

|                          |                              |                                    |              |
|--------------------------|------------------------------|------------------------------------|--------------|
| <b>Course Title:</b>     | <b>Electronic Principles</b> | <b>Credit:</b>                     | <b>3 + 1</b> |
| <b>Course Code:</b>      | <b>CSIT 114</b>              | <b>Number of periods per week:</b> | <b>3</b>     |
| <b>Nature of Course:</b> | <b>Theory + Practical</b>    | <b>Total Hours:</b>                | <b>48</b>    |
| <b>Year:</b>             | <b>First</b>                 | <b>Semester:</b>                   | <b>First</b> |

## 1. Course Introduction

The course intends to enable the students to be acquainted with the basic concepts and principles of electronics. Students will be familiarized with the fundamentals of circuit analysis, semiconductors, transistors, amplifiers, oscillators, etc.

## 2. Objectives

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

- a. acquire sufficient basic knowledge in electronics.
- b. apply this knowledge base for studying major courses in CSIT.
- c. introduce the concepts and methods of electronics needed for application in various branch of CSIT

## 3. Specific Objective and Content

### Unit 1: Circuit Analysis (6 hrs)

| Specific Objective  | Content  |
|---|--|
| <ul style="list-style-type: none"> <li>• Understand and use Kirchoff's current and voltage law</li> <li>• Distinguish between current source and voltage source</li> <li>• Learn Thevenin's and Norton's theorems and their applications</li> </ul> | Kirchoff's current and voltage law, concept of current source, voltage source, application of Kirchoff's current and voltage law to simple circuits, Thevenin's and Norton's theorems and their applications |

### Unit 2: Semiconductors (5 hrs)

| Specific Objective   | Content  |
|--|--|
| <ul style="list-style-type: none"> <li>• Distinguish Intrinsic and extrinsic semiconductors and understand their working</li> <li>• Understand the formation of p-n junction</li> <li>• Explain the diode characteristics</li> <li>• Use diode as a rectifier</li> <li>• Use Zener diode as a voltage regulator</li> <li>• Understand the concept of photodiode and LED</li> </ul> | Intrinsic and extrinsic semiconductors, formation of pn junction, diode characteristics, diode as a rectifier, Zener diode, photodiode and LED |

### Unit 3: Bipolar Junction Transistor (8 hrs)

| Specific Objective  | Content  |
|---|--|
| <ul style="list-style-type: none"> <li>• Explain the structure and working of bipolar junction transistors</li> <li>• Use CB, CC, CE configurations and explain their characteristics</li> <li>• Derive the relation between <math>\alpha</math> and <math>\beta</math></li> <li>• Use of transistor as an amplifier and as a switch</li> </ul> | Intrinsic and extrinsic semiconductors, formation of pn junction, diode characteristics, diode as a rectifier, Zener diode, photodiode and LED |

### Unit 4: Field Effect Transistor (8 hrs)

| Specific Objective  | Content  |
|---|--|
| <ul style="list-style-type: none"> <li>• Explain the working of JFET and MOSFET</li> <li>• Understand the I-V characteristics and parameters</li> <li>• Develop idea of MOS capacitor and memory devices</li> <li>• Applications of FET as a Voltage Variable resistance (VVR), inverter, switch, DRAM</li> </ul> | JFET and MOSFET, I-V characteristics and parameters, Idea of MOS capacitor, memory device, CMOS, Applications - FET as a Voltage Variable resistance (VVR), inverter, switch, DRAM |

### Unit 5: Amplifiers (12 hrs)

#### Specific Objective

- Understand the classification of amplifier
- Learn frequency response and Q point
- Explain DC coupling and effect on frequency response
- Learn the concept of feedback and amplifiers
- Use of Op-amp as comparator
- Use of amplifiers

#### Content

General classification of amplifier based on frequency response and Q point, idea of multistage amplifier, Concept of DC coupling and effect on frequency response, concept of feedback, Concept of operational amplifier, characteristics of Op-amp, Op-amp as comparator, Virtual ground concept, Applications - Unity gain amplifier, buffer, inverting amplifier, non-inverting amplifier, Adder, subtractor, integrator and differentiator

### Unit 6: Oscillators (5 hrs)

#### Specific Objectives

- Understand the Barkhausen criteria
- Explain the working of Hartley, Colpitts and Phase shift oscillators

#### Content

Barkhausen criteria, Concept of Hartley, Colpitts and Phase shift oscillators

### Unit 7: Regulated Power Supplies (4 hrs)

#### Specific Objectives

- Differentiate unregulated and regulated power supplies
- Develop the concept of regulators and current boosters

#### Content

Unregulated and regulated power supply, concept of load and line regulation, Shunt and Series regulators, current boosters

## 4. Evaluation System

### Undergraduate Program

| External Evaluation      | Marks | Internal Evaluation  | Weightage | Marks |
|--------------------------|-------|----------------------|-----------|-------|
| Semester End Examination | 60    | Assignments          | 10%       | 40    |
|                          |       | Quizzes              | 10%       |       |
|                          |       | Attendance           | 10%       |       |
|                          |       | Presentation         | 10%       |       |
|                          |       | Term Papers          | 10%       |       |
|                          |       | Mid-Term Examination | 40%       |       |
|                          |       | Group Work           | 10%       |       |
| Total External           | 60    | Total Internal       | 100%      | 40    |
| Full Mark: 60 + 40       |       |                      |           | 100   |

## 5. External Evaluation

**End semester examination:** It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the grid in the following page:

| Nature of Question                                  | Total Questions to be asked | Total Questions to be Answered | Total Marks | Weight        |
|---|-----------------------------|--------------------------------|-------------|---------------|
| Group A:<br>Very short answer questions             | 8                           | 8                              | 8 X 3 = 24  | 24%           |
| Group B:<br>Short answer type questions             | 6                           | 5                              | 5 X 8 = 40  | 40%           |
| Group C:<br>Long answer type questions/case studies | 4                           | 3                              | 3 X 12 = 36 | 36%           |
|   |                             |                                |             | 100      100% |

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUALIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

**Practical examination:** Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

**Internal evaluation:**

**Assignment:**

Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

**Quizzes:**

Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

**Attendance in class:**

Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

**Presentation:**

Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

**Term paper:**

Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

**Mid-term examination:**

It is a written examination and the questions will be asked covering all the topics in the session of the course.

**Discussion and participation:**

Students will be evaluated on the basis of their active participation in the classroom discussions.

**Instructional Techniques:**

All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion

- Group work and Individual work
- Self-study
- Assignments
- Presentation by Students
- Term Paper writing

#### Quizzes

#### Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

#### Prescribed Text

- *Principles of Electronics:* A. P. Malvino, Tata Mc-Graw Hill Publication, 7th Edition

#### Reference

- *Basic Electronics:* B. L. Theraja, S.Chand & Company Ltd
- *Electronic Devices and Circuits:* T. F. Bogart, Universal Book Stall, New Delhi
- *Principles of Electronics:* V. K. Meheta, S.Chand & company Ltd. 5th Edition
- *Basic Electronics and Linear Circuits:* N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta, Tata McGraw Hill Publishing company.
- *Electronic Devices and circuits:* Boylstead, Tata Mc-Graw Hill

|                      |  |                         |                  |
|----------------------|--|-------------------------|------------------|
| <b>Course Title:</b> | <b>Electronic Principles Practical</b> | <b>Credit:</b>          | <b>1</b>         |
| <b>Course Code:</b>  | <b>CSIT 114</b>                        | <b>Nature of Course</b> | <b>Practical</b> |
| <b>Year:</b>         | <b>First</b>                           | <b>Total Hours:</b>     | <b>16</b>        |

## 1. Objectives

By the end of the course the student should be able to:

- measure correctly the basic physical quantities
- determine errors in measurements
- analyze raw data and make valid conclusions
- validate corresponding theoretical component
- develop proper laboratory skills
- design basic physics experiments
- interpret experimental results and draw logical conclusions
- relate theoretical concepts to practical skills

## 2. Laboratory Works

---

- To draw I-V characteristics of Ohmic and non Ohmic resistors and find voltage current ration.
- To study the junction diode and LED characteristics.
- To study the temperature dependence of resistance of a given semiconductor
- To determine the impedance of a given LCR circuit.
- To study characteristics of NPN transistor.
- To determine dielectric constant by using Lissagous pattern.
- To construct CE amplifier for the determination of the voltage gain of the amplifier.
- To study the characteristic of a Zener diode (Switches) and use it to regulate power supply.
- To construct and study the working of NOT-AND-OR, NAND and NOR gates.
- To construct and study the working of OR, NAN and NOR gates.

### Note:

- Student must perform 6 Hours of lab work (2 Hours x 3 times or 3 Hours x 2 times) every week
- In every semester, at least Eight experiments are to be performed. Additional experiments may be added subject to availability of time.
- Practical Exams will be graded on the basis of the following marking schemes:
 

|                                |     |
|--------------------------------|-----|
| ✓ In-Semester Evaluation:      | 20% |
| ✓ Final Examination (Written): | 60% |
| ✓ Final Exam (Oral):           | 20% |

## 3. Books:

- *B.Sc. Practical Physics*: C. L. Arora, S Chand and Company Ltd.
- *Practical Physics*: G. L. Squires, Cambridge University Press.
- *Practical Physics*, P. K. Shukla and A. Srivastava, New Age International (P) Limited