# SEMESTER 1

## ELECTRONICS & COMMUNICATION ENGINEERING

## SEMESTER S1

## MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE - 1

| | | | |
|---|---|---|---|
| **Course Code** | **GYMAT101** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 2:1:0:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | Basic knowledge in single variable calculus and matrix operations. | **Course Type** | Theory |

**Course Objectives:**

1. To provide a comprehensive understanding and basic techniques of matrix theory to analyze linear systems.
2. To offer advanced knowledge and practical skills in solving second-order ordinary differential equations, applying Laplace transforms, and understanding Fourier series, enabling students to analyze and model dynamic systems encountered in engineering disciplines effectively.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | Linear systems of equations: Gauss elimination, Row echelon form, Linear Independence: rank of a matrix, Solutions of linear systems: Existence, Uniqueness (without proof), The matrix Eigen Value Problem, Determining Eigen values and Eigen vector, Diagonalization of matrices.<br>**(Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)** | **9** |

| | | |
|---|---|---|
| **2** | Homogeneous linear ODEs of second order, Superposition principle, General solution, Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial Value Problem). Non homogenous ODEs (with constant coefficients) - General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions $□□^{\gamma x}$ , $□□^{n}$, □□□□□□, □□□□□□□, $□□^{\alpha x}$□□□□□□, $□□^{\alpha x}$□□□□□□), Initial value Problem for Non-Homogeneous Second order linear ODE(with constant coefficients), Solution by variation of parameters (Second Order).<br><br>**(Text 1: Relevant topics from sections 2.1, 2.2, 2.7, 2.10)** | **9** |
| **3** | Laplace Transform, Inverse Laplace Transform, Linearity property, First shifting theorem, Transform of derivatives, Solution of Initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at t=0 only), Unit step function, Second shifting theorem, Dirac delta function and its transform (Initial value problems involving unit step function and Dirac delta function are excluded), Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.<br><br>**(Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)** | **9** |
| **4** | Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions), Fourier series of $2\pi$ periodic functions, Fourier series of $2l$ periodic functions, Half range sine series expansion, Half range cosine series expansion.<br><br>**(Text 1: Relevant topics from sections 11.1, 11.2, Text 2: Relevant topics from section 10.8)** | **9** |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Solve systems of linear equations and diagonalize matrices. | **K3** |
| **CO2** | Solve homogeneous and non-homogeneous linear differential equation with constant coefficients. | **K3** |
| **CO3** | Compute Laplace transform and apply it to solve ODEs arising in engineering. | **K3** |
| **CO4** | Determine the Taylor series and evaluate Fourier series expansion for different periodic functions. | **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** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO3** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO4** | 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 | $10^{th}$ edition, 2016 |
| **2** | Calculus | H.Anton,I.Biven,S.Davis | Wiley | $12^{th}$ edition, 2024 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Thomas' Calculus | Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki | Pearson | 15th edition, 2023 |
| **2** | Essential Calculus | J. Stewart | Cengage | 2nd edition, 2017 |
| **3** | Elementary Linear Algebra | Howard Anton, Chris Rorres | Wiley | 11th edition, 2019 |
| **4** | Bird's Higher Engineering Mathematics | John Bird | Taylor & Francis | 9th edition, 2021 |
| **5** | Higher Engineering Mathematics | B. V. Ramana | McGraw-Hill Education | 39th edition, 2023 |
| **6** | Calculus | H. Anton, I. Biven, S.Davis | Wiley | 12th edition, 2024 |
| **7** | Signals and Systems | Simon Haykin, Barry Van Veen | Wiley | 2nd edition, 2002 |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| **Module No.** | **Link ID** |
| 1 | https://archive.nptel.ac.in/courses/111/107/111107164/ |
| 2 | https://archive.nptel.ac.in/courses/111/104/111104031/ |
| 3 | https://archive.nptel.ac.in/courses/111/106/111106139/ |
| 4 | https://archive.nptel.ac.in/courses/111/101/111101164/ |

# SEMESTER S1/S2

# PHYSICS FOR ELECTRICAL SCIENCE

| **Course Code** | **GBPHT121** | **CIE Marks** | 40 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 3:0:1:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory + Lab |

**Course Objectives:**

1. To provide students with a solid background in the fundamentals of Physics and to impart this knowledge in Electrical Science disciplines.
2. To develop scientific attitudes and enable students to correlate Physics concepts with their core programs.
3. To equip students with practical knowledge that complements their theoretical studies and develop their ability to create practical applications and solutions in engineering based on their understanding of Physics.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Semiconductor Physics**<br>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)<br>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), V-I Characteristics of p-n junction | **9** |

| | | |
|---|---|---|
| **2** | **Semiconductor Devices**<br>Semiconductor devices - Rectifiers- Full wave and Half wave, Zener diode - V-I characteristics - Zener breakdown and Avalanche breakdown, Tunnel diode - V-I characteristics, Applications of Zener and Tunnel diodes.<br>Photonic devices (qualitative) - Photo detectors (Junction and PIN photodiodes), Applications, Solar cells- V-I Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications of LED | **9** |
| **3** | **Superconductivity & Dielectrics**<br>Super conductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors, Applications of superconductors.<br>Dielectric constant, Polarization, Permittivity- relative permittivity, Relation between polarization and dielectric constant, Types of Polarization, Internal fields in liquids and solids, Clausius Mossotti Relation, Dielectric loss(qualitative), Dielectric breakdown (qualitative) | **9** |
| **4** | **Laser & Fiber Optics**<br>Optical processes - Absorption, Spontaneous emission and stimulated emission, Properties of laser, Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states, Basic components of laser - Active medium- Optical resonant cavity, Construction and working of Ruby laser, Semiconductor Laser (Qualitative), Applications of laser.<br>Optical fiber-Principle of propagation of light, Types of fibers-Step index and Graded index fibers, Numerical aperture –Derivation, Applications of optical fibers - Fiber optic communication system (block diagram) | **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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Explain the fundamentals of Semiconductor Physics. | **K2** |
| **CO2** | Describe the behaviour of semiconductor materials in semiconductor devices. | **K2** |
| **CO3** | Explain Superconductivity and basic theory of dielectrics | **K2** |
| **CO4** | Apply the comprehended knowledge about laser and fibre optics in various engineering applications | **K3** |
| **CO5** | Apply basic knowledge of principles and theories in physics to conduct experiments. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | | | | | | | 3 |
| **CO2** | 3 | | | | | | | | | | | 3 |
| **CO3** | 3 | | | | | | | | | | | 3 |
| **CO4** | 3 | 2 | | | | | | | | | | 3 |
| **CO5** | 3 | 2 | | | 3 | | | | 2 | | | 3 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Concepts of Modern Physics | Arthur Beiser | Tata McGraw Hill Publications | 6th Edition, 2003 |
| **2** | Engineering Physics | H K Malik and A K Singh | McGraw Hill | 2nd Edition, 2017 |
| **3** | A Textbook of Engineering Physics | MN Avadhanulu, P G Kshirsagar, TVS Arun murthy | S. Chand | 11th 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 | 2nd 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 | 10th Edition, 2022 |
| **5** | Introduction to Solid State Physics | Charles Kittel | Wiley India Edition | 2019 |
| **6** | Advanced Engineering Physics | Premlet B | Phasor Books | 10th Edition ,2017 |
| **7** | A Text Book of Engineering Physics | I. Dominic and. A. Nahari, | Owl Books Publishers | Revised Edition, 2016 |

| Video Links (NPTEL, SWAYAM etc) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://nptel.ac.in/courses/108106181 |
| **2** | https://nptel.ac.in/courses/108108112 |
| **3** | https://nptel.ac.in/courses/115103108 |
| **4** | https://nptel.ac.in/courses/115102124 |

## 1. 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.*

## 2. 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

**Laboratory Experiments to be conducted in the virtual lab mode**

**(Minimum 6 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 |
| **8** | Characteristics of LED |
| **9** | Solar Cell- V-I and Intensity Characteristics |

| | |
|---|---|
| **10** | Laser – Determination of wavelength using diffraction grating |
| **11** | Laser- To measure the wavelength using a millimetre scale as a grating |
| **12** | Compare the variation of current with potential difference, for a metal, filament bulb and semiconductor diode. |
| **13** | Determination of dielectric constant |
| **14** | CRO -Measurement of frequency and amplitude of wave forms |
| **15** | Photo diode- V-I Characteristics |
| **16** | Numerical aperture of optical fiber |

# SEMESTER S1/S2

# CHEMISTRY FOR INFORMATION SCIENCE & ELECTRICAL SCIENCE

| **Course Code** | **GXCYT122** | **CIE Marks** | 40 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 3:0:1:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | 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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Electrochemistry and Corrosion Science**<br>**Electrochemical Cell**- Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery & $H_2$-$O_2$ fuel cell (acid electrolyte only) construction and working.<br>**Corrosion** –Electrochemical corrosion mechanism (acidic & alkaline medium) - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of copper - Electroless plating of copper. | **9** |

| | | |
|---|---|---|
| **2** | **Materials for Electronic Applications**<br>**Nanomaterials** - Classification based on Dimension & Materials- Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials – Carbon Nanotubes, Fullerenes, Graphene & Carbon Quantum Dots – structure, properties & application.<br>**Polymers** - Fire Retardant Polymers- Halogenated & Non-halogenated polymers (Examples only)- Conducting Polymers-Classification-Polyaniline & Polypyrrole-synthesis, properties and applications.<br>**Organic electronic materials and devices**- construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC)<br>Materials used in Quantum computing Technology**,** Super capacitors, Spintronics | **9** |
| **3** | **Molecular Spectroscopy and Analytical Techniques**<br>**Spectroscopy**-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 $CO_2$ and $H_2O$ – Applications<br>**Thermal Analysis**: Dielectric Thermal Analysis (DETA) of Polymers-Working and Application.<br>**Electron Microscopic Techniques:** SEM - Principle, instrumentation and Applications. | **9** |
| **4** | **Environmental Chemistry**<br>**Water characteristics** - 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 & Significance. | **9** |

| | | |
|---|---|---|
| | **Waste Management**: 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. | |

**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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br><br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

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

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

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** | 3 | 3 | | | | | | | | | | 2 |
| **CO3** | 3 | 3 | | | | | | | | | | 2 |
| **CO4** | 3 | 3 | | | | 2 | 3 | | | | | 2 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **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 | 17th 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 | 4th 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** | https://archive.nptel.ac.in/courses/104/106/104106137/<br>https://archive.nptel.ac.in/courses/113/105/113105102/<br>https://archive.nptel.ac.in/courses/113/104/113104082/<br>https://www.youtube.com/watch?v=BeSxFLvk1h0 |
| **2** | https://archive.nptel.ac.in/courses/113/104/113104102/<br>https://archive.nptel.ac.in/courses/104/105/104105124/<br>https://archive.nptel.ac.in/courses/105/104/105104157/ |

## 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
## Laboratory Experiments to be conducted in the virtual Mode

***Minimum 6 Experiments**

| 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 $Fe^{3+}$ in solution |
| **7** | Determination of molar absorptivity of a compound (KMnO4 or any water-soluble food colorant) |
| **8** | Analysis of IR spectra |
| **9** | Identification of drugs using TLC |

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

## Semester S1/S2

# ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **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. | **9** |

| | | |
|---|---|---|
| **2** | Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone and Cylinder only. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes. | **9** |
| **3** | **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)<br><br>**Development of Surfaces:** Development of surfaces of the solids and solids cut by different section planes. (Exclude problems with through holes) | **9** |
| **4** | **Isometric Projection:** Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Sphere, Hemisphere and their combinations.<br><br>**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) | **9** |

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

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

| Attendance | Assignment+ Lab Exam | Internal Examination-1 | Internal Examination- 2 | Total |
|---|---|---|---|---|
| **5** | **10+5** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*Student can choose any one full question out of two questions from each module*

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

**Course Outcomes (COs)**

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

| **Course Outcome** | | **Bloom's Knowledge Level (KL)** |
|---|---|---|
| **CO1** | Understand the projection of points and lines located in different quadrants | **K2** |
| **CO2** | Prepare Multiview orthographic projections of objects by visualizing them in different positions | **K3** |
| **CO3** | Plot sectional views and develop surfaces of a given object | **K3** |
| **CO4** | Prepare pictorial drawings using the principles of isometric projection | **K3** |
| **CO5** | Sketch simple drawing using CAD tools. | **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** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | | | | | | | |
| **CO2** | 3 | 2 | | | | | | | | | | |
| **CO3** | 3 | 2 | | | | | | | | | | |
| **CO4** | 3 | 2 | | | | | | | | | | |
| **CO5** | 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 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 |
| **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** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **2** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **3** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **4** | https://archive.nptel.ac.in/courses/112/102/112102304/ |

*B.Tech 2025–S1/S2*

# SEMESTER S1/S2

# ENGINEERING MECHANICS

| | | | |
|---|---|---|---|
| **Course Code** | **GBEST103** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 2-1-0-0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. The course aims to enable students to analyse and solve fundamental mechanics problems

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | Introduction to statics: introduction to branches of mechanics, concept of rigid body scalars and vectors, vector operations, forces in space. Support reactions of beams (point load and UDL only) Force systems: rectangular components in 2D and 3D, moment and couple, resultants Equilibrium: system isolation and the free-body diagram, equilibrium conditions 2D and 3D | **10** |
| **2** | Friction: -laws of friction – analysis of blocks and ladder Centroid of composite areas- – moment of inertia- parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia-ring and disc | **10** |
| **3** | Dynamics – rectilinear translation - equations of motion in kinematics and kinetics – D'Alembert's principle. –motion on horizontal and inclined surfaces, motion of connected bodies | **8** |
| **4** | Curvilinear translation - equations of kinematics projectile motion (solution starting from differential equations) Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment | **8** |

*B.Tech 2025–S1/S2*

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

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

| Attendance | Assignment/ Microproject | Internal Examination- 1(Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

Course Outcomes (COs)

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

| | Course Outcome | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the vector representation of forces and moments | **K2** |
| **CO2** | Identify and describe the components of system of forces acting on the rigid body | **K3** |
| **CO3** | Apply the conditions of equilibrium to different force system. | **K3** |
| **CO4** | Identify appropriate principles to solve problems of mechanics. | **K3** |
| **CO5** | Develop the understanding of fundamental principles of rigid body dynamics | **K3** |

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

*B.Tech 2025–S1/S2*

**CO-PO Mapping Table:**

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

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Engineering Mechanics | Timoshenko and Young | McGraw Hill Publishers | 5th Edition 2017 |
| **2** | Engineering Mechanics: Combined Statics and Dynamics | Russell C. Hibbeler | Pearson Education, | 14th Edition 2015 |
| **3** | Engineering Mechanics - Statics and Dynamics, | Shames, I. H. | Prentice Hall ofIndia. | 4th Edition 2008 |
| **4** | Textbook of Engineering Mechanics | R. K. Bansal | Laxmi publications pvt ltd. | 4th Edition 2016 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Engineering Mechanics Statics | J. L. Meriam, L. G. | Wiley | *9th Edition 2020* |
| **2** | Engineering Mechanics | Kraige | PHI Learning | *2011* |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| | **Link ID** |
| **1** | https://nptel.ac.in/courses/112106286 |

*B.Tech 2025–S1/S2*

## SEMESTER S1/S2

# INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

*B.Tech 2025–S1/S2*

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

*B.Tech 2025–S1/S2*

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

*B.Tech 2025–S1/S2*

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

At the end of the course students should be able to

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

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

*B.Tech 2025–S1/S2*

**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 |

*B.Tech 2025–S1/S2*

| 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 |

*B.Tech 2025–S1/S2*

## SEMESTER S1/S2

## INTRODUCTION TO MECHANICAL ENGINEERING & CIVIL ENGINEERING

| **Course Code** | **GCEST104** | **CIE Marks** | 40 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 4-0-0-0 | **ESE Marks** | 60 |
| **Credits** | 4 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. Understand thermodynamic cycles and working of IC engines.
2. Understand the refrigeration cycles and psychrometric concepts.
3. Understand the relevance of civil engineering and its various disciplines.
4. Describe the relevance of various building codes and types of buildings as per NBC.
5. Understand different building components and building materials.

## SYLLABUS

| **Module No.** | **Syllabus Description** | **Contact Hours** |
|---|---|---|
| **1** | **General introduction to Mechanical Engineering:** Thermodynamic cycles -Carnot Cycle -Derivation of efficiency (problems on efficiency) Otto, Diesel cycles (no derivation of efficiency and problems).<br><br>**IC Engines:** CI & SI Engines, working of 2-Stroke & 4-Stroke engines. Listing the parts of IC Engines. Concept of CRDI, MPFI and hybrid engines.<br><br>**Refrigeration:** Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Psychrometric chart, Cooling and dehumidification, Layout of central air conditioning systems. | **9** |

| | | |
|---|---|---|
| **2** | Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines.<br><br>Different type of gears and its applications (spur, helical, bevel, worm and worm wheel), List types of clutches and their use, Bearings and their classification (Journal bearing and ball bearing)<br><br>**Manufacturing Process**: Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, SMAW, Soldering and Brazing and their applications.<br>**Machining processes:** Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing. | **9** |
| **3** | **General Introduction to Civil Engineering**: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering.<br>**Introduction to buildings:** Types of buildings according to character of occupancy as per NBC, Load bearing and non-load bearing building structures, components of a residential building and their functions (conceptonly).<br>Selection of site for a residential building.<br><br>Building Area Definitions: Built up area, Plinth area, Floor area, Carpet area and Floor area ratio of a building as per KBR.<br>Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion of relevance only). | **9** |
| **4** | **Conventional construction materials:** Brick, stone, sand, cement and timber- Classifications, Qualities, Tests and Uses of construction materials. **Cement concrete**: Constituent materials, properties and types. | **9** |

| | | |
|---|---|---|
| | **Tests on fresh and hardened concrete** - slump test, cube compressivestrength as per IS Codes.<br>**Steel:** Structural steel sections and steel reinforcements – types and uses.<br>**Soil**-Origin of soil-weathering of rocks, types of weathering | |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the relevance of mechanical engineering and its various disciplines. | **K2** |
| **CO2** | Learn the applications of thermodynamics through IC engines and refrigeration systems. | **K2** |
| **CO3** | Understand the various manufacturing processes adapted by mechanical engineers. | **K2** |
| **CO4** | Understand the relevance of civil engineering and its various disciplines. | **K2** |
| **CO5** | Describe the relevance of various building codes and types of buildings as per NBC | **K2** |
| **CO6** | Understand different building components and building materials. | **K2** |

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 | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | 2 |
| **CO4** | 3 | | | | | | | | | | | |
| **CO5** | 3 | | | | | | | 2 | | | | 2 |
| **CO6** | 3 | | | | | | | | | | | 2 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Basic Mechanical Engineering | Pravin Kumar | Pearson Education | 1st Edition,2013 |
| **2** | A Textbook of Basic MechanicalEngineering | R.K. Rajput | Laxmi Publications | 3rd Edition,2017 |
| **3** | Elements of Mechanical Engineering | K.P. Roy, S.K. Hajra Choudhury, A.K. Hajra Choudhury | Media Promoters & Publishers Pvt. Ltd. | Revised Edition, 2012 |
| **4** | Fundamentals of Mechanical Engineering | G.S. Sawhney | PHI Learning Pvt. Ltd. | 1st Edition,2013 |
| **5** | Essentials of Civil Engineering | Dalal K R | Charotar Publishing house | 1st Edition 2012 |
| **6** | Engineering Materials(Material Science) | Rangwala S C | Charotar PublishingHouse Pvt Limited | 43rd Edition2019 |
| **7** | Building Materials | Duggal S K | New Age International | 5thEdition2019 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Hybrid Electric Vehicles: Principles and Applicationswith Practical Perspectives | Chris Mi and M. Abul Masrur | John Wiley & Sons | 2nd Edition, 2017 |
| **2** | Automotive Engineering Fundamentals | Richard Stone and Jeffrey K. Ball | SAE International | 1st Edition, 2004 |
| **3** | Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing | Ian Gibson, David W. Rosen, and Brent Stucker | Springer | 2nd Edition, 2015 |
| **4** | Heating, Ventilating, and AirConditioning Analysis and Design | Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler | John Wiley & Sons | 6th Edition, 2005 |
| **5** | Materials for Civil and Construction Engineering | Mamlouk, M.S.,and Zaniewski, J.P | Pearson Publishers | 4th Edition, 2017 |
| **6** | Building Construction | Rangwala, S.C and Dalal, KB | Charotar Publishing house | 34th Edition 2022 |
| **7** | Construction Technology Vol.I to IV | Chudley, R | Longman group,England Course Plan | 2nd Edition 2014 |
| **8** | Building Construction Volumes1to4 | Mckay, W.B.and Mckay,J.K | Pearson India Education Services | 5th Edition |
| **9** | Engineering Geology | Duggal S. K., Pandey H.K. and Rawat N, | Mcgraw Hill Education, New Delhi | 1st Edition 2017 |
| **10** | Latest Building codes and related rules and regulations. | | | |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://nptel.ac.in/courses/112/105/112105123/<br>https://nptel.ac.in/courses/112/106/112106133/<br>https://nptel.ac.in/courses/112/105/112105129/ |
| **2** | https://nptel.ac.in/courses/112/105/112105171/<br>https://nptel.ac.in/courses/112/105/112105268/<br>https://archive.nptel.ac.in/courses/112/107/112107145 |
| **3** | https://archive.nptel.ac.in/courses/105/106/105106201/ |
| **4** | https://archive.nptel.ac.in/courses/105/106/105106206/ |

## SEMESTER S1

## ALGORITHMIC THINKING WITH PYTHON

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

**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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | PROBLEM-SOLVING STRATEGIES:- Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies, Trial and Error, Heuristics, Means- Ends Analysis, and Backtracking (Working backward).<br><br>THE PROBLEM-SOLVING PROCESS:- 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. | **7** |

| | | |
|---|---|---|
| | ESSENTIALS OF PYTHON PROGRAMMING:- 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. | |
| **2** | ALGORITHM AND PSEUDOCODE REPRESENTATION:- Meaning and 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*<br><br>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. | **9** |
| | * - *Evaluate an expression,* ***d=a+b*c****, 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 (****Not to be limited to these exercises. More can be worked out if time permits****).*<br><br>** ***Only for visualizing the control flow of Algorithms. The use of tools like RAPTOR (https://raptor.martincarlisle.com/) is suggested. Flowcharts for the sample problems listed earlier may be discussed*** | |

| | | |
|---|---|---|
| **3** | SELECTION AND ITERATION USING PYTHON:- if-else, elif, for loop, range, while loop.<br><br>Sequence data types in Python - list, tuple, set, strings, dictionary, Creating and using Arrays in Python (using Numpy library).<br><br>DECOMPOSITION AND MODULARISATION* :- Problem decomposition as a strategy for solving complex problems, Modularisation, Motivation for modularisation, Defining and using functions in Python, Functions with multiple return values | **10** |

| | | |
|---|---|---|
| | RECURSION:- Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, Sample problems - Finding the **n**th Fibonacci number, greatest common divisor of two positive integers, the<br>factorial of a positive integer, adding two positive integers, the sum of digits of a positive number **.<br><br>* The idea should be introduced and demonstrated using Merge sort, the problem of returning the top three integers from a list of **n>=3** integers as examples. (**Not to be limited to these two exercises. More can be worked out if time permits**).<br>** ***Not to be limited to these exercises. More can be worked out if time permits***. | |

| | | |
|---|---|---|
| **4** | COMPUTATIONAL APPROACHES TO PROBLEM-SOLVING(*Introductory diagrammatic/algorithmic explanations only. Analysis not required*) :-<br><br>Brute-force Approach -<br>- *Example: Padlock, Password guessing*<br>Divide-and-conquer Approach -<br>- *Example: The Merge Sort Algorithm*<br>- Advantages of Divide and Conquer Approach<br>- Disadvantages of Divide and<br>Conquer Approach Dynamic Programming<br>Approach<br>- *Example: Fibonacci series*<br>- Recursion vs Dynamic<br>Programming Greedy Algorithm<br>Approach<br>- *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.*<br>- Motivations for the Greedy Approach | **10** |

| | | |
|---|---|---|
| | - Characteristics of the Greedy Algorithm<br>- Greedy Algorithms vs Dynamic<br>Programming Randomized Approach<br>- *Example 1: A company selling jeans gives a coupon for each pair of jeans. There are n different coupons. Collecting **n** different coupons would give you free jeans. How many jeans do you expect to buy before getting a free one?*<br>*Example 2: **n** 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 **n** hats randomly back to each person. What is the expected number of people who get back their hats?*<br>-Motivations for the Randomized Approach | |

**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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

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

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

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

**CO-PO Mapping Table:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | | | | | | | 3 |
| **CO2** | 3 | 3 | 3 | | | | | | | | | 3 |
| **CO3** | 3 | 3 | 3 | | | | | | | | | 3 |
| **CO4** | 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 | 2012 |
| **2** | How to Solve It: A New Aspect of Mathematical Method | George Pólya | Princeton University Press | 2015 |
| **3** | Creative Problem Solving: An Introduction | Donald Treffinger., Scott Isaksen, Brian Stead-Doval | Prufrock Press | 2005 |
| **4** | Psychology (Sec.. Problem Solving.) | Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M | H5P Edition | 2021 |
| **5** | Computer Arithmetic Algorithms | Koren, Israel | AK Peters/CRC Press | 2018 |
| **6** | Introduction to Computation and Programming using Python | Guttag John V | PHI | 2/e., 2016 |
| **7** | Python for Everyone | Cay S. Horstmann, Rance D. Necaise | Wiley | 3/e, 2024 |
| **8** | Computational Thinking: A Primer for Programmers and Data Scientists | G Venkatesh Madhavan Mukund | Mylspot Education Services Pvt Ltd | 2020 |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://opentextbc.ca/h5ppsychology/chapter/problem-solving/ |
| **2** | https://onlinecourses.nptel.ac.in/noc21_cs32/preview |

## 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 ill-defined problem and well-defined problems
2. How do you differentiate the methods for solving algorithmic problems: introspection, simulation, computer modelling, and experimentation?
3. Use cases for Trial and error, Algorithm, Heuristic and Means-ends analysis can be applied in proffering solution to problems

4. Use a diagram to describe the application of Tower of Hanoi in choosing and analysing an action at a series of smaller steps to move closer to the goal
5. What effect will be generated if the stage that involves program writing is not observed in the problem-solving process?
6. What effect will be generated if the stage that involves program writing is not observed in the problem-solving process?
7. Evaluate different algorithms based on their efficiency by counting the number of steps.
8. Recursive function that takes a number and returns the sum of all the numbers from zero to that number.
9. Recursive function that takes a number as an input and returns the factorial of that number.
10. Recursive function that takes a number 'n' and returns the nth number of the Fibonacci number.
11. Recursive function that takes an array of numbers as an input and returns the product of all the numbers in the list.

**LAB Experiments:**

1. Demonstrate about Basics of Python Programming
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Demonstrate different Arithmetic Operations on numbers in Python.
4. Create, concatenate, and print a string and access a sub-string from a given string.
5. Familiarize time and date in various formats (Eg. "Sun May 29 02:26:23 IST 2017")
6. Write a program to create, append, and remove lists in Python using numPy.
7. Programs to find the largest of three numbers.
8. Convert temperatures to and from Celsius, and Fahrenheit. [Formula: c/5 = f-32/9]
9. Program to construct the stars (*) pattern, using a nested for loop
10. Program that prints prime numbers less than 20.
11. Program to find the factorial of a number using Recursion.
12. Recursive function to add two positive numbers.
13. Recursive function to multiply two positive numbers
14. Recursive function to the greatest common divisor of two positive numbers.
15. Program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate 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.

16. Program to define a module to find Fibonacci Numbers and import the module to another program.
17. Program to define a module and import a specific function in that module to another program.
18. 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

## SEMESTER S1

# FOUNDATIONS OF COMPUTING: FROM HARDWARE ESSENTIALS TO WEB DESIGN

| | | | |
|---|---|---|---|
| **Course Code** | **GXEST106** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 3:0:0:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**CourseCourse 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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | 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 | **9** |
| **2** | 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. | **9** |

| | | |
|---|---|---|
| **3** | 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. | **9** |
| **4** | Web Design (Basics of HTML, CSS, and JavaScript) – Understanding the web content delivery, Understanding HTML and XHTML Connections, Understanding Cascading Style Sheets, Understanding JavaScript | **9** |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Identify the fundamental components and the working of an IT environment. | **K2** |
| **CO2** | Explain the data representations, CPU architectures, and the basic functioning of a computer. | **K2** |
| **CO3** | Explain the operating systems, computer network architecture, and necessary protocols used. | **K2** |
| **CO4** | Develop simple interactive web pages and validate the inputs. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | | | | | | | 3 |
| **CO2** | 3 | 3 | | | | | | | | | | 3 |
| **CO3** | 3 | 3 | | | | | | | | | | 3 |
| **CO4** | 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, Judith Gersting | Cengage | Ed 2, 2020 |
| **2** | The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach | Irv Englander | Wiley | Ed 5, 2014 |
| **3** | HTML, CSS, and JavaScript All in One, Sams Teach Yourself | Julie C. Meloni Jennifer Kyrnin | Pearson | Ed 1, 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 Systems, second edition: Building a Modern Computer from First Principles | Noam Nisan and Shimon Schocken | The MIT Press | 2nd Edn, 2021 |
| **2** | Peter Norton's Introduction to Computers | Peter Notron | McGrawHill | 6th Edn, 2010 |
| **3** | Web Design with HTML, CSS, JavaScript and Jquery | Jon Duckett | Wiley | First Ed., 2014 |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://www.nand2tetris.org/ |
| **2** | https://onlinecourses.swayam2.ac.in/nou20_cs05/preview |

# SEMESTER S1/S2

# BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

| **Course Code** | **GXESL107** | **CIE Marks** | 50 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 0:0:2:0 | **ESE Marks (Internal only)** | 50 |
| **Credits** | 1 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Lab |

**Course 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

| **Expt. No.** | **Experiments** |
|---|---|
| **Electrical Workshop (Minimum of 7 Experiments to be done)** | |
| **1** | 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. |
| **2** | Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control. |
| **3** | Wiring of light/fan circuit using two-way switches. (Staircase wiring) |
| **4** | Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch. |
| **5** | Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter. |
| **6** | 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 |
| **7** | Familiarisation of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit. |

| | |
|---|---|
| **8** | a) Identify battery specifications using different types of batteries. (Lead acid, Li Ion,NiCd etc.)<br>b) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM). |

| **ELECTRONICS WORKSHOP**<br>**(Minimum of 7 Experiments to be done)** | |
|---|---|
| **1** | 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,<br>Crystals, Displays, Fasteners, Heat sink etc.) |
| **2** | Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's |
| **3** | Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO.<br>Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station |
| **4** | Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET. |
| **5** | Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processingmethods.<br>Design and fabrication of a single sided PCB for a simple circuit. |
| **6** | Inter-connection methods and soldering practice.<br>Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions.<br>Soldering practice in connectors and general-purpose PCB, Crimping. |
| **7** | Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)-<br>Fixed voltage power supply with transformer<br>• Rectifier diode<br>• Capacitor filter<br>• Zener/IC regulator<br>Square wave generation using IC 555 timer in IC base. |
| **8** | Assembling of electronic circuits using SMT (Surface Mount Technology) stations. |
| **9** | Introduction to EDA tools (such as KiCad or XCircuit) |

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

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

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

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

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ troubleshooting/ Programming | Result with valid inference/ Quality of Output | Viva 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 record.
- Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.
- There will not be any relaxation in the attendance requirement.

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Demonstrate safety measures against electrical shocks | **K2** |
| **CO2** | Familiarise with transformers, rheostats, batteries and earthing schemes | **K2** |
| **CO3** | Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits | **K3** |
| **CO4** | Identify various electronic components | **K2** |
| **CO5** | Operate various measuring instruments | **K3** |
| **CO6** | Apply the design procedure of simple electronic circuits on breadboard and PCB | **K3** |
| **CO7** | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | 3 | | | | | | 2 |
| **CO2** | 1 | | | | | 2 | 1 | | | | | 2 |
| **CO3** | 2 | | | | | 1 | | | | | | 2 |
| **CO4** | 3 | | | | | 2 | | | | | | 3 |
| **CO5** | 3 | | | | 3 | 2 | | | 2 | | | 3 |
| **CO6** | 3 | | 3 | 1 | 3 | 2 | 1 | | 2 | | | 3 |
| **CO7** | | | | | | | | | 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 voice 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

## BASIC MECHANICAL AND CIVIL ENGINEERING LAB

| | | | |
|---|---|---|---|
| **Course Code** | **GCESL107** | **CIE Marks** | 50 |
| **Teaching Hours/Week (L: T:P: R)** | 0-0-2-0 | **ESE Marks (Internal only)** | 50 |
| **Credits** | 1 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Lab |

Course Objectives:

1. To enable the student to familiarize various tools, measuring devices, practices and different methods employed in the industry.
2. To enable the students to apply this experience while developing product/project for the benefit of society.

| Expt. No. | Experiments (Minimum 12 Exercises) |
|---|---|
| **1** | General: Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals, O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc. |
| **2** | Carpentry: Understanding carpentry tools and knowledge of at least one model<br>1. T –Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joints |
| **3** | Foundry: Understanding of foundry tools and knowledge of at least one model<br>1. Bench Moulding 2. Floor Moulding 3. Core making 4. Pattern making |
| **4** | Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model<br>1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal |

| | |
|---|---|
| **5** | Fitting: Understanding the tools used for fitting and knowledge of at least one model<br>1. Square Joint 2. V- Joint 3. Male and female fitting |

| | |
|---|---|
| **6** | Plumbing: - Understanding plumbing tools and pipe joints, along with practicing one exercise on joining pipes using a minimum of three types of pipe joints |
| **7** | Smithy: - Understanding the tools used in smithy. Demonstrating the forge-ability of different materials (MS, Al, alloy steel and cast steels) in both cold and hot states.Observing the qualitative difference in the hardness of these materials. One exercise on smithy (Square prism ). |
| **8** | Welding: Understanding welding equipment and practicing at least one welding technique, such as making joints using electric arc welding. Bead formation in horizontal, vertical-and overhead positions |
| **9** | Assembly: Demonstration only Dissembling and assembling of<br>1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump or any other machine |
| **10** | Use of proper Personal Protective Equipments. Measurements using Tape, Ruler, Vernier calipers, screw gauge |
| **11** | Measuring the area of a plot with an irregular boundary using a chain and cross staff |
| **12** | Measuring the area of a building using Distomat |
| **13** | Finding the level difference between two points using dumpy level |
| **14** | Onsite quality assessment of brick, and cement |

| | |
|---|---|
| **15** | Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall |
| **16** | Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall |
| **17** | Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows. |
| **18** | Setting out of a two roomed building using thread, tape and water tube levelling. |

| | |
|---|---|
| **19** | Conduct a market study to understand the types, prices, and general specifications of at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures, welding rods, fasteners etc.). |

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

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

| Attendance | Preparation/Pre-Lab Work, experiments, Viva and Timelycompletion of Lab Reports / Record (Continuous Assessment) | Total |
|---|---|---|
| 5 | 45 | 50 |

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

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ troubleshooting/ Programming | Result with valid inference/ Quality of Output | Viva 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 record.*
- *Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.*
- *There will not be any relaxation in the attendance requirement.*

Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Identify workshop operations and instruments in accordance with the material and objects. | **K3** |
| **CO2** | Understand appropriate tools and instruments with respect to the workshop specializations. | **K2** |
| **CO3** | Apply various tools, measuring devices, practices and different methods employed in the industry. | **K3** |
| **CO4** | Examine the quality of common materials used in the industry. | **K3** |
| **CO5** | Conduct market study of various engineering materials and consumables available in the market. | **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** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | 2 | | 2 |
| CO2 | 3 | | | | | | | | | 2 | | 2 |
| CO3 | 3 | | | | 2 | | | | | 2 | | 3 |
| CO4 | 3 | | | | | | | | | 2 | | 3 |
| CO5 | 3 | | | | | | | | 2 | 3 | | 3 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Mechanical Workshop Practice | K C John | PHI Learning | Edition 2 2010 |
| **2** | Engineering Materials | S C Rangwala | Charotar Publishing House Pvt Limited | Edition 43 2019 |
| **3** | Building Materials | S K Duggal | New Age International | Edition 6 2025 |
| **4** | Indian Practical Civil EngineeringHandbook | Khanna P.N, | UBS Publishers Distributers (P) Ltd. | Year 2012 |
| **5** | Building Construction | Arora S.P and Bindra S.P | Dhanpat Rai Publications | Edition 5 Year 2022 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Elements of Workshop Technology Vol-1- ManufacturingProcesses | S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy | MPP Media Promoters and Publishers | 2008 |

| Video Links (NPTEL, SWAYAM…) |
|---|
| **Link ID** |
| https://archive.nptel.ac.in/courses/105/106/105106206/ |
| https://archive.nptel.ac.in/courses/105/106/105106201/ |
| https://archive.nptel.ac.in/courses/105/104/105104101/ |
| https://archive.nptel.ac.in/courses/117/106/117106108/ |

**Continuous Assessment (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.
   - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. **Conduct of Experiments (15 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 (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 andmaintaining a well-organized fair record.

4. **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 (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

# LIFE SKILLS AND PROFESSIONAL COMMUNICATION

| | | | |
|---|---|---|---|
| **Course Code** | **UCHUT128** | **CIE Marks** | 100 |
| **Teaching Hours/Week (L: T:P: R)** | 2:0:0:0 | **ESE Marks** | 0 |
| **Credits** | 0 | **Exam Hours** | - |
| **Prerequisites (if any)** | None | **Course Type** | 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) and 3 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.

## Table 1: Activity Table

| 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 Gant 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, | 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 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | from the point of view of the following assumed roles<br>i) their parent/guardian/mentor<br>ii) their friend/sibling/cousin | | | | | | |
| 2.3 | Role-storming exercise 2:<br>Students assume the role of their teacher and write about the<br>• Skills required as a B.Tech graduate<br>• Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set Goals | SS | 1 | I | 2 | | CO1 |
| 2.4 | Discuss the skills identified through rolestorming excercise 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<br>• Networking through various media including LinkedIn<br>• Discussion in groups<br>• Report preparation<br>• Creativity<br><br>Goal setting - Preparation of | |
| 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 | SS | 3 | I | 4 | | CO2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Prepare a documentation of this | | | | | action plan | |
| 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 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 | Profile-building | CO6 |
| 6.2 | Resume preparation | SS | 8 | I | 2 | | 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 | • English vocabulary<br>• English language skills<br>• Writing<br>• Presentation<br>• Group work<br>• Self-reflection | 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 mispelled words, commonly mispronounced words and confusing Words | L | 10 | I/G | 2 | | CO4 |
| 11.4 | Write a self-reflection report on the improvement in English language communication through this course | SS | 12 | I | 2 | | CO4 |
| 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 | • Audio-visual presentations creations with the use of technology tools<br>• Effective use of social media platforms<br>• Profile building | 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 |

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks | **K5** |
| **CO2** | 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 | **K5** |
| **CO3** | Develop thinking skills, problem-solving and decision-making skills | **K5** |
| **CO4** | Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyze, interpret & effectively summarize textual, audio & visual content | **K6** |
| **CO5** | 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 | **K6** |
| **CO6** | Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians | **K6** |

**CO-PO Mapping**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | | | | | 1 | | 3 |
| **CO2** | | | | | 1 | | | 3 | | 3 | | 3 |
| **CO3** | | 1 | 1 | | 1 | | | | | 1 | | 1 |
| **CO4** | | | | | 1 | | | | | 1 | | 2 |
| **CO5** | | | | | 1 | 1 | | | | 1 | | 2 |
| **CO6** | | | | | 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 | 5th 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

# Electronics & Communication Engineering

## SEMESTER S2

## MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE - 2

| | | | |
|---|---|---|---|
| **Course Code** | **GYMAT201** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 2:1:0:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | Basic knowledge in single variable calculus. | **Course Type** | Theory |

**Course Objectives:**

1. To provide a comprehensive understanding of partial derivatives, multiple integrals, and the differentiation and integration of vector-valued functions, emphasizing their applications in engineering contexts.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|

| | | |
|---|---|---|
| **1** | Limits and continuity, Partial derivatives, Partial derivatives of functions with two variables, Partial derivatives viewed as rate of change and slopes, Partial derivatives of functions with more than two variables, Higher order partial derivatives, Local Linear approximations, Chain rule, Implicit differentiation, Maxima and minima of functions of two variables - relative maxima and minima<br><br>**(Text 1: Relevant topics from sections 13.2, 13.3, 13.4, 13.5, 13.8)** | **9** |

| | | |
|---|---|---|
| **2** | Double integrals, Reversing the order of integration in double integrals, change of coordinates in double integrals (Cartesian to polar), Evaluating areas using Double integrals, Finding volumes using double integration, Triple integrals, Volume calculated as triple integral, Triple integral in Cartesian and cylindrical coordinates.<br>**(Text 1: Relevant topics from section 14.1, 14.2, 14.3, 14.5, 14.6)** | **9** |
| **3** | Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields, Gradient and its properties, Directional derivative, Divergent and curl, Line integrals of vector fields, Work done as line integral, Conservative vector field, independence of path, Potential function (results without proof).<br>**(Text 1: Relevant topics from section 12.1, 12.2, 13.6, 15.1, 15.2, 15.3)** | **9** |
| **4** | Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Greens theorem, Surface integrals over surfaces of the form $z = g(x, y)$, Flux integrals over surfaces of the form $z = g(x, y)$, Divergence theorem (without proof), Using Divergence theorem to find flux, Stokes theorem (without proof)<br>**(Text 1: Relevant topics from section 15.4, 15.5, 15.6, 15.7,15.8)** | **9** |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| ● 2 Questions from each module.<br>● Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | ● Each question carries 9 marks.<br>● Two questions will be given from each module, out of which 1 question should be answered.<br>● Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Compute the partial and total derivatives and maxima and minima of multivariable functions and to apply in engineering problems. | **K3** |
| **CO2** | Understand theoretical idea of multiple integrals and to apply them to find areas and volumes of geometrical shapes. | **K3** |
| **CO3** | Compute the derivatives and line integrals of vector functions and to learn their applications. | **K3** |
| **CO4** | Apply the concepts of surface and volume integrals and to learn their inter-relations and applications. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO3** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 |
| **CO4** | 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** | Calculus | H. Anton, I. Biven, S.Davis | Wiley | 12th edition, 2024 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Thomas' Calculus | Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki | Pearson | 15th edition, 2023 |
| **2** | Essential Calculus | J. Stewart | Cengage | 2nd edition, 2017 |
| **3** | Advanced Engineering Mathematics | Erwin Kreyszig | John Wiley & Sons | 10th edition, 2016 |
| **4** | Bird's Higher Engineering Mathematics | John Bird | Taylor & Francis | 9th edition, 2021 |
| **5** | Higher Engineering Mathematics | B. V. Ramana | McGraw-Hill Education | 39th edition, 2023 |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| **Module No.** | **Link ID** |
| 1 | https://nptel.ac.in/courses/111107108 |
| 2 | https://nptel.ac.in/courses/111107108 |
| 3 | https://nptel.ac.in/courses/111107108 |
| 4 | https://nptel.ac.in/courses/111107108 |

# SEMESTER S1/S2

# PHYSICS FOR ELECTRICAL SCIENCE

| | | | |
|---|---|---|---|
| **Course Code** | **GBPHT121** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 3:0:1:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory + Lab |

**Course Objectives:**

1.To provide students with a solid background in the fundamentals of Physics and to impart this knowledge in Electrical Science disciplines.

2.To develop scientific attitudes and enable students to correlate Physics concepts with their core programs.

3.To equip students with practical knowledge that complements their theoretical studies and develop their ability to create practical applications and solutions in engineering based on their understanding of Physics.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Semiconductor Physics**<br>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)<br>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), V-I Characteristics of p-n junction | **9** |

| | | |
|---|---|---|
| **2** | **Semiconductor Devices**<br>Semiconductor devices - Rectifiers- Full wave and Half wave, Zener diode - V-I characteristics - Zener breakdown and Avalanche breakdown, Tunnel diode - V-I characteristics, Applications of Zener and Tunnel diodes.<br>Photonic devices (qualitative) - Photo detectors (Junction and PIN photodiodes), Applications, Solar cells- V-I Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications of LED | **9** |
| **3** | **Superconductivity & Dielectrics**<br>Super conductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors, Applications of superconductors.<br>Dielectric constant, Polarization, Permittivity- relative permittivity, Relation between polarization and dielectric constant, Types of Polarization, Internal fields in liquids and solids, Clausius Mossotti Relation, Dielectric loss(qualitative), Dielectric breakdown (qualitative) | **9** |
| **4** | **Laser & Fiber Optics**<br>Optical processes - Absorption, Spontaneous emission and stimulated emission, Properties of laser, Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states, Basic components of laser - Active medium- Optical resonant cavity, Construction and working of Ruby laser, Semiconductor Laser (Qualitative), Applications of laser.<br>Optical fiber-Principle of propagation of light, Types of fibers-Step index and Graded index fibers, Numerical aperture –Derivation, Applications of optical fibers - Fiber optic communication system (block diagram) | **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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Explain the fundamentals of Semiconductor Physics. | **K2** |
| **CO2** | Describe the behaviour of semiconductor materials in semiconductor devices. | **K2** |
| **CO3** | Explain Superconductivity and basic theory of dielectrics | **K2** |
| **CO4** | Apply the comprehended knowledge about laser and fibre optics in various engineering applications | **K3** |
| **CO5** | Apply basic knowledge of principles and theories in physics to conduct experiments. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | | | | | | | 3 |
| **CO2** | 3 | | | | | | | | | | | 3 |
| **CO3** | 3 | | | | | | | | | | | 3 |
| **CO4** | 3 | 2 | | | | | | | | | | 3 |
| **CO5** | 3 | 2 | | | 3 | | | | 2 | | | 3 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Concepts of Modern Physics | Arthur Beiser | Tata McGraw Hill Publications | 6th Edition, 2003 |
| **2** | Engineering Physics | H K Malik and A K Singh | McGraw Hill | 2nd Edition, 2017 |
| **3** | A Textbook of Engineering Physics | MN Avadhanulu, P G Kshirsagar, TVS Arun murthy | S. Chand | 11th 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 | 2nd 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 | 10th Edition, 2022 |
| **5** | Introduction to Solid State Physics | Charles Kittel | Wiley India Edition | 2019 |
| **6** | Advanced Engineering Physics | Premlet B | Phasor Books | 10th Edition ,2017 |
| **7** | A Text Book of Engineering Physics | I. Dominic and. A. Nahari, | Owl Books Publishers | Revised Edition, 2016 |

| Video Links (NPTEL, SWAYAM etc) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://nptel.ac.in/courses/108106181 |
| **2** | https://nptel.ac.in/courses/108108112 |
| **3** | https://nptel.ac.in/courses/115103108 |
| **4** | https://nptel.ac.in/courses/115102124 |

## 3. Continuous Assessment (10 Marks)

**v. 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.

**vi. 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.

**vii. 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.

**viii. 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.*

## 4. Evaluation Pattern for Lab Examination (5 Marks)

**4. 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

**5. Result (2 Marks)**

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

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

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

## Experiment List

**Laboratory Experiments to be conducted in the virtual lab mode**

**(Minimum 6 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 |
| **8** | Characteristics of LED |
| **9** | Solar Cell- V-I and Intensity Characteristics |

| | |
|---|---|
| **10** | Laser – Determination of wavelength using diffraction grating |
| **11** | Laser- To measure the wavelength using a millimetre scale as a grating |
| **12** | Compare the variation of current with potential difference, for a metal, filament bulb and semiconductor diode. |
| **13** | Determination of dielectric constant |
| **14** | CRO -Measurement of frequency and amplitude of wave forms |
| **15** | Photo diode- V-I Characteristics |
| **16** | Numerical aperture of optical fiber |

# SEMESTER S1/S2

# CHEMISTRY FOR INFORMATION SCIENCE & ELECTRICAL SCIENCE

| **Course Code** | **GXCYT122** | **CIE Marks** | 40 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 3:0:1:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory+ Lab |

**Course Objectives:**

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

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Electrochemistry and Corrosion Science**<br>**Electrochemical Cell**- Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery & $H_2$-$O_2$ fuel cell (acid electrolyte only) construction and working.<br>**Corrosion** –Electrochemical corrosion mechanism (acidic & alkaline medium) - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of copper - Electroless plating of copper. | **9** |

| | | |
|---|---|---|
| **2** | **Materials for Electronic Applications**<br>**Nanomaterials** - Classification based on Dimension & Materials- Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials – Carbon Nanotubes, Fullerenes, Graphene & Carbon Quantum Dots – structure, properties & application.<br>**Polymers** - Fire Retardant Polymers- Halogenated & Non-halogenated polymers (Examples only)- Conducting Polymers-Classification-Polyaniline & Polypyrrole-synthesis, properties and applications.<br>**Organic electronic materials and devices**- construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC)<br>Materials used in Quantum computing Technology**,** Super capacitors, Spintronics | **9** |
| **3** | **Molecular Spectroscopy and Analytical Techniques**<br>**Spectroscopy**-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 $CO_2$ and $H_2O$ – Applications<br>**Thermal Analysis**: Dielectric Thermal Analysis (DETA) of Polymers-Working and Application.<br>**Electron Microscopic Techniques:** SEM - Principle, instrumentation and Applications. | **9** |
| **4** | **Environmental Chemistry**<br>**Water characteristics** - 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 & Significance. | **9** |

| | | |
|---|---|---|
| | **Waste Management**: 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. | |

**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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br><br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

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

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

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** | 3 | 3 | | | | | | | | | | 2 |
| **CO3** | 3 | 3 | | | | | | | | | | 2 |
| **CO4** | 3 | 3 | | | | 2 | 3 | | | | | 2 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **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 | 17th 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 | 4th 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** | https://archive.nptel.ac.in/courses/104/106/104106137/<br>https://archive.nptel.ac.in/courses/113/105/113105102/<br>https://archive.nptel.ac.in/courses/113/104/113104082/<br>https://www.youtube.com/watch?v=BeSxFLvk1h0 |
| **2** | https://archive.nptel.ac.in/courses/113/104/113104102/<br>https://archive.nptel.ac.in/courses/104/105/104105124/<br>https://archive.nptel.ac.in/courses/105/104/105104157/ |

## Continuous Assessment (10 Marks)

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

## Mark distribution

5. **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.

6. **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.
7. **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.
8. **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)

4. **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.

**5. Result (2 Marks)**

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

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

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

## List of Experiments
## Laboratory Experiments to be conducted in the virtual Mode

***Minimum 6 Experiments**

| 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>(c) Urea-formaldehyde resin<br>(d) Phenol-formaldehyde resin |
| **6** | Determination of wavelength of absorption maximum and colorimetric estimation of $Fe^{3+}$ in solution |
| **7** | Determination of molar absorptivity of a compound (KMnO4 or any water-soluble food colorant) |
| **8** | Analysis of IR spectra |
| **9** | Identification of drugs using TLC |

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

## Semester S1/S2

# ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **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. | **9** |

| | | |
|---|---|---|
| **2** | Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone and Cylinder only. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes. | **9** |
| **3** | **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)<br><br>**Development of Surfaces:** Development of surfaces of the solids and solids cut by different section planes. (Exclude problems with through holes) | **9** |
| **4** | **Isometric Projection:** Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Sphere, Hemisphere and their combinations.<br><br>**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) | **9** |

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

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

| Attendance | Assignment+ Lab Exam | Internal Examination-1 | Internal Examination- 2 | Total |
|---|---|---|---|---|
| **5** | **10+5** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*Student can choose any one full question out of two questions from each module*

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

**Course Outcomes (COs)**

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

| **Course Outcome** | | **Bloom's Knowledge Level (KL)** |
|---|---|---|
| **CO1** | Understand the projection of points and lines located in different Quadrants | **K2** |
| **CO2** | Prepare Multiview orthographic projections of objects by visualizing them in different positions | **K3** |
| **CO3** | Plot sectional views and develop surfaces of a given object | **K3** |
| **CO4** | Prepare pictorial drawings using the principles of isometric projection | **K3** |
| **CO5** | Sketch simple drawing using CAD tools. | **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** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | | | | | | | |
| **CO2** | 3 | 2 | | | | | | | | | | |
| **CO3** | 3 | 2 | | | | | | | | | | |
| **CO4** | 3 | 2 | | | | | | | | | | |
| **CO5** | 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 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 |
| **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** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **2** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **3** | https://archive.nptel.ac.in/courses/112/102/112102304/ |
| **4** | https://archive.nptel.ac.in/courses/112/102/112102304/ |

*B.Tech 2025–S1/S2*

# SEMESTER S1/S2

# ENGINEERING MECHANICS

| | | | |
|---|---|---|---|
| **Course Code** | **GBEST103** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 2-1-0-0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. The course aims to enable students to analyse and solve fundamental mechanics problems

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | Introduction to statics: introduction to branches of mechanics, concept of rigid body scalars and vectors, vector operations, forces in space. Support reactions of beams (point load and UDL only)<br>Force systems: rectangular components in 2D and 3D, moment and couple, resultants Equilibrium: system isolation and the free-body diagram, equilibrium conditions 2D and 3D | **10** |
| **2** | Friction: -laws of friction – analysis of blocks and ladder<br>Centroid of composite areas- – moment of inertia- parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia-ring and disc | **10** |
| **3** | Dynamics – rectilinear translation - equations of motion in kinematics and kinetics – D'Alembert's principle. –motion on horizontal and inclined surfaces, motion of connected bodies | **8** |
| **4** | Curvilinear translation - equations of kinematics projectile motion (solution starting from differential equations)<br>Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment | **8** |

*B.Tech 2025–S1/S2*

**Course Assessment Method (CIE: 40 marks, ESE: 60 marks)**
**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/ Microproject | Internal Examination- 1(Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

Course Outcomes (COs)

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

| | Course Outcome | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the vector representation of forces and moments | **K2** |
| **CO2** | Identify and describe the components of system of forces acting on the rigid body | **K3** |
| **CO3** | Apply the conditions of equilibrium to different force system. | **K3** |
| **CO4** | Identify appropriate principles to solve problems of mechanics. | **K3** |
| **CO5** | Develop the understanding of fundamental principles of rigid body dynamics | **K3** |

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

*B.Tech 2025–S1/S2*

**CO-PO Mapping Table:**

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

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Engineering Mechanics | Timoshenko and Young | McGraw Hill Publishers | 5th Edition 2017 |
| **2** | Engineering Mechanics: Combined Statics and Dynamics | Russell C. Hibbeler | Pearson Education, | 14th Edition 2015 |
| **3** | Engineering Mechanics - Statics and Dynamics, | Shames, I. H. | Prentice Hall ofIndia. | 4th Edition 2008 |
| **4** | Textbook of Engineering Mechanics | R. K. Bansal | Laxmi publications pvt ltd. | 4th Edition 2016 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Engineering Mechanics Statics | J. L. Meriam, L. G. | Wiley | *9th Edition 2020* |
| **2** | Engineering Mechanics | Kraige | PHI Learning | *2011* |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| | **Link ID** |
| **1** | https://nptel.ac.in/courses/112106286 |

*B.Tech 2025–S1/S2*

## SEMESTER S1/S2

# INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

*B.Tech 2025–S1/S2*

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

*B.Tech 2025–S1/S2*

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

*B.Tech 2025–S1/S2*

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

At the end of the course students should be able to

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

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

*B.Tech 2025–S1/S2*

**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 |

*B.Tech 2025–S1/S2*

| 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 |

*B.Tech 2025–S1/S2*

## SEMESTER S1/S2

## INTRODUCTION TO MECHANICAL ENGINEERING & CIVIL ENGINEERING

| **Course Code** | **GCEST104** | **CIE Marks** | 40 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 4-0-0-0 | **ESE Marks** | 60 |
| **Credits** | 4 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. Understand thermodynamic cycles and working of IC engines.
2. Understand the refrigeration cycles and psychrometric concepts.
3. Understand the relevance of civil engineering and its various disciplines.
4. Describe the relevance of various building codes and types of buildings as per NBC.
5. Understand different building components and building materials.

## SYLLABUS

| **Module No.** | **Syllabus Description** | **Contact Hours** |
|---|---|---|
| **1** | **General introduction to Mechanical Engineering:** Thermodynamic cycles -Carnot Cycle -Derivation of efficiency (problems on efficiency) Otto, Diesel cycles (no derivation of efficiency and problems).<br><br>**IC Engines:** CI & SI Engines, working of 2-Stroke & 4-Stroke engines. Listing the parts of IC Engines. Concept of CRDI, MPFI and hybrid engines.<br><br>**Refrigeration:** Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Psychrometric chart, Cooling and dehumidification, Layout of central air conditioning systems. | **9** |

| | | |
|---|---|---|
| **2** | Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines.<br><br>Different type of gears and its applications (spur, helical, bevel, worm and worm wheel), List types of clutches and their use, Bearings and their classification (Journal bearing and ball bearing)<br><br>**Manufacturing Process**: Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, SMAW, Soldering and Brazing and their applications.<br>**Machining processes:** Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing. | **9** |
| **3** | **General Introduction to Civil Engineering**: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering.<br>**Introduction to buildings:** Types of buildings according to character of occupancy as per NBC, Load bearing and non-load bearing building structures, components of a residential building and their functions (conceptonly).<br>Selection of site for a residential building.<br><br>Building Area Definitions: Built up area, Plinth area, Floor area, Carpet area and Floor area ratio of a building as per KBR.<br>Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion of relevance only). | **9** |
| **4** | **Conventional construction materials:** Brick, stone, sand, cement and timber- Classifications, Qualities, Tests and Uses of construction materials. **Cement concrete**: Constituent materials, properties and types. | **9** |

| | | |
|---|---|---|
| | **Tests on fresh and hardened concrete** - slump test, cube compressivestrength as per IS Codes.<br>**Steel:** Structural steel sections and steel reinforcements – types and uses.<br>**Soil**-Origin of soil-weathering of rocks, types of weathering | |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the relevance of mechanical engineering and its various disciplines. | **K2** |
| **CO2** | Learn the applications of thermodynamics through IC engines and refrigeration systems. | **K2** |
| **CO3** | Understand the various manufacturing processes adapted by mechanical engineers. | **K2** |
| **CO4** | Understand the relevance of civil engineering and its various disciplines. | **K2** |
| **CO5** | Describe the relevance of various building codes and types of buildings as per NBC | **K2** |
| **CO6** | Understand different building components and building materials. | **K2** |

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 | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | 2 |
| **CO4** | 3 | | | | | | | | | | | |
| **CO5** | 3 | | | | | | | 2 | | | | 2 |
| **CO6** | 3 | | | | | | | | | | | 2 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Basic Mechanical Engineering | Pravin Kumar | Pearson Education | 1st Edition,2013 |
| **2** | A Textbook of Basic MechanicalEngineering | R.K. Rajput | Laxmi Publications | 3rd Edition,2017 |
| **3** | Elements of Mechanical Engineering | K.P. Roy, S.K. Hajra Choudhury, A.K. Hajra Choudhury | Media Promoters & Publishers Pvt. Ltd. | Revised Edition, 2012 |
| **4** | Fundamentals of Mechanical Engineering | G.S. Sawhney | PHI Learning Pvt. Ltd. | 1st Edition,2013 |
| **5** | Essentials of Civil Engineering | Dalal K R | Charotar Publishing house | 1st Edition 2012 |
| **6** | Engineering Materials(Material Science) | Rangwala S C | Charotar PublishingHouse Pvt Limited | 43rd Edition2019 |
| **7** | Building Materials | Duggal S K | New Age International | 5thEdition2019 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Hybrid Electric Vehicles: Principles and Applicationswith Practical Perspectives | Chris Mi and M. Abul Masrur | John Wiley & Sons | 2nd Edition, 2017 |
| **2** | Automotive Engineering Fundamentals | Richard Stone and Jeffrey K. Ball | SAE International | 1st Edition, 2004 |
| **3** | Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing | Ian Gibson, David W. Rosen, and Brent Stucker | Springer | 2nd Edition, 2015 |
| **4** | Heating, Ventilating, and AirConditioning Analysis and Design | Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler | John Wiley & Sons | 6th Edition, 2005 |
| **5** | Materials for Civil and Construction Engineering | Mamlouk, M.S.,and Zaniewski, J.P | Pearson Publishers | 4th Edition, 2017 |
| **6** | Building Construction | Rangwala, S.C and Dalal, KB | Charotar Publishing house | 34th Edition 2022 |
| **7** | Construction Technology Vol.I to IV | Chudley, R | Longman group,England Course Plan | 2nd Edition 2014 |
| **8** | Building Construction Volumes1to4 | Mckay, W.B.and Mckay,J.K | Pearson India Education Services | 5th Edition |
| **9** | Engineering Geology | Duggal S. K., Pandey H.K. and Rawat N, | Mcgraw Hill Education, New Delhi | 1st Edition 2017 |
| **10** | Latest Building codes and related rules and regulations. | | | |

| **Video Links (NPTEL, SWAYAM…)** | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://nptel.ac.in/courses/112/105/112105123/<br>https://nptel.ac.in/courses/112/106/112106133/<br>https://nptel.ac.in/courses/112/105/112105129/ |
| **2** | https://nptel.ac.in/courses/112/105/112105171/<br>https://nptel.ac.in/courses/112/105/112105268/<br>https://archive.nptel.ac.in/courses/112/107/112107145 |
| **3** | https://archive.nptel.ac.in/courses/105/106/105106201/ |
| **4** | https://archive.nptel.ac.in/courses/105/106/105106206/ |

# SEMESTER S2

# PROGRAMMING IN C

| | | | |
|---|---|---|---|
| **Course Code** | **GXEST205** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 2:0:2:0 | **ESE Marks** | 60 |
| **Credits** | 3 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | 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

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **C Fundamentals** - 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>**Control Statements** - if, if-else, nested if, switch, while, do-while, for, break & continue, nested loops. | **9** |

| | | |
|---|---|---|
| **2** | **Arrays** - 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>**Strings** - Declaring a string variable, Reading and displaying strings, String related library functions – Programs for string matching. | **9** |
| **3** | **Functions** - Function definition, Function call, Function prototype, Parameter passing; Recursion; Passing array to function; Macros - Defining and calling macros; Command line Arguments.<br>**Structures** - Defining a Structure variable, Accessing members, Array of structures, Passing structure to function; Union.<br>**Storage Class** - Storage Classes associated with variables: automatic, static, external and register. | **9** |
| **4** | **Pointers -** 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>**Files**- 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(). | **9** |

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

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

| Attendance | Continuous Assessment (Lab) | 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 |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Infer a computational problem and develop C programs from them using basic constructs of C language including the control statements. | **K2** |
| **CO2** | Develop C programs using arrays, matrices, and strings. | **K3** |
| **CO3** | Utilize functions to find solution to the computational problems by dividing it into a number of modules and abstract data types. | **K3** |
| **CO4** | Develop C programs using pointers for dynamic data handling. | **K3** |
| **CO5** | Use files in C to permanently store and manipulate data. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | - | 1 | - | 1 | - | - | - | 1 |
| **CO2** | 3 | 3 | 3 | 3 | - | 1 | - | 1 | - | - | - | 1 |
| **CO3** | 3 | 3 | 3 | 3 | - | 1 | - | 1 | - | - | - | 1 |
| **CO4** | 3 | 3 | 3 | 3 | - | 1 | - | 1 | - | - | - | 1 |
| **CO5** | 3 | 3 | 3 | 3 | - | 1 | - | 1 | - | - | - | 1 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Programming with C | Byron S Gottfried | Mc Graw Hill Education | 4th Edition July 2018 |
| **2** | The C Programming Language | Brian W. Kernighan and Dennis Ritchie | Pearson | 2nd Edition January 2015 |
| **3** | C The Complete Reference | Herbert Schildt | Mc Graw Hill Education | 4th Edition July 2017 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Programming In Ansi C | E Balagurusamy | Mc Graw Hill | 8th Edition March 2019 |
| **2** | Programming in C | Kamthane | Pearson | 3rd Edition January 2015 |
| **3** | Let us C | Yashavant Kanetkar | Bpb publishers | 19th Edition December 2022 |
| **4** | Computer Programming in C | V Rajaraman | PHI Learning Private Limited | 2nd July 2019 |

**SEMESTER S2**

# ENGINEERING ETHICS AND SUSTAINABLE DEVELOPMENT

| | | | |
|---|---|---|---|
| **Course Code** | **UCHUT247** | **CIE Marks** | 50 |
| **Teaching Hours/Week (L: T:P: R)** | 2:0:0:0 | **ESE Marks** | 50 |
| **Credits** | 2 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. Equip with the knowledge and skills to make ethical decisions and implement gender-sensitive practices in their professional lives.
2. Develop a holistic and comprehensive interdisciplinary approach to understanding engineering ethics principles from a perspective of environment protection and sustainable development.
3. Develop the ability to find strategies for implementing sustainable engineering solutions.

**SYLLABUS**

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Fundamentals of ethics** - Personal vs. professional ethics, Civic Virtue, Respect for others, **Profession and Professionalism,** Ingenuity, diligence and responsibility, Integrity in design, development, and research domains, Plagiarism, a balanced outlook on law - challenges - case studies, **Technology and digital revolution**-Data, information, and knowledge, Cybertrust and cybersecurity, Data collection & management, **High technologies: connecting people and places**-accessibility and social impacts, **Managing conflict**, Collective bargaining, **Confidentiality**, Role of confidentiality in moral integrity, **Codes of Ethics**.<br>**Basic concepts in Gender Studies** - sex, gender, sexuality, gender spectrum: beyond the binary, gender identity, gender expression, gender stereotypes, **Gender disparity and discrimination in education**, employment and everyday life, History of women in Science & Technology, Gendered technologies & innovations**, Ethical values and practices in connection with gender** - equity, diversity & gender justice, **Gender policy and women/transgender empowerment initiatives.** | **6** |

| | | |
|---|---|---|
| **2** | **Introduction to Environmental Ethics:** Definition, importance and historical development of environmental ethics, key philosophical theories (anthropocentrism, biocentrism, ecocentrism). **Sustainable Engineering Principles:** Definition and scope, triple bottom line (economic, social and environmental sustainability), life cycle analysis and sustainability metrics. **Ecosystems and Biodiversity:** Basics of ecosystems and their functions, Importance of biodiversity and its conservation, Human impact on ecosystems and biodiversity loss, An overview of various ecosystems in Kerala/India, and its significance. **Landscape and Urban Ecology:** Principles of landscape ecology, Urbanization and its environmental impact, Sustainable urban planning and green infrastructure. | **6** |
| **3** | **Hydrology and Water Management:** Basics of hydrology and water cycle, Water scarcity and pollution issues, Sustainable water management practices, Environmental flow, disruptions and disasters. **Zero Waste Concepts and Practices:** Definition of zero waste and its principles, Strategies for waste reduction, reuse, reduce and recycling, Case studies of successful zero waste initiatives. **Circular Economy and Degrowth:** Introduction to the circular economy model, Differences between linear and circular economies, degrowth principles, Strategies for implementing circular economy practices and degrowth principles in engineering. **Mobility and Sustainable Transportation:** Impacts of transportation on the environment and climate, Basic tenets of a Sustainable Transportation design, Sustainable urban mobility solutions, Integrated mobility systems, E-Mobility, Existing and upcoming models of sustainable mobility solutions. | **6** |
| **4** | **Renewable Energy and Sustainable Technologies:** Overview of renewable energy sources (solar, wind, hydro, biomass), Sustainable technologies in energy production and consumption, Challenges and opportunities in renewable energy adoption. **Climate Change and Engineering Solutions:** Basics of climate change science, Impact of climate change on natural and human systems, Kerala/India and the Climate crisis, Engineering solutions to mitigate, adapt and build resilience to climate change. **Environmental Policies and Regulations:** Overview of key environmental policies and regulations (national and international), Role of engineers in policy implementation and compliance, Ethical considerations in environmental policy-making. **Case Studies and Future Directions:** Analysis of real-world case studies, Emerging trends and future directions in environmental ethics and sustainability, Discussion on the role of engineers in promoting a sustainable future. | **6** |

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

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

Continuous internal evaluation will be based on individual and group activities undertaken throughout the course and the portfolio created documenting their work and learning. The portfolio will include reflections, project reports, case studies, and all other relevant materials.

- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. These groups can be the same ones they have formed in the previous semester.
- Activities are to be distributed between 2 class hours and 3 Self-study hours.
- The portfolio and reflective 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 various

courses.

| Sl. No. | Item | Particulars | Group/Individual (G/I) | Marks |
|---|---|---|---|---|
| 1 | Reflective Journal | Weekly entries reflecting on what was learned, personal insights, and how it can be applied to local contexts. | I | 5 |
| 2 | Micro project<br><br>(Detailed documentation of the project, including methodologies, findings, and reflections) | 1 a) Perform an Engineering Ethics Case Study analysis and prepare a report<br>1 b) Conduct a literature survey on 'Code of Ethics for Engineers' and prepare a sample code of ethics | G | 8 |
| | | 2. Listen to a TED talk on a Gender-related topic, do a literature survey on that topic and make a report citing the relevant papers with a specific analysis of the Kerala context | G | 5 |
| | | 3. Undertake a project study based on the concepts of sustainable development* - Module II, Module III & Module IV | G | 12 |
| 3 | Activities | 2. One activity* each from Module II, Module III & Module IV | G | 15 |
| 4 | Final Presentation | A comprehensive presentation summarising the key takeaways from the course, personal reflections, and proposed future actions based on the learnings. | G | 5 |
| | | Total Marks | | **50** |

*Can be taken from the given sample activities/projects

**Evaluation Criteria:**

- **Depth of Analysis**: Quality and depth of reflections and analysis in project reports and case studies.
- **Application of Concepts**: Ability to apply course concepts to real-world problems and local contexts.
- **Creativity**: Innovative approaches and creative solutions proposed in projects and reflections.
- **Presentation Skills**: Clarity, coherence, and professionalism in the final presentation.

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Develop the ability to apply the principles of engineering ethics in their professional life. | **K3** |
| **CO2** | Develop the ability to exercise gender-sensitive practices in their professional lives | **K4** |
| **CO3** | Develop the ability to explore contemporary environmental issues and sustainable practices. | **K5** |
| **CO4** | Develop the ability to analyse the role of engineers in promoting sustainability and climate resilience. | **K4** |
| **CO5** | Develop interest and skills in addressing pertinent environmental and climate-related challenges through a sustainable engineering approach. | **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | 3 | 2 | 3 | 3 | 2 | | 2 |
| **CO2** | | 1 | | | | 3 | 2 | 3 | 3 | 2 | | 2 |
| **CO3** | | | | | | 3 | 3 | 2 | 3 | 2 | | 2 |
| **CO4** | | 1 | | | | 3 | 3 | 2 | 3 | 2 | | 2 |
| **CO5** | | | | | | 3 | 3 | 2 | 3 | 2 | | 2 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Ethics in Engineering Practice and Research | Caroline Whitbeck | Cambridge University Press & Assessment | 2nd edition & August 2011 |
| **2** | Virtue Ethics and Professional Roles | Justin Oakley | Cambridge University Press & Assessment | November 2006 |
| **3** | Sustainability Science | Bert J. M. de Vries | Cambridge University Press & Assessment | 2nd edition & December 2023 |
| **4** | Sustainable Engineering Principles and Practice | Bhavik R. Bakshi, | Cambridge University Press & Assessmen | 2019 |
| **5** | Engineering Ethics | M Govindarajan, S Natarajan and V S Senthil Kumar | PHI Learning Private Ltd, New Delhi | 2012 |
| **6** | Professional ethics and human values | RS Naagarazan | New age international (P) limited New Delhi | 2006. |
| | Ethics in Engineering | Mike W Martin and Roland Schinzinger, | Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi | 4" edition, 2014 |

**Suggested Activities/Projects:**

**Module-II**

- Write a reflection on a local environmental issue (e.g., plastic waste in Kerala backwaters or oceans) from different ethical perspectives (anthropocentric, biocentric, ecocentric).
- Write a life cycle analysis report of a common product used in Kerala (e.g., a coconut, bamboo or rubber-based product) and present findings on its sustainability.
- Create a sustainability report for a local business, assessing its environmental, social, and economic impacts
- Presentation on biodiversity in a nearby area (e.g., a local park, a wetland, mangroves, college campus etc) and propose conservation strategies to protect it.
- Develop a conservation plan for an endangered species found in Kerala.
- Analyze the green spaces in a local urban area and propose a plan to enhance urban ecology using native plants and sustainable design.
- Create a model of a sustainable urban landscape for a chosen locality in Kerala.

**Module-III**

- Study a local water body (e.g., a river or lake) for signs of pollution or natural flow disruption and suggest sustainable management and restoration practices.
- Analyse the effectiveness of water management in the college campus and propose improvements - calculate the water footprint, how to reduce the footprint, how to increase supply through rainwater harvesting, and how to decrease the supply-demand ratio
- Implement a zero waste initiative on the college campus for one week and document the challenges and outcomes.
- Develop a waste audit report for the campus. Suggest a plan for a zero-waste approach.
- Create a circular economy model for a common product used in Kerala (e.g., coconut oil, cloth etc).
- Design a product or service based on circular economy and degrowth principles and present a business plan.
- Develop a plan to improve pedestrian and cycling infrastructure in a chosen locality in Kerala

**Module-IV**

- Evaluate the potential for installing solar panels on the college campus including cost-benefit analysis and feasibility study.
- Analyse the energy consumption patterns of the college campus and propose sustainable alternatives to reduce consumption - What gadgets are being used? How can we reduce demand using energy-saving gadgets?
- Analyse a local infrastructure project for its climate resilience and suggest improvements.
- Analyse a specific environmental regulation in India (e.g., Coastal Regulation Zone) and its impact on local communities and ecosystems.
- Research and present a case study of a successful sustainable engineering project in Kerala/India (e.g., sustainable building design, water management project, infrastructure project).
- Research and present a case study of an unsustainable engineering project in Kerala/India highlighting design and implementation faults and possible corrections/alternatives (e.g., a housing complex with water logging, a water management project causing frequent floods, infrastructure project that affects surrounding landscapes or ecosystems).

# SEMESTER S1/S2

# BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

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

**Course 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

| **Expt. No.** | **Experiments** |
|---|---|
| **Electrical Workshop (Minimum of 7 Experiments to be done)** | |
| **1** | c) Demonstrate the precautionary steps adopted in case of Electrical shocks.<br>d) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings. |
| **2** | Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control. |
| **3** | Wiring of light/fan circuit using two-way switches. (Staircase wiring) |
| **4** | Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch. |
| **5** | Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter. |
| **6** | 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 |

| | |
|---|---|
| **7** | Familiarisation of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit. |
| **8** | c) Identify battery specifications using different types of batteries. (Lead acid, Li Ion,NiCd etc.)<br>d) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM). |

| **ELECTRONICS WORKSHOP**<br>**(Minimum of 7 Experiments to be done)** | |
|---|---|
| **1** | 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,<br>Crystals, Displays, Fasteners, Heat sink etc.) |
| **2** | Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's |
| **3** | Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO.<br>Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station |
| **4** | Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET. |
| **5** | Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processingmethods.<br>Design and fabrication of a single sided PCB for a simple circuit. |
| **6** | Inter-connection methods and soldering practice.<br>Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions.<br>Soldering practice in connectors and general-purpose PCB, Crimping. |
| **7** | Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)-<br>Fixed voltage power supply with transformer<br>• Rectifier diode<br>• Capacitor filter<br>• Zener/IC regulator<br>Square wave generation using IC 555 timer in IC base. |
| **8** | Assembling of electronic circuits using SMT (Surface Mount Technology) stations. |
| **9** | Introduction to EDA tools (such as KiCad or XCircuit) |

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

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

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

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

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ troubleshooting/ Programming | Result with valid inference/ Quality of Output | Viva 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 record.
- Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.
- There will not be any relaxation in the attendance requirement.

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Demonstrate safety measures against electrical shocks | **K2** |
| **CO2** | Familiarise with transformers, rheostats, batteries and earthing schemes | **K2** |
| **CO3** | Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits | **K3** |
| **CO4** | Identify various electronic components | **K2** |
| **CO5** | Operate various measuring instruments | **K3** |
| **CO6** | Apply the design procedure of simple electronic circuits on breadboard and PCB | **K3** |
| **CO7** | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | 3 | | | | | | 2 |
| **CO2** | 1 | | | | | 2 | 1 | | | | | 2 |
| **CO3** | 2 | | | | | 1 | | | | | | 2 |
| **CO4** | 3 | | | | | 2 | | | | | | 3 |
| **CO5** | 3 | | | | 3 | 2 | | | 2 | | | 3 |
| **CO6** | 3 | | 3 | 1 | 3 | 2 | 1 | | 2 | | | 3 |
| **CO7** | | | | | | | | | 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.

### 4. 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.

### 5. Viva Voce (10 Marks)

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

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

### 6. 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.

### 7. Conduct of Experiment/Execution of Work/Programming (15 Marks)

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

### 8. 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.

**9. 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.

**10. Record (5 Marks)**

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

## SEMESTER S1 /S2

## BASIC MECHANICAL AND CIVIL ENGINEERING LAB

| | | | |
|---|---|---|---|
| **Course Code** | **GCESL106** | **CIE Marks** | 50 |
| **Teaching Hours/Week (L: T:P: R)** | 0-0-2-0 | **ESE Marks (Internal only)** | 50 |
| **Credits** | 1 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Lab |

Course Objectives:

1.To enable the student to familiarize various tools, measuring devices, practices and differentmethods employed in the industry.

2.To enable the students to apply this experience while developing product/project for thebenefit of society.

| Expt. No. | Experiments (Minimum 12 Exercises) |
|---|---|
| **1** | General: Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals, O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc. |
| **2** | Carpentry: Understanding carpentry tools and knowledge of at least one model<br>1. T –Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joints |
| **3** | Foundry: Understanding of foundry tools and knowledge of at least one model<br>1. Bench Moulding 2. Floor Moulding 3. Core making 4. Pattern making |
| **4** | Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model<br>1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal |

| | |
|---|---|
| **5** | Fitting: Understanding the tools used for fitting and knowledge of at least one model<br>1. Square Joint 2. V- Joint 3. Male and female fitting |

| | |
|---|---|
| **6** | Plumbing: - Understanding plumbing tools and pipe joints, along with practicing one exercise on joining pipes using a minimum of three types of pipe joints |
| **7** | Smithy: - Understanding the tools used in smithy. Demonstrating the forge-ability of different materials (MS, Al, alloy steel and cast steels) in both cold and hot states.Observing the qualitative difference in the hardness of these materials. One exercise on smithy (Square prism ). |
| **8** | Welding: Understanding welding equipment and practicing at least one welding technique, such as making joints using electric arc welding. Bead formation in horizontal, vertical-and overhead positions |
| **9** | Assembly: Demonstration only Dissembling and assembling of<br>1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump or any other machine |
| **10** | Use of proper Personal Protective Equipments. Measurements using Tape, Ruler, Vernier calipers, screw gauge |
| **11** | Measuring the area of a plot with an irregular boundary using a chain and cross Staff |
| **12** | Measuring the area of a building using Distomat |
| **13** | Finding the level difference between two points using dumpy level |
| **14** | Onsite quality assessment of brick, and cement |

| | |
|---|---|
| **15** | Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall |
| **16** | Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall |
| **17** | Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows. |
| **18** | Setting out of a two roomed building using thread, tape and water tube levelling. |

| | |
|---|---|
| **19** | Conduct a market study to understand the types, prices, and general specifications of at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures, welding rods, fasteners etc.). |

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

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

| Attendance | Preparation/Pre-Lab Work, experiments, Viva and Timelycompletion of Lab Reports / Record (Continuous Assessment) | Total |
|---|---|---|
| 5 | 45 | 50 |

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

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ troubleshooting/ Programming | Result with valid inference/ Quality of Output | Viva 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 record.*
- *Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.*
- *There will not be any relaxation in the attendance requirement.*

Course Outcomes (COs)

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Identify workshop operations and instruments in accordance with the material and objects. | **K3** |
| **CO2** | Understand appropriate tools and instruments with respect to the workshop specializations. | **K2** |
| **CO3** | Apply various tools, measuring devices, practices and different methods employed in the industry. | **K3** |
| **CO4** | Examine the quality of common materials used in the industry. | **K3** |
| **CO5** | Conduct market study of various engineering materials and consumables available in the market. | **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** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | 2 | | 2 |
| CO2 | 3 | | | | | | | | | 2 | | 2 |
| CO3 | 3 | | | | 2 | | | | | 2 | | 3 |
| CO4 | 3 | | | | | | | | | 2 | | 3 |
| CO5 | 3 | | | | | | | | 2 | 3 | | 3 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Mechanical Workshop Practice | K C John | PHI Learning | Edition 2 2010 |
| **2** | Engineering Materials | S C Rangwala | Charotar Publishing House Pvt Limited | Edition 43 2019 |
| **3** | Building Materials | S K Duggal | New Age International | Edition 6 2025 |
| **4** | Indian Practical Civil EngineeringHandbook | Khanna P.N, | UBS Publishers Distributers (P) Ltd. | Year 2012 |
| **5** | Building Construction | Arora S.P and Bindra S.P | Dhanpat Rai Publications | Edition 5 Year 2022 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Elements of Workshop Technology Vol-1- ManufacturingProcesses | S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy | MPP Media Promoters and Publishers | 2008 |

| Video Links (NPTEL, SWAYAM…) |
|---|
| **Link ID** |
| https://archive.nptel.ac.in/courses/105/106/105106206/ |
| https://archive.nptel.ac.in/courses/105/106/105106201/ |
| https://archive.nptel.ac.in/courses/105/104/105104101/ |
| https://archive.nptel.ac.in/courses/117/106/117106108/ |

**Continuous Assessment (45 Marks)**

5. **Preparation and Pre-Lab Work (10 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.

6. **Conduct of Experiments (15 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.

7. **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 andmaintaining a well-organized fair record.

8. **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 (50 Marks)**

6. **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.

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

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

8. **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.

9. **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.

10. **Record (5 Marks)**

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

## SEMESTER S2

# NATIONAL SERVICE SCHEME/NATURECONSERVATION ACTIVITIES

| | | | |
|---|---|---|---|
| **Course Code** | **UCHUT128** | **CIE Marks** | 50 |
| **Teaching Hours/Week (L: T:P: R)** | 1:0:1:0 | **ESE Marks** | 0 |
| **Credits** | 0 | **Exam Hours** | Nil |
| **Prerequisites (if any)** | None | **Course Type** | |

**Course Objectives:**

1. **To instill environmental and social responsibility.**
2. **To promote drug-free lifestyles and prevent substance abuse among youth.**
3. **To empower students through hands-on service and awareness programs.**
4. **To engage with communities on issues of ecology, health, and youth well-being.**
5. **Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.**

**SYLLABUS**

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **NSS Foundation & Youth Engagement:**History, motto, objectives of NSS,Role of youth in nation-building,Volunteerism and leadership.<br><br>**Environmental Conservation:**Biodiversity and ecosystem balance,Environmental pollution, waste management,Climate change and its impact on society.<br><br>**HEALTH, HYGIENE, SANITATION AND YOGA:** Importance of health, hygiene, and sanitation, various Govt., Programmes, Healthy life style, HIV /AIDS, drugs and substance abuse, First Aids, Yoga for healthy living | **6** |

| | | |
|---|---|---|
| **2** | **Advanced Conservation and Community Initiatives:**Water and soil conservation methods, Clean energy and sustainable practices,Local biodiversity mapping,Organic farming and kitchen garden initiatives.<br>**Drug Abuse Prevention & Social Health:**Role of family, school, and peer group in prevention, Case studies on addiction and recovery, Role of NSS volunteers in anti-drug campaigns ,Collaboration with local NGOs, rehabilitation centers, law enforcement<br><br>**Disaster Preparedness & Community Resilience:**Disaster risk reduction and climate adaptation,First aid, emergency response,Volunteer roles during natural calamities | **6** |
| **3** | **Field Activities :**<br>**1.Environmental & Nature Conservation Activities**<br>Tree Plantation Drives<br>➢ Conducted on campus or in nearby villages<br>➢ Include awareness talks on benefits of afforestation<br>Campus Cleanliness and Beautification<br>➢ Weekly clean-up drives under *Swachh Bharat Abhiyan*<br>➢ Installation of dustbins and eco-friendly signage<br><br>Plastic-Free Zone Campaign<br><br>➢ Replace single-use plastics on campus<br>➢ Awareness stalls and poster exhibitions<br><br>Waste Segregation & Composting Unit<br><br>➢ Set up basic waste segregation system | **10** |

| | | |
|---|---|---|
| | ➢ Vermicomposting demonstration or setup<br><br>Nature Trails and Biodiversity Walks<br><br>➢ Field visits to national parks, sanctuaries, or local eco-parks<br>➢ Flora-fauna identification and mapping<br><br>**2.Disaster Management & Emergency Preparedness**<br><br>• **Mock Drills & Training**<br><br>Fire safety, first aid, and evacuation procedures<br><br>• **Flood/Drought Relief Work**<br><br>Volunteer support during natural calamities<br><br>Distribution of food packets, clothes, medicines<br><br>• **Road Safety Awareness Drive**<br><br>Reflective stickers, helmets, traffic rules education | |
| **4** | **3.Health, Hygiene & Drug Awareness Activities**<br>Drug Abuse Awareness Rally<br>➢ Collaboration with NGOs or Narcotics Bureau<br>➢ Posters, placards, slogans, and street plays<br><br>• **Health Check-up Camps**<br><br>➢ In collaboration with local health departments<br>➢ Free medical and dental check-ups for rural or urban poor<br><br>**Personal Hygiene Awareness in Schools**<br><br>➢ Demonstrations and kits distribution in government schools<br><br>**Yoga and Mental Wellness Workshops** | **8** |

| | | |
|---|---|---|
| | ➢ Daily or weekly sessions during camps or regular activity hours<br><br>4.**Community Development Activities**<br><br>**Village Adoption Program**<br><br>➢ Identify a nearby village for year-round development efforts<br>➢ Focus areas: sanitation, education, clean water, livelihood<br><br>**Adult Education/Literacy Campaigns**<br><br>➢ Evening teaching programs in slums or rural areas<br><br>**Digital Literacy Program**<br><br>➢ Teach basic smartphone/internet usage to villagers or senior citizens<br><br>**Awareness Drives**<br><br>Topics: Child labor, gender equality, legal rights, voting rights | |

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

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

| Attendance | Case Study/Micro project/Field Visit | 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) |
|---|---|---|
| **CO1** | Understand the importance of his / her responsibilities towards society. | **K2** |
| **CO2** | Analyse the environmental and societal problems/issues and will be able to design solutions for the same. | **K4** |
| **CO3** | Evaluate the existing system and to propose practical solutions for the same for sustainable development. | **K5** |
| **CO4** | Implement government or self-driven projects effectively in the field. | **K3** |
| **CO5** | Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general. | **K6** |

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** | 1 | 2 | ----- | ---- | ------ | 3 | 2 | 2 | 3 | 2 | --- | 2 |
| **CO2** | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | --- | 2 |
| **CO3** | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 |
| **CO4** | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 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** | National Service Scheme (NSS) – A Handbook | Ministry of Youth Affairs & Sports | Government of India, | Revised Edition 2021 |
| **2** | Disaster Management | Harsh K. Gupta | Universities Press | Latest Edition 2020 |
| **3** | Value Education and Human Rights<br>R. R. Gaur, R. Sangal, G.<br>Excel Books | R. R. Gaur, R. Sangal, G Excel Books | AICTE Recommended | 2021 Edition |

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

Students will be evaluated as follows.

<table>
<tr><th>Title</th><th>Method of Evaluation</th></tr>
<tr><td>Attendance</td><td>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.</td></tr>
<tr><td>Case study/Micro Project/field Visit</td><td>Case study will be given to students to assess their understanding of the subjects taught. .Students will be awarded a total of 20 marks based on their fieldwork, social projects, group campaign or presentation, and submitted assignments or reports.</td></tr>
<tr><td>Activity Evaluation</td><td>Students must take part in at least 8 activities and submit a report to get the 20 marks.<br>Field Activity – Evaluation Mark Split-Up<br>(Total: 20 Marks)<br>Component — Marks<br>Participation in minimum 8 activities — 8 marks<br>Report submission (clarity & completeness) — 4 marks<br>Final group campaign or presentation — 4 marks<br>Involvement, teamwork & initiative — 4 marks<br>Total — 20 marks<br>Note:Last Activity Report should be signed by NSS Officer & Faculty Coordinator</td></tr>
</table>

# PROGRAMME CORE 1

## SEMESTER S2

## NETWORK THEORY

| | | | |
|---|---|---|---|
| **Course Code** | **PCECT206** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 3:1:0:0 | **ESE Marks** | 60 |
| **Credits** | 4 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. To analyze electrical networks using Mesh / Nodal methods /network theorems
2. To analyze transient behavior of electrical networks using Laplace transform
3. To identify the network functions and parameters of single-port and two-port networks.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Network fundamentals and analysis methods:**<br><br>Concept of networks and circuits, Circuit variables, Ideal and practical sources, Independent and dependent sources, Source transformation, Kirchhoff's laws. Mesh analysis, Node analysis, Super-mesh analysis and super-node analysis applied to both DC and AC networks containing independent and dependent sources. | **11** |

| | | |
|---|---|---|
| **2** | **Network theorems and applications**: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Millman's theorem and Maximum power transfer theorem for the analysis of DC and AC networks having independent and dependent sources. | **11** |
| **3** | **Laplace transforms and transient analysis:** Laplace transforms of standard signals and common functions, Laplace transform theorems (proof not required), Inverse Laplace transforms, Solution of differential equations. Transformation of basic signals and circuits to s – domain with and without initial conditions. Transient analysis of RL, RC and RLC networks with DC, impulse, step and sinusoidal inputs. Analysis of low pass and high pass RC circuits using Laplace transforms. | **11** |
| **4** | **Network functions and two-port parameters:** Network functions for single-port and two-port networks, Properties of driving point and transfer functions, Significance of poles and zeros of network functions, Pole-zero plot. Impedance, Admittance, Hybrid and Transmission parameters of two- port networks, Reciprocity and symmetry conditions (derivation not required), Inter-relationships between parameters, Series and parallel connections of two-port networks. | **11** |

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

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

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (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 full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Analyze electrical networks using mesh and node methods | **K4** |
| **CO2** | Apply network theorems to analyze electrical networks | **K3** |
| **CO3** | Analyze transient behavior of electrical networks using Laplace transforms | **K4** |
| **CO4** | Identify the network functions and parameters of single-port and two-port networks | **K2** |

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 | | | | | | | | | 2 |
| **CO2** | 3 | 3 | 2 | | | | | | | | | 2 |
| **CO3** | 3 | 3 | 3 | 2 | | | | | | | | 2 |
| **CO4** | 3 | 3 | 2 | 3 | | | | | | | | 2 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Basic Engineering Circuit Analysis | R. Mark Nelms, J. David | Irwin Wiley | 12/e, 2020 |
| **2** | Network Analysis and Synthesis | Franklin F. Kuo | Wiley | 2/e, 2012 |
| **3** | Circuits and Networks- Analysis and Synthesis | Sudhakar A and Shyammohan S. P | McGraw Hill | 5/e, 2015 |
| **4** | Network Analysis | Van Valkenburg M.E | Prentice Hall India | Revised 3/e,2019 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Circuit Theory Analysis and Synthesis | Abhijit Chakrabarti | Dhanpat Rai & Co. | Revised 7/e, 2018 |
| **2** | Electric Circuits – Schaum's Outline Series | Joseph A. Edminister, K. Rao and M. Nahvi | McGraw-Hill | 5/e, 2017 |
| **3** | Electric Circuits and Networks | K. S. Suresh Kumar | Pearson | 2008 |
| **4** | Network analysis and synthesis | Ravish R | McGraw-Hil | 2/e,2015 |