Computer Science and Engineering (CSE) Program (*Undergraduate*)

COURSE OUTLINE	SUMMER 2024	FULL MARKS: 100

Course Code	CSE 210	**Course Title**	Electronics I
Course Type	Core	**Prerequisite (if any)**	CSE104 + Lab
Credit Value	3	**Contact Hours / Week**	3 hours (theory)
Year	3rd Year	**Semester**	1st Semester

COURSE DESCRIPTION

The study of electronics is an integral part of the Electrical and Computer Engineering curriculum. For a degree in Computer Science and Engineering, it is important to have a basic understanding of electronic devices and circuits since the most important component of a Computer CPU is an electronic device called the transistor. The topics covered in this course are semiconductor basics, p-n junction diodes, rectifiers, clippers and clampers, Zener diodes, bipolar junction transistors (BJT), DC, and AC biasing of BJT. Upon successful completion of this course students will be able to explain the basic operational principles of semiconductor diodes and BJTs, and they will get familiar with a few important applications of these electronic devices.

COURSE OBJECTIVE

1. To acquire in-depth knowledge about Semiconductor Physics
2. To attain the basic knowledge of PN Junctions.
3. To acquire the application knowledge to understand Diodes and Bipolar Junction Transistor (BJT) circuits.
4. To impart how to design Diode and BJT circuits.

COURSE & ADMINISTRATIVE POLICY

1. It is the student's responsibility to gather information about the assignments and cover topics during the lectures missed. Regular class attendance is mandatory. According to IUB system, students must enter the classroom within the first 10 minutes to get the attendance submitted.

2. The approximate time and syllabus of quiz, midterm, and final exam are already given here, however, announcements will be given ahead of time as well.

3. There will be no make-up for quizzes and project assignments. Missed assignments and quizzes will result in a grade of zero. Make-ups for Midterm Exams will be available if and only if you have a legitimate reason for missing the exam. In case of an illness or emergency, you must supply formal documentation that supports your claim.

4. All announcements will be made available via **google classroom**.

5. The lecture notes, reading materials, codes, or other resources will be made available prior to the discussion on that material in class so that students may have a cursory look into the materials. Students are recommended to get a printed copy of the lecture note to keep notes.

6. Class participation is vital for a better understanding of Hardware concepts. Moreover, this is considered an indicator of a good learner.

7. Students are invited to raise questions at any point during the lecture.

8. Students should take tutorials with the teaching assistant and/or instructor during office hours. Prior appointment is required

ACADEMIC DISHONESTY

1. A student who cheats plagiarizes, or furnishes false, misleading information in the course is subject to disciplinary action up to and including an **F grade** in the course and/or suspension/expulsion from the University.

2. Students must maintain the code of IUB.

3. No collaboration whatsoever is permitted during the examination.

4. Plagiarism and other anti-intellectual behavior cannot be tolerated in any academic environment that prides itself on individual accomplishment. If you have any questions about the collaboration policy, or if you feel that you may have violated the policy, please talk to one of the course staff. Although the course staff is obligated to deal with cheating appropriately, we are more understanding and lenient if we find out from the transgressor himself or herself rather than from a third party or by ourselves

NON DISCREMINATION POLICY

The course and University policy prohibit discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability, sexual orientation, or military status. If you see either the course instructor or any other person related to the course showing any form of discrimination, please inform the proctor's office of the wrongdoing.

COURSE CONTENT

a. Introduction, Semiconductor Materials, Covalent Bonding, Intrinsic Materials

1. Student will be introduced with the course content.
2. Student will be given a basic idea about semiconductor physics.

b. Energy Levels Extrinsic Semiconductors. PN Junction

1. Student will be presented with the concept of energy levels.
2. Student will learn how to draw band diagrams.
3. Student will be familiarized with the concept of doping, n- and p-type semiconductors, and the PN Junction.

c. Diode Biasing, Diode Equivalent Circuits, Zener **Diodes, Ideal vs Practical Diodes, Diode Resistance**

1. Student will be introduced to the concept of PN junction diode
2. Student will learn about the different types of diode biasing
3. Student will be familiarized. with various diode equivalent circuits.
4. Student will learn about the concept of Zener diodes.

d. Load-Line Analysis, Series-Parallel Diode configurations, Half-**wave and Full-wave rectifiers, Clippers**

1.Student will learn how to perform load-line analysis of non-linear circuits.
2.Student will be familiarized with series, parallel and series-parallel diode circuits.
3.Student will understand the method of rectification using diode circuits.
4.Student will be introduced to the concept of clippers.

e. Clampers, Zener Diodes, Bipolar Junction Transistor (BJT) Construction, Operation BJT Configurations 1 DC Biasing -BJT, AC Analysis – BJT

1.Student will be introduced to clamper circuits.
2.Student will understand the operation of a voltage regulator using Zener diodes.
3.Student will be introduced to the working principle of Bipolar Junction Transistor (BJT).
4.Student will learn the Common-Emitter, Common-Base and Common-Collector configurations.
5.Student will be familiarized with establishing an operating point.
6.Student will be introduced to Fixed Bias and Emitter Bias configurations.
7.Student will be familiarized with Voltage-Divider Bias and Common-Base configurations.
8.Student will learn how to design BJT networks.
9.Student will be introduced to different BJT Transistor AC Models.
10.Student will learn the re transistor model for Common-Emitter Fixed-Bias and Emitter-Bias configuration.

COURSE LEARNING OUTCOME (CLO) MATRIX							
CLOs	**CO Description**	**Blooms Learning Level***				**PLO Assessed**	**CLO – PLO Correlation** **
		C	**P**	**A**	**S**		
CLO1	Students will be able to analyze different types of diode and diode circuits.	4				PLO-b	2
CLO2	Students will be able to understand the mathematical model behind diodes and BJTs and figure out different types of diodes and BJT circuits.	2,4				PLO-a	3
CLO3	Students will be able to evaluate any given diode and BJT-related problems and solve them.		5,6			PLO-c	3

*Blooms Learning Level: Numbers signifies the Level of Blooms skills.

**CLO – PLO Correlation: 3 – high, 2 – medium, 1- low

PLO-a (Engineering Knowledge): Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in K1 to K4 respectively to the solution of complex engineering problems.

PLO-b (Problem Analysis): Identify, formulate, research literature and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PLO-c (Design/Development of Solutions): Design solutions for complex engineering problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

	CLASS & EXAM SCHEDULE, TOPICS AND READINGS			
Week	**Lectures**	**Lecture Outcome**	**Readings**	**Corresponding CLOs**
1	1.Introduction 2.Semiconductor Materials, Covalent Bonding, Intrinsic Materials	1.Student will be introduced with the course content. 2.Student will be given a basic idea about semiconductor physics.	Book, Lecture Note	-
2	1.Energy Levels 2.Extrinsic Semiconductors, PN Junction	1. Student will be presented with the concept of energy levels. 2. Student will learn how to draw band diagrams. 3. Student will be familiarized with the concept of doping, n- and p-type semiconductors, and the PN Junction.	Book, Lecture Note	CLO1
3	1.Diode Biasing, Diode Equivalent Circuits, Zener Diodes 2.Ideal vs Practical Diodes, Diode Resistance	1. Student will be introduced to the concept of PN junction diode. 2. Student will learn about the different types of diode biasing. 3. Student will be familiarized. with various diode equivalent circuits. 4. Student will learn about the concept of Zener diodes.	Book, Lecture Note	CLO1
4	1.Load-Line Analysis 2.Series-Parallel Diode configurations	1. Student will learn how to perform load-line analysis of non-linear circuits. 2. Student will be familiarized with series, parallel and series-parallel diode circuits.	Book, Lecture Note	CLO1
5	1.Half-wave and Full-wave rectifiers 2.Clippers	1. Student will understand the method of rectification using diode circuits. 2. Student will be introduced to the concept of clippers.	Book, Lecture Note	CLO2
6	1. Clampers 2. Zener Diodes	1. Student will be introduced to clamper circuits. 2. Student will understand the operation of a voltage regulator using Zener diodes.	Book, Lecture Note	CLO2

7	Midterm	---	---	---
8	1.Bipolar Junction Transistor (BJT) Construction, Operation 2.BJT Configurations	1. Student will be introduced to the working principle of Bipolar Junction Transistor (BJT). 2. Student will learn the Common-Emitter, Common-Base and Common-Collector configurations.	Book, Lecture Note	CLO2
9	1.DC Biasing - BJT	1. Student will be familiarized with establishing an operating point. 2. Student will be introduced to Fixed Bias and Emitter Bias configurations.	Book, Lecture Note	CLO2
10	1. DC Biasing -BJT	1. Student will be familiarized with Voltage-Divider Bias and Common-Base configurations. 2. Student will learn how to design BJT networks.	Book, Lecture Note	CLO3
11	1.AC Analysis - BJT	1. Student will be introduced to different BJT Transistor AC Models. 2. Student will learn the re transistor model for Common-Emitter Fixed-Bias and Emitter-Bias configuration.	Book, Lecture Note	CLO3
12	1.Revision	---	---	---
13	Final	---	---	---

ASSESSMENT AND EVALUATION				
Assessment Type	**Assessment Tools**	**Marks Distribution**	**Blooms Category**	**Sub Total**
Continuous Internal Evaluation	Pop Quizzes	5	Remember	25
	Assignment	5	Understand	
	Quizzes	15	Understand, Apply, Analyze	
SMEE - Semester	Mid Term Examination	30	Remember, Understand, Apply, Analyze, Evaluate	75

Mid & End Examination	Final Term Examination	45	Understand, Apply, Analyze, Evaluate, Create	
			Total	100

The following chart will be followed for grading. Please note that for each category.
* Numbers are inclusive

A	A-	B+	B	B-	C+	C	C-	D+	D	F
90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	50-54	45-49	0-44

REFERENCE BOOK AND ADDITIONAL MATERIALS

1. The course will be based mostly on the following book:

   a. Electronic Devices and Circuit Theory, R. Boylestad and L. Nashelsky (11th Edition, 2013)

2. These are some optional reference materials to study and know more about the topics:

   a. Principles of Electronics, K. Mehta and R. Mehta (S. Chand, New Delhi, 2005)

   b. Electronic Principles, Albert P. Malvino (Tata McGraw-Hill, New Delhi)

VERIFICATION

Prepared by:

XXXXXXX
Course Coordinator
Date:......................................

Moderated by:

XXXXXX
Lead
OBE Committee for CSE
Date:......................................

Checked by:

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XXXXX
Head, Dept of CSE, IUB.
Date:......................................

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