EE

# VIMAL JYOTHI

ENGINEERING COLLEGE (AUTONOMOUS)

CHEMPERI - KANNUR I WWW.VJEC.AC.IN


# VJEC B. Tech. Syllabus 2024

## Semester III

## Electrical and Electronics Engineering

**Branch Code: EE**

# SEMESTER S3
# MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE-3
# (Common to B & C Groups)

| | | | |
|---|---|---|---|
| **Course code** | **GYMAT301** | **CIE Marks** | **40** |
| **Teaching Hours/Week (L:T:P:R)** | **3:0:0:0** | **ESE Marks** | **60** |
| **Credits** | **3** | **Exam Hours** | **2Hrs. 30 MIn** |
| **Prerequisites (if any)** | **Basic knowledge in complex numbers** | **Course Type** | **Theory** |

## Course Objectives:

1. To introduce the concept and applications of Fourier transforms in various engineering fields.
2. To introduce the basic theory of function of a complex variable, including residue integration and conformal transforms, and their applications.

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | Fourier integral,From Fourier series to Fourier integral, Fourier cosine and Sine integrals,Fourier Cosine and Sine transforms,Linearity,Transforms of Derivatives,Fourier Transform and its inverse,Linearity, Transforms of Derivative.<br>**(Text1: Relevant topics from sections 11.7, 11.8, 11.9)** | 9 |
| 2 | Complex Function, Limit, Continuity, Derivative, Analytic functions, Cauchy-Riemann Equations(without proof), Laplace's Equations, Harmonic functions, Finding harmonic conjugate, Conformal mapping, Mappings of $w=z^2$, $w=e^z$, $w=\frac{1}{z}$, w=sinz<br>**(Text1: Relevant topics from sections 13.3,13.4,17.1,17.2,17.4)** | 9 |
| 3 | Complex Integration: Line integrals in the complex plane (Definition& Basic properties), First evaluation method, Second evaluation method, Cauchy's integral theorem(without proof) on simply connected domain, Independence of path, Cauchy integral theorem on multiply connected Domain (without proof), Cauchy Integral formula(without proof)<br>**(Text1: Relevant topics from sections 14.1,14.2,14.3)** | 9 |
| 4 | Taylor series and maclaurin series, Laurent series(without proof), Singularities and Zeros-Isolated Singularity, Poles, essential Singularities, Removable singularities, Zeros of Analytic functions-Poles and Zeros, Formulas for Residues, Residue theorem(without proof), Residue integration-Integral of rational Functions of $\cos\theta$ & $sin\theta$<br>**(Text1: Relevant topics from sections 15.4.16.1,16.2,16.3,16.4)** | 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) | Internal Examination-3 (written) | Total |
|---|---|---|---|---|---|
| 5 | 15 | 5 | 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>$(8\times 3 = 24\ Marks)$ | • 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>$(4\times 9 = 36\ Marks)$ | 60 |

**Course Outcomes (COs) and Assessment Tool**

| Course Outcomes | | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| CO1 | Determine the Fourier transforms of functions and apply them to solve problems arising in engineering. | K3 | Written Exam & Assignments |
| CO2 | Understand the analyticity of complex functions and apply it in conformal mapping. | K3 | |
| C03 | Compute complex integrals using Cauchy's integral theorem and Cauchy's integral formula. | K3 | |
| CO4 | Understand the series expansion of complex function about a singularity and apply residue theorem to compute real integrals. | K3 | |

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

**CO-PO Mapping Table**

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

| **Text Book** | | | | |
|---|---|---|---|---|
| **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 Wily &Sons | 10th edition,2016 |

| **REFERENCE BOOKS** | | | | |
|---|---|---|---|---|
| **Sl.No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Complex Analysis | Dennis G.Zill, Patrick D.Shanahan | Jones& Bartlett | 3rd edition,2015 |
| 2 | Higher Engineering Mathematics | B.V Ramana | McGraw-Hill Education | 39th edition,2023 |
| 3 | Higher Engineering Mathematics | B.S Grewal | Khanna Publishers | 44th edition, 2018 |
| 4 | Fast Fourier Transforms-Algorithms and applications | K.R.Rao, Do Nyeon Kim, Jae Jeong Hwang | Springer | 1st edition, 2011 |

# SEMESTER S3

# CIRCUITS & NETWORKS

| | | | |
|---|---|---|---|
| **Course Code** | **PCEET302** | **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)** | Introduction to Electrical Engineering | **Course Type** | Theory |

**Course Objectives:**

1. This course analyses electrical circuits in steady-state and dynamic conditions with DC and sinusoidal excitations
2. It also describes the two-port networks in terms of various parameters.

**SYLLABUS**

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Mesh analysis and nodal analysis** (Review only) - super mesh and super node -Superposition principle - source transformation – analysis with DC and AC (sinusoidal) excitation.<br>**Network Theorems** - Thevenin's theorem - Norton's theorem - Maximum power transfer theorem - analysis with DC and AC (sinusoidal) excitation with independent and dependent sources. Reciprocity Theorem-application to the analysis of DC Circuits. | **12** |
| **2** | **Resonance** - series resonance– resonant frequency – variations of impedance and current with frequency – bandwidth – quality factor– parallel resonance (series RL in parallel with C –calculation of resonant frequency).<br>**Power in 3-phase circuits** – complex power - active, reactive and apparent power in balanced load – steady state analysis of 3-wire unbalanced delta connected circuit - steady state analysis of 3-phase4-wire and 3-wire unbalanced star connected circuit – neutral shift | **12** |
| **3** | Laplace transforms (Review only)<br>**Transient response** –Transient response of simple series and parallel RL and RC circuits with DC excitation and initial conditions – natural response and forced response – time constant - solution using Laplace transforms – transformed circuits in s-domain – solution using mesh analysis and nodal analysis<br>Transient response of series RLC circuit with DC excitation and initial conditions - solution using Laplace transforms | **12** |

| | | |
|---|---|---|
| | Transient response of simple series and parallel RL and RC circuits with sinusoidal excitation and zero initial conditions – solution using Laplace transforms | |
| **4** | **Two port networks** – Z, Y, h, T parameters – conditions for symmetry and reciprocity – relationship between parameters – interconnection of two port networks – series, parallel and cascade Coupled circuit – dot convention – fixing of dots – coefficient of coupling - conductively coupled equivalent circuit - sinusoidal steady state analysis of coupled circuits. | **9** |

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

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

| Attendance | Assignment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Written) | Total |
|---|---|---|---|---|---|
| 5 | 15 | 5 | 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 9marks.<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=36marks)** | **60** |

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level(KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Apply circuit theorems to solve complex DC and AC electric networks | **K3** | **Written exam and Assignment** |
| **CO2** | Apply transformation from time domain to s-domain, solve dynamic electric circuits. | **K3** | **Written exam** |
| **CO3** | Solve series and parallel resonant circuits | **K3** | **Written exam** |
| **CO4** | Analyse three-phase networks in star and delta configurations under balanced and unbalanced conditions. | **K3** | **Written exam** |

| | | | |
|---|---|---|---|
| **CO5** | Describe two-port networks in terms of various parameters. | **K3** | **Written exam and Assignment** |
| **CO6** | Explain the steady-state behavior of coupled circuits with sinusoidal excitation | **K3** | **Written exam** |

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

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

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | | | | | | 3 |
| **CO2** | 3 | 3 | | | | | | | | | 3 |
| **CO3** | 3 | 3 | | | | | | | | | 3 |
| **CO4** | 3 | 3 | | | | | | | | | 3 |
| **CO5** | 3 | 3 | | | | | | | | | 3 |
| **CO6** | 3 | 3 | | | | | | | | | 3 |

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

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl.No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Network Analysis | Van Valkenburg | Pearson | 3rd 2019 |
| 2 | Network Analysis and Synthesis | Ravish R Singh | Mc Graw Hill Education | 2nd 2019 |
| 3 | Electric Circuits & Networks | Suresh Kumar | Pearson | Ist 2008 |
| 4 | Circuits and Networks, Analysis and Synthesis | A Sudhakar, Shyammohan S Palli | Mc Graw Hill Education | 5th 2017 |

| **Video Links (NPTEL,SWAYAM…)** | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | NPTEL :: Electrical Engineering - NOC:Network Analysis |
| **2** | NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits |

## SEMESTER S3

# DC MACHINES & TRANSFORMERS

| | | | |
|---|---|---|---|
| **Course Code** | **PCEET303** | **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. Describe the constructional details, working and analyse the performance of DC machines and transformers under various load conditions.

## SYLLABUS

| Module No | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Constructional details of dc machines** - armature winding - lap and wave – simplex, progressive only – winding diagrams of simplex, lap wound, double layer, 12-slot, 4-pole, dc armature with 12 commutator segments – winding diagram of simplex wave wound, double layer, 16-slot, 6-pole, dc armature with 12 commutator segments (winding diagram not for evaluation)<br>**DC generator** - principle of operation of DC generator – emf equation – numerical problems,<br>**Classification DC generators** – steady-state equations – numerical problems<br>**DC shunt generator** - no-load characteristics – critical field resistance, critical speed, voltage build-up - load characteristics – numerical problems<br>**Armature reaction** - cross magnetising & demagnetising effect (computation of ampere-turns not required) – compensating winding – interpoles – commutation (concept only) – numerical problems<br>**Power flow diagram** – losses and efficiency – maximum efficiency - numerical problems<br>**Parallel operation of DC shunt generators** – load sharing – numerical problems | **15** |

| | | |
|---|---|---|
| **2** | **DC motor** – back emf – torque equation – numerical problems Classification of DC motors – steady-state equations – numerical problems<br>**Characteristics of DC motors** – numerical problems<br>**Starting of DC motors** – 3-point starter<br>**Braking** – regenerative braking, dynamic braking and plugging (concepts only)<br>**Speed control of DC shunt and series motors** – field control and armature control – numerical problems<br>**Power flow diagram** – losses and efficiency – numerical problems **Testing -** Swinburne's test – Hopkinson's test – retardation test - separation of rotational losses. | **12** |
| **3** | **Single phase transformers** – constructional details - principle of operation - EMF equation - ideal and practical transformer – numerical problems<br>**Operation on no load and on load** - phasor diagram at different load conditions - equivalent circuit - voltage regulation – numerical problems<br>**Losses and efficiency** - condition for maximum efficiency – numerical problems<br>**Testing of transformers** - polarity test - OC test, SC test - Sumpner's test – separation of losses | **10** |
| **4** | **Autotransformer** – saving of copper – numerical problems<br>**3- phase transformer** – construction - different connections of 3-phase transformers - Y-Y, Δ-Δ, Y-Δ, Δ-Y – numerical problems<br>**Difference between power transformer and distribution transformer** – all day efficiency – numerical problems<br>**Scott connection** for 3-phase to 2-phase conversion<br>**Vector groupings** – Yy0, Dd0, Yd1, Yd11, Dy1, Dy11<br>**Parallel operation of 1-phase and 3-phase transformers** - essential and desirable conditions<br>**On load and off-load tap-changers** | **8** |

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

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

| Attendance | Assignment | Internal Examination-1 (Written) | Internal Examination-2 (Written) | Internal Examination-3 (Written) | Total |
|---|---|---|---|---|---|
| 5 | 15 | 5 | 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 9marks.<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=36marks)** | **60** |

**Course Outcomes (COs)**

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

| CO | Course Outcome | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Describe the constructional details of DC machines. | **K2** | Written Exam |
| **CO2** | Analyse the performance DC generator under various load conditions. | **K3** | Written Exam & Assignment |
| **CO3** | Analyse the performance DC motor under various load conditions. | **K3** | Written Exam & Assignment |
| **CO4** | Analyse the performance of 1-phase transformer and auto-transformer under various load conditions. | **K3** | Written Exam & Assignment |
| **CO5** | Describe the constructional details and operation of 3-phase transformers. | **K2** | Written Exam |

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

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

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

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

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Electrical Machinery | P. S. Bimbhra | Khanna Publishers | 7th edition 2021 |
| 2 | Electric Machines | D P Kothari & I J Nagrath | Tata Mc Graw Hill | 5th edition 2017 |
| 3 | DC Machines & Transformers | K Murugesh Kumar | Vikas Publishing House | 2nd edition 2004 |
| 4 | Theory & Performance of Electrical Machines | J.B. Gupta | S K Kataria | 15th edition 2022 |

**Video Links (NPTEL, SWAYAM…)**

| Sl. No. | Link ID |
|---|---|
| **1** | *https://archive.nptel.ac.in/courses/108/105/108105155/* |
| **2** | *https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-ee24/* |

## SEMESTER S3

# ANALOG ELECTRONICS

| Course Code | PBEET304 | CIE Marks | 60 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:0:0:1 | ESE Marks | 40 |
| Credits | 4 | Exam Hours | 2 Hrs.30 Min. |
| Prerequisites (if any) | None | Course Type | Theory |

**Course Objectives:**

1. At the end of the course the student will be able to design of analog electronic systems using BJT, FET and OP-Amp

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Review of Bipolar Junction Transistor-** Introduction to DC Biasing – Base Bias – Voltage Divider Bias<br>**Common Emitter Amplifier** – AC concepts —Role of coupling capacitors and emitter bypass capacitor- Common Emitter AC equivalent circuit Amplifier Gain - Calculation of amplifier gains and impedances using h parameter equivalent circuit.<br>**Emitter Follower Amplifier**<br>**Power Amplifiers -**AC load line – RC Coupled amplifiers – Transformer coupled Class A amplifiers – Class B amplifiers (Derivation of efficiency) – Class AB amplifiers – Class C and Class D amplifiers | **9** |
| 2 | **Introduction to JFET** – JFET biasing circuits – Common Source Amplifier<br>**Introduction to MOSFET -**MOSFET construction -D-MOSFET, EMOSFET-Complementary MOSFET<br>**Amplifier Frequency Response** – Basic concepts – BJT amplifier Frequency response – FET amplifier Frequency Response<br>**Feedback and Oscillator circuits** – Feedback concepts – Feedback connection types – Practical Feedback circuits<br>**Oscillators** – Phase Shift Oscillator (Expression of frequency oscillation)– Wien Bridge Oscillator – Tuned Oscillator circuits – Crystal Oscillator | **9** |
| 3 | **Introduction to Operational Amplifiers (Op-Amps)** – Operation Overview – Differential amplifiers and Op-Amp Specifications -Gain, CMRR and slew rate<br>**Op- Amp Circuits** – Inverting Amplifiers – Non inverting Amplifiers – Summing and Difference Amplifiers – Instrumentation Amplifiers | **9** |

| | | |
|---|---|---|
| | Differentiator and Integrator circuits-practical circuits Comparators: Zero crossing and voltage level detectors, Schmitt trigger. | |
| **4** | **Active Filters** – Butterworth, Chebyshev and Bessel Filters, Low pass filter – high pass filter -band pass and notch filters- Butterworth<br>**Wave form generation using Op-Amps**: Square, triangular and ramp generator circuits using Op-Amp- Effect of slew rate on waveform generation.<br>**Timer555 IC**: Internal diagram of 555 IC– Astable and Monostable multivibrators using 555 IC | **9** |

*In this curriculum Analog Electronics is the first Project Based Learning Course for the Electrical and Electronics Engineering students.*

*Project-Based Learning (PBL) is a student-centered teaching approach where the teacher serves as a facilitator and advisor.*

*Students are encouraged to think the need of the society and industry. Select a project topic relevant to the present society as well as covers topics in the syllabus.*

*In the first step they start defining problem statement with requirements and specifications.*

*In the second step, students work in groups to discover optimal and creative solutions by sharing their unique and inventive ideas for solutions.*

*They begin designing and developing components using contemporary tools and technology in the third level. Design the circuit and simulate it using available simulation tools. Also perform the hardware implementation to make it a product*

**Project Topic Suggestions:**

1. Regulated power supply
2. Electronic Thermometer with diode/transistor/instrumentation amplifier
3. Audio Amplifier
4. Multistage amplifiers
5. Biomedical signal processing devices
6. RF Transmitter

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

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

| Attendance | Project | Internal Examination-1 (Written) | Internal Examination-2 (Written ) | Internal Examination-3 (Written ) | Total |
|---|---|---|---|---|---|
| 5 | 35 | 5 | 10 | 5 | 60 |

**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. Total of 8 Questions<br>• each carrying 2 marks<br>**(8x2=16 marks)** | • 2 questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 2 sub divisions.<br>• Each question carries 6 marks.<br>**(4x6=24marks)** | **40** |

**Course Outcomes (COs)**

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

| CO | Course Outcome | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Design BJT and FET amplifier circuits | **K6** | Written Exam and Project |
| **CO2** | Design Oscillator circuits | **K3** | Written Exam |
| **CO3** | Design and develop various OPAMP application circuits. | **K6** | Written Exam and Project |
| **CO4** | Implementation of active filters | **K6** | Written Exam and Project |
| **CO5** | Implement an electronic hardware circuit for the solution of a real time problem | **K6** | Project |

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

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

| CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | | | | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | | | | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | | | | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | | | | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |

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

| **TextBooks** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Introductory Electronic Devices And Circuits | Robert T Paynter | Pearson Education | 7th edition 2008 |
| **2** | Electronic devices and Circuit Theory | Boylestad R. L.and L. Nashelsky | Pearson Education | 11th edition 2012 |
| **3** | Electronic Circuits : Analysis And Design | Donald A Neaman | Mc Graw Hill Companies | 2nd edition 2000 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl.No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition And Year** |
| **1** | Fundamentals of Analog Circuits | Floyd T.L. | Pearson Education | 2nd edition 2001 |
| **2** | Op-Amps and Linear Integrated Circuits | Gayakward R.A. | PHI Learning Pvt. Ltd. | 4th edition 2001 |
| **3** | Electronic Devices and Circuits | David A Bell | Oxford Higher Education | 5th edition 2008 |
| **4** | Linear Integrated Circuits | Choudhury R. | New Age International Publishers | 6th edition 2022 |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://archive.nptel.ac.in/courses/108/105/108105158/ |
| **2** | https://archive.nptel.ac.in/courses/108/102/108102112/ |
| **3** | https://nptel.ac.in/courses/108106084 |
| **4** | https://www.allaboutcircuits.com/latest/analog/ |
| **5** | https://www.electronicsforu.com/ |

**PBL Course Elements**

| **L:Lecture (3 Hrs.)** | **R:Project(1Hr.),2FacultyMembers** | | |
|---|---|---|---|
| | **Tutorial** | **Practical** | **Presentation** |
| Lecture delivery | Project identification | Simulation/ Laboratory Work/ Workshops | Presentation (Progress and Final Presentations) |
| Group discussion | Project Analysis | Data Collection | Evaluation |
| Question answer Sessions/ Brain storming Sessions | Analytical thinking and self-learning | Testing | Project Milestone Reviews, Feedback, Project reformation (If required) |
| Guest Speakers (Industry Experts) | Case Study/ Field Survey Report | Prototyping | Poster Presentation/ Video Presentation: Students present their results in a 2 to 5 Minutes video |

**Assessment and Evaluation for Project Activity**

| **Sl.No** | **Evaluation for** | **Allotted Marks** |
|---|---|---|
| 1 | Project Planning and Proposal | 5 |
| 2 | Contribution in Progress Presentations and Question Answer Sessions | 4 |
| 3 | Involvement in the project work and Team Work | 3 |
| 4 | Execution and Implementation | 10 |
| 5 | Final Presentations | 5 |
| 6 | Project Quality, Innovation and Creativity | 3 |
| **Total** | | **30** |

1. **Project Planning and Proposal (5 Marks)**

   Clarity and feasibility of the project plan

   Research and background understanding

   Defined objectives and methodology

2. **Contribution in Progress Presentation and Question Answer Sessions (4 Marks)**

   Individual contribution to the presentation

   Effectiveness in answering questions and handling feedback

3. **Involvement in the Project Work and Team Work (3 Marks)**

   Active participation and individual contribution

   Teamwork and collaboration

4. **Execution and Implementation (10 Marks)**

   Adherence to the project timeline and milestones

   Application of theoretical knowledge and problem-solving

   Final Result

5. **Final Presentation (5 Marks)**

   Quality and clarity of the overall presentation

   Individual contribution to the presentation

   Effectiveness in answering questions

6. **Project Quality, Innovation, and Creativity (3 Marks)**

   Overall quality and technical excellence of the project

   Innovation and originality in the project

   Creativity in solutions and approach.

## SEMESTER S3

# INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

## (Common to Group B and C)

| | | | |
|---|---|---|---|
| **Course Code** | **GYEST305** | **CIA 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. Demonstrate a solid understanding of advanced linear algebra concepts, machine learning algorithms and statistical analysis techniques relevant to engineering applications, principles and algorithms.
2. Apply theoretical concepts to solve practical engineering problems, analyze data to extract meaningful insights, Implement appropriate mathematical and computational techniques for AI and data science applications.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | **Introduction to AI and Machine Learning**: Basics of Machine Learning - types of Machine Learning systems-challenges in ML- Supervised learning model example- regression models- Classification model example- Logistic regression-unsupervised model example- K-means clustering. Artificial Neural Network, Types of Neural networks - Perceptron - Universal Approximation Theorem (statement only)- Multi-Layer Perceptron - Deep Neural Network- demonstration of regression and classification problems using MLP.(Text-2). | **11** |

| | | |
|---|---|---|
| **2** | **Mathematical Foundations of AI and Data science:**Role of linear algebra in Data representation and analysis – Matrix decomposition- Singular Value Decomposition (SVD)- Spectral decomposition- Dimensionality reduction technique-Principal Component Analysis (PCA). (Text-1) | **11** |
| **3** | **Applied Probability and Statistics for AI and Data Science:**Basics of probability-random variables and statistical measures - rules in probability- Bayes theorem and its applications- statistical estimation-Maximum Likelihood Estimator (MLE) - statistical summaries- Correlation analysis- linear correlation (direct problems only)- regression analysis- linear regression (using least square method) (Text book 4) | **11** |
| **4** | **Basics of Data Science:** Benefits of data science - use of statistics and Machine Learning in Data Science - data science process - applications of Machine Learning in Data Science - modelling process- demonstration of ML applications in data science - Big Data and Data Science. (Text book-5) | **11** |

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

**Continuous Internal Assessment Marks (CIA):**

| **Attendance** | **Assignment/ Micro project/ IBM data science certification** | **Internal Examination-1 (Written)** | **Internal Examination-2 (Written)** | **Internal Examination- 3 (Written)** | **Total** |
|---|---|---|---|---|---|
| **5** | **15** | **5** | **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 =24 marks)** | • 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 subdivisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs) and Assessment Tool**

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

| | Course Outcome | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Apply the concept of machine learning algorithms including neural networks and supervised/unsupervised learning techniques for engineering applications. | **K3** | Written exam |
| **CO2** | Apply advanced mathematical concepts such as matrix operations, singular values, and principal component analysis to analyze and solve engineering problems**.** | **K3** | Written exam |
| **CO3** | Analyze and interpret data using statistical methods including descriptive statistics, correlation, and regression analysis to derive meaningful insights and make informed decisions. | **K3** | Written exam |
| **CO4** | Integrate statistical approaches and machine learning techniques to ensure practically feasible solutions in engineering contexts. | **K3** | Written exam |

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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | | | | | | | 3 |
| **CO2** | 3 | 3 | 3 | 3 | | | | | | | 3 |
| **CO3** | 3 | 3 | 3 | 3 | | | | | | | 3 |
| **CO4** | 3 | 3 | 3 | 3 | | | | | | | 3 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Introduction to Linear Algebra | Gilbert Strang | Wellesley-Cambridge Press | 6th edition, 2023 |
| **2** | Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow | Aurélien Géron | O'Reilly Media, Inc. | 2nd edition,2022 |
| **3** | Mathematics for machine learning | Deisenroth, Marc Peter,A. Aldo Faisal, and Cheng Soon Ong | Cambridge University Press | 1st edition. 2020 |
| **4** | Fundamentals of mathematical statistics | Gupta, S. C., and V. K. Kapoor | Sultan Chand & Sons | 9th edition, 2020 |
| **5** | Introducing data science: big data, machine learning, and more, using Python tools | Cielen, Davy, and Arno Meysman | Simon and Schuster | 1st edition, 2016 |

| Reference Books | | | | |
|---|---|---|---|---|
| 1 | Data science: concepts and practice | Kotu, Vijay, and Bala Deshpande | Morgan Kaufmann | 2nd edition, 2018 |
| 2 | Probability and Statistics for Data Science | Carlos Fernandez - Granda | Center for Data Science in NYU | 1st edition, 2017 |
| 3 | Foundations of Data Science | Avrim Blum, John Hopcroft, and Ravi Kannan | Cambridge University Press | 1st edition, 2020 |
| 4 | Statistics For Data Science | James D. Miller | Packt Publishing | 1st edition, 2019 |
| 5 | Probability and Statistics - The Science of Uncertainty | Michael J. Evans and Jeffrey S. Rosenthal | University of Toronto | 1st edition, 2009 |
| 6 | An Introduction to the Science of Statistics: From Theory to Implementation | Joseph C. Watkins | chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj https://www.math.arizo | Preliminary Edition. |

## SEMESTER S3/S4

## ECONOMICS FOR ENGINEERS

## (Common to All Groups)

| | | | |
|---|---|---|---|
| **Course Code** | **UCHUT346** | **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. Understanding of finance and costing for engineering operation, budgetary planning and control
2. Provide fundamental concept of micro and macroeconomics related to engineering industry.
3. Deliver the basic concepts of Value Engineering

## SYLLABUS

| Module No | Syllabus Description | Contact Hours |
|---|---|---|
| **1** | Basic Economics Concepts - Basic economic problems – Production Possibility Curve – Utility – Law of diminishing marginal utility – Law of Demand - Law of supply – Elasticity - measurement of elasticity and its applications – Equilibrium- Changes in demand and supply and its effects Production function - Law of variable proportion – Economies of Scale – Internal and External Economies – Cobb-Douglas Production Function | **6** |
| **2** | Cost concepts – Social cost, private cost – Explicit and implicit cost – Sunk cost - Opportunity cost - short run cost curves - Revenue concepts Firms and their objectives – Types of firms – Markets – Perfect Competition – Monopoly - Monopolistic Competition - Oligopoly (features and equilibrium of a firm) Behavioral Economics – Decision-making biases, bounded rationality, and engineering applications. | **7** |
| **3** | Monetary System – Money – Functions - Central Banking – Inflation - Causes and Effects – Measures to Control Inflation - Monetary and Fiscal policies – Deflation Taxation – Direct and Indirect taxes (merits and demerits) – GST, National income – Concepts - Circular Flow – Methods of Estimation and Difficulties - Stock Market – Functions- Problems faced by the Indian stock market – Demat Account and Trading Account – Stock market Indicators SENSEX and NIFTY | **6** |

| | | |
|---|---|---|
| **4** | Value Analysis and value Engineering - Cost Value, Exchange Value, Use Value, Esteem Value - Aims, Advantages and Application areas of Value Engineering - Value Engineering Procedure - Break-even Analysis – Cost Benefit Analysis - Capital Budgeting - Process planning | **6** |

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

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

| Attendance | Micro Project | Internal Examination-1 | Internal Examination- 2 | Internal Examination- 3 | Total |
|---|---|---|---|---|---|
| 5 | 25 | 5 | 10 | 5 | 50 |

**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 |
|---|---|---|
| • Minimum 1 and Maximum 2 Questions from each module<br>• Total of 6 Questions, each carrying 3 marks<br>**(6x3 =18 marks)** | • Two questions will be given from each module, out of which l question should be answered.<br>• Each question can have a maximum of 2 sub divisions.<br>• Each question carries 8 marks<br>**(4x8 = 32 marks)** | 50 |

**Course Outcomes (COs)**

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

| CO | Course Outcome | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| CO l | Understand the fundamentals of various economic issues using laws and learn the concepts of demand, supply, elasticity and production function. | K2 | Internal Exams and Micro Project |
| CO 2 | Develop decision making capability by applying concepts relating to costs and revenue, and acquire knowledge regarding the functioning of firms in different market situations. | K3 | |
| CO 3 | Outline the macroeconomic principles of monetary and fiscal systems, national income and stock market. | K2 | |

| | | | |
|---|---|---|---|
| CO 4 | Make use of the possibilities of value analysis and engineering, and solve simple business problems using break even analysis, cost benefit analysis and capital budgeting techniques. | K3 | |

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

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

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

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Managerial Economics | Geetika, Piyali Ghosh and Chodhury | Tata McGraw Hill | 2015 |
| 2 | Engineering Economy | H. G. Thuesen, W. J. Fabrycky | PHI | 1966 |
| 3 | Engineering Economics | R. Paneerselvam | PHI | 2012 |
| 4 | Thinking, Fast and Slow | Daniel Kahneman | Farrar, Straus and Giroux | 2011 |
| 5 | An Introduction to Behavioral Economics (3rd ed.) | Wilkinson, N., & Klaes M | Macmillan International Higher Education | 2018 |

| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Engineering Economy | Leland Blank P.E, Anthony Tarquin P. E | Mc Graw Hill | 7TH Edition |
| 2 | Indian Financial System | Khan M. Y. | Tata McGraw Hill | 2011 |
| 3 | Engineering Economics and analysis | Donald G. Newman, Jerome P. Lavelle | Engg. Press, Texas | 2002 |
| 4 | Contemporary Engineering Economics | Chan S. Park | Prentice Hall of India Ltd | 2001 |

## SEMESTER S3/S4

## ENGINEERING ETHICS AND SUSTAINABLE DEVELOPMENT

(Common to All Groups)

| | | | |
|---|---|---|---|
| **Course Code** | **UCHUT347** | **CIE Marks** | 50 |
| **Teaching Hour/Week (L:T:P:R)** | 2:0:0:0 | **ESE Marks** | 50 |
| **Credits** | 2 | **Exam Hours** | 2Hrs. 30 Min. |
| **Prerequisites (if any)** | None | **Course Type** | Theory |

**Course Objectives:**

1. Equip with the knowledge and skills to make ethical decision and implement gender-sensitive practices in their professional lives.

2. Develop a holistic and comprehensive interdisciplinary approach to understanding engineering ethics principles from a prospective of Environment Protection and sustainable development.

3. Develop the ability to find Strategies for implementing sustainable Engineering solutions.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hour |
|---|---|---|
| 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 and 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 and technology, Gendered technology and innovations, Ethical value 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 | **6** |

| | | |
|---|---|---|
| | 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. | |
| **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):**

| Attendance | Portfolio | Internal Examination-1 | Internal Examination- 2 | Internal Examination- 3 | Total |
|---|---|---|---|---|---|
| **5** | **25** | **5** | **10** | **5** | **50** |

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 | 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.

**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 |
|---|---|---|
| • Minimum of one question from each module.<br>• Total of 6 questions, each carrying 3 marks.<br><br>**(6 x 3 = 18 marks)** | • Each question carries 8 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 subdivisions.<br><br>**(4 x 8 = 32 marks)** | **50** |

**Course Outcomes (COs)**

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

| Course Outcomes | | Bloom's Knowledge Level (KL) | Assessment Tool |
|---|---|---|---|
| CO1 | Develop the ability to apply the principles of engineering ethics in their professional life. | K3 | Written exam, Portfolio and course end survey |
| 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. | K3 | |
| 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 – Analysis, K5 – Evaluate, K6 – Create*

**CO-PO Mapping Table**:

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

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

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition & 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 & Assessment | 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 |
| 7 | 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 S3

# CIRCUITS AND MEASUREMENTS LAB

| **Course Code** | **PCEEL307** | **CIE Marks** | 50 |
|---|---|---|---|
| **Teaching Hours/Week (L: T:P: R)** | 0:0:0:3 | **ESE Marks** | 50 |
| **Credits** | 2 | **Exam Hours** | 2Hrs.30Min. |
| **Prerequisites(if any)** | 1. GXEST104: Introduction to Electrical and Electronics Engineering<br>2. PCEET205: Measurements and Instrumentation | **Course Type** | Lab |

**Course Objectives:**

1. To train the students to familiarize and practice various measuring instruments and different transducers for measurement of physical parameters.
2. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing basic instrumentation systems.

| **Expt. No.** | **Experiments** |
|---|---|
| **1** | Verification of Superposition theorem. |
| **2** | Verification of Thevenin's theorem |
| **3** | Determination of impedance, admittance and power factor in RLC series circuit and to study the effect of reactive components on power factor . |
| **4** | 3-phase power measurement using two-wattmeter method, and determination of reactive/apparent power drawn. |
| **5** | Resistance measurement using Wheatstone's bridge and extension of range of voltmeters. |
| **6** | Resistance measurement using Kelvin's bridge and extension of range of voltmeters. |
| **7** | Extension of instrument range using instrument transformers (CT and PT). |
| **8** | Calibration of 1-phase Energy meter at various power factors and phantom loading (minimum 3 conditions). |
| **9** | Calibration of 3-phase Energy meter using standard wattmeter |

| | |
|---|---|
| **10** | Determination of B-H curve, μ-H curve and μ-B curve of a magnetic specimen |
| **11** | Measurement of self inductance, Mutual inductance, and Coupling coefficient of a 1-phase transformer. |
| **12** | Calibration of meters (Ammeter/Voltmeter) using Potentiometers. |
| **13** | Determination of characteristics of transducers: LVDT, Strain gauge, and Load-cell |
| **14** | Demo experiments/ Simulation of circuits using the software MATLAB<br>(a) Measurement of energy using Bidirectional meter<br>(b) Familiarize smart energy meter<br>(c) Measurement of electrical parameter using clamp on meter<br>(b) Measurement of electrical variables using DSO<br>(c) Power quality analyzers<br>(d) Simulation of Circuits using software platform- Electric Vehicle Modeling, battery management etc. |

10 experiments are mandatory out of 14 experiments.

**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)** | **Internal Examination** | **Total** |
|---|---|---|---|
| 5 | 25 | 20 | 50 |

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

| **Procedure/ Preparatory work/Design/ Algorithm** | **Conduct of experiment/ Execution of work/ trouble shooting/ 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.
- Endorsement by External Examiner: The external examiner shall endorse the record.

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level(KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Analyse voltage current phasor relations of RLC circuits | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO2** | Verify DC network theorems by setting up various electric circuits | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO3** | Measure power in single and three phase circuits by various methods | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO4** | Determine the calibration characteristics of various meters used in electrical systems | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO5** | Determine magnetic characteristics of different electrical devices | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO6** | Analyze the characteristics of various types of transducer systems | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO7** | Determine electrical parameters using various bridges | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO8** | Analyze the performance of various electric circuits using modern tools. | **K3** | Continuous Internal Evaluation, End semester examination |

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

**CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | P10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | | | 2 | | | 3 | 3 | 1 |
| CO2 | 3 | 3 | 2 | | | | | 2 | | | 3 | 3 | 1 |
| CO3 | 3 | 3 | | | | | | 2 | | | 3 | 3 | 1 |
| CO4 | 3 | 3 | | | | | | 2 | | | 3 | 3 | 1 |
| CO5 | 3 | 3 | | | | | | 2 | | | 3 | 3 | 1 |
| CO6 | 3 | 3 | 2 | | 3 | | | 2 | | | 3 | 3 | 1 |
| CO7 | 3 | 3 | | | | | | 2 | | | 3 | 3 | 1 |
| CO8 | 3 | 3 | 2 | | 3 | | | 3 | | | 3 | 3 | 1 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | A course in Electrical and Electronic Measurements & Instrumentation, | A.K. Sawhney | Dhanpat Rai Publishers | 2023 |
| 2 | A course in Electrical& Electronic Measurement & Instrumentation | J.B. Gupta | S.K. Kataria & Sons Publishers | 14th Ed., 2014 |
| 3 | Electronic Instrumentation | Kalsi H.S | Tata Mc Graw Hill, New Delhi. | *4th Ed., 2019* |

**Continuous Assessment (25 Marks)**

1. **Preparation and Pre-Lab Work (7 Marks)**
    - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
    - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (7 Marks)**
    - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
    - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
    - Teamwork: Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (6 Marks)**
    - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
    - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (5 Marks)**
    - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

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

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

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
    - 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 Experiment/Execution of Work/Programming (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. Result with Valid Inference/Quality of Output (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.

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

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

**5. Record (5 Marks)**

Completeness, clarity, and accuracy of the lab record submitted

## ASSESSMENT RUBRICS

**Preparation and Pre-Lab Work (7 Marks)**

| Description | Score | Marks Scored |
|---|---|---|
| Fully prepared, pre-lab work complete and detailed | 7 | |
| Well prepared with minor omissions. | 6 | |
| Good preparation, some missing points. | 5 | |
| Partially prepared; pre-lab work incomplete. | 4 | |
| Minimal preparation. | 3 | |
| Very poor preparation. | 2 | |
| Almost no preparation. | 1 | |
| Not prepared at all. | 0 | |

- **Conduct of Experiments (7 Marks)**

| Description | Score | Marks Scored |
|---|---|---|
| Excellent execution, all steps followed with precision. | 7 | |
| Experiment conducted very well with minor slips. | 6 | |
| Good execution with some errors. | 5 | |
| Basic experiment done but lacks accuracy. | 4 | |
| Poor conduct, key steps missed. | 3 | |
| Very poor execution. | 2 | |
| Attempted but largely incorrect. | 1 | |
| Not done. | 0 | |

- **Lab Reports and Record Keeping (6 Marks)**

| Description | Score | Marks Scored |
|---|---|---|
| Complete, neat, and accurate records. | 6 | |
| Well written with small errors. | 5 | |
| Good, but needs improvements. | 4 | |
| Incomplete or untidy. | 3 | |
| Major parts missing. | 2 | |
| Very poor record. | 1 | |
| No report submitted. | 0 | |

- **Viva Voce (5 Marks)**

| Description | Score | Marks Scored |
|---|---|---|
| Excellent understanding and confident answers. | 5 | |
| Good understanding with minor mistakes. | 4 | |
| Moderate knowledge with some difficulty. | 3 | |
| Poor understanding. | 2 | |
| Very limited responses. | 1 | |
| Did not attend or answer. | 0 | |
| Total marks (out of 25) | | |
| Signature of the staff | | |

# SEMESTER S3

# ANALOG ELECTRONICS LAB

| Course Code | PCEEL308 | CIE Marks | 50 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 0:0:3:0 | ESE Marks | 50 |
| Credits | 2 | Exam Hours | 2Hrs.30Min. |
| Prerequisites(if any) | Nil | Course Type | Lab |

**Course Objectives:**

1. Design of Transistor and Op-amp Circuits
2. Simulation and hardware implementation of the circuits

| Expt. No. | Experiments |
|---|---|
| 1 | Clipping circuits using diodes |
| 2 | Clamping circuits using diodes. |
| 3 | Basic RC circuits- High pass and Low pass filters |
| 4 | Emitter Follower Amplifier |
| 5 | RC coupled amplifier using BJT in CE configuration - Measurement of gain, BW and plotting of frequency response. |
| 6 | Design and testing of voltage regulators – Zener and series |
| 7 | Design and set-up of inverting and non-inverting amplifiers. |
| 8 | Op-amps circuits - Scale changer, adder, integrator, and differentiator. |
| 9 | Precision rectifier using Op-amp. |
| 10 | Op- Amp Oscillators – RC Phase shift and Wien Bridge Oscillator |
| 11 | Waveform generation– Triangular and saw tooth waveform generation using OPAMPs. |
| 12 | Basic comparator and Schmitt trigger circuits using Op-amp (Use comparator ICs such as LM311). |
| 13 | Astable and Monostable circuit using 555IC. |
| 14 | Simulate and observe the generation of a sinusoidal waveform using a Wien Bridge Oscillator model using MATLAB. |
| 15 | Simulate a small-signal BJT amplifier using MATLAB and study voltage gain and phase shift. |

10 experiments are mandatory out of 13 experiments.

**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) | Internal Examination | Total |
|---|---|---|---|
| 5 | 25 | 20 | 50 |

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

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ trouble shooting/ 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.
- Endorsement by External Examiner: The external examiner shall endorse the record.

**Course Outcomes (COs)**

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

| Course Outcome | | Bloom's Knowledge Level(KL) | Assessment Tool |
|---|---|---|---|
| **CO1** | Use the various electronic instruments and for conducting experiments. | **K1** | Continuous Internal Evaluation, End semester examination |
| **CO2** | Design and develop various electronic circuits using diodes and Zener diodes. | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO3** | Design and implement amplifier and oscillator circuits using BJT and JFET. | **K3** | Continuous Internal Evaluation, End semester |

| | | | |
|---|---|---|---|
| | | | examination |
| **CO4** | Design and implement basic circuits using IC (OPAMP and 555 timers). | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO5** | Simulate electronic circuits using any circuit simulation software. | **K3** | Continuous Internal Evaluation, End semester examination |
| **CO6** | Use PCB layout software for circuit design | **K2** | Continuous Internal Evaluation, End semester examination |

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

**CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | P10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | | | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 3 | | | 3 | 3 | | | 3 | 1 |
| CO3 | 2 | 3 | 3 | 3 | 3 | | | 3 | 3 | | | 3 | 1 |
| CO4 | 2 | 3 | 3 | 3 | 3 | | | 3 | 3 | | | 3 | 1 |
| CO5 | 2 | 3 | 3 | 3 | 3 | | | 3 | 3 | | | 3 | 1 |
| CO6 | 3 | | | | | | | 3 | 3 | | | 3 | 1 |

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Introductory Electronic Devices And Circuits | Robert T Paynter | Pearson Education | 6th 2020 |
| 2 | Electronic devices and Circuit Theory | Boylestad R.L. and L. Nashelsky | Pearson Education | 11th 2012 |
| 3 | Electronic Circuits: Analysis And Design | Donald A Neaman | Mc Graw Hill Companies | 3rd 2006 |

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5. **Record (5 Marks)**
    - Completeness, clarity, and accuracy of the lab record submitted

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| Moderate knowledge with some difficulty. | 3 | |
| Poor understanding. | 2 | |
| Very limited responses. | 1 | |
| Did not attend or answer. | 0 | |
| Total marks (out of 25) | | |

## CERTIFICATE OF APPROVAL

This is to certify that the syllabus for the courses of **Semester 3 of the B.Tech Programme in Electrical and Electronics Engineering** has been reviewed and duly approved by the following academic bodies of **Vimal Jyothi Engineering College**:

1. The **Board of Studies in Electrical and Electronics Engineering**, in its meeting held on **29/04/2025.**
2. The **Academic Council**, in its meeting held on **12/5/2025**.

This syllabus shall be implemented **with effect from the academic year 2025–2026 onwards**.

5/6/25

HoD/~~Program Coordinator~~

Dean Academics

Principal

PRINCIPAL
VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI - 670632

VIMAL JYOTHI ENGINEERING COLLEGE
Dated.....
CHEMPERI-670 632