

|           |                                |          |   |   |   |   |        |                         |
|-----------|--------------------------------|----------|---|---|---|---|--------|-------------------------|
| 25UECL305 | ELECTRONIC<br>CIRCUITS – I LAB | Category | L | T | P | R | Credit | Year of<br>Introduction |
|           |                                | PCL      | 0 | 0 | 3 | 0 | 2      | 2025                    |

**Preamble:** The course familiarizes the students with the design, analysis, and practical implementation of analog electronic circuits using discrete components along with simulation-based verification of circuit behavior.

**Prerequisite:** Nil

**Course Outcomes (COs):** At the end of the course students should be able to:

| CO  | Course Outcomes                                                                                                        | Knowledge Level |
|-----|------------------------------------------------------------------------------------------------------------------------|-----------------|
| CO1 | Apply circuit concepts to analyze wave shaping circuits, feedback circuits, and oscillators using discrete components. | K3<br>Apply     |
| CO2 | Apply the principles of amplifier and voltage regulator circuits to determine their performance parameters.            | K3<br>Apply     |
| CO3 | Apply simulation tools to analyze wave shaping circuits, amplifiers, feedback circuits, and oscillators.               | K3<br>Apply     |
| CO4 | Apply simulation tools to implement electronic circuits and determine their performance characteristics.               | K3<br>Apply     |

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

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 3   | 2   | 2   | -   | -   | -   | 3   | 3   | -    | 3    | 3    | 2    |
| CO2 | 3   | 3   | 3   | 2   | -   | -   | -   | 3   | 3   | -    | 3    | 3    | 3    |
| CO3 | 3   | 3   | 2   | 2   | 3   | -   | -   | 3   | 3   | -    | 3    | 3    | 2    |
| CO4 | 3   | 3   | 3   | 2   | 3   | -   | -   | 3   | 3   | -    | 3    | 3    | 3    |
| Avg | 3   | 3   | 2.5 | 2   | 3   | -   | -   | 3   | 3   | -    | 3    | 3    | 2.5  |

#### Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

|     | WK1 | WK2 | WK3 | WK4 | WK5 | WK6 | WK7 | WK8 | WK9 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | *   | *   | *   | *   | *   |     |     | *   |     |

|            |   |   |   |   |   |   |  |   |  |
|------------|---|---|---|---|---|---|--|---|--|
| <b>CO2</b> | * | * | * | * | * |   |  | * |  |
| <b>CO3</b> | * | * | * | * | * | * |  | * |  |
| <b>CO4</b> | * | * | * | * | * | * |  | * |  |

#### Wks Mapped with the Course

| <b>WK1</b> | <b>WK2</b> | <b>WK3</b> | <b>WK4</b> | <b>WK5</b> | <b>WK6</b> | <b>WK7</b> | <b>WK8</b> | <b>WK9</b> |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| *          | *          | *          | *          | *          | *          |            | *          |            |

| <b>Expt. No.</b>                                                                                  | <b>Experiments</b>                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Part A – List of Experiments using discrete components<br/>(Any Six experiments mandatory)</b> |                                                                                                                                                                                    |
| 1                                                                                                 | RC Integrator and Differentiator - Study transient response and frequency response of RC integrating and differentiating circuits.                                                 |
| 2                                                                                                 | <ul style="list-style-type: none"> <li>Diode Clipping and Clamping Circuits - Study the operation and characteristics of clipping and clamping circuits.</li> </ul>                |
| 3                                                                                                 | <ul style="list-style-type: none"> <li>CE BJT Amplifier - Design a CE amplifier for a given voltage gain and plot its frequency response.</li> </ul>                               |
| 4                                                                                                 | <ul style="list-style-type: none"> <li>CS MOSFET Amplifier - Design a CS MOSFET amplifier for a given voltage gain and plot its frequency response.</li> </ul>                     |
| 5                                                                                                 | <ul style="list-style-type: none"> <li>Cascaded CE Amplifier - Design a two-stage CE amplifier and study gain and bandwidth.</li> </ul>                                            |
| 6                                                                                                 | <ul style="list-style-type: none"> <li>Cascode Amplifier - Design a cascode amplifier and study its frequency response.</li> </ul>                                                 |
| 7                                                                                                 | <ul style="list-style-type: none"> <li>Feedback Amplifiers - Study current-series and voltage-series feedback amplifiers and their gain.</li> </ul>                                |
| 8                                                                                                 | <ul style="list-style-type: none"> <li>RC Oscillator - Study RC phase shift or Wien bridge oscillator and measure frequency of oscillation.</li> </ul>                             |
| 9                                                                                                 | <ul style="list-style-type: none"> <li>Class B and Class AB Power Amplifiers - Study operation and performance characteristics.</li> </ul>                                         |
| 10                                                                                                | <ul style="list-style-type: none"> <li>Transistor Series Voltage Regulator - Design a voltage regulator and study load and line regulation with and without protection.</li> </ul> |

| <b>Part B – Simulation Experiments (Any Six experiments mandatory)</b><br>The experiments shall be conducted using Open-Source Tools such as QUCS, KiCad, LT SPICE, or variants of SPICE tools. |                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                                                                                                               | RC Integrator and Differentiator - Study transient response and frequency response of RC integrating and differentiating circuits. |
| 2                                                                                                                                                                                               | Diode Clipping and Clamping Circuits - Study the operation and characteristics of clipping and clamping circuits.                  |
| 3                                                                                                                                                                                               | CE BJT Amplifier - Design a CE amplifier for a given voltage gain and plot its frequency response.                                 |
| 4                                                                                                                                                                                               | CS MOSFET Amplifier - Design a CS MOSFET amplifier for a given voltage gain and plot its frequency response.                       |
| 5                                                                                                                                                                                               | Cascaded CE Amplifier - Design a two-stage CE amplifier and study gain and bandwidth.                                              |
| 6                                                                                                                                                                                               | Cascode Amplifier - Design a cascode amplifier and study its frequency response.                                                   |
| 7                                                                                                                                                                                               | Feedback Amplifiers - Study current-series and voltage-series feedback amplifiers and their gain.                                  |
| 8                                                                                                                                                                                               | RC Oscillator - Study RC phase shift or Wien bridge oscillator and measure frequency of oscillation.                               |
| 9                                                                                                                                                                                               | Class B and Class AB Power Amplifiers - Study operation and performance characteristics.                                           |
| 10                                                                                                                                                                                              | Transistor Series Voltage Regulator - Design a voltage regulator and study load and line regulation with and without protection.   |

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

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

| Attendance | Preparation/Pre-Lab Work experiments,<br>Viva and Timely completion of Lab Reports /<br>Record<br>(Continuous Assessment) | Internal<br>Examination | Total |
|------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|
|------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|

|          |           |           |           |
|----------|-----------|-----------|-----------|
| <b>5</b> | <b>25</b> | <b>20</b> | <b>50</b> |
|----------|-----------|-----------|-----------|

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

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

**Text Books:**

- Boylestad, R. L., & Nashelsky, L. (2019). *Electronic devices and circuit theory* (12th ed.). Pearson.
- Sedra, A. S., Smith, K. C., Carusone, A. C., & Gaudet, V. (2020). *Microelectronic circuits* (8th ed.). Oxford University Press.
- Bogart, T. F., Beasley, J. S., & Rico, G. (2019). *Electronic devices and circuits* (7th ed.). Pearson.

**Reference Books:**

1. Razavi, B. (2015). *Fundamentals of microelectronics* (2nd ed.). Wiley.
2. Bell, D. A. (2008). *Electronic devices and circuits* (5th ed.). Oxford University Press.
3. Meganathan, D. (2023). *Electronic circuits: Analysis and design I* (1st ed.). Yes Dee Publishing.
4. Gopakumar, K. (2023). *Analysis and design of electronic circuits* (1st ed.). OWL Books.