



Kot Bhalwal, Jammu



Model Institute of Engineering  
& Technology (Autonomous)  
Dr. Arun K. Gupta Teaching-Learning Centre

## Department of Electrical Engineering

### Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Power Electronics
2.	Course Code	EE-602
3.	Academic Year	2024-2025
4.	Semester	6th
5.	Number of Lesson plans	32
6.	Faculty Assigned	Parveen Kumar

Faculty Signature

<b>Lesson Plan No. 1</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. To introduce students to the fundamental concepts of power electronics.</li> <li>b. To familiarize students with the applications and significance of power electronics in various industries.</li> <li>c. To provide a basic understanding of power semiconductor devices and their characteristics.</li> <li>d. Target Audience: Undergraduate students in Electrical Engineering or related fields.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides (optional)</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>- Greet the students and introduce the topic of power electronics.</li> <li>- Discuss the importance of power electronics in modern electrical systems, including renewable energy, electric vehicles, industrial applications, and consumer electronics.</li> <li>- Provide a brief overview of what will be covered in the lesson.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes) <ul style="list-style-type: none"> <li>a. Define power electronics as the study of the control and conversion of electrical power using solid-state electronics devices.</li> <li>b. Discuss the importance of power conversion in various applications and industries.</li> <li>c. Highlight the role of power electronics in improving energy efficiency and enabling new technologies.</li> <li>d. Use diagrams and examples to illustrate the operation of these devices.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – <ul style="list-style-type: none"> <li>- Present various applications of power electronics in different industries, such as: <ul style="list-style-type: none"> <li>- Variable speed drives</li> <li>- Switch-mode power supplies</li> <li>- Renewable energy systems (solar inverters, wind turbine converters)</li> <li>- Electric vehicles</li> <li>- Power distribution systems</li> </ul> </li> <li>- Discuss the role of power electronics in improving efficiency, reliability, and performance in these applications.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>



<b>Closure</b>	<ol style="list-style-type: none"><li>1. Encourage students to ask questions and participate in a discussion about the significance of power electronics in today's world.</li><li>2. Provide recommendations for further reading or exploration of advanced topics in power electronics.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 2</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will understand the basic theory of operation of a Silicon Controlled Rectifier (SCR)</li> <li>Students will understand its structure, characteristics, and applications.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides (optional)</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Welcome students to the lesson and introduce the topic of Silicon Controlled Rectifiers (SCRs).</li> <li>Explain the importance of SCRs in electronics and power control systems.</li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Discuss the classification of semiconductor devices into two categories: diodes and transistors.</li> <li>Briefly review the operation principles of diodes and transistors to provide context for understanding SCRs.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Discuss the operating principle of an SCR in forward and reverse bias conditions.</li> <li>Explain the role of the gate signal in triggering the SCR into conduction.</li> <li>Discuss the latching and holding current characteristics of SCRs.</li> <li>Introduce the concept of forward and reverse blocking voltage. Switch-mode power supplies</li> </ul>           Use Nearpod to collect responses and discuss the answers.         </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Highlight the various applications of SCRs in power control systems, such as phase control, voltage regulation, and power switching.</li> <li>Provide examples of devices or systems where SCRs are commonly used.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> </ol>



	<ol style="list-style-type: none"><li>2. Evaluate students' understanding through class participation, questions, and any assignments or quizzes related to the topic.</li><li>3. Review any misconceptions or areas of confusion before concluding the lesson.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 3</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will be able to differentiate between the static and dynamic characteristics of Silicon Controlled Rectifiers (SCRs).</li> <li>Understand their significance, and apply this knowledge to analyze SCR circuits.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides (optional)</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Welcome students and provide an overview of the lesson objectives.</li> <li>Recap briefly on the basic theory of operation of SCRs covered in previous lessons.</li> </ul> </li> <li><b>Development</b> (20 minutes)           <ol style="list-style-type: none"> <li>Define static characteristics and their importance in SCR analysis.</li> <li>Discuss the following static characteristics:               <ul style="list-style-type: none"> <li>Forward and reverse voltage ratings</li> <li>Forward and reverse blocking capability</li> <li>Forward and reverse leakage current</li> <li>Breakover voltage</li> </ul> </li> <li>Explain the graphical representation of static characteristics on the SCR datasheet.</li> </ol> </li> <li><b>Exercise</b> (15 minutes) –           <ul style="list-style-type: none"> <li>Compare and contrast static and dynamic characteristics.</li> <li>Discuss how static characteristics define the fundamental behavior of SCRs, while dynamic characteristics describe their transient response.</li> <li>Highlight the importance of understanding both static and dynamic characteristics in SCR circuit design and analysis. Present real-world applications where static and dynamic characteristics play a crucial role in SCR performance.</li> <li>Discuss case studies of SCR circuits in power control, motor drives, and voltage regulation.</li> <li>Analyze the impact of different SCR characteristics on circuit behavior and performance.</li> <li>Use Nearpod to collect responses and discuss the answers.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points discussed in the lesson.</li> <li>Emphasize the importance of understanding both static and dynamic characteristics for effective SCR circuit design and</li> </ol>



	<p>troubleshooting.</p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>2. Assign a brief quiz or problem-solving activity to assess comprehension of static and dynamic characteristics of SCRs.</li><li>3. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 4</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>a. Students will understand the importance of protecting Silicon Controlled Rectifiers (SCRs) in electronic circuits.</li> <li>b. Identify common causes of SCR failure.</li> <li>c. Learn about various protection methods to ensure reliable operation of SCRs in different applications.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>- Discuss the importance of power electronics in modern electrical systems, including renewable energy, electric vehicles, industrial applications, and consumer electronics.</li> <li>-</li> </ul> </li> <li>2. <b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>a. Discuss the common factors that can lead to SCR failure, such as:               <ul style="list-style-type: none"> <li>- Over voltage spikes</li> <li>- Over current conditions</li> <li>- Excessive temperature</li> <li>- Reverse voltage</li> </ul> </li> <li>b. Highlight the consequences of SCR failure on electronic systems.</li> <li>c. Discuss various methods for protecting SCRs against different failure modes.</li> <li>d. Explain the advantages and limitations of each protection method.</li> </ol> </li> <li>3. <b>Exercise</b> (5 minutes) –           <ul style="list-style-type: none"> <li>- Conduct a demonstration or simulation to showcase the effectiveness of SCR protection methods.</li> <li>- Show how protection circuits respond to overvoltage spikes, over current conditions, and excessive temperature.</li> <li>- Assign a practical project where students design and implement SCR protection circuits for specific applications.</li> </ul>           Use Nearpod to collect responses and discuss the answers.         </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Emphasize the importance of proactive SCR protection to ensure the reliability and safety of electronic systems.</li> </ol>



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Assign a brief quiz or problem-solving activity to assess comprehension of SCR protection methods and their applications.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 5</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Begin the lesson by asking students if they have heard about snubber circuits and what they understand about them.</li> <li>Introduce the concept of snubber circuits, explaining that they are used to protect electronic components from voltage spikes or transients.</li> </ol>	
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Present an overview of snubber circuits, covering the following points:               <ul style="list-style-type: none"> <li>Purpose: To suppress voltage transients, reduce switching losses, and improve the reliability of electronic systems.</li> <li>Types: Discuss different types of snubber circuits, including RC snubbers, RCD snubbers, and RC snubber networks.</li> <li>Components: Explain the role of resistors, capacitors, and diodes in snubber circuits</li> </ul> </li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Discuss the working principles of each type of snubber circuit and their typical applications in electronic circuits.</li> <li>Explain the advantages and disadvantages of using snubber circuits in electronic designs, such as increased component count, added complexity, and improved system reliability.</li> <li>Optionally, demonstrate the construction and behavior of basic snubber circuits using electronic components.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to design a basic snubber circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li> <li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li> <li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of snubber</li> </ol>	

	circuits. Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>4. Nearpod Quiz on power Electronics.</li> </ol> Spend 5 minutes to evaluate student assimilation of the lesson contents



<b>Lesson Plan No. 6</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. To introduce students to the fundamental concepts of power electronics.</li> <li>b. To familiarize students with the applications and significance of power electronics in various industries.</li> <li>c. To provide a basic understanding of power semiconductor devices and their characteristics.</li> <li>d. Target Audience: Undergraduate students in Electrical Engineering or related fields.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides (optional)</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>- Greet the students and introduce the topic of power electronics.</li> <li>- Discuss the importance of power electronics in modern electrical systems, including renewable energy, electric vehicles, industrial applications, and consumer electronics.</li> <li>- Provide a brief overview of what will be covered in the lesson.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes) <ul style="list-style-type: none"> <li>a. Define power electronics as the study of the control and conversion of electrical power using solid-state electronics devices.</li> <li>b. Discuss the importance of power conversion in various applications and industries.</li> <li>c. Highlight the role of power electronics in improving energy efficiency and enabling new technologies.</li> <li>d. Use diagrams and examples to illustrate the operation of these devices.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – <ul style="list-style-type: none"> <li>- Present various applications of power electronics in different industries, such as: <ul style="list-style-type: none"> <li>- Variable speed drives</li> <li>- Switch-mode power supplies</li> <li>- Renewable energy systems (solar inverters, wind turbine converters)</li> <li>- Electric vehicles</li> <li>- Power distribution systems</li> </ul> </li> <li>- Discuss the role of power electronics in improving efficiency, reliability, and performance in these applications.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>



<b>Closure</b>	<ol style="list-style-type: none"><li>1. Encourage students to ask questions and participate in a discussion about the significance of power electronics in today's world.</li><li>2. Provide recommendations for further reading or exploration of advanced topics in power electronics.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 7</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will understand the basic theory of operation of a Silicon Controlled Rectifier (SCR)</li> <li>Students will understand its structure, characteristics, and applications.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides (optional)</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Welcome students to the lesson and introduce the topic of Silicon Controlled Rectifiers (SCRs).</li> <li>Explain the importance of SCRs in electronics and power control systems.</li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Discuss the classification of semiconductor devices into two categories: diodes and transistors.</li> <li>Briefly review the operation principles of diodes and transistors to provide context for understanding SCRs.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Discuss the operating principle of an SCR in forward and reverse bias conditions.</li> <li>Explain the role of the gate signal in triggering the SCR into conduction.</li> <li>Discuss the latching and holding current characteristics of SCRs.</li> <li>Introduce the concept of forward and reverse blocking voltage. Switch-mode power supplies</li> </ul>           Use Nearpod to collect responses and discuss the answers.         </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Highlight the various applications of SCRs in power control systems, such as phase control, voltage regulation, and power switching.</li> <li>Provide examples of devices or systems where SCRs are commonly used.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> </ol>



	<ol style="list-style-type: none"><li>2. Evaluate students' understanding through class participation, questions, and any assignments or quizzes related to the topic.</li><li>3. Review any misconceptions or areas of confusion before concluding the lesson.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 8</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will be able to differentiate between the static and dynamic characteristics of Silicon Controlled Rectifiers (SCRs).</li> <li>Understand their significance, and apply this knowledge to analyze SCR circuits.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides (optional)</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Welcome students and provide an overview of the lesson objectives.</li> <li>Recap briefly on the basic theory of operation of SCRs covered in previous lessons.</li> </ul> </li> <li><b>Development</b> (20 minutes)           <ol style="list-style-type: none"> <li>Define static characteristics and their importance in SCR analysis.</li> <li>Discuss the following static characteristics:               <ul style="list-style-type: none"> <li>Forward and reverse voltage ratings</li> <li>Forward and reverse blocking capability</li> <li>Forward and reverse leakage current</li> <li>Breakover voltage</li> </ul> </li> <li>Explain the graphical representation of static characteristics on the SCR datasheet.</li> </ol> </li> <li><b>Exercise</b> (15 minutes) –           <ul style="list-style-type: none"> <li>Compare and contrast static and dynamic characteristics.</li> <li>Discuss how static characteristics define the fundamental behavior of SCRs, while dynamic characteristics describe their transient response.</li> <li>Highlight the importance of understanding both static and dynamic characteristics in SCR circuit design and analysis. Present real-world applications where static and dynamic characteristics play a crucial role in SCR performance.</li> <li>Discuss case studies of SCR circuits in power control, motor drives, and voltage regulation.</li> <li>Analyze the impact of different SCR characteristics on circuit behavior and performance.</li> <li>Use Nearpod to collect responses and discuss the answers.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points discussed in the lesson.</li> <li>Emphasize the importance of understanding both static and dynamic characteristics for effective SCR circuit design and</li> </ol>



	<p>troubleshooting.</p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>2. Assign a brief quiz or problem-solving activity to assess comprehension of static and dynamic characteristics of SCRs.</li><li>3. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 9</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Students will understand the importance of protecting Silicon Controlled Rectifiers (SCRs) in electronic circuits.</li> <li>b. Identify common causes of SCR failure.</li> <li>c. Learn about various protection methods to ensure reliable operation of SCRs in different applications.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>- Discuss the importance of power electronics in modern electrical systems, including renewable energy, electric vehicles, industrial applications, and consumer electronics.</li> <li>-</li> </ul> </li> <li>2. <b>Development</b> (30 minutes) <ul style="list-style-type: none"> <li>a. Discuss the common factors that can lead to SCR failure, such as: <ul style="list-style-type: none"> <li>- Over voltage spikes</li> <li>- Over current conditions</li> <li>- Excessive temperature</li> <li>- Reverse voltage</li> </ul> </li> <li>b. Highlight the consequences of SCR failure on electronic systems.</li> <li>c. Discuss various methods for protecting SCRs against different failure modes.</li> <li>d. Explain the advantages and limitations of each protection method.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – <ul style="list-style-type: none"> <li>- Conduct a demonstration or simulation to showcase the effectiveness of SCR protection methods.</li> <li>- Show how protection circuits respond to overvoltage spikes, over current conditions, and excessive temperature.</li> <li>- Assign a practical project where students design and implement SCR protection circuits for specific applications.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Emphasize the importance of proactive SCR protection to ensure the reliability and safety of electronic systems.</li> </ol>



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Assign a brief quiz or problem-solving activity to assess comprehension of SCR protection methods and their applications.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 10</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Begin the lesson by asking students if they have heard about snubber circuits and what they understand about them. b. Introduce the concept of snubber circuits, explaining that they are used to protect electronic components from voltage spikes or transients.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction (10 minutes)</b><ul style="list-style-type: none"><li>- Present an overview of snubber circuits, covering the following points:<ul style="list-style-type: none"><li>- Purpose: To suppress voltage transients, reduce switching losses, and improve the reliability of electronic systems.</li><li>- Types: Discuss different types of snubber circuits, including RC snubbers, RCD snubbers, and RC snubber networks.</li><li>- Components: Explain the role of resistors, capacitors, and diodes in snubber circuits</li></ul></li></ul></li><li><b>Development (30 minutes)</b><ol style="list-style-type: none"><li>Discuss the working principles of each type of snubber circuit and their typical applications in electronic circuits.</li><li>Explain the advantages and disadvantages of using snubber circuits in electronic designs, such as increased component count, added complexity, and improved system reliability.</li><li>Optionally, demonstrate the construction and behavior of basic snubber circuits using electronic components.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to design a basic snubber circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>- Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>- Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of snubber</li></ol>	



	<p>circuits. Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 11</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	<p>At the end of the lesson the student shall be able to:</p> <ol style="list-style-type: none"> <li>Understand the principles and operation of single-phase half-wave controlled converters.</li> <li>Analyze the waveforms and performance characteristics of these converters.</li> <li>Calculate relevant parameters such as average output voltage, ripple factor, and efficiency.</li> <li>Identify applications and limitations of single-phase half-wave-controlled converters.</li> </ol>	
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>Briefly introduce the concept of power electronic converters.</li> <li>Explain the significance of single-phase half-wave-controlled converters in various industrial applications.</li> <li>Highlight the objectives of the lesson.</li> </ul> </li> <li><b>Development</b> (30 minutes) <ol style="list-style-type: none"> <li>Explain the structure and basic working principle of a single-phase half-wave-controlled converter.</li> <li>Draw the circuit diagram and discuss the function of each component</li> <li>Discuss the role of the thyristor in controlling the load current.</li> <li>Explain how gating signals control the firing angle of the thyristor.</li> </ol> </li> <li>Exercise (5 minutes) – <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li> <li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li> <li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol>	



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 12</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Students will understand the operation and characteristics of fully controlled converter rectifiers, their applications, and the control strategies involved.</li> <li>b. Identify applications and limitations of single-phase Fully-wave-controlled converters.</li> </ul>	
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ul>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>- Briefly introduce the concept of power electronic converters.</li> <li>- Brief review of rectification and the need for controlled rectifiers.</li> <li>- Overview of fully controlled converter rectifiers and their significance in power electronics.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes) <ul style="list-style-type: none"> <li>a. Explain the structure and basic working principle of a single-phase fully-wave-controlled converter.</li> <li>b. Introduction to firing angle control and its significance.</li> <li>c. Description of firing angle control methods: phase control and integral cycle control.</li> <li>d. Comparison of different control strategies in terms of efficiency and harmonic distortion.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – <ul style="list-style-type: none"> <li>- Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li> <li>- Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li> <li>- Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to</li> </ol>	



	<p>answer and discuss.</p> <ol style="list-style-type: none"><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 13</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	<p>At the end of the lesson the student shall be able to:</p> <ol style="list-style-type: none"> <li>Understand the principles and operation of single-phase half-wave controlled converters.</li> <li>Analyze the waveforms and performance characteristics of these converters.</li> <li>Calculate relevant parameters such as average output voltage, ripple factor, and efficiency.</li> <li>Identify applications and limitations of single-phase half-wave-controlled converters.</li> </ol>	
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>Briefly introduce the concept of power electronic converters.</li> <li>Explain the significance of single-phase half-wave-controlled converters in various industrial applications.</li> <li>Highlight the objectives of the lesson.</li> </ul> </li> <li><b>Development</b> (30 minutes) <ol style="list-style-type: none"> <li>Explain the structure and basic working principle of a single-phase half-wave-controlled converter.</li> <li>Draw the circuit diagram and discuss the function of each component</li> <li>Discuss the role of the thyristor in controlling the load current.</li> <li>Explain how gating signals control the firing angle of the thyristor.</li> </ol> </li> <li>Exercise (5 minutes) – <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li> <li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li> <li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol>	



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 14</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>a. Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>- Brief overview of converter circuits and their role in power electronics.</li> <li>- Explanation of half-wave and full-wave rectifiers.</li> <li>- Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>a. Half-Wave Converter Operation</li> <li>b. Full-Wave Converter Operation without Freewheeling Diode</li> <li>c. Full-Wave Converter Operation with Freewheeling Diode</li> <li>d. Performance Analysis</li> </ol> </li> <li>3. Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>- Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>4. Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 15</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>a. Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>- Brief overview of converter circuits and their role in power electronics.</li> <li>- Explanation of half-wave and full-wave rectifiers.</li> <li>- Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>a. Half-Wave Converter Operation</li> <li>b. Full-Wave Converter Operation without Freewheeling Diode</li> <li>c. Full-Wave Converter Operation with Freewheeling Diode</li> <li>d. Performance Analysis</li> </ol> </li> <li>3. Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>- Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>4. Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 16	Course Name: Power Electronics	Course No.: EE-602
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will comprehend the principles, operation, and applications of three-phase fully controlled converters, including the analysis of different firing strategies and their effects on output waveforms and performance.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Overview of three-phase power systems and their significance in electrical engineering.</li> <li>Introduction to the need for three-phase power conversion and its applications in industrial and commercial sectors.</li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Discussion of practical applications of three-phase fully controlled converters, such as motor drives, AC voltage regulation, and reactive power compensation systems.</li> <li>Case studies and examples showcasing real-world implementations in industrial settings.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 17</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will comprehend the principles, operation, and applications of three-phase fully controlled converters, including the analysis of different firing strategies and their effects on output waveforms and performance.
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes) <ul style="list-style-type: none"> <li>- Overview of three-phase power systems and their significance in electrical engineering.</li> <li>- Introduction to the need for three-phase power conversion and its applications in industrial and commercial sectors.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes) <ol style="list-style-type: none"> <li>a. Discussion of practical applications of three-phase fully controlled converters, such as motor drives, AC voltage regulation, and reactive power compensation systems.</li> <li>b. Case studies and examples showcasing real-world implementations in industrial settings.</li> </ol> </li> <li>3. <b>Exercise</b> (5 minutes) – <ul style="list-style-type: none"> <li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>- Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>4. Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 18</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Brief overview of converter circuits and their role in power electronics.</li> <li>Explanation of half-wave and full-wave rectifiers.</li> <li>Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Half-Wave Converter Operation</li> <li>Full-Wave Converter Operation without Freewheeling Diode</li> <li>Full-Wave Converter Operation with Freewheeling Diode</li> <li>Performance Analysis</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 19</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>a. Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>a. Whiteboard and markers</li> <li>b. PowerPoint slides</li> <li>c. Handouts or reading materials on power electronics basics</li> <li>d. Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>- Brief overview of converter circuits and their role in power electronics.</li> <li>- Explanation of half-wave and full-wave rectifiers.</li> <li>- Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li> </ul> </li> <li>2. <b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>a. Half-Wave Converter Operation</li> <li>b. Full-Wave Converter Operation without Freewheeling Diode</li> <li>c. Full-Wave Converter Operation with Freewheeling Diode</li> <li>d. Performance Analysis</li> </ol> </li> <li>3. Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li> <li>- Case studies and examples showcasing real-world applications and challenges.</li> </ul> </li> </ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the key points covered in the lesson.</li> <li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li> <li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li> <li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li> <li>4. Nearpod Quiz on power Electronics.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 20</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the principles and operation of single-phase half-wave controlled converters.</li> <li>Analyze the waveforms and performance characteristics of these converters.</li> <li>Calculate relevant parameters such as average output voltage, ripple factor, and efficiency.</li> <li>Identify applications and limitations of single-phase half-wave-controlled converters.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Whiteboard and markers</li> <li>PowerPoint slides</li> <li>Handouts or reading materials on power electronics basics</li> <li>Use of Nearpod tool for online quiz</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (10 minutes)           <ul style="list-style-type: none"> <li>Briefly introduce the concept of power electronic converters.</li> <li>Explain the significance of single-phase half-wave-controlled converters in various industrial applications.</li> <li>Highlight the objectives of the lesson.</li> </ul> </li> <li><b>Development</b> (30 minutes)           <ol style="list-style-type: none"> <li>Explain the structure and basic working principle of a single-phase half-wave-controlled converter.</li> <li>Draw the circuit diagram and discuss the function of each component</li> <li>Discuss the role of the thyristor in controlling the load current.</li> <li>Explain how gating signals control the firing angle of the thyristor.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li> <li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li> <li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li> </ul>           Use Nearpod to collect responses and discuss the answers.         </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the key points covered in the lesson.</li> <li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li> </ol>



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 21</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Understand the principles and operation of choppers. b. Classify the different types of choppers. c. Identify applications and limitations of various chopper types.
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>Briefly introduce the concept of power electronic converters.</li><li>Explain the significance of choppers in various industrial applications.</li><li>Highlight the objectives of the lesson.</li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Define what a chopper is.</li><li>Explain the basic operation using a simple diagram.</li><li>Discuss how choppers use high-speed switching to control the average voltage and current supplied to a load.</li><li>Introduce the concept of the duty cycle.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>Completion and comprehension of any assigned follow-up</li></ol>



	questions or reflections on the topic. 4. Nearpod Quiz on power Electronics. Spend 5 minutes to evaluate student assimilation of the lesson contents
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Lesson Plan No. 22	Course Name: Power Electronics	Course No.: EE-602
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will be able to differentiate between the static and dynamic characteristics of Silicon Controlled Rectifiers (SCRs). b. Understand their significance, and apply this knowledge to analyze SCR circuits.
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides (optional) c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz
<b>Teaching Development</b>	<ol style="list-style-type: none"><li>1. <b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>- Welcome students and provide an overview of the lesson objectives.</li><li>- Recap briefly on the basic theory of operation of SCRs covered in previous lessons.</li></ul></li><li>2. <b>Development</b> (20 minutes)<ol style="list-style-type: none"><li>a. Define static characteristics and their importance in SCR analysis.</li><li>b. Discuss the following static characteristics:<ul style="list-style-type: none"><li>- Forward and reverse voltage ratings</li><li>- Forward and reverse blocking capability</li><li>- Forward and reverse leakage current</li><li>- Breakover voltage</li></ul></li><li>c. Explain the graphical representation of static characteristics on the SCR datasheet.</li></ol></li><li>3. <b>Exercise</b> (15 minutes) –<ul style="list-style-type: none"><li>- Compare and contrast static and dynamic characteristics.</li><li>- Discuss how static characteristics define the fundamental behavior of SCRs, while dynamic characteristics describe their transient response.</li><li>- Highlight the importance of understanding both static and dynamic characteristics in SCR circuit design and analysis. Present real-world applications where static and dynamic characteristics play a crucial role in SCR performance.</li><li>- Discuss case studies of SCR circuits in power control, motor drives, and voltage regulation.</li><li>- Analyze the impact of different SCR characteristics on circuit behavior and performance.</li><li>- Use Nearpod to collect responses and discuss the answers.</li></ul></li></ol>
<b>Closure</b>	<ol style="list-style-type: none"><li>1. Summarize the key points discussed in the lesson.</li><li>2. Emphasize the importance of understanding both static and dynamic characteristics for effective SCR circuit design and</li></ol>



	<p>troubleshooting.</p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>2. Assign a brief quiz or problem-solving activity to assess comprehension of static and dynamic characteristics of SCRs.</li><li>3. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 23</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Begin the lesson by asking students if they have heard about snubber circuits and what they understand about them. b. Introduce the concept of snubber circuits, explaining that they are used to protect electronic components from voltage spikes or transients.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>- Present an overview of snubber circuits, covering the following points:<ul style="list-style-type: none"><li>- Purpose: To suppress voltage transients, reduce switching losses, and improve the reliability of electronic systems.</li><li>- Types: Discuss different types of snubber circuits, including RC snubbers, RCD snubbers, and RC snubber networks.</li><li>- Components: Explain the role of resistors, capacitors, and diodes in snubber circuits</li></ul></li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Discuss the working principles of each type of snubber circuit and their typical applications in electronic circuits.</li><li>Explain the advantages and disadvantages of using snubber circuits in electronic designs, such as increased component count, added complexity, and improved system reliability.</li><li>Optionally, demonstrate the construction and behavior of basic snubber circuits using electronic components.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to design a basic snubber circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>- Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>- Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of snubber</li></ol>	



	<p>circuits. Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 24</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will understand the basic theory of operation of a Silicon Controlled Rectifier (SCR) b. Students will understand its structure, characteristics, and applications.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides (optional) c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>Welcome students to the lesson and introduce the topic of Silicon Controlled Rectifiers (SCRs).</li><li>Explain the importance of SCRs in electronics and power control systems.</li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Discuss the classification of semiconductor devices into two categories: diodes and transistors.</li><li>Briefly review the operation principles of diodes and transistors to provide context for understanding SCRs.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>Discuss the operating principle of an SCR in forward and reverse bias conditions.</li><li>Explain the role of the gate signal in triggering the SCR into conduction.</li><li>Discuss the latching and holding current characteristics of SCRs.</li><li>Introduce the concept of forward and reverse blocking voltage. Switch-mode power supplies</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Highlight the various applications of SCRs in power control systems, such as phase control, voltage regulation, and power switching.</li><li>Provide examples of devices or systems where SCRs are commonly used.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	<ol style="list-style-type: none"><li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li></ol>	



	<ol style="list-style-type: none"><li>2. Evaluate students' understanding through class participation, questions, and any assignments or quizzes related to the topic.</li><li>3. Review any misconceptions or areas of confusion before concluding the lesson.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 25</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will be able to differentiate between the static and dynamic characteristics of Silicon Controlled Rectifiers (SCRs). b. Understand their significance, and apply this knowledge to analyze SCR circuits.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides (optional) c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li>1. <b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>- Welcome students and provide an overview of the lesson objectives.</li><li>- Recap briefly on the basic theory of operation of SCRs covered in previous lessons.</li></ul></li><li>2. <b>Development</b> (20 minutes)<ol style="list-style-type: none"><li>a. Define static characteristics and their importance in SCR analysis.</li><li>b. Discuss the following static characteristics:<ul style="list-style-type: none"><li>- Forward and reverse voltage ratings</li><li>- Forward and reverse blocking capability</li><li>- Forward and reverse leakage current</li><li>- Breakover voltage</li></ul></li><li>c. Explain the graphical representation of static characteristics on the SCR datasheet.</li></ol></li><li>3. <b>Exercise</b> (15 minutes) –<ul style="list-style-type: none"><li>- Compare and contrast static and dynamic characteristics.</li><li>- Discuss how static characteristics define the fundamental behavior of SCRs, while dynamic characteristics describe their transient response.</li><li>- Highlight the importance of understanding both static and dynamic characteristics in SCR circuit design and analysis. Present real-world applications where static and dynamic characteristics play a crucial role in SCR performance.</li><li>- Discuss case studies of SCR circuits in power control, motor drives, and voltage regulation.</li><li>- Analyze the impact of different SCR characteristics on circuit behavior and performance.</li><li>- Use Nearpod to collect responses and discuss the answers.</li></ul></li></ol>	
<b>Closure</b>	<ol style="list-style-type: none"><li>1. Summarize the key points discussed in the lesson.</li><li>2. Emphasize the importance of understanding both static and dynamic characteristics for effective SCR circuit design and</li></ol>	



	<p>troubleshooting.</p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>2. Assign a brief quiz or problem-solving activity to assess comprehension of static and dynamic characteristics of SCRs.</li><li>3. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 26</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Begin the lesson by asking students if they have heard about snubber circuits and what they understand about them. b. Introduce the concept of snubber circuits, explaining that they are used to protect electronic components from voltage spikes or transients.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction (10 minutes)</b><ul style="list-style-type: none"><li>- Present an overview of snubber circuits, covering the following points:<ul style="list-style-type: none"><li>- Purpose: To suppress voltage transients, reduce switching losses, and improve the reliability of electronic systems.</li><li>- Types: Discuss different types of snubber circuits, including RC snubbers, RCD snubbers, and RC snubber networks.</li><li>- Components: Explain the role of resistors, capacitors, and diodes in snubber circuits</li></ul></li></ul></li><li><b>Development (30 minutes)</b><ol style="list-style-type: none"><li>Discuss the working principles of each type of snubber circuit and their typical applications in electronic circuits.</li><li>Explain the advantages and disadvantages of using snubber circuits in electronic designs, such as increased component count, added complexity, and improved system reliability.</li><li>Optionally, demonstrate the construction and behavior of basic snubber circuits using electronic components.</li></ol></li><li><b>Exercise (5 minutes) –</b><ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to design a basic snubber circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>- Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>- Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of snubber</li></ol>	



	<p>circuits. Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 27</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will understand the operation and characteristics of fully controlled converter rectifiers, their applications, and the control strategies involved. b. Identify applications and limitations of single-phase Fully-wave-controlled converters.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>1. Introduction (10 minutes)</b><ul style="list-style-type: none"><li>- Briefly introduce the concept of power electronic converters.</li><li>- Brief review of rectification and the need for controlled rectifiers.</li><li>- Overview of fully controlled converter rectifiers and their significance in power electronics.</li></ul></li><li><b>2. Development (30 minutes)</b><ol style="list-style-type: none"><li>a. Explain the structure and basic working principle of a single-phase fully-wave-controlled converter.</li><li>b. Introduction to firing angle control and its significance.</li><li>c. Description of firing angle control methods: phase control and integral cycle control.</li><li>d. Comparison of different control strategies in terms of efficiency and harmonic distortion.</li></ol></li><li><b>3. Exercise (5 minutes) –</b><ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>- Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>- Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>1. Summarize the key points covered in the lesson.</li><li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	1. Reflective Questions (What, Why, Who?). Allow students to	



	<p>answer and discuss.</p> <ol style="list-style-type: none"><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 28</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Understand the principles and operation of single-phase half-wave controlled converters. b. Analyze the waveforms and performance characteristics of these converters. c. Calculate relevant parameters such as average output voltage, ripple factor, and efficiency. d. Identify applications and limitations of single-phase half-wave-controlled converters.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>Briefly introduce the concept of power electronic converters.</li><li>Explain the significance of single-phase half-wave-controlled converters in various industrial applications.</li><li>Highlight the objectives of the lesson.</li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Explain the structure and basic working principle of a single-phase half-wave-controlled converter.</li><li>Draw the circuit diagram and discuss the function of each component</li><li>Discuss the role of the thyristor in controlling the load current.</li><li>Explain how gating signals control the firing angle of the thyristor.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol>	



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



<b>Lesson Plan No. 29</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>1. Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>- Brief overview of converter circuits and their role in power electronics.</li><li>- Explanation of half-wave and full-wave rectifiers.</li><li>- Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li></ul></li><li><b>2. Development</b> (30 minutes)<ol style="list-style-type: none"><li>a. Half-Wave Converter Operation</li><li>b. Full-Wave Converter Operation without Freewheeling Diode</li><li>c. Full-Wave Converter Operation with Freewheeling Diode</li><li>d. Performance Analysis</li></ol></li><li><b>3. Exercise</b> (5 minutes) –<ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li><li>- Case studies and examples showcasing real-world applications and challenges.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>1. Summarize the key points covered in the lesson.</li><li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>	



<b>Lesson Plan No. 30</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will comprehend the principles, operation, and applications of three-phase fully controlled converters, including the analysis of different firing strategies and their effects on output waveforms and performance.
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>Overview of three-phase power systems and their significance in electrical engineering.</li><li>Introduction to the need for three-phase power conversion and its applications in industrial and commercial sectors.</li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Discussion of practical applications of three-phase fully controlled converters, such as motor drives, AC voltage regulation, and reactive power compensation systems.</li><li>Case studies and examples showcasing real-world implementations in industrial settings.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li><li>Case studies and examples showcasing real-world applications and challenges.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"><li>Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 31	Course Name: Power Electronics	Course No.: EE-602
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Students will understand the operation, characteristics, and differences in performance of converters (both half-wave and full-wave) with resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads, with and without freewheeling diode.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>1. Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>- Brief overview of converter circuits and their role in power electronics.</li><li>- Explanation of half-wave and full-wave rectifiers.</li><li>- Introduction to resistive (R), resistive-inductive (RL), and resistive-inductive-capacitive (RLE) loads.</li></ul></li><li><b>2. Development</b> (30 minutes)<ol style="list-style-type: none"><li>a. Half-Wave Converter Operation</li><li>b. Full-Wave Converter Operation without Freewheeling Diode</li><li>c. Full-Wave Converter Operation with Freewheeling Diode</li><li>d. Performance Analysis</li></ol></li><li><b>3. Exercise</b> (5 minutes) –<ul style="list-style-type: none"><li>- Divide the class into small groups and assign each group to Discussion on practical applications and considerations when selecting converter configurations for specific loads.</li><li>- Case studies and examples showcasing real-world applications and challenges.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>1. Summarize the key points covered in the lesson.</li><li>2. Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>	



<b>Lesson Plan No. 32</b>	<b>Course Name: Power Electronics</b>	<b>Course No.: EE-602</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Understand the principles and operation of single-phase half-wave controlled converters. b. Analyze the waveforms and performance characteristics of these converters. c. Calculate relevant parameters such as average output voltage, ripple factor, and efficiency. d. Identify applications and limitations of single-phase half-wave-controlled converters.	
<b>Teaching Aids (if any)</b>	a. Whiteboard and markers b. PowerPoint slides c. Handouts or reading materials on power electronics basics d. Use of Nearpod tool for online quiz	
<b>Teaching Development</b>	<ol style="list-style-type: none"><li><b>Introduction</b> (10 minutes)<ul style="list-style-type: none"><li>Briefly introduce the concept of power electronic converters.</li><li>Explain the significance of single-phase half-wave-controlled converters in various industrial applications.</li><li>Highlight the objectives of the lesson.</li></ul></li><li><b>Development</b> (30 minutes)<ol style="list-style-type: none"><li>Explain the structure and basic working principle of a single-phase half-wave-controlled converter.</li><li>Draw the circuit diagram and discuss the function of each component</li><li>Discuss the role of the thyristor in controlling the load current.</li><li>Explain how gating signals control the firing angle of the thyristor.</li></ol></li><li>Exercise (5 minutes) –<ul style="list-style-type: none"><li>Divide the class into small groups and assign each group to design a basic half wave circuit for a given electronic application (e.g., a flyback converter, a motor drive).</li><li>Provide students with access to simulation software (if available) to simulate their snubber circuit designs and analyze their performance.</li><li>Encourage students to discuss their design choices and the trade-offs involved in selecting snubber components.</li></ul></li></ol> <p>Use Nearpod to collect responses and discuss the answers.</p>	
<b>Closure</b>	<ol style="list-style-type: none"><li>Summarize the key points covered in the lesson.</li><li>Encourage students to explore additional resources or conduct further experiments to deepen their understanding of converter circuits.</li></ol>	



	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</li><li>2. Evaluate students' understanding through class participation, responses to questions, and engagement in discussions.</li><li>3. Completion and comprehension of any assigned follow-up questions or reflections on the topic.</li><li>4. Nearpod Quiz on power Electronics.</li></ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>