

**Course Assessment Method**  
(CIE: 60 marks, ESE: 40 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Micro Project | Internal Ex-1 | Internal Ex-2 | Total |
|------------|---------------|---------------|---------------|-------|
| 5          | 35            | 10            | 10            | 60    |

**Micro project / Comprehensive Business Plan:**

The course will be evaluated based on a comprehensive Business Plan Report submitted and prototype development evaluation at the end of the course. The report should integrate learnings and activities from each module, demonstrating a deep understanding of the concepts and your ability to apply them to a chosen engineering venture.

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A                                                                                                                                                    | Part B                                                                                                                                                                                                                                                                           | Total |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <ul style="list-style-type: none"> <li>1 or 2 Questions from each module.</li> <li>Total of 6 Questions, each carrying 2 marks (6x2 =12 marks)</li> </ul> | <ul style="list-style-type: none"> <li>2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 7 marks.</li> </ul> <p style="text-align: center;">(4x7 = 28 marks)</p> | 40    |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| <b>Course Outcome</b> |                                                                                                                                       | <b>Bloom's Knowledge Level (KL)</b> |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>CO1</b>            | Gain foundational knowledge of Innovation and Entrepreneurship, Intellectual Property Rights (IPR) and their importance for startups. | <b>K2</b>                           |
| <b>CO2</b>            | Develop a framework for identifying, curating and validating engineering-based business ideas.                                        | <b>K3</b>                           |
| <b>CO3</b>            | Learn essential tools for understanding product-market fit and customer needs.                                                        | <b>K3</b>                           |
| <b>CO4</b>            | Create a comprehensive business plan for a new venture.                                                                               | <b>K6</b>                           |
| <b>CO5</b>            | Develop skills for prototyping, stakeholder engagement, and team collaboration.                                                       | <b>K4</b>                           |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

| Text Books |                                                                                                                             |                                               |                                   |                                              |
|------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------|----------------------------------------------|
| Sl. No     | Title of the Book                                                                                                           | Name of the Author/s                          | Name of the Publisher             | Edition and Year                             |
| 1          | The Engineering Handbook                                                                                                    | Richard C.Dorf                                | CRC Press                         | 2 <sup>nd</sup> edition<br>2004              |
| 2          | The Innovator's DNA                                                                                                         | Clayton M. Christensen and<br>Jeffrey H. Dyer | Harvard Business<br>Review Press; | Revised<br>edition<br>(June 4,<br>2019)      |
| 3          | Start with Why                                                                                                              | SIMON SINEK                                   | Portfolio                         | Reprint<br>edition<br>(December<br>27, 2011) |
| 4          | Business Model Generation                                                                                                   | Alexander Osterwalder<br>& Yves Pigneur       | Wiley                             | 2010                                         |
| 5          | The Engineering Entrepreneur:<br>A Practical Guide to Starting<br>and Running a Successful<br>Engineering Business in India | Saibal Gupta and Ashok<br>Jhunjhunwala        | Sage Publications                 | 2011                                         |
| 6          | Innovation and<br>Entrepreneurship for Engineers                                                                            | Bharat Bhushan and Seema<br>Bhushan           | CRS Press                         | 2016                                         |
| 7          | Indian Patent Law                                                                                                           | P. Narayanan                                  | Eastern Book Company              | 2 <sup>nd</sup> edn/<br>2020                 |
| 8          | The Law of Copyright and<br>Designs                                                                                         | B.L. Wadehra                                  | Universal Law                     | 5 <sup>th</sup><br>edn/2010                  |
| 9          | Intellectual Property Rights<br>(Including IPR in the Digital<br>Age)                                                       | Prabuddha Ganguli                             | Tata McGraw-Hill<br>Education     | 2001                                         |
| 10         | The Startup India Manifesto: A<br>Guide to the Indian Startup<br>Ecosystem                                                  | Rashmi Bansal and<br>Deepinder Goyal          | Westland Publications             | 2020                                         |

## SEMESTER S1/S2 HEALTH AND WELLNESS

(Common to all Groups)

|                                            |                 |                    |                                 |
|--------------------------------------------|-----------------|--------------------|---------------------------------|
| <b>Course Code</b>                         | <b>UCHWT127</b> | <b>CIE Marks</b>   | <b>50</b>                       |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | <b>1:0:1:0</b>  | <b>ESE Marks</b>   | <b>0</b>                        |
| <b>Credits</b>                             | <b>1</b>        | <b>Exam Hours</b>  | <b>Nil</b>                      |
| <b>Prerequisites (if any)</b>              | <b>None</b>     | <b>Course Type</b> | <b>Theory and<br/>Practical</b> |

### Course Objectives:

1. To provide essential knowledge on physical activity, health, and wellness.
2. To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
3. To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills.
4. To equip students with the ability to lead healthier lifestyles.
5. To enable students to design effective and personalized exercise programs.

## SYLLABUS

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Contact Hours</b> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | Human Body Systems related to Physical activity and its functions:<br>Respiratory System - Cardiovascular System .<br>Musculoskeletal System and the Major Muscle groups of the HumanBody.<br>Quantifying Physical Activity Energy Expenditure and Metabolicequivalent of task (MET)<br>Exercise Continuum: Light-intensity physical activity, Moderate -intensity physical activity, Vigorous -intensity physical activity.<br>Defining Physical Activity, Aerobic Physical Activity, Anaerobic | <b>4</b>             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|   | <p>Physical Activity, Exercise and Health-Related Physical Fitness.</p> <p>FITT principle to design an Exercise programme</p> <p>Components of Health-related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| 2 | <p>Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health.</p> <p>Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports</p> <p>Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet Carbohydrate &amp; the Glycemic Index</p> <p>Animal &amp; Plant - based Proteins and their Effects on Human Health</p> <p>Dietary Fats &amp; their Effects on Human Health</p> <p>Essential Vitamins and Minerals</p>                                                                                                                                                                                 | 2 |
| 3 | <p>Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - Cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis , flat foot, Knock knee )</p> <p>Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga</p> <p>Understanding on substance abuse and addiction - Psychoactive substances &amp; its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.</p> | 4 |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4</b> | First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider<br>First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds.<br>First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling<br>Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain) | <b>2</b> |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|

### Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile
- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

### Course Assessment Method(CIE: 50 marks)

### Continuous Internal Evaluation Marks (CIE):

| Attendance | Case Study/Micro project/Presentation | Activity evaluation | Total |
|------------|---------------------------------------|---------------------|-------|
| 10         | 20                                    | 20                  | 50    |

### Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome |                                                                                                                                                                                                             | Bloom's Knowledge Level (KL) |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities.                                                     | <b>K2</b>                    |
| <b>CO2</b>     | Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.                                                                              | <b>K2</b>                    |
| <b>CO3</b>     | Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leading a healthy lifestyle through the practice of yoga and abstaining from addictive substances. | <b>K2</b>                    |
| <b>CO4</b>     | Explain the basics of first aid and describe common sports injuries                                                                                                                                         | <b>K2</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> |     |     |     | 2   |     | 3   |     | 3   | 3   | 2    |      | 2    |
| <b>CO2</b> |     |     |     | 2   |     | 3   |     | 2   | 2   |      |      | 2    |
| <b>CO3</b> |     |     |     | 0   |     | 3   |     | 3   |     |      |      | 2    |
| <b>CO4</b> |     |     |     | 2   |     | 3   |     |     |     |      |      | 2    |

| Text Books |                                               |                      |                          |                  |
|------------|-----------------------------------------------|----------------------|--------------------------|------------------|
| Sl. No     | Title of the Book                             | Name of the Author/s | Name of the Publisher    | Edition and Year |
| 1          | Foundations of Nutrition                      | Bhavana Sabarwal     | Common wealth Publishers | 1999             |
| 2          | Anatomy and physiology in health and illness. | Ross and Wilson      | Waugh, A., & Grant, A.   | 2022             |



| Reference Books |                                                                                                                                        |                                                              |                                                               |                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|------------------|
| Sl. No          | Title of the Book                                                                                                                      | Name of the Author/s                                         | Name of the Publisher                                         | Edition and Year |
| 1               | Fit to be Well<br>Essential Concept                                                                                                    | Thygerson, A. L.,<br>Thygerson, S. M., &<br>Thygerson, J. S. | Jones & Bartlett<br>Learning.                                 | 2018             |
| 2               | Introduction to physical<br>education, fitness, and sport.                                                                             | Siedentop, D., &<br>Van der Mars, H.                         | Human kinetics.                                               | 2022             |
| 3               | Substance Use<br>Disorders. Manual for<br>Physicians.                                                                                  | Lal, R., & Ambekar, A                                        | National Drug<br>Dependence<br>Treatment Centre,<br>New Delhi | 2005             |
| 4               | The exercise health<br>connection-how to<br>reduce your risk of<br>disease and other<br>illnesses by making<br>exercise your medicine. | Nieman, D. C., &<br>White, J. A                              | Public Health                                                 | 1998             |
| 5               | ACSM's resource manual<br>for guidelines for<br>exercise testing and<br>prescription.                                                  | Lippincott Williams &<br>Wilkins.                            | American College<br>of Sports<br>Medicine.                    | 2012             |
| 6               | Exercise Physiology:<br>energy, nutrition and<br>human performance.                                                                    | Katch, F. I., Katch,<br>V. L., & McArdle,<br>W. D.           | Lippincott Williams &<br>Wilkins                              | 2010             |

**Continuous Internal Evaluation Marks (CIE): for the Health and wellness course**

Students will be evaluated as follows.

| Title                            | Method of Evaluation                                                                                                                                                                                                                                                                                                           |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Attendance</b>                | Students must attend at least 75% of both theory and practical classes. They will receive 10 marks based on their class attendance.<br>Students who do not meet the minimum attendance requirement for a course, as specified in the B. Tech regulations, will not be eligible to proceed to the next criteria.                |
| <b>Assignment / Presentation</b> | Assignments will be given to students to assess their understanding of the subjects taught. Students will be required to make presentations on the subjects taught in class, and their understanding of the subjects will be assessed. Based on the Assignments and Presentations the students will be awarded marks out of 20 |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Activity Evaluation</b>                              | <p>The Assignment / Presentation faculty handling the class will use the tests from the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests:</p> <ol style="list-style-type: none"> <li>1. V Sit Reach Test</li> <li>2. Partial Curl Up - 30 seconds</li> <li>3. Push Ups (Male) and Modified Push Up (Female)</li> <li>4. Two (2) Km Run/Walk</li> </ol> <p>Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be awarded pass marks for activity evaluation. Students who score better will be awarded a maximum mark of 20.</p> |
| <b>Activity Evaluation - Special Circumstances</b>      | <p>Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be awarded marks out of 20.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Activity Evaluation - Special Considerations NCC</b> | <p>Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be awarded pass marks for activity evaluation. Students who attend more parades will be eligible for a maximum mark of 20 based on their parade attendance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### **Tests to evaluated as per Criterion - 2 and Benchmark Scores**

#### **V Sit Reach Test**

#### **How to Perform:**

1. The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.
2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.

3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.
4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

**Infrastructure/Equipment Required:**

1. A tape for marking the ground, marker pen, and ruler.
2. With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.
3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.

Scoring: The score is recorded in centimeters and millimeters as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position.

**Scoring for V Sit Reach Test for Males**

| Level | Benchmark Score | Measurement (cm) |
|-------|-----------------|------------------|
| 1     | 2               | <11              |
| 2     | 4               | 12-13            |
| 3     | 6               | 14-17            |
| 4     | 7               | 18-19            |
| 5     | 8               | 20-21            |
| 6     | 9               | 22               |
| 7     | 10              | >22              |

**Scoring for V Sit Reach Test for Females**

| Level | Benchmark Score | Measurement (cm) |
|-------|-----------------|------------------|
| 1     | 2               | <14              |
| 2     | 4               | 15-16            |
| 3     | 6               | 17-19            |
| 4     | 7               | 20-21            |
| 5     | 8               | 22               |
| 6     | 9               | 23               |
| 7     | 10              | >23              |

**Partial Curl Up - 30 seconds****How to Perform:**

1. The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
2. The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).
3. The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

**Infrastructure/Equipment Required:**

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch

Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

**Scoring for Partial Curl Up - 30 seconds Test for Males**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <25     |
| 2     | 4               | 25-30   |
| 3     | 6               | 31-34   |
| 4     | 7               | 35-38   |
| 5     | 8               | 39-43   |
| 6     | 9               | 44-49   |
| 7     | 10              | >49     |

**Scoring for Partial Curl Up - 30 seconds Test for Females**

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <18     |
| 2     | 4               | 18-24   |
| 3     | 6               | 25-28   |
| 4     | 7               | 29-32   |
| 5     | 8               | 33-36   |
| 6     | 9               | 37-43   |
| 7     | 10              | >43     |

## Push Ups for Male/Modified Push Ups for Female

### How to Perform:

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
3. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
4. For Female: push-up technique is with the knees resting on the ground.

### Infrastructure/Equipment Required:

Flat clean cushioned surface/Gym mat

Scoring: Record number of correctly completed pushups.

### Scoring for Push Ups for Male

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | <4      |
| 2     | 4               | 04- 10  |
| 3     | 6               | 11 -18  |
| 4     | 7               | 19-34   |
| 5     | 8               | 35-46   |
| 6     | 9               | 47-56   |
| 7     | 10              | >56     |

### Scoring for Modified Push Ups for Female

| Level | Benchmark Score | Numbers |
|-------|-----------------|---------|
| 1     | 2               | 0-1     |
| 2     | 4               | 2 - 5   |
| 3     | 6               | 6 -10   |
| 4     | 7               | 11 - 20 |
| 5     | 8               | 21-27   |
| 6     | 9               | 27-35   |
| 7     | 10              | >35     |

## 2 Km Run/Walk

### How to Perform:

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.
2. The participants begin on signal (Starting point)- “ready, start”. As they cross the finish line, elapsed time should be announced to the participants.
3. Walking is permitted but the objective is to cover the distance in the shortest possible time.

### Infrastructure/Equipment Required:

Stopwatch, whistle, marker cone, lime powder, measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.

Scoring: Time taken for completion (Run or Walk) in min, sec.

### Scoring for 2Km Run/walk for Male

| Level | Benchmark Score | Minutes: Seconds |
|-------|-----------------|------------------|
| 1     | 2               | > 11:50          |
| 2     | 4               | 10:42            |
| 3     | 6               | 09:44            |
| 4     | 7               | 08:59            |
| 5     | 8               | 08:33            |
| 6     | 9               | 07:37            |
| 7     | 10              | >07:37           |

### Scoring for 2Km Run/walk for Female

| Level | Benchmark Score | Minutes: Seconds |
|-------|-----------------|------------------|
| 1     | 2               | >13:47           |
| 2     | 4               | 12:51            |
| 3     | 6               | 12:00            |
| 4     | 7               | 11:34            |
| 5     | 8               | 10:42            |
| 6     | 9               | 09:45            |
| 7     | 10              | >09:45           |

**SEMESTER - S1/S2**  
**LIFE SKILLS AND PROFESSIONAL COMMUNICATION**

**(Common to all Branches)**

|                                            |                 |                    |                         |
|--------------------------------------------|-----------------|--------------------|-------------------------|
| <b>Course Code</b>                         | <b>UCHUT128</b> | <b>CIE Marks</b>   | 100                     |
| <b>Teaching Hours/Week<br/>(L: T:P: R)</b> | 2:0:1:0         | <b>ESE Marks</b>   | 0                       |
| <b>Credits</b>                             | 1               | <b>Exam Hours</b>  | -                       |
| <b>Prerequisites (if any)</b>              | None            | <b>Course Type</b> | Activity-based learning |

**Course objectives:**

1. To foster self-awareness and personal growth, enhance communication and interpersonal connection skills, promote effective participation in groups and teams, develop critical thinking, problem-solving, and decision-making skills, and cultivate the ability to exercise emotional intelligence.
2. To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise
3. To equip students to build their profile in line with the professional requirements and standards.

**Continuous Internal Evaluation Marks (CIE):**

- Continuous internal evaluation is based on the individual and group activities as detailed in the activity table given below.
- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. They should use online collaboration tools for group activities, report/presentation making and work management.
- Activities are to be distributed between 3 class hours (2L+1P) and 3.5 Self-study hours.
- Marks given against each activity should be awarded fully if the students successfully complete the activity.
- Students should maintain a portfolio file with all the reports and other textual materials generated from the activities. Students should also keep a journal related to the activities undertaken.

- Portfolio and journal are mandatory requirements for passing the course, in addition to the minimum marks required.
- The portfolio and journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through the HMC courses and Mini project course.
- Self-reflection questionnaire shall be given at the beginning of the semester, in between and at the end of the semester based on the guidelines in the manual of the course.

| Sl. No. | Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Class room (L) / Self Study (SS) | Week of completion | Group / Individual (G/I) | Marks | Skills                                                                                                                                                                                                                             | CO  |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|--------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1     | Group formation and self-introduction among the group members                                                                                                                                                                                                                                                                                                                                                                                                                            | L                                | 1                  | G                        | -     | <ul style="list-style-type: none"><li>• Connecting with group members</li><li>• Time management - Gantt Chart</li></ul>                                                                                                            |     |
| 1.2     | Familiarizing the activities and preparation of the time plan for the activities                                                                                                                                                                                                                                                                                                                                                                                                         | L                                | 1                  | G                        | -     |                                                                                                                                                                                                                                    |     |
| 1.3     | Preparation of Gantt chart based on the time plan                                                                                                                                                                                                                                                                                                                                                                                                                                        | SS                               | 1                  | G                        | 2     |                                                                                                                                                                                                                                    |     |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                    |                          |       |                                                                                                                                                                                                                                    |     |
| 2.1     | Take an online personality development test, self reflect and report                                                                                                                                                                                                                                                                                                                                                                                                                     | SS                               | 1                  | I                        | 2     | <ul style="list-style-type: none"><li>• Self-awareness Writing</li></ul>                                                                                                                                                           | CO1 |
| 2.2     | Role-storming exercise 1:<br>Students assume 2 different roles given below and write about their <ul style="list-style-type: none"><li>• Strengths,</li><li>• Areas for improvement,</li><li>• Concerns,</li><li>• Areas in which he/she hesitates to take advice,</li><li>• Goals/Expectations,</li></ul> from the point of view of the following assumed roles <ul style="list-style-type: none"><li>i) their parent/guardian/mentor</li><li>ii) their friend/sibling/cousin</li></ul> | L                                | 1                  | I                        | 2     | <ul style="list-style-type: none"><li>• Goal setting - Identification of skills and setting goal</li><li>• Self-awareness</li><li>• Discussion in groups</li><li>• Group work- Compiling of ideas</li><li>• Mind mapping</li></ul> | CO1 |
| 2.3     | Role-storming exercise 2:<br>Students assume the role of their teacher and write about the <ul style="list-style-type: none"><li>• Skills required as a B.Tech graduate</li><li>• Attitudes, habits, approaches required</li></ul>                                                                                                                                                                                                                                                       | SS                               | 1                  | I                        | 2     |                                                                                                                                                                                                                                    | CO1 |



|     |                                                                                                                                                                                                                                                                                                                                     |    |        |   |   |                                                                                                                                                                          |     |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|     | and activities to be practised during their B.Tech years, in order to achieve the set goals                                                                                                                                                                                                                                         |    |        |   |   |                                                                                                                                                                          |     |
| 2.4 | Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills                                                                                                                                                                                                    | L  | 1      | G | 2 |                                                                                                                                                                          | CO1 |
| 2.5 | Prepare a mind map based on the role-storming exercise and exhibit/present it in class                                                                                                                                                                                                                                              | SS | 2      | G | 2 |                                                                                                                                                                          | CO1 |
|     |                                                                                                                                                                                                                                                                                                                                     |    |        |   |   |                                                                                                                                                                          |     |
| 3   | Prepare a presentation on instances of empathy they have observed in their own life or in other's life                                                                                                                                                                                                                              | L  | 2 to 4 | I | 2 | ● Empathy                                                                                                                                                                | CO2 |
| 4.1 | Each student connects and networks with a minimum of 3 professionals from industry/public sector organizations/other agencies/NGOs /academia (atleast 1 through LinkedIn)                                                                                                                                                           | SS | 3      | I | 2 | ● Workplace awareness<br>● Listening<br>● Communication - interacting with people                                                                                        |     |
| 4.2 | Interact with them to understand their workplace details including<br>● workplace skills required<br>● their work experience<br>● activities they have done to enhance their employability during their B.Tech years<br>● suggestions on the different activities to be done during B.Tech years<br>Prepare a documentation of this | SS | 3      | I | 4 | ● Networking through various media including LinkedIn<br>● Discussion in groups<br>● Report preparation<br>● Creativity<br><br>Goal setting - Preparation of action plan | CO2 |
| 4.3 | Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals<br>Prepare the Minutes of the discussions                                                                                                   | SS | 3      | G | 2 |                                                                                                                                                                          | CO2 |
| 4.4 | Report preparation based on the discussions                                                                                                                                                                                                                                                                                         | SS | 4      | G | 3 |                                                                                                                                                                          | CO4 |
| 4.5 | Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions                                                                                                                                                                                                                          | L  | 5      | G | 4 |                                                                                                                                                                          | CO3 |
| 4.6 | Identify their own goal and prepare an action plan for their undergraduate                                                                                                                                                                                                                                                          | SS | 5      | I | 2 |                                                                                                                                                                          | CO1 |

|      |                                                                                                                                                                              |    |    |     |   |                                                          |          |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-----|---|----------------------------------------------------------|----------|
|      | journey to achieve the goal                                                                                                                                                  |    |    |     |   |                                                          |          |
| 5.1  | Select a real-life problem that requires a technical solution and list the study materials needed                                                                            | L  | 6  | G   | 2 |                                                          | CO3      |
| 5.2  | Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource) | SS | 6  | I   | 2 |                                                          | CO4      |
| 5.3  | Use any online tech forum to gather ideas for solving the problem chosen                                                                                                     | SS | 6  | G   | 2 |                                                          | CO5      |
| 5.4  | Arrive at a possible solution using six thinking hat exercise                                                                                                                | L  | 7  | G   | 3 |                                                          | CO3      |
| 5.5  | Prepare a report based on the problem-solving experience                                                                                                                     | SS | 7  | G   | 2 |                                                          | CO4      |
| 6.1  | Linkedin profile creation                                                                                                                                                    | SS | 1  | I   | 2 |                                                          | CO6      |
| 6.2  | Resume preparation                                                                                                                                                           | SS | 8  | I   | 2 | Profile-building                                         | CO6      |
| 6.3  | Self introduction video                                                                                                                                                      | SS | 8  | I   | 3 |                                                          | CO6      |
| 7    | Prepare a presentation on instances of demonstration of emotional intelligence                                                                                               | SS | 9  | I   | 2 | Emotional intelligence                                   | CO2      |
| 8    | Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)                                                                             | SS | 10 | G   | 3 | Diversity                                                | CO2, CO5 |
| 9    | Take online Interview skills development sessions like robotic interviews; self-reflect and report                                                                           | SS | 10 | I   | 2 | • Interview skills                                       | CO6      |
| 10   | Take an online listening test, self reflect and report                                                                                                                       | SS | 11 | I   | 2 | Listening skills                                         | CO6      |
| 11.1 | Activities to improve English vocabulary of students                                                                                                                         | L  | 8  | I/G | 4 |                                                          | CO4      |
| 11.2 | Activities to help students identify errors in English language usage                                                                                                        | L  | 9  | I/G | 2 | • English vocabulary                                     | CO4      |
| 11.3 | Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words                                                               | L  | 10 | I/G | 2 | • English language skills<br>• Writing<br>• Presentation | CO4      |
| 11.4 | Write a self-reflection report on the improvement in English language communication through this course                                                                      | SS | 12 | I   | 2 | • Group work<br>• Self-reflection                        | CO4      |
| 11.5 | Presentation by groups on the                                                                                                                                                |    |    |     |   |                                                          | CO4, CO5 |

|      |                                                                                                                                                                                                                                            |    |          |   |   |                                                                                                                                                                                                          |               |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|      | experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared                                                                                                  | L  | 11 to 12 | G | 2 |                                                                                                                                                                                                          |               |
| 12.1 | Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies | SS | 12       | G | 4 | <ul style="list-style-type: none"> <li>• Audio-visual presentations creations with the use of technology tools</li> <li>• Effective use of social media platforms</li> <li>• Profile building</li> </ul> | CO2, CO4, CO5 |
| 12.2 | Upload the video content to podcasting platforms or YouTube                                                                                                                                                                                | SS | 12       | G | 1 |                                                                                                                                                                                                          | CO5           |
| 12.3 | Add the link of the podcast in their LinkedIn profile                                                                                                                                                                                      | SS | 12       | G | 1 |                                                                                                                                                                                                          | CO5           |

**Table 2. Lab hour Activities (P): 24 Marks**

| Sl No    | Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks     | Skill                              | CO       |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------|----------|
| <b>1</b> | <p>Hands-on sessions on day-to-day engineering skills and a self-reflection report on the experience gained:</p> <ol style="list-style-type: none"> <li>1. Drilling practice using electric hand drilling machines.</li> <li>2. Cutting of MS rod and flat using electric hand cutters.</li> <li>3. Filing, finishing and smoothening using electrically operated hand grinders.</li> <li>4. MS rod cutting using Hack saw by holding the work in bench wise.</li> <li>5. Study and handling different types of measuring instruments.</li> <li>6. Welding of MS, SS work pieces.</li> <li>7. Pipe bending practice (PVC and GI).</li> <li>8. Water tap fitting.</li> <li>9. Water taps rubber seal changing practice.</li> <li>10. Union and valves connection practice in pipes.</li> <li>11. Foot valve fitting practice.</li> <li>12. Water pump seal and bearing changing practice.</li> </ol> | <b>24</b> | Basic practical engineering skills | <b>3</b> |
| <b>2</b> | Language Lab sessions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -         | Language Skills                    | <b>4</b> |

| Course Outcome |                                                                                                                                                                                                                             | Bloom's Knowledge Level (KL) |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks                                                                        | <b>K5</b>                    |
| <b>CO2</b>     | Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence                            | <b>K5</b>                    |
| <b>CO3</b>     | Develop thinking skills, problem-solving and decision-making skills                                                                                                                                                         | <b>K5</b>                    |
| <b>CO4</b>     | Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyze, interpret & effectively summarize textual, audio & visual content                      | <b>K6</b>                    |
| <b>CO5</b>     | Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions | <b>K6</b>                    |
| <b>CO6</b>     | Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians                                                                                        | <b>K6</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping**

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> |     |     |     |     |     |     |     |     |     | 1    |      | 3    |
| <b>CO2</b> |     |     |     |     | 1   |     |     | 3   |     | 3    |      | 3    |
| <b>CO3</b> |     | 1   | 1   |     | 1   |     |     |     |     | 1    |      | 1    |
| <b>CO4</b> |     |     |     |     | 1   |     |     |     |     | 1    |      | 2    |
| <b>CO5</b> |     |     |     |     | 1   | 1   |     |     |     | 1    |      | 2    |
| <b>CO6</b> |     |     |     |     | 1   |     |     |     |     | 1    |      |      |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

| <b>Text Books</b> |                                                                                    |                                                     |                              |                                           |
|-------------------|------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------|-------------------------------------------|
| <b>Sl. No</b>     | <b>Title of the Book</b>                                                           | <b>Name of the Author/s</b>                         | <b>Name of the Publisher</b> | <b>Edition and Year</b>                   |
| 1                 | Life Skills & Personality Development                                              | Maithry Shinde et.al.                               | Cambridge University Press   | First Edition, 2022                       |
| 2                 | Emotional Intelligence: Why it can matter more than IQ                             | Daniel Goleman                                      | Bloomsbury, Publishing PLC   | 25th Anniversary Edition<br>December 2020 |
| 3                 | Think Faster, Talk Smarter: How to speak successfully when you are put on the spot | Matt Abrahams                                       | Macmillan Business           | September 2023                            |
| 4                 | Deep Work: Rules for focused success in a distracted world                         | Cal Newport                                         | PIATKUS                      | January 2016                              |
| 5                 | Effective Technical Communication                                                  | Ashraf Rizvi                                        | McGraw Hill Education        | 2nd Edition 2017                          |
| 6                 | Interchange                                                                        | Jack C. Richards, With Jonathan Hull, Susan Proctor | Cambridge publishers         | 5 <sup>th</sup> Edition                   |

| Reference Books |                                    |                                  |                                          |                     |
|-----------------|------------------------------------|----------------------------------|------------------------------------------|---------------------|
| Sl. No          | Title of the Book                  | Name of the Author/s             | Name of the Publisher                    | Edition and Year    |
| 1               | Life Skills for Engineers          | Remesh S., Vishnu R.G.           | Ridhima Publications                     | First Edition, 2016 |
| 2               | Soft Skills & Employability Skills | Sabina Pillai and Agna Fernandez | Cambridge University Press               | First Edition, 2018 |
| 3               | Effective Technical Communication  | Ashraf Rizvi                     | McGraw Hill Education                    | 2nd Edition 2017    |
| 4               | English Grammar in Use             | Raymond Murphy,                  | Cambridge University Press India PVT LTD | 5th Edition 2023    |
| 5               | Guide to writing as an Engineer    | David F. Beer and David McMurrey | John Willey. New York                    | 2004                |

**SEMESTER S2**

**IT WORKSHOP**

**(Common to Group A&B)**

|                                       |                 |                                      |                |
|---------------------------------------|-----------------|--------------------------------------|----------------|
| <b>Course Code</b>                    | <b>GXESL208</b> | <b>CIE Marks</b>                     | 50             |
| <b>Teaching Hours/Week(L: T:P: R)</b> | 0:0:2:0         | <b>ESE Marks<br/>(Internal Only)</b> | 50             |
| <b>Credits</b>                        | 1               | <b>Exam Hours</b>                    | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>         | None            | <b>Course Type</b>                   | Lab            |

**Course Objectives:**

1. To provide a basic understanding about computer hardware, software, and computer network.
2. To familiarize the learner with the web development process using HTML, CSS, and Javascript.

**Details of Experiments**

| <b>Expt.<br/>No</b> | <b>Experiment<br/>(Minimum 10 Experiments)</b>                                                                                                                                                                                                            |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                   | Practice Computer Hardware – Familiarization CPU Box, Motherboard, CPU & Chip-set, Interface cards, Card slots, Hard disk, Cables, SMPS, NIC, Various ports, etc. Computer Peripherals - I/O Devices. Storage devices, Interface cards – Buses – Firmware |
| 2                   | Familiarization of Boot process                                                                                                                                                                                                                           |
| 3                   | Familiarizing installation of Linux and Windows operating systems                                                                                                                                                                                         |
| 4                   | Familiarizing basic Unix/Linux commands - ls, mkdir, cp, mv, grep, rmdir, chmod, useradd, passwd, history, dmesg, cpuinfo, uname, du, time, write, fdisk                                                                                                  |
| 5                   | Familiarizing networking hardware - RJ45, UTP, fibre, switch, NIC, router, Wireless Access Point (WAP), modem                                                                                                                                             |
| 6                   | Familiarizing basic networking commands - ifconfig, ping, traceroute, nslookup, ssh, scp, telnet, ftp                                                                                                                                                     |
| 7                   | View network traffic using Wireshark/Packet tracer                                                                                                                                                                                                        |



|    |                                                                                                                                 |
|----|---------------------------------------------------------------------------------------------------------------------------------|
| 8  | Familiarizing the steps how to configure and establishing a network connecting                                                  |
| 9  | Shell programming in Linux(bash)                                                                                                |
| 10 | Create a web page and deploy on a local web server.                                                                             |
| 11 | Use Javascript to validate forms.                                                                                               |
| 12 | Create an image slider using HTML, CSS, and JavaScript. Allow users to navigate between images using previous and next buttons. |
| 13 | Familiarisation of LaTeX - Basic only                                                                                           |
| 14 | Familiarisation of Development Environments - Visual studio code, Sublime Text, Atom                                            |
| 15 | Introducing Repositories - Git / Bitbucket                                                                                      |

**Course Assessment Method**  
(CIE: 50 Marks, ESE: 50 Marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Preparation/Pre-Lab Work, experiments, Viva and<br>Timely completion of Lab Reports / Record.<br>(Continuous Assessment) | Internal<br>Exam | Total |
|------------|--------------------------------------------------------------------------------------------------------------------------|------------------|-------|
| 5          | 25                                                                                                                       | 20               | 50    |

**End Semester Examination Marks (ESE):**

| Procedure/<br>Preparatory<br>work/Design/<br>Algorithm | Conduct of experiment/<br>Execution of work/<br>troubleshooting/ Programming | Result with<br>valid inference/<br>Quality of<br>Output | Viva<br>voce | Record | Total |
|--------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------|--------------|--------|-------|
| 10                                                     | 15                                                                           | 10                                                      | 10           | 5      | 50    |

*Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified Lab record.*

**Pass Criteria:**

■ A student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE).

■ In addition, the student must secure at least 40% in the End Semester Examination (ESE).

The ESE shall be conducted internally, with evaluation carried out by a panel of faculty members.

This panel must include at least one faculty member who was not involved in the Continuous Internal Evaluation (CIE) of the lab course.

### Course Outcomes (COs)

**At the end of the course the student will be able to:**

| Course Outcome |                                                                                                                    | Bloom's Knowledge Level (KL) |
|----------------|--------------------------------------------------------------------------------------------------------------------|------------------------------|
| CO1            | Experiment with the fundamental hardware components of a computer and how to interface them with software systems. | K3                           |
| CO2            | Make use of the command line of Linux operating system and shell programming.                                      | K3                           |
| CO3            | Experiment with the data network communication scenarios using Wireshark.                                          | K3                           |
| CO4            | Develop basic websites using HTML, CSS & JavaScript and manage the versions.                                       | K3                           |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create**

### CO-PO Mapping Table

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 3   | 3   |     | 3   |     |     |     |     |      |      | 3    |
| CO2 | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      |      | 3    |
| CO3 | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      |      | 3    |
| CO4 | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      |      | 3    |

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), : No Correlation

| Text Books |                                                               |                                          |                       |                  |
|------------|---------------------------------------------------------------|------------------------------------------|-----------------------|------------------|
| Sl. No     | Title of the Book                                             | Name of the Author/s                     | Name of the Publisher | Edition and Year |
| 1          | Invitation to Computer Science                                | G. Michael Schneider,<br>Judith Gersting | Cengage               | 2/e, 2020        |
| 2          | LINUX for Developers: Jumpstart Your Linux Programming Skills | William Rothwell                         | Pearson               | 1/e, 2018        |
| 3          | HTML, CSS, and JavaScript -All in One, Sams Teach Yourself    | Julie C. Meloni<br>Jennifer Kyrnin       | Pearson               | 1/e, 2018        |

| Reference Books |                                                                                                                |                      |                       |                  |
|-----------------|----------------------------------------------------------------------------------------------------------------|----------------------|-----------------------|------------------|
| Sl. No          | Title of the Book                                                                                              | Name of the Author/s | Name of the Publisher | Edition and Year |
| 1               | The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach      | Irv Englander        | Wiley                 | 5/e, 2014        |
| 2               | Mastering Git : Attain expert level proficiency with Git for enhanced productivity and efficient collaboration | Jakub Narębski       | Packt                 | 1/e, 2016        |
| 3               | Web Design with HTML, CSS, JavaScript, and JQuery.                                                             | Jon Duckett          | Wiley                 | 1/e, 2014        |

| Video Links (NPTEL, SWAYAM...) |                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------|
| Sl. No.                        | Link ID                                                                                         |
| 1                              | <a href="https://overthewire.org/wargames/bandit/">https://overthewire.org/wargames/bandit/</a> |
| 2                              | <a href="https://www.w3schools.com/">https://www.w3schools.com/</a>                             |

### **Continuous Assessment (25 Marks)**

#### **1. Preparation and Pre-Lab Work (7 Marks)**

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

#### **2. Conduct of Experiments (7 Marks)**

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

#### **3. Lab Reports and Record Keeping (6 Marks)**

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

#### **4. Viva Voce (5 Marks)**

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

*Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.*

**Evaluation Pattern for End Semester Examination (50 Marks)**

**1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

**2. Conduct of Experiment/Execution of Work/Programming (15 Marks)**

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

**3. Result with Valid Inference/Quality of Output (10 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

**4. Viva Voce (10 Marks)**

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

**5. Record (5 Marks)**

- Completeness, clarity, and accuracy of the lab record submitted

# **PROGRAMME CORE 1**

**SEMESTER S2**  
**DISCRETE MATHEMATICS**  
**(Common to all Computer Science and its allied branches)**

|                                       |                 |                    |                |
|---------------------------------------|-----------------|--------------------|----------------|
| <b>Course Code</b>                    | <b>PCCST205</b> | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week(L: T:P: R)</b> | 3:1:0:0         | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                        | 4               | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>         | None            | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. To equip students with the ability to analyze and solve problems using discrete mathematical techniques.
2. To give a deeper understanding of mathematical logic, set theory, and proof techniques such as direct proofs, proof by contradiction, and mathematical induction.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Contact Hours</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b>          | <p><b>Sets, Functions, and Relations</b></p> <p>Sets and Subsets, Venn Diagrams, Set Operations, Set Identities, Generalized Unions and Intersections, The Principle of Inclusion-Exclusion (Basic and Generalized versions), and applications.</p> <p>Function definition, Injections, Surjections and Bijections, Inverse Functions, and Compositions of Functions, Cardinality of Sets, Cantor diagonalization argument</p> <p>Relations and Their Properties, Composition of relations, n-ary Relations, Representing Relations Using Matrices, Equivalence Relations, Equivalence Classes, Partial Orderings, Hasse Diagrams, Maximal and Minimal Elements, Lattices</p> | <b>11</b>            |

|   |                                                                                                                                                                                                                                                                                                                                                                                                        |    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | <b>Mathematical logic and proofs</b><br><br>Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference<br><br>Introduction to Proofs, Methods of Proving Theorems - Direct proof, Indirect proof (Proof by Contraposition), Proof by Contradiction, Proof by counter examples, The Pigeonhole Principle. | 11 |
| 3 | <b>Induction and Recurrences</b><br><br>Mathematical Induction, Weak and Strong induction<br><br>Recursive (Inductive) definitions and recurrence relations, Modeling with Recurrence Relations, Solving Linear Recurrence Relations (homogeneous and nonhomogeneous), Generating Functions, Using Generating Functions to Solve Recurrence Relations.                                                 | 11 |
| 4 | <b>Group theory</b><br><br>Groups - Definition, Examples, and Elementary Properties, Abelian group, Permutation group, Subgroup, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets and Lagrange's Theorem                                                                                                                                                                                         | 11 |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/<br>Microproject | Internal<br>Examination-1<br>(Written) | Internal<br>Examination- 2<br>(Written) | Total |
|------------|-----------------------------|----------------------------------------|-----------------------------------------|-------|
| 5          | 15                          | 10                                     | 10                                      | 40    |



**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one fullquestion out of two questions.*

| Part A                                                                                                                                                          | Part B                                                                                                                                                                                                                                                                           | Total     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <ul style="list-style-type: none"> <li>Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p><b>(4x9 = 36 marks)</b></p> | <b>60</b> |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| Course Outcome |                                                                                                                                                                                                                   | Bloom's Knowledge Level (KL) |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic                                          | <b>K3</b>                    |
| <b>CO2</b>     | Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion. | <b>K3</b>                    |
| <b>CO3</b>     | Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science.                                                                                 | <b>K2</b>                    |
| <b>CO4</b>     | Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science                                                                                                                   | <b>K3</b>                    |
| <b>CO5</b>     | Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients                                                                                        | <b>K3</b>                    |
| <b>CO6</b>     | Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups.                                                                                      | <b>K2</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |
| CO2 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |
| CO3 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |
| CO4 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |
| CO5 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |
| CO6 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 2    |

| Text Books |                                           |                                         |                       |                  |
|------------|-------------------------------------------|-----------------------------------------|-----------------------|------------------|
| Sl. No     | Title of the Book                         | Name of the Author/s                    | Name of the Publisher | Edition and Year |
| 1          | Discrete Mathematics and its Applications | Kenneth H. Rosen,<br>Kamala Krithivasan | McGraw Hill           | 8/e, 2021        |

| Reference Books |                                          |                                      |                       |                  |
|-----------------|------------------------------------------|--------------------------------------|-----------------------|------------------|
| Sl. No          | Title of the Book                        | Name of the Author/s                 | Name of the Publisher | Edition and Year |
| 1               | Schaum's Outline of Discrete Mathematics | Marc Lipson,<br>Seymour Lipschutz    | McGraw-Hill           | 3/e, 2021        |
| 2               | Discrete Mathematics                     | Kenneth A. Ross, Charles R.B. Wright | Pearson               | 5/e, 2012        |

| Video Links (NPTEL, SWAYAM...) |                                                                                                       |
|--------------------------------|-------------------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                               |
| 1                              | <a href="https://nptelvideos.com/lecture.php?id=6033">https://nptelvideos.com/lecture.php?id=6033</a> |
| 2                              | <a href="https://nptelvideos.com/lecture.php?id=6024">https://nptelvideos.com/lecture.php?id=6024</a> |
| 3                              | <a href="https://nptelvideos.com/lecture.php?id=6051">https://nptelvideos.com/lecture.php?id=6051</a> |
| 4                              | <a href="https://nptelvideos.com/lecture.php?id=6058">https://nptelvideos.com/lecture.php?id=6058</a> |

**SEMESTER S2**  
**DISCRETE MATHEMATICAL STRUCTURES**  
**(INFORMATION TECHNOLOGY)**

|                                       |                                                           |                    |                |
|---------------------------------------|-----------------------------------------------------------|--------------------|----------------|
| <b>Course Code</b>                    | <b>PCITT205</b>                                           | <b>CIE Marks</b>   | 40             |
| <b>Teaching Hours/Week(L: T:P: R)</b> | 3:1:0:0                                                   | <b>ESE Marks</b>   | 60             |
| <b>Credits</b>                        | 4                                                         | <b>Exam Hours</b>  | 2 Hrs. 30 Min. |
| <b>Prerequisites (if any)</b>         | A sound background in higher secondary school Mathematics | <b>Course Type</b> | Theory         |

**Course Objectives:**

1. Students will be able to understand and apply mathematical notations and concepts essential for computing.
2. Students can develop and utilize mathematical reasoning and proof strategies to enhance their analytical thinking and creative problem-solving skills.

**SYLLABUS**

| <b>Module No.</b> | <b>Syllabus Description</b>                                                                                                                                                                                                                                                                                                                                                                                                | <b>Contact Hours (44 Hrs)</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| <b>1</b>          | <p><b>Introduction to Logic:</b> Propositional Logic, Truth tables, Conditional propositions and Logical Equivalence, The laws of Logic, The Principle of Duality, Resolution proofs.</p> <p><b>Predicates and Quantifiers:</b> Universal quantifier and Existential quantifier, Negation of Quantifiers, The Rule of Universal Specification, The Rule of Universal Generalizations. The implications of Quantifiers.</p> | <b>11</b>                     |
| <b>2</b>          | <p><b>Fundamental Principles of Counting:</b> The Rules of Sum and Product, Permutations, Combinations, The Binomial Theorem (without proof), Combinations with Repetition, Pigeon Hole Principle, Principle of Inclusion and Exclusion (without proof), Derangements.</p>                                                                                                                                                 | <b>11</b>                     |

|          |                                                                                                                                                                                                                                                                                                                                                                        |           |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3</b> | <b>Relations, Functions and Algebraic Structures:</b> Sets, Relations, Functions, Equivalence Relations, Posets and Lattices, HasseDiagrams, Complimented and Distributive lattices, Structured sets for binary operations, Semigroups, Monoids, Groups, Rings, Fields.                                                                                                | <b>12</b> |
| <b>4</b> | <b>Generating Function:</b> Definitions and Examples, Calculation Techniques, Exponential Generating Function.<br><b>Recurrence Relations:</b> First-order linear recurrence relations with constant coefficients – homogeneous, non-homogeneous Solution. Second-order linear recurrence relations with constant coefficients, homogeneous, non-homogeneous Solution. | <b>10</b> |

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

| <b>Attendance</b> | <b>Assignment/<br/>Microproject</b> | <b>Internal<br/>Examination-1<br/>(Written)</b> | <b>Internal<br/>Examination- 2<br/>(Written )</b> | <b>Total</b> |
|-------------------|-------------------------------------|-------------------------------------------------|---------------------------------------------------|--------------|
| <b>5</b>          | <b>15</b>                           | <b>10</b>                                       | <b>10</b>                                         | <b>40</b>    |

**End Semester Examination Marks (ESE):**

| In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions                                                                |                                                                                                                                                                                                                                                                                                              |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Part A</b>                                                                                                                                                                                 | <b>Part B</b>                                                                                                                                                                                                                                                                                                | <b>Total</b> |
| <ul style="list-style-type: none"> <li>2 Questions from each module.</li> <li>Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24marks)</b></p> | <ul style="list-style-type: none"> <li>Each question carries 9 marks.</li> <li>Two questions will be given from each module, out of which 1 question should be answered.</li> <li>Each question can have a maximum of 3 sub divisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p> | <b>60</b>    |

### Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome |                                                                                                                                                                                                                                     | Bloom's Knowledge Level (KL) |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>CO1</b>     | Apply logical reasoning and formal methods to construct and verify logical arguments and proofs involving propositions, truth tables, logical equivalence, and quantifiers.                                                         | <b>K3</b>                    |
| <b>CO2</b>     | Apply fundamental counting principles, including permutations, combinations, and the pigeonhole principle, to solve problems related to combinatorial analysis and discrete structures.                                             | <b>K3</b>                    |
| <b>CO3</b>     | Describe the concepts of sets, relations, and functions, and recognize the properties and structures of algebraic systems such as lattices, semigroups, monoids, groups, rings, and fields.                                         | <b>K2</b>                    |
| <b>CO4</b>     | Explain the concepts of sets, relations, functions, algebraic structures such as groups and fields, and the methods for solving first and second-order linear recurrence relations using generating functions and other techniques. | <b>K2</b>                    |

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

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

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

| Text Books |                                                                 |                                 |                       |                                |
|------------|-----------------------------------------------------------------|---------------------------------|-----------------------|--------------------------------|
| Sl. No     | Title of the Book                                               | Name of the Author/s            | Name of the Publisher | Edition and Year               |
| 1          | Discrete and Combinatorial Mathematics: An Applied Introduction | Ralph P. Grimaldi, B. V. Ramana | Pearson               | 5 <sup>th</sup> Edition, 2007. |
| 2          | Discrete Mathematics with Graph Theory and Combinatorics.       | T Veerarajan                    | Tata McGraw Hill      | 1 <sup>st</sup> Edition, 2007  |

| Reference Books |                                                                       |                                                   |                       |                               |
|-----------------|-----------------------------------------------------------------------|---------------------------------------------------|-----------------------|-------------------------------|
| Sl. No          | Title of the Book                                                     | Name of the Author/s                              | Name of the Publisher | Edition and Year              |
| 1               | Discrete Mathematics and its Applications                             | K. H. Rosen                                       | McGraw Hill           | 7 <sup>th</sup> Edition, 2012 |
| 2               | Discrete Mathematical Structures                                      | D. S. Chandrasekharaiah                           | PRISM Books           | 4 <sup>th</sup> Edition, 2012 |
| 3               | Discrete Mathematical Structures with Application to Computer Science | J. P. Tremblay and R. Manohar                     | Tata McGraw Hill      | 2 <sup>nd</sup> Edition, 2002 |
| 4               | Discrete Mathematics for Computer Scientists & Mathematicians         | Joe L. Mott, Abraham Kandel and Theodore P. Baker | Pearson Education     | 2nd Edition, 2015             |

| Video Links (NPTEL, SWAYAM...) |                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------|
| Module No.                     | Link ID                                                                                   |
| 1                              | <a href="https://nptel.ac.in/courses/106106094">https://nptel.ac.in/courses/106106094</a> |
| 2                              | <a href="https://nptel.ac.in/courses/106103205">https://nptel.ac.in/courses/106103205</a> |
| 3                              | <a href="https://nptel.ac.in/courses/106106094">https://nptel.ac.in/courses/106106094</a> |
| 4                              | <a href="https://nptel.ac.in/courses/106103205">https://nptel.ac.in/courses/106103205</a> |