Department of CSE

Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Basic Electrical and Electronics Engineering
2.	Course Code	ESC-201
3.	Academic Year	2024-2025
4.	Semester	2nd
5.	Number of Lesson plans	40
6.	Faculty Assigned	Dr. Suhaib Ahmed Batt, Dr. Sarabdeep Singh Dr. Parveen Kumar Dr. Umar Farooq

Faculty Signature

Lesson Plan No. 1	Course Name Basic Electrical & Electronics Engineering Topic: Nodal Analysis	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Nodal analysis. b. illustrate different nodal problems with examples. c. appreciate the advantages of nodal analysis.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions - What is KCL and how KCL is different from KVL? - What parameters can be calculated using KCL & KVL? Introduce the concept of Nodal Analysis: - Talk about the concept. - Introduce the formal definition of using nodes in a circuit. - Highlight the important characteristics of Nodal Analysis. - Need of Nodal over conventional methods of current and voltage calculations 2. **Development** (30 minutes) a. Nodal Analysis - Introduction to DC Networks. - Network Terminology. - Nodal Voltage Method. - Problems based on Nodal voltage analysisExercise (5 minutes) – - Numerical problems on the covered content National b. Matrix Method - To apply the Matrix Method for solving unknown quantities. - Examples with two and three unknowns. - Number of problems based on this method. c. Advantages of Nodal Analysis - Simpler for circuits with many components. - Directly applies Kirchhoff's Current Law (KCL). - Effective for circuits with multiple voltage sources. d. Challenges in Nodal Analysis - Presence of current source in a circuit. - Need to solve simultaneous equations. - Time-consuming for complex circuits. - Requires systematic approach for large networks **3. Exercise (5 minutes)**

	Give different numerical problems on the covered content. - With two nodes. - With multiple nodes. - Use of Matrix Method for three unknowns.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested reading: Nodal analysis problems from D.P. Kothari and I.J. Nagrath. 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 2	Course Name Basic Electrical & Electronics Engineering Topic: Elementary Concepts of DC and AC Circuits	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) understand the basic concepts of DC and AC circuits. b) differentiate between DC and AC circuits. c) appreciate the importance of DC and AC in electrical engineering
Teaching Aids (if any)	a) Power point presentation b) Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions: - What do you know about DC and AC? - Where do we use DC and AC in everyday life? Introduce the concept of DC and AC circuits. - Define DC (Direct Current) and AC (Alternating Current). - Highlight the differences between DC and AC. - Discuss applications and importance in electrical engineering. 2. **Development** (30 minutes) a. DC Circuits - Introduction to DC circuits. - Characteristics of DC circuits. - Basic components: resistors, batteries. - Example problems. b. AC Circuits - Introduction to AC circuits. - Characteristics of AC circuits. - Basic components: inductors, capacitors, AC sources. - Example problems. c. Differences and Similarities - Discuss the uses in various applications. - Compare and contrast DC and AC circuits. 3. Exercise (5 minutes) – - Provide simple numerical problems on DC and AC circuits. - Ask students to solve and discuss answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested video lectures: - Basic Electrical Engineering by V. N. Mittle. 3. Homework - Ask students to solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 3	Course Name: Basic Electrical & Electronics Engineering Topic: Mesh Analysis	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Mesh analysis. b. illustrate different mesh problems with examples. c. appreciate advantages of mesh analysis
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) - Ask questions. - What is KVL and how KVL is different from KCL? - What parameters can be calculated using KVL & KCL? Introduce the concept of Mesh Analysis. - Talk about the concept - Introduce the formal definition of using mesh in a circuit - Highlight the important characteristics of Mesh Analysis - Need of Mesh over conventional method of current and voltage calculations. 2. **Development** (30 minutes) a. Mesh analysis - Introduction to DC Networks - Network Terminology - Maxwell's Mesh Current Method - Problems based on Mesh current analysis b. Mesh analysis - Introduce the concepts to circuit congaing two mesh - Extend the problem to circuit containing multiple meshes. - Numerical based on various current, voltage and power calculation using mesh analysis. c. Cramer's Rule - To apply Cramer's Rule for two unknown quantities - To apply Cramer's Rule for three unknown quantities - Number of problems based on this rule. d. Advantages of Mesh analysis - Simpler - Use with voltage sources - To solve complex circuits e. Challenges in Mesh analysis - Presence of current source in a circuit - Need to solve complete circuit to find currents in particular branch - Time consuming - Complex method for simplification of quations

	3. Exercise (5 minutes) – Give different Numerical problems on the covered content. - With two meshes - With multiple meshes - Use of cramer;s rule for three unkwons
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Mesh analysis problems from D.P. Kothari and I. J.Nagrath 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 4	Course Name: Basic Electrical & Electronics Engineering Topic: DC Circuit Elements (R, L, and C)	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. understand the characteristics of resistors (R), inductors (L), and capacitors (C). b. analyze circuits containing these elements. c. appreciate the role of these elements in DC circuits.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions. - What are the basic components used in DC circuits? - Can you identify the symbols for resistors, inductors, and capacitors? Introduce the concept of DC circuit elements. - Discuss the importance of understanding these basic components. 2. **Development** (30 minutes) f. . Resistors (R) - Definition and characteristics. - Ohm's Law. - Series and parallel connections. - Example problems. g. Inductors (L) - Definition and characteristics. - Inductance and its effects in DC circuits. - Series and parallel connections. - Example problems. h. Capacitors (C) - Definition and characteristics. - Capacitance and its effects in DC circuits. - Series and parallel connections. - Example problems. i. Combination Circuits - Analyzing circuits with R, L, and C elements. - Numerical problems for practice. **3. Exercise (5 minutes) –** - Provide problems combining R, L, and C elements. - Ask students to solve and discuss answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Mesh analysis problems from D.P. Kothari and I. J.Nagrath

	3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 5	Course Name: Basic Electrical & Electronics Engineering Topic: Kirchhoff's Current and Voltage Laws	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. understand Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). b. apply KCL and KVL to analyze electrical circuits. c. appreciate the significance of these laws in circuit analysis.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) - Ask questions: - What do you know about Kirchhoff's laws? - How do you think these laws help in circuit analysis? - Introduce Kirchhoff's Current and Voltage Laws. - Define KCL and KVL. - Discuss their importance in circuit analysis. 2. **Development** (30 minutes) j. Kirchhoff's Current Law (KCL) - Definition and mathematical representation. - Application of KCL in simple circuits. - Example problems. k. Kirchhoff's Voltage Law (KVL) - Definition and mathematical representation. - Application of KVL in simple circuits. l. Combined Application - Using KCL and KVL together in circuit analysis. - Numerical problems for practice. **3. Exercise (5 minutes)** Provide problems involving KCL and KVL. Ask students to solve and discuss answers.With multiple meshes - Use of cramer;s rule for three unkwons
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku. 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 6	Course Name: Basic Electrical & Electronics Engineering Topic: Superposition, Maximum Power Transfer, Thevenin and Norton Theorems	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. understand the concept of superposition. b. apply the maximum power transfer theorem. c. articulate the concepts of Thevenin and Norton theorems. d. solve problems using these theorems.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	4. **Introduction** (5 minutes) - Ask questions: - What do you know about superposition in circuits? - How do you think the maximum power transfer theorem is useful? - Introduce the concept of superposition and the theorems. - Define each theorem. - Discuss their importance in circuit analysis. 5. **Development** (30 minutes) a. Superposition Theorem - Definition and principle. - Application in circuits. - Example problems. b. Maximum Power Transfer Theorem - Definition and principle. - Conditions for maximum power transfer. - Example problems. c. Thevenin's Theorem - Definition and principle. - Steps to find Thevenin equivalent. - Example problems. p. Norton's Theorem - Definition and principle. - Steps to find Norton equivalent. - Example problems. 6. Exercise (5 minutes) – - Provide problems involving each theorem. - Ask students to solve and discuss answers.
Closure	2. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 3. Suggested Reading - Circuit analysis problems from D.P. Kothari and I. J. Nagrath. 4. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	2. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 7	Course Name: Basic Electrical & Electronics Engineering Topic: Peak and RMS Values	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. understand the concepts of peak and RMS values. b. calculate peak and RMS values for different waveforms. c. appreciate the importance of RMS values in AC circuit analysis.
Teaching Aids (if any)	e. Power point presentation f. Chalk and Talk
Teaching Development	7. **Introduction** (5 minutes) - Ask questions: - What is the difference between DC and AC signals? - How do you measure the strength of an AC signal? - Introduce the concepts of peak and RMS values. - Define peak value and RMS value. - Discuss their significance in AC circuits. 8. **Development** (30 minutes) q. Peak Value - Definition and characteristics. - Examples of peak values in different waveforms (sine, square, triangular). r. RMS Value - Definition and characteristics. - Mathematical derivation of RMS value. - Examples of RMS values in different waveforms (sine, square, triangular). s. Applications - Importance of RMS values in power calculations. - Use of RMS values in practical applications. t. Numerical Problems - Provide problems for calculating peak and RMS values. - Solve and discuss solutions in class. 9. Exercise (5 minutes) – Give different Numerical problems on the covered content. - With two meshes - With multiple meshes - Use of cramer;s rule for three unkwons
Closure	5. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 6. Suggested Reading - Mesh analysis problems from D.P. Kothari and I. J.Nagrath 7. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	3. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 8	Course Name: Basic Electrical & Electronics Engineering Topic: Mesh Analysis	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: k. articulate the concept of Mesh analysis. l. illustrate different mesh problems with examples. m. appreciate advantages of mesh analysis
Teaching Aids (if any)	g. Power point presentation h. Chalk and Talk
Teaching Development	10. **Introduction** (5 minutes) - Ask questions. - What is KVL and how KVL is different from KCL? - What parameters can be calculated using KVL & KCL? Introduce the concept of Mesh Analysis. - Talk about the concept - Introduce the formal definition of using mesh in a circuit - Highlight the important characteristics of Mesh Analysis - Need of Mesh over conventional method of current and voltage calculations. 11. **Development** (30 minutes) u. Mesh analysis - Introduction to DC Networks - Network Terminology - Maxwell's Mesh Current Method - Problems based on Mesh current analysis v. Mesh analysis - Introduce the concepts to circuit congaing two mesh - Extend the problem to circuit containing multiple meshes. - Numerical based on various current, voltage and power calculation using mesh analysis. w. Cramer's Rule - To apply Cramer's Rule for two unknown quantities - To apply Cramer's Rule for three unknown quantities - Number of problems based on this rule. x. Advantages of Mesh analysis - Simpler - Use with voltage sources - To solve complex circuits y. Challenges in Mesh analysis - Presence of current source in a circuit - Need to solve complete circuit to find currents in particular branch - Time consuming - Complex method for simplification of quations 12. Exercise (5 minutes) –

	Give different Numerical problems on the covered content. - With two meshes - With multiple meshes - Use of cramer;s rule for three unkwons
Closure	8. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 9. Suggested Reading - Mesh analysis problems from D.P. Kothari and I. J.Nagrath 10. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	4. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 9	Course Name: Basic Electrical & Electronics Engineering Topic: Phasor Representation	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: n. understand the concept of phasor representation. o. convert time-domain sinusoidal signals to phasors. p. appreciate the use of phasors in simplifying AC circuit analysis.
Teaching Aids (if any)	i. Power point presentation j. Chalk and Talk
Teaching Development	13. **Introduction** (5 minutes) - Ask questions: - What is a sinusoidal signal? - How do you represent sinusoidal signals graphically? - Introduce the concept of phasor representation. - Define phasors. 14. **Development** (30 minutes) z. Phasor Basics - Definition and characteristics. - Relationship between time-domain signals and phasors. aa. Conversion to Phasors - Steps to convert sinusoidal signals to phasors. - Examples with different sinusoidal signals. bb. Phasor Diagrams - Drawing phasor diagrams. - Interpreting phasor diagrams. cc. Applications - Use of phasors in simplifying circuit analysis. - Examples of phasor application in AC circuits. 15. **Exercise (5 minutes)** – Give different Numerical problems on the covered content. - Provide problems on converting time-domain signals to phasors. - Ask students to solve and discuss answers
Closure	11. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 12. Suggested Reading - Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku 13. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	5. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 10	Course Name: Basic Electrical & Electronics Engineering Topic: Real Power, Reactive Power, Apparent Power, Power Factor	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: q. understand the concepts of real, reactive, and apparent power. r. calculate power factor and its significance. s. appreciate the importance of power factor in AC circuits.
Teaching Aids (if any)	k. Power point presentation l. Chalk and Talk
Teaching Development	16. **Introduction** (5 minutes) - What do you understand by power in electrical circuits? - How is power different in DC and AC circuits? - Introduce the concepts of real, reactive, and apparent power. - Define each type of power. - Discuss their significance in AC circuits. 17. **Development** (30 minutes) dd. Real Power - Definition and characteristics. - Mathematical representation. - Examples and applications. ee. Reactive Power - Definition and characteristics. - Mathematical representation. - Examples and applications. ff. Apparent Power - Definition and characteristics. - Mathematical representation. - Relationship between real, reactive, and apparent power. gg. Power Factor - Definition and significance. - Calculation of power factor. - Importance of power factor in efficiency. hh. Numerical Problems - Provide problems for calculating real, reactive, and apparent power, and power factor. - Solve and discuss solutions in class. **18. Exercise (5 minutes) –** - Provide additional numerical problems on power calculations and power factor. - Ask students to solve and discuss answers.
Closure	14. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 15. Suggested Reading - Mesh analysis problems from D.P. Kothari and I. J.Nagrath 16. Homework

	- To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	6. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 11	Course Name: Basic Electrical & Electronics Engineering Topic: Rectifiers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: t. Understand the principles, types, and applications of rectifiers in electronic circuits. u. Learn how rectifiers convert AC to DC and explore different types of rectifiers such as half-wave, full-wave, and bridge rectifiers.
Teaching Aids (if any)	m. Power point presentation n. Chalk and Talk
Teaching Development	19. **Introduction** (5 minutes) - Ask questions. - What is rectification? - Why do we need to convert AC to DC? Introduce the concept of rectification - Talk about the concept of rectification - Introduce the formal definition of rectification - Highlight the importance of rectification. 20. **Development** (30 minutes) a. Half-wave rectifier. - Explain the construction, operation, and characteristics of a half-wave rectifier. - Show circuit diagrams and waveforms of a half-wave rectifier. Demonstrate a half-wave rectifier circuit using a simulation software or physical components. b. Full wave rectifier. - Explain the construction, operation, and characteristics of a Full wave rectifier. - Show circuit diagrams and waveforms of a Full wave rectifier. Demonstrate a Full wave rectifier. circuit using a simulation software or physical components. o. Bridge rectifier. - Detail the operation, characteristics, and applications of a bridge rectifier. - Show circuit diagrams and waveforms of a bridge rectifier. - Demonstrate a bridge rectifier circuit using simulation software or physical components. 21. Exercise (5 minutes) –

	- Recap the types, characteristics, and applications of rectifiers.
Closure	17. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 18. Suggested Reading - Rectifiers from D.P. Kothari and I. J.Nagrath 19. Homework - To solve numerical problems provided in the classroom on rectifiers - Students will research a specific application of rectifiers, create a report detailing its operation and significance, and present their findings to the class. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	7. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 12	Course Name: Basic Electrical & Electronics Engineering Topic: Filters	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: v. Understand the principles, types of filters in electronic circuits. w. Articulate how filters shape the frequency response of signals and explore different types of filters such as low-pass, high-pass, band-pass, and band-stop filters. x. Explain the applications of filters
Teaching Aids (if any)	p. Power point presentation q. Chalk and Talk
Teaching Development	22. **Introduction** (5 minutes) Ask questions. - What is a filter? - Why is a filter required? Introduce the concept of filtering. - Define filters and explain their role in shaping signal frequency response+ - Discuss the applications of filters in audio processing, communications, and signal conditioning. 23. **Development** (30 minutes) Filters - Explain the different types of filters and their characteristics. - Provide examples of applications for each type of filter. - Explain the construction, operation, and applications of low-pass filters. - Explain the construction, operation, and applications of high-pass filters. - Explain the construction, operation, and applications of band-pass and band-stop filters. Exercise (5 minutes) – Circuit construction: Students build a simple RC low-pass filter and a high-pass filter. Measure and observe the frequency response using a signal generator and oscilloscope or simulation software. Discuss the observed results and relate them to the theoretical concepts learned. -
Closure	20. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 21. Suggested Reading

	- Filters from D.P. Kothari and I. J.Nagrath - 22. Homework Choose a specific type of filter, research its applications in real-world scenarios, create a report detailing its operation and significance, and present their findings to the class. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	8. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 13	Course Name: Basic Electrical & Electronics Engineering Topic: Clippers and Clampers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: y. Articulate the principles, types, and applications of clippers and clampers in electronic circuits. z. Understand how these circuits modify the shape of AC signals and explore different configurations and their uses.
Teaching Aids (if any)	r. Power point presentation s. Chalk and Talk
Teaching Development	24. **Introduction** (5 minutes) - Ask questions. - What is waveform shaping? - What is signal conditioning? Introduce the concept of Clippers and Clampers - Introduce the concepts of clippers and clampers and their importance in signal processing. - Discuss the applications of clippers and clampers in electronics, such as waveform shaping and signal conditioning. 25. **Development** (30 minutes) ii. Clippers - Define clippers and explain their roles in modifying signal waveforms. - Discuss the applications of clippers in electronics, such as waveform shaping and signal conditioning. - Explain the construction, operation, and characteristics of clippers. - Show circuit diagrams of positive and negative clippers (both series and parallel configurations). - Explain the operation of each type of clipper and show the expected output waveforms. - Demonstrate clipper circuits using simulation software or physical components. jj. Clampers - Define clampers and explain their roles in modifying signal waveforms. - Discuss the applications of clampers in electronics, such as waveform shaping and signal conditioning. - Explain the construction, operation, and characteristics of clampers - Show circuit diagrams of positive and negative clampers (both series and parallel configurations). - Explain the operation of each type of clampers and show the expected output waveforms. - Demonstrate clampers circuits using simulation software or

	physical components. 26. Exercise (5 minutes) – Students sketch the output waveforms of various Clippers and Clamper circuits based on given input AC signals.
Closure	23. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 24. Suggested Reading - Clippers and Clampers from D.P. Kothari and I. J.Nagrath 25. Homework - Research a specific application of clippers or clampers, create a report detailing its operation and significance, and present their findings to the class.. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	9. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 14	Course Name: Basic Electrical & Electronics Engineering Topic: Principle and Operation of NPN Transistor	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand the principle of operation of an NPN transistor. b) Illustrate the working of an NPN transistor with examples. c) Appreciate the importance and applications of NPN transistors.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions. - What are the basic components of a transistor? - How do electrons and holes contribute to the working of a transistor? Introduce the concept of NPN transistors: - Explain the structure and doping levels. - Highlight the movement of electrons and holes. - Need for transistors in modern circuits. **2. Development (30 minutes)** a) Basic Structure and Principle of Operation - Discuss the emitter, base, and collector regions. - Illustrate the flow of current and the role of minority and majority carriers. b) Operation in Different Modes - Active mode: Explain the biasing of the emitter-base and collector-base junctions. - Saturation mode - Cut-off mode - Discuss how the transistor switches between these modes. c) Applications - Amplification - Switching - Introduce simple circuits using NPN transistors. d) Advantages and Disadvantages - High speed - Sensitivity to temperature variations **3. Exercise (5 minutes)** - Provide numerical problems related to transistor currents and voltages. - Examples of small signal amplification circuits.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Chapters on transistors from Millman-Halkias. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 15	Course Name: Basic Electrical & Electronics Engineering **Topic:** Configuration and Characteristics (CB, CE, and CC)	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: (a) Differentiate between Common Base (CB), Common Emitter (CE), and Common Collector (CC) configurations. (b) Analyze the input and output characteristics of each configuration. (c) Understand the applications of each configuration.
Teaching Aids (if any)	a. PowerPoint presentation b. Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions. - What is a transistor configuration? - Why are different configurations used? - Introduce the concept of transistor configurations: - Highlight CB, CE, and CC configurations. - Discuss the importance of different configurations in circuits. **2. Development (30 minutes)** a. Common Base (CB) Configuration - Explain the input and output characteristics. - Illustrate the configuration with circuit diagrams. - Discuss the high voltage gain and low input impedance. b. Common Emitter (CE) Configuration - Discuss the input and output characteristics. - Show circuit diagrams and explain current gain. - Highlight the importance of CE configuration in amplification. c. Common Collector (CC) Configuration - Describe the input and output characteristics. - Use circuit diagrams to explain voltage gain. - Discuss applications like impedance matching. - Give real-world examples. d. Comparison and Applications - Compare CB, CE, and CC configurations. - Discuss the suitability of each configuration for different applications. **3. Exercise (5 minutes)** - Provide numerical problems related to each configuration. - Examples of practical circuits using CB, CE, and CC configurations.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Transistor characteristics from Boylestad. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 16	Course Name: Basic Electrical & Electronics Engineering **Topic:** Types of Biasing Circuit	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand different types of transistor biasing circuits. b) Analyze the stability of each biasing method. c) Appreciate the importance of proper biasing in transistor operation.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions. - What is transistor biasing? - Why is biasing necessary? Introduce the concept of biasing circuits: - Discuss the purpose and need for biasing. - Highlight the role of biasing in stable transistor operation. **2. Development (30 minutes)** a) Fixed Bias - Explain the fixed bias circuit and its operation. - Discuss the advantages and disadvantages. - Provide practical examples. b) Collector-to-Base Bias - Illustrate the circuit and operation. - Explain the impact on stability and thermal runaway. - Examples of applications. c) Voltage Divider Bias - Discuss the circuit and its advantages. - Explain the improved stability and reduced sensitivity to variations. - Provide practical examples. d) Emitter Bias - Describe the circuit and operation. - Highlight the stability and common applications. - Real-world examples. e) Comparison and Analysis - Compare the different biasing methods. - Discuss the suitability for various applications. **3. Exercise (5 minutes)** 1. Provide numerical problems related to each biasing method. 2. Examples of biasing in practical circuits.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Biasing methods from Sedra/Smith. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 17	Course Name Basic Electrical & Electronics Engineering Topic: Single Phase Transformers Principle of Operation	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: aa. articulate the concept of single phase transformers. bb. illustrate the principle of operation of single phase transformers. cc. appreciate the advantages of transformers.
Teaching Aids (if any)	t. Power point presentation u. Chalk and Talk
Teaching Development	27. **Introduction** (5 minutes) Ask questions - What is a transformer? - What are the different phases of an AC signal? Introduce the concept of Transformer: - Talk about the concept. - Introduce the formal definition of single phase transformer. - Highlight the important characteristics of single phase transformer. 28. **Development** (30 minutes) e. Construction - Primary winding. - Secondary winding. - Laminated magnetic core. - AC supply and load f. Operation - Mutual induction between coils - Emf generation. - Alternating flux in core. - Emf equation derivation - Current ratio of transformers - Voltage ratio of transformers **29. Exercise (5 minutes)** Numerical problems on the ratios of transformers and emf equation
Closure	26. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 27. Suggested reading: Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath. 28. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	10. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 18	Course Name Basic Electrical & Electronics Engineering Topic: Ideal and Practical Transformers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of ideal and practical transformers. b. illustrate the principle of operation of ideal and practical single phase transformers. c. appreciate the advantages of transformers.
Teaching Aids (if any)	v. Power point presentation w. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions - What is a transformer? - What are the different types of transformers? Introduce the concept of Ideal and Practical Transformer: - Talk about the concept. - Introduce the formal definition of ideal transformer. - Introduce the formal definition of practical transformer. 2. **Development** (30 minutes) a. Ideal Transformer - Assumptions: ✓ No losses ✓ Zero winding resistance ✓ Zero leakage flux ✓ High permeability of core b. Ideal Transformer on No Load - Construction - Working - Phasor Diagram c. Ideal Transformer - Characteristics: ✓ Losses ✓ Finite resistance ✓ Leakage flux ✓ Finite permeability of core d. Practical Transformer on No Load - Construction - Working - Phasor Diagram 3. **Exercise (5 minutes)** Numerical problems on the phasor diagrams of ideal and practical transformers
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested reading:

	Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath. 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 19	Course Name Basic Electrical & Electronics Engineering Topic: Equivalent Circuits of Transformers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of equivalent circuit of transformers. b. illustrate the derivation process for component values in the equivalent circuits. c. appreciate the significance of each component in the equivalent circuit.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions - What are the different types of transformers? - Why do practical transformers not behave exactly like ideal transformers? Introduce the concept of equivalent circuits - Talk about the concept. - Introduce the formal definition. - Introduce the purpose. 2. **Development** (30 minutes) a. No load equivalent circuit - Core losses represented by a parallel combination of resistance and reactance. - Explanation of core loss resistance: Accounts for hysteresis and eddy current losses. - Explanation of magnetizing reactance: ✓ Represents the magnetizing inductance required to establish the magnetic flux. b. Practical Transformer Equivalent Circuit - Primary and secondary winding resistances. - Explanation of leakage reactance: ✓ Represents the leakage flux that does not contribute to mutual coupling. - Equivalent circuit referred to primary/secondary: ✓ Concept of referring secondary parameters to the primary side (or vice versa) using the turns ratio. ✓ Drawing the complete equivalent circuit diagram with all components referred to the primary side. ✓ Drawing the complete equivalent circuit diagram with all components referred to the secondary side. - Approximate equivalent circuit: Combining resistance's and reactance's into single equivalent values ✓ Drawing the approximate equivalent circuit diagram with all components referred to the primary side.

	✓ Drawing the approximate equivalent circuit diagram with all components referred to the secondary side. 3. **Exercise (5 minutes)** Numerical problems on the equivalent circuit components of ideal and practical transformers
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested reading: Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath. 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 20	Course Name Basic Electrical & Electronics Engineering Topic: Losses in Transformers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of different losses in transformers. b. illustrate the derivations for calculation of different losses in transformers. c. analyse the impact of losses on the performance of transformers.
Teaching Aids (if any)	x. Power point presentation y. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions - What type of transformer is used in homes? - Why do transformers get heated when in operation? Introduce the concept of Losses in Transformer: - Talk about the concept. - Introduce the formal definition variable losses in transformers. - Introduce the formal definition of fixed losses in transformers. 2. **Development** (30 minutes) a. Copper Losses - Explanation: Caused by the resistance of the windings. - Formula - Dependence on load current: Increases with the square of the current. - Practical considerations: Importance of minimizing winding resistance. b. Core Losses - Hysteresis Loss: ✓ Explanation: Caused by the reversal of magnetization in the core material. ✓ Formula ✓ Factors affecting hysteresis loss: Frequency and maximum flux density - Eddy Current Loss: ✓ Explanation: Caused by circulating currents induced in the core due to alternating magnetic flux. ✓ Formula ✓ Factors affecting eddy current loss: lamination thickness, frequency and maximum flux density 3. **Exercise (5 minutes)** Numerical problems on the different losses in transformers
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.

	2. Suggested reading: Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath. 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 21	Course Name: Basic Electrical & Electronics Engineering **Topic:** Biasing of FET	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand different methods of biasing FETs. b) Analyze the stability of each biasing method. c) Appreciate the importance of proper biasing in FET operation.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What is FET biasing? - Why is biasing necessary for FETs? Introduce the concept of FET biasing circuits: - Discuss the purpose and need for biasing. - Highlight the role of biasing in stable FET operation. **2. Development (30 minutes)** a) Fixed Bias - Explain the fixed bias circuit and its operation. - Discuss the advantages and disadvantages. - Provide practical examples. b) Self-Bias - Illustrate the circuit and operation. - Explain the impact on stability and thermal runaway. - Examples of applications. c) Voltage Divider Bias - Discuss the circuit and its advantages. - Explain the improved stability and reduced sensitivity to variations. - Provide practical examples. d) Source Bias - Describe the circuit and operation. - Highlight the stability and common applications. - Real-world examples. e) Comparison and Analysis - Compare the different biasing methods. - Discuss the suitability for various applications. **3. Exercise (5 minutes)** - Provide numerical problems related to each biasing method. - Examples of biasing in practical circuits.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Biasing methods for FETs from Sedra/Smith. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 22	Course Name Basic Electrical & Electronics Engineering Topic: Principle of Operation of AC and DC Machines	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of basic operation of AC and DC machines. b. illustrate the differences between DC and AC machines in terms of operation c. analyse the working mechanisms of DC motors and generators, and AC motors and generators
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) Ask questions - What is a DC machine? - What is an AC machine? Introduce the concept of AC and DC Machines: - Talk about the concept. - Introduce the formal definition of AC Machine - Introduce the formal definition of DC Machine 2. **Development** (30 minutes) a. DC Motor - Principle: Current flowing through armature windings creates a magnetic field that interacts with the stator field, producing torque. - Commutation process: Ensures unidirectional torque. - Types: Series, shunt, and compound motors. b. DC Generator - Principle: Mechanical rotation of the armature induces an electromotive force (EMF) via electromagnetic induction. - Commutation process: Converts the alternating EMF within the armature windings to direct current. c. AC Motor *Induction Motor* - Principle: Rotating magnetic field in the stator induces a current in the rotor, producing torque. - Slip: Difference between synchronous speed and actual rotor speed. - Types: Single-phase and three-phase induction motors. *Synchronous Motor* - Principle: Rotor is magnetically locked with the rotating magnetic field of the stator, running at synchronous speed. - Application: Power factor correction, constant speed applications. d. AC Generator (Alternator)

	- Principle: Rotating a magnetic field within the stator windings induces an alternating EMF. - Types: Single-phase and three-phase alternators. - Application: Power generation in power plants. 3. **Exercise (5 minutes)** Numerical problems on the synchronous speed, slip, induced emf, etc.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested reading: Electrical Machines by P.S. Bimbhra and G.C. Garg 3. Homework - To solve numerical problems provided in the classroom. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 23	Course Name: Basic Electrical & Electronics Engineering Topic: Evolution of Electronics	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: dd. Articulate the concept of Electronics and their significance in modern life. ee. Discuss invention of the vacuum tube and its applications. ff. Appreciate major electronic devices and innovations over the past century.
Teaching Aids (if any)	z. Power point presentation aa. Chalk and Talk
Teaching Development	30. **Introduction** (5 minutes) - Ask questions. - What is Electronics? - How is electronics different than electrical Introduce the concept of Electronics. - Show images and brief descriptions of early electronic devices like the radio and the first computers (ENIAC). - Discuss how these inventions laid the groundwork for modern electronics. - Explain the significance of integrated circuits and microprocessors in the evolution of electronics. 31. **Development** (30 minutes) **(a) Evolution of Electronics** - Present a slideshow of modern electronic devices and their functionalities. - Discuss how these technologies impact daily life and potential future developments. (b) Highlight recent advancements in electronics and future trends. - Present a slideshow of modern electronic devices and their functionalities. - Discuss how these technologies impact daily life and potential future developments. 32. Exercise (5 minutes) – - Open the floor for students to ask questions and discuss their thoughts on the evolution of electronics. - Prompt discussion on how future innovations might shape society.
Closure	29. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 30. Suggested Reading

	- Evolution of electronics from D.P. Kothari and I. J.Nagrath 31. Homework 32. Assign a homework project: Students will choose one electronic device (e.g., smartphone, laptop, etc.) and research its history, development, and impact on society. They will present their findings in the next class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	11. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 24	Course Name: Basic Electrical & Electronics Engineering Topic: Types and Specifications of Resistors, Inductors, and Capacitors	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a. Understand the different types of resistors, inductors, and capacitors, their specifications, and their applications in electronic circuits. b. Compare and contrast the different types of resistors, inductors, and capacitors. c. Demonstrate the ability to design and analyze basic circuits incorporating resistors, inductors, and capacitors, applying their knowledge to solve practical electronic problems and optimize circuit performance.
Teaching Aids (if any)	a. Power point presentation b. Chalk and Talk
Teaching Development	1. **Introduction** (5 minutes) - Ask questions. - Define resistance? - What is inductance? - What is capacitance? Provide a brief overview of passive components and their role in electronic circuits.- - Define passive components and their importance. - Explain the basic function of resistors, inductors, and capacitors. 2. **Development** (30 minutes) **(a) Resistors** - Show physical examples or images of different resistors. - Demonstrate how to read resistor color codes. - Explain a practical application: Using a potentiometer to adjust volume in an audio circuit. **(b) Inductors** - Discuss the types: Air core, iron core, ferrite core inductors, and variable inductors. - Analyse the specifications: Inductance value, current rating, and resistance. - Discuss the applications of different types of inductors. (c) **Capacitors** - Introduce various types of capacitors and their specifications. - Discuss the types: Ceramic, electrolytic, tantalum, film. - Analyse the specifications: Capacitance value, voltage rating, tolerance and temperature coefficient. - Discuss the applications of different types of capacitors. - Numerical based on various current, voltage and power

	calculation using mesh analysis Show examples or images of different capacitors. - Demonstrate how to read capacitor values from their markings. - Explain a practical application: Using capacitors for power supply decoupling. - Group activity: Students identify and classify capacitors based on their specifications.. -
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Active- Passive Elements from D.P. Kothari and I. J.Nagrath 3. Homework Spend 5 minutes to wrap up and consolidate the learnings Students will select one passive component (resistor, inductor, or capacitor), research its various types and specifications, and create a short presentation on its applications in electronic circuits.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 25	Course Name: Basic Electrical & Electronics Engineering Topic: PN Junction and Zener Diode	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: d. Articulate the concept of Diodes. e. Illustrate PN Junction diagrammatically. f. Understand the applications of diodes
Teaching Aids (if any)	c. Power point presentation d. Chalk and Talk
Teaching Development	3. **Introduction** (5 minutes) - Ask questions. - What is a semi conductor? - What is a diode? Introduce the concept of diodes. - Talk about the concept of doping - Introduce the formal definition of diodes - Advantage of zener over PN Junction 4. **Development** (30 minutes) kk. Doping - Introduction to Doping, its types and need - Construction of PN Junction diode - Working of PN Junction diode - Introduction to depletion layer - VI Characteristics of PN Junction diode ll. Zener Diode - Introduce the Construction of Zener Diode - Discuss the working of zener diode. - VI Characteristics of PN Junction diode mm. Zener diode as a voltage regulator - To apply zener diode as a voltage regulator - Discuss types of biasing - Explain how Zener diodes maintain a constant voltage across a load.. 5. Exercise (5 minutes) – - Circuit construction: Students build a simple rectifier circuit using a PN junction diode and a voltage regulator circuit using a Zener diode. - Measure and observe the behavior of the circuits using a multimeter or oscilloscope. - Discuss the observed results and relate them to the theoretical concepts learned. -
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 5. Suggested Reading

	- PN Junction and Zener Diode from D.P. Kothari and I. J.Nagrath 6. Homework Students will choose an application involving either a PN junction diode or a Zener diode, research how it works, and create a short presentation explaining its operation and significance.
Evaluation	2. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 26	Course Name: Basic Electrical & Electronics Engineering Topic: Types of diodes	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: g. Discuss types of diodes h. Understand the applications of various types of diodes i. Analyse the characteristics of different types of diodes
Teaching Aids (if any)	e. Power point presentation f. Chalk and Talk
Teaching Development	6. **Introduction** (5 minutes) - Ask questions. - What is a diode? - What parameters can help differentiate between different types of diodes? Introduce the Different types of diodes. - Talk about varactor, LED, Photodode, schottkey, tunnel diode - Introduce the formal definition of varactor, LED, Photodode, schottkey, tunnel diode - Highlight the important characteristics of varactor, LED, Photodode, schottkey, tunnel diode - Discuss the applications of varactor, LED, Photodode, schottkey, tunnel diode 7. **Development** (30 minutes) (a) Varactor diode - Introduction to Varactor diode - Symbol and working of Varactor diode - Applications of Varactor diode (b) LED - Introduction to LED - Symbol and working of LED - Applications of LED (c) Photodode - Introduction to Photodode - Symbol and working of Photodode - Applications of Photodode (d) Schottkey Diode - Introduction to Schottkey Diode - Symbol and working of Schottkey Diode - Applications of Schottkey Diode (e) Tunnel diode - Introduction to tunnel diode - Symbol and working of tunnel diode - Applications of tunnel diode 8. Exercise (5 minutes) –

	- Recap the types, characteristics, and applications of various diodes..
Closure	7. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 8. Suggested Reading - Types of diodes from D.P. Kothari and I. J.Nagrath 9. Homework - Assign a homework project: Students will choose one type of diode, research its various uses in electronic circuits, and create a short presentation explaining its operation and significance.
Evaluation	3. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 27	Course Name: Basic Electrical & Electronics Engineering Topic: Voltage Regulators	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: j. Understand the principles, types, and applications of voltage regulators in electronic circuits. k. Learn how voltage regulators work to provide stable output voltage and explore different types of regulators such as linear regulators and switching regulators.
Teaching Aids (if any)	g. Power point presentation h. Chalk and Talk
Teaching Development	9. **Introduction** (5 minutes) - Ask questions. - What is Voltage regulation? - Why is Voltage regulation needed? Introduce the concept of Voltage regulation. - Define voltage regulation and explain why stable voltage is essential. - Discuss the impact of voltage fluctuations on electronic devices. - Understand the block diagram of Voltage regulators - Highlight the importance of Voltage regulation 10. **Development** (30 minutes) a. Explain the different types of voltage regulators and their characteristics b. Detail the operation, characteristics, and applications of linear voltage regulators. c. Construction: Series and shunt regulators. d. Characteristics: Voltage drop, power dissipation, efficiency. e. Examples: 78xx series (fixed), LM317 (adjustable). f. Applications: Low-noise power supplies.
Closure	10. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 11. Suggested Reading - Voltage regulators from D.P. Kothari and I. J.Nagrath - 12. Homework - Students will research a specific voltage regulator (e.g., a specific model of a linear or switching regulator), create a report detailing its operation, specifications, and practical applications, and present their findings to the class.

	Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	4. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 28	Course Name: Basic Electrical & Electronics Engineering Topic: Rectifiers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: l. Understand the principles, types, and applications of rectifiers in electronic circuits. m. Learn how rectifiers convert AC to DC and explore different types of rectifiers such as half-wave, full-wave, and bridge rectifiers.
Teaching Aids (if any)	i. Power point presentation j. Chalk and Talk
Teaching Development	11. **Introduction** (5 minutes) - Ask questions. - What is rectification? - Why do we need to convert AC to DC? Introduce the concept of rectification - Talk about the concept of rectification - Introduce the formal definition of rectification - Highlight the importance of rectification. 12. **Development** (30 minutes) a. Half-wave rectifier. - Explain the construction, operation, and characteristics of a half-wave rectifier. - Show circuit diagrams and waveforms of a half-wave rectifier. Demonstrate a half-wave rectifier circuit using a simulation software or physical components. b. Full wave rectifier. - Explain the construction, operation, and characteristics of a Full wave rectifier. - Show circuit diagrams and waveforms of a Full wave rectifier. Demonstrate a Full wave rectifier. circuit using a simulation software or physical components. k. Bridge rectifier. - Detail the operation, characteristics, and applications of a bridge rectifier. - Show circuit diagrams and waveforms of a bridge rectifier. - Demonstrate a bridge rectifier circuit using simulation software or physical components. 13. Exercise (5 minutes) –

	- Recap the types, characteristics, and applications of rectifiers.
Closure	13. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 14. Suggested Reading - Rectifiers from D.P. Kothari and I. J.Nagrath 15. Homework - To solve numerical problems provided in the classroom on rectifiers - Students will research a specific application of rectifiers, create a report detailing its operation and significance, and present their findings to the class. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	5. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 29	Course Name: Basic Electrical & Electronics Engineering Topic: Filters	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: n. Understand the principles, types of filters in electronic circuits. o. Articulate how filters shape the frequency response of signals and explore different types of filters such as low-pass, high-pass, band-pass, and band-stop filters. p. Explain the applications of filters
Teaching Aids (if any)	l. Power point presentation m. Chalk and Talk
Teaching Development	14. **Introduction** (5 minutes) Ask questions. - What is a filter? - Why is a filter required? Introduce the concept of filtering. - Define filters and explain their role in shaping signal frequency response+ - Discuss the applications of filters in audio processing, communications, and signal conditioning. 15. **Development** (30 minutes) Filters - Explain the different types of filters and their characteristics. - Provide examples of applications for each type of filter. - Explain the construction, operation, and applications of low-pass filters. - Explain the construction, operation, and applications of high-pass filters. - Explain the construction, operation, and applications of band-pass and band-stop filters. Exercise (5 minutes) – Circuit construction: Students build a simple RC low-pass filter and a high-pass filter. Measure and observe the frequency response using a signal generator and oscilloscope or simulation software. Discuss the observed results and relate them to the theoretical concepts learned. -
Closure	16. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 17. Suggested Reading

	- Filters from D.P. Kothari and I. J.Nagrath - 18. Homework Choose a specific type of filter, research its applications in real-world scenarios, create a report detailing its operation and significance, and present their findings to the class. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	6. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 30	Course Name: Basic Electrical & Electronics Engineering Topic: Clippers and Clampers	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: q. Articulate the principles, types, and applications of clippers and clampers in electronic circuits. r. Understand how these circuits modify the shape of AC signals and explore different configurations and their uses.
Teaching Aids (if any)	n. Power point presentation o. Chalk and Talk
Teaching Development	16. **Introduction** (5 minutes) - Ask questions. - What is waveform shaping? - What is signal conditioning? Introduce the concept of Clippers and Clampers - Introduce the concepts of clippers and clampers and their importance in signal processing. - Discuss the applications of clippers and clampers in electronics, such as waveform shaping and signal conditioning. 17. **Development** (30 minutes) nn. Clippers - Define clippers and explain their roles in modifying signal waveforms. - Discuss the applications of clippers in electronics, such as waveform shaping and signal conditioning. - Explain the construction, operation, and characteristics of clippers. - Show circuit diagrams of positive and negative clippers (both series and parallel configurations). - Explain the operation of each type of clipper and show the expected output waveforms. - Demonstrate clipper circuits using simulation software or physical components. oo. Clampers - Define clampers and explain their roles in modifying signal waveforms. - Discuss the applications of clampers in electronics, such as waveform shaping and signal conditioning. - Explain the construction, operation, and characteristics of clampers - Show circuit diagrams of positive and negative clampers (both series and parallel configurations). - Explain the operation of each type of clampers and show the expected output waveforms. - Demonstrate clampers circuits using simulation software or

	physical components. 18. Exercise (5 minutes) – Students sketch the output waveforms of various Clippers and Clamper circuits based on given input AC signals.
Closure	19. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 20. Suggested Reading - Clippers and Clampers from D.P. Kothari and I. J.Nagrath 21. Homework - Research a specific application of clippers or clampers, create a report detailing its operation and significance, and present their findings to the class.. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	7. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 31	Course Name: Basic Electrical & Electronics Engineering Topic: Principle and Operation of NPN Transistor	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: d) Understand the principle of operation of an NPN transistor. e) Illustrate the working of an NPN transistor with examples. f) Appreciate the importance and applications of NPN transistors.
Teaching Aids (if any)	c) PowerPoint presentation d) Chalk and Talk
Teaching Development	**4. Introduction (5 minutes)** - Ask questions. - What are the basic components of a transistor? - How do electrons and holes contribute to the working of a transistor? Introduce the concept of NPN transistors: - Explain the structure and doping levels. - Highlight the movement of electrons and holes. - Need for transistors in modern circuits. **5. Development (30 minutes)** e) Basic Structure and Principle of Operation - Discuss the emitter, base, and collector regions. - Illustrate the flow of current and the role of minority and majority carriers. f) Operation in Different Modes - Active mode: Explain the biasing of the emitter-base and collector-base junctions. - Saturation mode - Cut-off mode - Discuss how the transistor switches between these modes. g) Applications - Amplification - Switching - Introduce simple circuits using NPN transistors. h) Advantages and Disadvantages - High speed - Low cost - Sensitivity to temperature variations **6. Exercise (5 minutes)** - Provide numerical problems related to transistor currents and voltages. - Examples of small signal amplification circuits.
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students. 5. Suggested Reading: Chapters on transistors from Millman-Halkias. 6. Homework: Solve numerical problems provided in class.
Evaluation	4. Reflective Questions (What, Why, Who?). Allow students to answer and

	discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 32	**Course Name: Basic Electrical & Electronics Engineering** **Topic:** Configuration and Characteristics (CB, CE, and CC)	**Course No.: ESC-201**

Objectives	At the end of the lesson the student shall be able to: (d) Differentiate between Common Base (CB), Common Emitter (CE), and Common Collector (CC) configurations. (e) Analyze the input and output characteristics of each configuration. (f) Understand the applications of each configuration.
Teaching Aids (if any)	c. PowerPoint presentation d. Chalk and Talk
Teaching Development	**2. Introduction (5 minutes)** - Ask questions. - What is a transistor configuration? - Why are different configurations used? - Introduce the concept of transistor configurations: - Highlight CB, CE, and CC configurations. - Discuss the importance of different configurations in circuits. **5. Development (30 minutes)** e. Common Base (CB) Configuration - Explain the input and output characteristics. - Illustrate the configuration with circuit diagrams. - Discuss the high voltage gain and low input impedance. - Provide examples of applications. f. Common Emitter (CE) Configuration - Discuss the input and output characteristics. - Show circuit diagrams and explain current gain. - Highlight the importance of CE configuration in amplification. - Provide practical examples. g. Common Collector (CC) Configuration - Describe the input and output characteristics. - Use circuit diagrams to explain voltage gain. h. Comparison and Applications - Compare CB, CE, and CC configurations. - Discuss the suitability of each configuration for different applications. **6. Exercise (5 minutes)** - Provide numerical problems related to each configuration. - Examples of practical circuits using CB, CE, and CC configurations.
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students. 5. Suggested Reading: Transistor characteristics from Boylestad. 6. Homework: Solve numerical problems provided in class.
Evaluation	2. Reflective Questions (What, why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 33	Course Name: Basic Electrical & Electronics Engineering **Topic:** Types of Biasing Circuit	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: d) Understand different types of transistor biasing circuits. e) Analyze the stability of each biasing method. f) Appreciate the importance of proper biasing in transistor operation.
Teaching Aids (if any)	c) PowerPoint presentation d) Chalk and Talk
Teaching Development	**4. Introduction (5 minutes)** - Ask questions. - What is transistor biasing? - Why is biasing necessary? Introduce the concept of biasing circuits: - Discuss the purpose and need for biasing. - Highlight the role of biasing in stable transistor operation. **5. Development (30 minutes)** f) Fixed Bias - Explain the fixed bias circuit and its operation. - Discuss the advantages and disadvantages. - Provide practical examples. g) Collector-to-Base Bias - Illustrate the circuit and operation. - Explain the impact on stability and thermal runaway. - Examples of applications. h) Voltage Divider Bias - Discuss the circuit and its advantages. - Explain the improved stability and reduced sensitivity to variations. - Provide practical examples. i) Emitter Bias - Describe the circuit and operation. - Highlight the stability and common applications. - Real-world examples. j) Comparison and Analysis - Compare the different biasing methods. - Discuss the suitability for various applications. **6. Exercise (5 minutes)** 3. Provide numerical problems related to each biasing method. 4. Examples of biasing in practical circuits.
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students. 5. Suggested Reading: Biasing methods from Sedra/Smith. 6. Homework: Solve numerical problems provided in class.
Evaluation	2. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 34	Course Name: Basic Electrical & Electronics Engineering **Topic:** Hybrid Parameters Introduction	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand the concept of hybrid parameters. b) Explain the significance of h-parameters in transistor analysis. c) Apply h-parameters in solving transistor circuit problems.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions - What are parameters in electrical circuits? - Why do we need to simplify transistor analysis? Introduce the concept of hybrid parameters: - Discuss the need for h-parameters. - Highlight the advantages of using h-parameters in circuit analysis. **2. Development (30 minutes)** a) Definition and Representation - Explain the definition of h-parameters. - Discuss the representation of h-parameters in matrix form. - Provide examples of h-parameter matrices. b) Calculation of h-Parameters - Explain how to calculate h-parameters for a given transistor. - Discuss the significance of each parameter (h11, h12, h21, h22). - Provide numerical examples. c) Application in Circuit Analysis - Illustrate the use of h-parameters in analyzing transistor circuits. - Solve example problems using h-parameters. - Discuss the impact on input and output impedance. d) Advantages and Limitations - Simplification of complex circuits - Usefulness in small signal analysis - Limitations in high-frequency analysis **3. Exercise (5 minutes)** - Provide numerical problems related to h-parameter calculation. - Examples of circuit analysis using h-parameters.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: h-parameter analysis from Boylestad. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 35	Course Name: Basic Electrical & Electronics Engineering **Topic:** Two Port Networks	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand the concept of two-port networks. b) Analyze the parameters and characteristics of two-port networks. c) Apply two-port network theory to solve electrical circuit problems.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What is a network in electrical engineering? - Why do we use two-port networks? Introduce the concept of two-port networks: - Discuss the significance in simplifying complex circuits. - Highlight the applications of two-port networks. **2. Development (30 minutes)** a) Definition and Parameters - Explain the definition of a two-port network. - Discuss the different parameters (Z, Y, H, ABCD). - Provide examples of each parameter type. b) Impedance (Z) Parameters - Discuss the Z parameters and their calculation. - Provide numerical examples and applications. c) Admittance (Y) Parameters - Explain the Y parameters and their significance. - Solve example problems using Y parameters. d) Hybrid (H) Parameters - Discuss the H parameters and their use in transistor circuits. - Provide practical examples and problems. e) Transmission (ABCD) Parameters - Explain the ABCD parameters and their application in network analysis. - Solve numerical examples using ABCD parameters. f) Comparison and Applications - Compare the different parameters. - Discuss their suitability for various applications. **3. Exercise (5 minutes)** - Provide numerical problems related to each parameter type. - Examples of practical circuit analysis using two-port networks.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Two-port network analysis from Hayt/Kemmerly. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 36	**Course Name: Basic Electrical & Electronics Engineering** **Topic:** Hybrid Model for CE, CC, CB Configuration and Their Analysis Using H-Parameters	**Course No.: ESC-201**

Objectives	At the end of the lesson the student shall be able to: a) Understand the hybrid model for CE, CC, and CB configurations. b) Analyze transistor circuits using h-parameters. c) Apply h-parameter analysis to practical problems.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What are hybrid parameters? - How are they used in transistor analysis? Introduce the hybrid model: - Discuss the significance of using hybrid models. - Highlight the benefits of h-parameter analysis. **2. Development (30 minutes)** a) Hybrid Model for CE Configuration - Explain the hybrid model for the CE configuration. - Discuss the h-parameter equations. - Provide examples and solve numerical problems. b) Hybrid Model for CC Configuration - Discuss the hybrid model for the CC configuration. - Illustrate the h-parameter equations. - Solve example problems using CC configuration. c) Hybrid Model for CB Configuration - Explain the hybrid model for the CB configuration. - Discuss the h-parameter equations. - Provide practical examples and problems. d) Comparison and Applications - Compare the hybrid models for CE, CC, and CB configurations. - Discuss the applications of each configuration. **3. Exercise (5 minutes)** - Provide numerical problems related to h-parameter analysis. - Examples of circuit analysis using hybrid models.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Hybrid model analysis from Boylestad. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 37	Course Name: Basic Electrical & Electronics Engineering **Topic:** Miller Theorem	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand Miller Theorem and its significance in circuit analysis. b) Apply Miller Theorem to simplify complex circuits. c) Appreciate the practical applications of Miller Theorem.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What is the importance of simplifying circuits? - How do we handle feedback in circuits? Introduce Miller Theorem: - Discuss the concept and need for Miller Theorem. - Highlight the advantages of using Miller Theorem in circuit analysis. **2. Development (30 minutes)** a) Explanation of Miller Theorem - Define Miller Theorem and its mathematical formulation. - Discuss the application in voltage gain and impedance calculations. - Provide numerical examples. b) Application in Feedback Circuits - Explain the impact of feedback on impedance. - Illustrate examples of feedback circuits simplified using Miller Theorem. c) Examples and Numerical Problems - Provide step-by-step examples of circuit simplification using Miller Theorem. - Solve numerical problems involving impedance and gain calculations. d) Advantages and Limitations - Discuss the benefits of Miller Theorem in simplifying analysis. - Highlight the limitations and cases where Miller Theorem is not applicable. **3. Exercise (5 minutes)** - Provide numerical problems related to Miller Theorem. - Examples of practical circuits simplified using Miller Theorem.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: Miller Theorem applications from Sedra/Smith. 3. 1Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 38	**Course Name: Basic Electrical & Electronics Engineering** **Topic:** Principle of Operation and Characteristics of JFET	**Course No.: ESC-201**

Objectives	At the end of the lesson the student shall be able to: a) Understand the principle of operation of JFETs. b) Analyze the characteristics of JFETs. c) Appreciate the applications of JFETs in electronic circuits.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What are the basic components of a Field Effect Transistor (FET)? - How do JFETs differ from BJTs? Introduce the concept of JFETs: - Explain the structure and working principle. - Highlight the importance of JFETs in modern electronics. **2. Development (30 minutes)** a) Structure and Operation - Explain the structure of N-channel and P-channel JFETs. - Discuss the operation of JFETs in different regions (ohmic, active, pinch-off). - Provide practical examples. b) Characteristics of JFETs - Discuss the transfer and output characteristics. - Explain the impact of gate-source voltage on drain current. - Provide numerical examples and problems. c) Biasing of JFETs - Explain different biasing techniques (fixed bias, self-bias, voltage-divider bias). d) Applications of JFETs - Discuss the use of JFETs in amplifiers, switches, and analog circuits. e) Advantages and Disadvantages - Highlight the high input impedance and low noise characteristics. - Discuss the limitations of JFETs compared to other transistors. **3. Exercise (5 minutes)** - Provide numerical problems related to JFET characteristics and biasing. - Examples of practical circuits using JFETs.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: JFET analysis from Millman-Halkias. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 39	Course Name: Basic Electrical & Electronics Engineering **Topic:** Biasing of FET	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: d) Understand different methods of biasing FETs. e) Analyze the stability of each biasing method. f) Appreciate the importance of proper biasing in FET operation.
Teaching Aids (if any)	c) PowerPoint presentation d) Chalk and Talk
Teaching Development	**4. Introduction (5 minutes)** - Ask questions: - What is FET biasing? - Why is biasing necessary for FETs? Introduce the concept of FET biasing circuits: - Discuss the purpose and need for biasing. - Highlight the role of biasing in stable FET operation. **5. Development (30 minutes)** f) Fixed Bias - Explain the fixed bias circuit and its operation. - Discuss the advantages and disadvantages. - Provide practical examples. g) Self-Bias - Illustrate the circuit and operation. - Explain the impact on stability and thermal runaway. - Examples of applications. h) Voltage Divider Bias - Discuss the circuit and its advantages. - Explain the improved stability and reduced sensitivity to variations. - Provide practical examples. i) Source Bias - Describe the circuit and operation. - Highlight the stability and common applications. - Real-world examples. j) Comparison and Analysis - Compare the different biasing methods. - Discuss the suitability for various applications. **6. Exercise (5 minutes)** - Provide numerical problems related to each biasing method. - Examples of biasing in practical circuits.
Closure	4. Summarize the Lesson Learning Outcomes and get affirmation from students. 5. Suggested Reading: Biasing methods for FETs from Sedra/Smith. 6. Homework: Solve numerical problems provided in class.
Evaluation	2. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents.

Lesson Plan No. 40	Course Name: Basic Electrical & Electronics Engineering **Topic:** MOSFET and CMOS	Course No.: ESC-201

Objectives	At the end of the lesson the student shall be able to: a) Understand the principle of operation of MOSFETs and CMOS. b) Analyze the characteristics and applications of MOSFETs and CMOS. c) Appreciate the advantages of CMOS technology in modern electronics.
Teaching Aids (if any)	a) PowerPoint presentation b) Chalk and Talk
Teaching Development	**1. Introduction (5 minutes)** - Ask questions: - What are the basic components of a MOSFET? - How do MOSFETs differ from JFETs? Introduce the concept of MOSFETs and CMOS: - Explain the structure and working principle of MOSFETs. - Highlight the importance of CMOS technology in modern electronics. **2. Development (30 minutes)** a) Structure and Operation of MOSFETs - Explain the structure of enhancement and depletion mode MOSFETs. - Discuss the operation of MOSFETs in different regions (cutoff, triode, saturation). - Provide practical examples. b) Characteristics of MOSFETs - Discuss the transfer and output characteristics. - Explain the impact of gate-source voltage on drain current. - Provide numerical examples and problems. c) CMOS Technology - Explain the structure and operation of CMOS. - Discuss the complementary nature of NMOS and PMOS transistors in CMOS. - Provide practical examples and problems. d) Applications of MOSFETs and CMOS - Discuss the use of MOSFETs in amplifiers, switches, and digital circuits. - Explain the advantages of CMOS in low power and high-speed applications. - Provide practical examples of MOSFET and CMOS circuits. e) Advantages and Disadvantages - Highlight the high input impedance and low power consumption of MOSFETs and CMOS. - Discuss the limitations compared to other transistors. **3. Exercise (5 minutes)** - Provide numerical problems related to MOSFET and CMOS characteristics and applications.

	- Examples of practical circuits using MOSFETs and CMOS.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students. 2. Suggested Reading: MOSFET and CMOS analysis from Millman-Halkias. 3. Homework: Solve numerical problems provided in class.
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents