



Lesson Plan No. 1	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Explain the concept of the continuous circulation of water on Earth. b. Recognize and differentiate between the main processes, including evaporation, condensation, precipitation, infiltration, and runoff. c. Understand the crucial role of the hydrological cycle in sustaining ecosystems, supporting human activities, and regulating climate. d. Demonstrate an understanding of how each stage in the hydrological cycle is interconnected and influences the others.
Teaching Aids (if any)	a. Chalk and talk
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. What is the hydrological cycle, and why is it essential for life on Earth? How does water move from the Earth's surface into the atmosphere and back again? How does the hydrological cycle differ in different regions or climates around the world?- Why is precipitation a critical component of the hydrological cycle?- Highlight the perpetual movement of Earth's water.- Break down evaporation, condensation, precipitation, infiltration, and runoff.- Discuss how human activities can disrupt the natural flow.- Connect the hydrological cycle to global climate patterns.- Illustrate its impact on landscapes and societies.2. Development (30 minutes)<ol style="list-style-type: none">a. Introduction:<ul style="list-style-type: none">- Define hydrologic cycle as the continuous movement of water on, above, and below the surface of the Earth.b. Processes:<ul style="list-style-type: none">- Evaporation: Water changes from liquid to vapor.- Condensation: Vapor forms clouds.- Precipitation: Water falls back to Earth as rain, snow, sleet, or hail.- Infiltration: Precipitated water enters the soil.- Runoff: Excess water flows over the land surface.c. Importance:<ul style="list-style-type: none">- Sustains ecosystems and human activities.- Regulates climate and temperature.d. Human Impact:<ul style="list-style-type: none">- Altered by human activities like deforestation and urbanization.e. Conclusion:



	<p>- Emphasize the interconnectedness and significance of each stage in the hydrologic cycle.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- How does the hydrological cycle influence climate patterns and temperatures on Earth?- How does the hydrological cycle differ in arid regions compared to humid climates?- In what ways do human activities impact the natural balance of the hydrological cycle?- What is the hydrological cycle, and how does it sustain life on Earth?- Can you describe the main processes involved in the hydrological cycle and their sequence?- How does water move from the Earth's surface into the atmosphere and back again? <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- NPTEL LECTURES https://archive.nptel.ac.in/content/storage2/courses/105107129/module1/lecture1/lecture1.pdf3. Homework<ul style="list-style-type: none">- Explore and understand the various components and processes of the hydrologic cycle through research and reflection. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Hydrological Cycle. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 2	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> Understand the forms of precipitation. Understand the basic properties of precipitation. Understand concept of different components forms of precipitation. Explain the concept of the continuous circulation of water on Earth.
Teaching Aids (if any)	<ol style="list-style-type: none"> Chalk and talk Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> Introduction (5 minutes) Ask questions. <ul style="list-style-type: none"> What is the hydrological cycle, and why is it essential for life on Earth? How does water move from the Earth's surface into the atmosphere and back again? How does the hydrological cycle differ in different regions or climates around the world? Why is precipitation a critical component of the hydrological cycle? Highlight the perpetual movement of Earth's water. Break down evaporation, condensation, precipitation, infiltration, and runoff. Discuss how human activities can disrupt the natural flow. Connect the hydrological cycle to global climate patterns. Illustrate its impact on landscapes and societies. Development (30 minutes) <ol style="list-style-type: none"> Introduction: <ul style="list-style-type: none"> Define Hydrologic Cycle: Continuous movement of water on, above, and below the surface of the Earth. Processes: <ul style="list-style-type: none"> Evaporation: Water changes from liquid to vapor. Condensation: Vapor turns into clouds. Precipitation: Water falls back to Earth as rain, snow, sleet, or hail. Infiltration: Water soaks into the ground. Runoff: Excess water flows over the surface. Importance: <ul style="list-style-type: none"> Sustains ecosystems. Drives weather patterns. Supports agriculture and human activities. Human Impact: <ul style="list-style-type: none"> Alters natural flow through urbanization and deforestation. Climate change impact on precipitation patterns. Conclusion: <ul style="list-style-type: none"> Emphasize the interconnectedness of Earth's systems in



	<p>maintaining the hydrologic cycle.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Define the Hydrologic Cycle and its key processes.- Describe the role of evaporation in the Hydrologic Cycle.- Explain how condensation contributes to cloud formation.- Discuss the different forms of precipitation in the Hydrologic Cycle.- What is the significance of infiltration in the cycle?- How does runoff occur, and what factors influence it?- Examine the importance of the Hydrologic Cycle in sustaining ecosystems.- How does the Hydrologic Cycle drive weather patterns? Provide examples. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<p>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</p> <p>2. Suggested Reading</p> <ul style="list-style-type: none">- NPTEL LECTURES https://archive.nptel.ac.in/content/storage2/courses/105107129/module1/lecture1/lecture1.pdf <p>3. Homework</p> <ul style="list-style-type: none">- Explore and understand the various components and processes of the hydrologic cycle through research and reflection. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<p>1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.</p> <p>2. Nearpod Quiz on Hydrological Cycle.</p> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 3	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Recognize and differentiate between rain, snow, sleet, and hail. b. Describe the conditions under which rain, snow, sleet, and hail are formed. c. Given specific weather conditions, predict the likely form of precipitation. d. Understand why certain forms of precipitation are more common in specific regions.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<p>1. Introduction (5 minutes)</p> <ul style="list-style-type: none"> - Ask questions. What comes to your mind when you hear the term "precipitation"? Name three forms of precipitation. - How does precipitation contribute to the Earth's water cycle? Have you noticed any changes in precipitation patterns in your region? - Introduce the concept of cloud. Show Figure on slide. - Talk about utilities – water, electricity and build the pay-per-use concept - Introduce the captivating journey of water from cloud formation to its descent as rain, snow, or other forms. - Discuss how precipitation serves as a storyteller of weather patterns, reflecting the conditions in different regions. - Discuss how climate change is influencing precipitation patterns globally, bringing attention to environmental challenges. <p>2. Development (30 minutes)</p> <ul style="list-style-type: none"> a. Introduction: <ul style="list-style-type: none"> - Define precipitation as any form of water – liquid or solid – falling from the atmosphere. b. Types of Precipitation: <ul style="list-style-type: none"> - Rain: Liquid water droplets falling from clouds. - Snow: Ice crystals or snowflakes falling in colder temperatures. - Sleet: Small ice pellets formed from freezing raindrops. - Hail: Large balls of ice formed in strong updrafts within thunderstorms. c. Formation Processes: <ul style="list-style-type: none"> - Rain and Snow: Result from condensation of water vapor in



	<p>clouds.</p> <ul style="list-style-type: none">- Sleet and Hail: Involve freezing processes in specific atmospheric conditions. <p>d. Geographical Distribution:</p> <ul style="list-style-type: none">- Explore regions where each type of precipitation is more prevalent. <p>e. Impact on Ecosystems:</p> <ul style="list-style-type: none">- Discuss how different forms of precipitation influence flora, fauna, and ecosystems. <p>f. Human Adaptations:</p> <ul style="list-style-type: none">- Explore how societies adapt to various forms of precipitation in construction, agriculture, and daily life. <p>g. Conclusion:</p> <ul style="list-style-type: none">- Summarize key points, emphasizing the significance of understanding forms of precipitation for environmental awareness and practical applications. <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Name three forms of precipitation commonly experienced.- Briefly describe the process that leads to the formation of hail.- Give a short example of how rain can positively impact a local ecosystem.- How might climate change influence the occurrence of extreme precipitation events?- Share a concise historical event where unusual precipitation affected a community. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- NPTEL LECTURES- https://archive.nptel.ac.in/courses/105/103/105103213/- https://youtu.be/thWKpvnXA8U?si=_449UdW5JatiyOMC3. Homework<ul style="list-style-type: none">- Investigate how different cultures represent precipitation in their traditions or folklore. Share your findings and reflect on cultural significance. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Forms of Precipitation <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 4	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Understand the recording and non-recording gauges b. Understand concept of recording and non-recording gauges c. Understand the basic properties of precipitation.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">Introduction (5 minutes)<ul style="list-style-type: none">Ask questions. How does the process of precipitation occur in the atmosphere? In what ways does precipitation contribute to the distribution of water on Earth? What is precipitation, and why is it crucial for the Earth's water cycle? Are there regions where specific forms of precipitation are more common, and why?Discuss the role of water in the Earth's atmosphere and its various forms, leading to precipitation.Explore the concept of the water cycle and how precipitation is a key component in the continuous movement of water on Earth.Explore how different forms of precipitation are distributed globally, showcasing regional variations.Discuss how precipitation patterns impact human activities, agriculture, and the need for adaptation in different regions.Discuss how different cultures perceive and adapt to various forms of precipitation, incorporating social perspectives.Development (30 minutes)<ol style="list-style-type: none">Introduction:<ul style="list-style-type: none">Define precipitation as any form of water – liquid or solid – falling from the atmosphere.Types of Precipitation:<ul style="list-style-type: none">Rain: Liquid water droplets falling from clouds.Snow: Ice crystals or snowflakes falling in colder temperatures.Sleet: Small ice pellets formed from freezing raindrops.Hail: Large balls of ice formed in strong updrafts within thunderstorms.Formation Processes:<ul style="list-style-type: none">Rain and Snow: Result from condensation of water vapor in clouds.Sleet and Hail: Involve freezing processes in specific



	<p>atmospheric conditions.</p> <p>d. Geographical Distribution: - Explore regions where each type of precipitation is more prevalent.</p> <p>e. Impact on Ecosystems: - Discuss how different forms of precipitation influence flora, fauna, and ecosystems.</p> <p>f. Human Adaptations: - Explore how societies adapt to various forms of precipitation in construction, agriculture, and daily life.</p> <p>g. Conclusion: - Summarize key points, emphasizing the significance of understanding forms of precipitation for environmental awareness and practical applications.</p> <p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none"> - Can you identify the four main forms of precipitation commonly experienced on Earth? - Distinguish between rain and drizzle. What are the key differences? - Explain how hail is formed in the atmosphere. - How does the topography of an area influence its precipitation patterns? - Explore how different forms of precipitation impact local ecosystems. Give examples. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none"> 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading <ul style="list-style-type: none"> - NPTEL LECTURES - https://youtu.be/TWvxYnu6hE0?si=DQvuWOzm-Aer1HiQ 3. Homework <ul style="list-style-type: none"> - Observe and record the forms of precipitation experienced in your local area for a week. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none"> 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on Precipitation. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 5	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none">a. Identify and classify the various forms of precipitation, including rain, snow, sleet, hail, and drizzle.b. Explain the atmospheric conditions and processes leading to the formation of different types of precipitation.c. Recognize regional patterns of precipitation.d. Discuss how human communities adapt to and manage different types of precipitation.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Chalk and talkb. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. What is precipitation, and why is it an essential component of Earth's water cycle? In what ways does the type of precipitation vary across different regions and climates? Do you think climate change is influencing precipitation patterns globally, and if so, how? Why does precipitation come in various forms, such as rain, snow, sleet, and hail?- Explore the interconnected dance of evaporation, condensation, and precipitation- Introducing the various forms of precipitation as key players in this symphony.- Showcase the variety in precipitation types, discussing their unique characteristics- Draw parallels between the diverse forms of precipitation- Frame precipitation as a captivating show put on by nature, with rain, snow, and hail each having their own distinct performances.2. Development (30 minutes)<ol style="list-style-type: none">a. Introduction: Begin with a captivating real-world scenario involving different types of precipitation.b. Concept Clarification: Define and discuss key terms: rain, snow, sleet, hail, and drizzle.c. Visual Aids: Employ visuals, charts, and animations to illustrate the formation processes of each precipitation type.



	<p>d. Interactive Discussion: Engage students with questions about their experiences and observations related to different forms of precipitation.</p> <p>e. Hands-On Activities: Conduct experiments or simulations to demonstrate how varying atmospheric conditions lead to different types of precipitation.</p> <p>f. Regional Variation Exploration: Explore how geography and climate influence the prevalence of specific precipitation types in different regions.</p> <p>g. Case Studies: Analyze case studies to understand the impact of various precipitation types on communities and ecosystems.</p> <p>h. Technology Integration: Utilize online resources, simulations, or virtual tours for an immersive learning experience.</p> <p>i. Group Projects: Assign collaborative projects for in-depth research and presentations on a chosen precipitation type.</p> <p>j. Assessment and Reflection: Conclude with assessments and reflective discussions to reinforce learning and understanding.</p> <p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none"> - Can you identify the different types of precipitation based on their characteristics? Describe each. - Compare and contrast the characteristics of hail and sleet. What distinguishes one from the other? - Explain the atmospheric conditions and processes leading to the formation of rain. How does it differ from the formation of snow? - Investigate and discuss the typical types of precipitation in a tropical region versus a polar region. What factors contribute to these patterns? - How do temperature and humidity levels influence the type of precipitation a region might experience? Provide examples. - Explore how different forms of precipitation impact local ecosystems. Give specific examples. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none"> 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading <ul style="list-style-type: none"> - https://youtu.be/pxXsyE-TXg?si=r04gNR2qrw7nQoL



	<ul style="list-style-type: none">- Homework- Research how climate change is affecting global precipitation patterns. Discuss potential consequences and adaptations required in different regions. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Precipitation. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 6	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Recognize tools for measuring rain. b. Describe techniques for precipitation measurement. c. Interpret data from precipitation measurements.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<p>1. Introduction (5 minutes)</p> <ul style="list-style-type: none">- Ask questions. <p>What is the primary purpose of measuring precipitation? How does a rain gauge work, and what does it measure? Why is it important to consider wind effects when measuring precipitation? Discuss the role of precipitation measurement in water resource management.</p> <ul style="list-style-type: none">- Highlight the crucial role of measuring precipitation in understanding climate, weather patterns, and water resource management.- Introduce the complexities involved in measuring precipitation due to its diverse forms, regional variations, and technological considerations.- Discuss the practical implications of accurate precipitation measurements, from agricultural planning to flood prediction and water supply management.- Discuss the practical implications of accurate precipitation measurements, from agricultural planning to flood prediction and water supply management. <p>2. Development (30 minutes)</p> <ul style="list-style-type: none">a. Introduction to Measurement Significance: Emphasize the importance of precise precipitation measurements in meteorology, hydrology, and environmental science.b. Instrument Overview: Introduce various instruments used for measuring precipitation, including rain gauges, snow gauges, and advanced technologies like weather radars.



	<p>c. Methodologies and Techniques: Explore different measurement methodologies, discussing the challenges and advancements in collecting accurate precipitation data.</p> <p>d. Hands-On Application: Incorporate practical exercises, allowing students to use rain gauges and understand the process of manual and automated precipitation measurements.</p> <p>e. Data Interpretation: Teach students how to interpret and analyze precipitation data, linking measurement outcomes to weather patterns, climate studies, and water resource management.</p> <p>f. Environmental Impact: Discuss the broader implications of precise precipitation measurement in mitigating natural disasters, supporting agriculture, and ensuring sustainable water resource utilization.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none"> - Quickly demonstrate how a rain gauge works, emphasizing its simplicity and accuracy. - Present a scenario where students must decide the most suitable precipitation measurement tool for a specific situation, encouraging quick thinking. - Briefly introduce a case study of a precipitation-related event. In pairs, students rapidly discuss the impact and potential improvements with accurate measurements. - In a fast-paced brainstorming session, have students list technological advancements in precipitation measurement, fostering quick idea generation. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none"> 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading <ul style="list-style-type: none"> - https://youtu.be/MHwppnaccpO8?si=JeVoy2j1-0y00S2D 3. Homework <ul style="list-style-type: none"> - Research different types of rain gauges and create a comparative report on their features, advantages, and disadvantages. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none"> 1. Reflective Questions (What, Why, Who?). Allow students to



	answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents
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Lesson Plan No. 7	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> a. Explain measurement challenges and solutions. b. Interpret precipitation data for analysis. c. Discuss technological advancements in measurement.
Teaching Aids (if any)	<ol style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. How do meteorologists convert precipitation measurements into meaningful data for analysis? Why is it important to consider wind effects when measuring precipitation? Discuss the role of precipitation measurement in water resource management. - Explore the interconnected dance of evaporation, condensation, and precipitation - Introducing the various forms of precipitation as key players in this symphony. - Showcase the variety in precipitation types, discussing their unique characteristics - Draw parallels between the diverse forms of precipitation - Frame precipitation as a captivating show put on by nature, with rain, snow, and hail each having their own distinct performances. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Introduction to Significance: Emphasize the critical role of precise precipitation measurement in climate studies, weather forecasting, and water resource management. b. Instruments Overview: Introduce rain gauges, snow gauges, and weather radars, explaining their functions and applications in quantifying precipitation. c. Methodologies and Challenges: Discuss various measurement techniques, highlighting challenges such as wind effects and technological advancements addressing these issues.



	<p>d. Practical Application: Engage students in hands-on activities with rain gauges, fostering a deeper understanding of manual and automated measurement processes.</p> <p>e. Data Interpretation: Teach students to interpret and analyze precipitation data, emphasizing its relevance to weather patterns, climate studies, and environmental sustainability.</p> <p>f. Environmental Impact: Explore how precise precipitation measurement contributes to disaster preparedness, agriculture, and effective water resource management, connecting theoretical knowledge to real-world applications.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Quickly demonstrate how a rain gauge works, emphasizing its simplicity and accuracy.- Present a scenario where students must decide the most suitable precipitation measurement tool for a specific situation, encouraging quick thinking.- Briefly introduce a case study of a precipitation-related event. In pairs, students rapidly discuss the impact and potential improvements with accurate measurements.- In a fast-paced brainstorming session, have students list technological advancements in precipitation measurement, fostering quick idea generation. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/MHwppnaccpO8?si=JeVoy2j1-0y00S2D- Homework- Explore the connection between precipitation data and agricultural planning. Discuss how farmers utilize precipitation measurements for decision-making <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 8	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Recognize standard, tipping bucket, and weighing rain gauges. b. Comprehend how each rain gauge functions c. Differentiate between gauges, considering precision and applications.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">Introduction (5 minutes)<ul style="list-style-type: none">Ask questions. which email service do the students use? where is your email account stored? do you know the location of your email data? Where is your bank data stored?Introduce the variety of rain gauge types, from standard to automated instruments, each designed to capture and quantify rainfall in specific ways.Provide a brief overview of how different rain gauges function, highlighting the unique mechanisms employed by each type for accurate precipitation measurement.Illuminate the crucial role rain gauges play in meteorology and hydrology, serving as fundamental tools for measuring precipitation.Development (30 minutes)<ol style="list-style-type: none">Introduction to Precipitation Measurement: Emphasize the importance of rain gauges in understanding and quantifying precipitation, a key aspect of meteorology.Diversity of Rain Gauges: Explore various rain gauge types, from traditional standard gauges to modern automated systems, showcasing their design variations.Functionality and Mechanisms: Delve into the working mechanisms of each rain gauge type, explaining how they capture and measure rainfall, fostering a deeper understanding.



	<p>d. Applications in Meteorology: Connect rain gauge types to real-world applications in meteorology, hydrology, and environmental science, illustrating their pivotal role in data collection and analysis for accurate weather predictions.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Present characteristics of two rain gauge types. In pairs, students must quickly compare and contrast their features, encouraging swift analysis.- Assign each group a rain gauge type. In a rapid-fire brainstorm, students list potential applications and benefits associated with their assigned type.- Divide students into roles representing various rain gauge types. Engage in a brief role-play scenario where each type explains its advantages and applications. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/3. Homework<ul style="list-style-type: none">- Explore regional differences in rain gauge usage. Investigate which types are prevalent in specific climates and the reasons behind these choices. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 8	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Recognize standard, tipping bucket, and weighing rain gauges. b. Comprehend how each rain gauge functions c. Differentiate between gauges, considering precision and applications.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. which email service do the students use? where is your email account stored? do you know the location of your email data? Where is your bank data stored?- Introduce the variety of rain gauge types, from standard to automated instruments, each designed to capture and quantify rainfall in specific ways.- Provide a brief overview of how different rain gauges function, highlighting the unique mechanisms employed by each type for accurate precipitation measurement.- Illuminate the crucial role rain gauges play in meteorology and hydrology, serving as fundamental tools for measuring precipitation.2. Development (30 minutes)<ol style="list-style-type: none">a. Introduction to Precipitation Measurement: Emphasize the importance of rain gauges in understanding and quantifying precipitation, a key aspect of meteorology.b. Diversity of Rain Gauges: Explore various rain gauge types, from traditional standard gauges to modern automated systems, showcasing their design variations.c. Functionality and Mechanisms: Delve into the working mechanisms of each rain gauge type, explaining how they capture and measure rainfall, fostering a deeper understanding.



	<p>d. Applications in Meteorology: Connect rain gauge types to real-world applications in meteorology, hydrology, and environmental science, illustrating their pivotal role in data collection and analysis for accurate weather predictions.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Present characteristics of two rain gauge types. In pairs, students must quickly compare and contrast their features, encouraging swift analysis.- Assign each group a rain gauge type. In a rapid-fire brainstorm, students list potential applications and benefits associated with their assigned type.- Divide students into roles representing various rain gauge types. Engage in a brief role-play scenario where each type explains its advantages and applications. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/3. Homework<ul style="list-style-type: none">- Explore regional differences in rain gauge usage. Investigate which types are prevalent in specific climates and the reasons behind these choices. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 10	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Explore applications in agriculture, ecology, planning. b. Recognize tools like rain gauges, radars. c. Describe how precipitation patterns influence climate.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">Introduction (5 minutes)<ul style="list-style-type: none">Ask questions. What are the main forms of precipitation? How does precipitation impact ecosystems? Name two tools used to measure precipitation. What factors influence regional precipitation patterns?Emphasize the critical role of understanding precipitation over a geographic area in climate studies, water resource management, and environmental planning.Introduce the various forms of precipitation, from rain to snow, and highlight how their distribution over an area contributes to regional climate patterns.Discuss the profound effects of precipitation on ecosystems, agriculture, and human communities, underlining the importance of accurate measurements for informed decision-making.Development (30 minutes)<ol style="list-style-type: none">Contextual Introduction: Set the stage by explaining the relevance of understanding precipitation patterns over geographic areas, emphasizing its impact on climate, ecosystems, and society.Exploration of Precipitation Forms: Delve into the various forms of precipitation, illustrating how rain, snow, and other types contribute to the overall hydrological balance of a region.Environmental Implications: Connect precipitation over an area to its direct influence on ecosystems, agriculture, and water resources, fostering an understanding of the broader environmental implications.



	<p>d. Instrumentation and Measurement Techniques: Introduce the tools and technologies used for measuring area-wide precipitation, providing insights into the methods that help quantify and analyze these essential meteorological phenomena.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Divide students into small groups. In five minutes, each group discusses and presents the environmental impact of area-wide precipitation, fostering collaborative learning.- Display images or descriptions of different precipitation forms. In a rapid-fire session, have students match each form with its name and characteristics.- Present quick scenarios involving area-wide precipitation. In small groups, students brainstorm and discuss the potential implications on agriculture, ecosystems, and communities. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/4RZF1L70mRY?si=HbZOH4ANDiQ44Wts3. Homework<ul style="list-style-type: none">- Keep a rain gauge observation diary for a week. Record the type of rain gauge used in your area and any notable weather patterns during this period. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Types of Rain -Gauges <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 11	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Articulate understanding of mass curves. b. Demonstrate graph creation skills. c. Understand the hydrological applications of mass curves.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. How does a Mass Curve differ from a hydrograph? Explain the purpose of creating a Mass Curve. What type of data does a Mass Curve represent? Describe the steps to construct a Mass Curve. In hydrology, why is a Mass Curve useful? - Introduce the Mass Curve as a powerful tool in hydrology, emphasizing its role in analyzing and visualizing the cumulative distribution of streamflow data. - Illustrate the concept with a simple example, showcasing how a mass curve graphically presents the cumulative inflow or outflow of water over time. - Discuss the practical applications of mass curves in hydrology, such as assessing water availability, designing reservoirs, and understanding streamflow characteristics. 2. Development (30 minutes) <ul style="list-style-type: none"> a. Initiate the lesson by introducing the concept of a Mass Curve, emphasizing its significance in hydrology for analyzing and interpreting cumulative streamflow data. b. Graphical Representation: Illustrate the graphical representation of a Mass Curve, elucidating how it visually displays the cumulative distribution of water inflow or outflow over time. c. Construction Techniques: Provide step-by-step guidance on constructing a Mass Curve, ensuring students grasp the practical aspects of creating this essential hydrological tool.



	<p>d. Hydrological Applications: Explore diverse applications of Mass Curves, from assessing water availability to aiding in reservoir design, fostering an understanding of its broader role in water resource management.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Present a sample Mass Curve graph. In a quick exercise, have students interpret the graph's patterns and discuss the implications.- Break students into small groups. In five minutes, each group discusses and presents the significance of Mass Curves in hydrology and water resource management.- Provide a snapshot of a real-world case where Mass Curves were instrumental. In pairs, students discuss the scenario's details and share potential insights. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/4RZF1L70mRY?si=HbZOH4ANDiQ44Wts3. Homework<ul style="list-style-type: none">- Investigate real-world applications of Mass Curves in hydrology. Provide examples and discuss their significance in water resource management. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Mass Curve <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 12	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> Proficiently create a Dad Curve graph. Analyze and interpret data patterns displayed on Dad Curves. Understand and discuss hydrological applications of Dad Curves.
Teaching Aids (if any)	<ol style="list-style-type: none"> Chalk and talk Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. which email service do the students use? where is your email account stored? do you know the location of your email data? Where is your bank data stored? - Briefly explain the origin of the term "Dad Curve" and its relation to the curve's representation of duration, aiding in easy recall and understanding. - Illustrate the graphical representation of a Dad Curve, highlighting its unique characteristics and how it efficiently communicates information about streamflow. - Discuss practical applications of Dad Curves in hydrology, emphasizing their role in flood analysis, water resource management, and decision-making processes. Development (30 minutes) <ol style="list-style-type: none"> Introducing the Dad Curve as a hydrological tool, emphasizing its role in depicting streamflow duration and magnitude. Historical Context: Provide a brief historical context, explaining the origin of the term "Dad Curve" and its connection to the graphical representation used in hydrology. Graphical Representation Insights: Dive into the graphical representation of Dad Curves, elucidating the components that make up this distinctive curve and how it efficiently communicates temporal characteristics of streamflow events.



	<p>d. Practical Applications: Explore real-world applications of Dad Curves in hydrology, discussing their relevance in flood analysis, water resource planning, and understanding streamflow dynamics.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Challenge students to discuss, within five minutes, how the Dad Curve efficiently represents the relationship between streamflow duration and magnitude.- Provide a set of streamflow data and guide students in creating a simple Dad Curve graph within the time constraint, fostering hands-on learning and practical application.- Begin with a rapid-fire session asking students to recall the meaning of "Dad Curve" and its primary function. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/4RZF1L70mRY?si=HbZOH4ANDiQ44Wts3. Homework<ul style="list-style-type: none">- Investigate real-world applications of Dad Curves in hydrology. Provide examples and discuss how they contribute to flood analysis and water resource management. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Dad Curve <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 13	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Clearly articulate the concept of water losses. b. Recognize common causes and sources. c. Understand the impact and mitigation strategies.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. <ul style="list-style-type: none"> What role do leaks play in water losses? How can technology help detect leaks? Name two strategies for water loss mitigation. What is the economic impact of water losses? - Introduce the various factors leading to water losses, spanning from leakages and pipe bursts to inefficiencies in distribution networks. - Provide an overview of methods and technologies used for measuring water losses, highlighting the significance of accurate assessment in water management. - Discuss the broader implications of water losses on communities and ecosystems, setting the stage for exploring effective mitigation strategies in the subsequent lesson. - Emphasize the importance of addressing water losses in distribution systems, stressing its impact on water availability and sustainability. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Introduction to Water Losses: Initiate the lesson by highlighting the critical issue of water losses in distribution systems, underscoring its impact on water conservation and sustainability. b. Identification of Causes: Delve into the diverse causes of water losses, ranging from physical infrastructure issues like leaks to operational inefficiencies within water supply networks. c. Measurement Techniques Overview: Present an overview of various measurement techniques employed to quantify water losses, offering insights into the tools and technologies used for accurate assessment.



	<p>d. Emphasis on Mitigation: Stress the importance of addressing water losses not only for resource preservation but also for enhancing the efficiency of water supply systems. Introduce the concept of mitigation strategies to manage and reduce water losses effectively.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- In five minutes, have students brainstorm and list various causes of water losses, fostering quick thinking and engagement.- Prepare a brief quiz on different measurement techniques for water losses. Encourage quick responses to test understanding of assessment methods.- Break students into small groups. In five minutes, each group discusses and presents potential mitigation strategies for addressing water losses in distribution systems. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/IOSHRWOZvsQ?si=or5_Clk9L1tFtd9S3. Homework<ul style="list-style-type: none">- Evaluate water losses in your local area. Research and discuss potential causes, measurements, and propose strategies for mitigation. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Water Losses <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 14	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Identify causes of water losses. b. Discuss impact on water systems. c. Introduce methods for mitigation.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. Name three common causes of water losses. How can water losses impact communities? Discuss one method for measuring water losses. Why is mitigating water losses important? - Introduce the various factors leading to water losses, spanning from leakages and pipe bursts to inefficiencies in distribution networks. - Provide an overview of methods and technologies used for measuring water losses, highlighting the significance of accurate assessment in water management. - Discuss the broader implications of water losses on communities and ecosystems, setting the stage for exploring effective mitigation strategies in the subsequent lesson. - Emphasize the importance of addressing water losses in distribution systems, stressing its impact on water availability and sustainability. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Introduction to Water Losses: Initiate the lesson by highlighting the critical issue of water losses in distribution systems, underscoring its impact on water conservation and sustainability. b. Identification of Causes: Delve into the diverse causes of water losses, ranging from physical infrastructure issues like leaks to operational inefficiencies within water supply networks. c. Measurement Techniques Overview: Present an overview of various measurement techniques employed to quantify water losses, offering insights into the tools and technologies used for accurate assessment.



	<p>d. Emphasis on Mitigation: Stress the importance of addressing water losses not only for resource preservation but also for enhancing the efficiency of water supply systems. Introduce the concept of mitigation strategies to manage and reduce water losses effectively.</p> <p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none">- Prepare a brief quiz on different measurement techniques for water losses. Encourage quick responses to test understanding of assessment methods.- Present scenarios related to water losses. Have students identify potential causes and sources within each scenario in a rapid-fire session.- Prompt students to list causes of water losses within a 5-minute timeframe, encouraging rapid thinking and engagement. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/IOSHRWOZvsQ?si=or5_Clk9L1tFtd9S3. Homework<ul style="list-style-type: none">- Choose a case study involving a water loss incident. Analyze the situation, the impact on the community, and suggest measures for future prevention. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Water Losses <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 15	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Define empirical relationships concept clearly. b. Understand applications in various fields. c. Introduce examples of empirical relationships.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. Define empirical relationships in water management. How do empirical relationships aid in mitigating water losses? Provide an example of an empirical relationship used in water losses. Why are empirical relationships crucial in hydrology? Explain how empirical relationships help understand data patterns.- Begin by establishing a conceptual foundation, defining water losses and their impact on distribution systems.- Transition to introducing empirical relationships, emphasizing their role in quantifying and understanding complex phenomena like water losses.- Illustrate how empirical relationships are applied in studying and mitigating water losses, providing practical examples to bridge theory and application.2. Development (30 minutes)<ol style="list-style-type: none">a. Exploration of Empirical Relationships: Dive into the concept of empirical relationships, explaining how they provide valuable insights into complex phenomena like water losses and aid in quantifying relationships through observed data.b. Applications in Water Losses: Explore specific applications of empirical relationships in studying and mitigating water losses. Present examples to illustrate their practical utility in addressing challenges within water distribution systems.c. Importance in Water Management: Emphasize the broader importance of empirical relationships in effective water management, enabling informed decision-making and sustainable practices in the field.



	<p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Initiate a challenge for students to quickly define both "water losses" and "empirical relationships" within a 5-minute timeframe.- Present scenarios involving water losses. Challenge students to identify potential empirical relationships that could be applied to analyze and address the issues.- Initiate a challenge for students to quickly define both "water losses" and "empirical relationships" within a 5-minute timeframe. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/Xbf1Pjc64eo?si=PlyXi0V_ttMoFmVL3. Homework<ul style="list-style-type: none">- Explore and identify empirical relationships commonly used in water management to address water losses. Discuss their applications and significance. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Empirical Relationships <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 16	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Understand applications in various fields. b. Introduce examples of empirical relationships. c. Explore significance in scientific research.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. Discuss the significance of empirical relationships in water management. How can empirical relationships contribute to efficient water use? In what ways do empirical relationships benefit water conservation efforts? Name two factors influencing empirical relationships in water losses.- Begin by establishing a conceptual foundation, defining water losses and their impact on distribution systems.- Transition to introducing empirical relationships, emphasizing their role in quantifying and understanding complex phenomena like water losses.- Illustrate how empirical relationships are applied in studying and mitigating water losses, providing practical examples to bridge theory and application.2. Development (30 minutes)<ol style="list-style-type: none">a. Empirical Relationships Overview: Introduce the concept of empirical relationships, highlighting their role in quantifying complex phenomena such as water losses.b. Examples in Water Losses: Provide examples of empirical relationships commonly used in studying and mitigating water losses, demonstrating their practical application in water management.c. Understanding Data Patterns: Discuss how empirical relationships help in understanding data patterns related to water losses, emphasizing their importance in identifying causes and developing effective mitigation strategies.



	<p>d. Integration with Hydrology: Explore the integration of empirical relationships with hydrological principles, showcasing their significance in analyzing and managing water distribution systems.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- Initiate a challenge for students to quickly define both "water losses" and "empirical relationships" within a 5-minute timeframe.- Present scenarios involving water losses. Challenge students to identify potential empirical relationships that could be applied to analyze and address the issues.- Initiate a challenge for students to quickly define both "water losses" and "empirical relationships" within a 5-minute timeframe. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/Xbf1Pjc64eo?si=PlyXi0V ttMoFmVL3. Homework<ul style="list-style-type: none">- Compare two empirical models used in studying water losses. Discuss their strengths, limitations, and applications in different contexts. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Empirical Relationships <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 17	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Understand its Role in Water Losses. b. Identify Factors Influencing Infiltration. c. Introduce Techniques for Mitigation.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. Define Infiltration Process in water management. Why is understanding infiltration crucial? Name two factors influencing infiltration. How does land use impact infiltration? - Start by presenting an overview of the infiltration process, focusing on its significance in water losses within distribution systems. - Discuss how understanding the infiltration process is crucial for effective water management, emphasizing its impact on water distribution efficiency. - Introduce key factors influencing infiltration, such as soil characteristics and land use, setting the stage for a deeper exploration of these components. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Infiltration Process Insight: Begin with an insightful exploration of the infiltration process, elucidating its role in water losses within distribution systems. b. Understanding Key Factors: Delve into the factors influencing infiltration, including soil properties, land use, and vegetation cover, providing students with a comprehensive understanding. c. Interactive Exploration: Foster engagement by encouraging students to explore real-world examples and case studies illustrating the impact of infiltration on water distribution networks. d. Mitigation Techniques Preview: Provide a preview of upcoming lessons, introducing strategies and technologies aimed at mitigating water losses associated with the infiltration process, building anticipation for further exploration.



	<p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none">- List common mitigation techniques for infiltration-related water losses. In pairs, students discuss and identify the advantages and limitations of each technique within the 5-minute period.- Share a real-world scenario where infiltration significantly impacted water distribution. Students discuss the challenges posed and propose potential solutions within the time constraint.- Challenge students to brainstorm key factors influencing infiltration within a 5-minute timeframe, encouraging rapid recall and engagement. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/IP3jj1T6a_s?si=y1X2T1Cje8caVye03. Homework<ul style="list-style-type: none">- Investigate and identify the key factors influencing infiltration in water distribution systems. Discuss their significance and potential impact on water losses. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Infiltration Process <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 18	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Understand its Role in Water Losses. b. Identify Factors Influencing Infiltration. c. Introduce Techniques for Mitigation.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. Provide an example of infiltration-related water losses. What mitigation techniques address infiltration issues? How can technology assist in infiltration management? Explain the significance of infiltration in water distribution. - Start by presenting an overview of the infiltration process, focusing on its significance in water losses within distribution systems. - Discuss how understanding the infiltration process is crucial for effective water management, emphasizing its impact on water distribution efficiency. - Introduce key factors influencing infiltration, such as soil characteristics and land use, setting the stage for a deeper exploration of these components. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Infiltration Process Insight: Begin with an insightful exploration of the infiltration process, elucidating its role in water losses within distribution systems. b. Understanding Key Factors: Delve into the factors influencing infiltration, including soil properties, land use, and vegetation cover, providing students with a comprehensive understanding. c. Interactive Exploration: Foster engagement by encouraging students to explore real-world examples and case studies illustrating the impact of infiltration on water distribution networks. d. Mitigation Techniques Preview: Provide a preview of upcoming lessons, introducing strategies and technologies aimed at mitigating water losses associated with the infiltration process, building anticipation for further exploration.





	<p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none">- List common mitigation techniques for infiltration-related water losses. In pairs, students discuss and identify the advantages and limitations of each technique within the 5-minute period.- Share a real-world scenario where infiltration significantly impacted water distribution. Students discuss the challenges posed and propose potential solutions within the time constraint.- Challenge students to brainstorm key factors influencing infiltration within a 5-minute timeframe, encouraging rapid recall and engagement. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/IP3jj1T6a_s?si=y1X2T1Cje8caVye03. Homework<ul style="list-style-type: none">- Research and write a report on emerging trends and innovations in managing infiltration-related water losses. Discuss potential advancements, challenges, and technological solutions. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Infiltration Process <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 19	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> a. Understand the recording and non-recording gauges b. Understand concept of recording and non-recording gauges c. Understand the basic properties of precipitation.
Teaching Aids (if any)	<ol style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. How does land use impact infiltration? Discuss the role of soil characteristics. Why is vegetation cover relevant to infiltration? Provide an example of infiltration-related water losses - Highlight the implications of infiltration on water distribution efficiency, emphasizing its role in reducing available water for consumption. - Preview mitigation strategies aimed at managing infiltration-related water losses, setting the stage for further exploration in subsequent lessons. - Discuss key factors such as soil characteristics, land use, and vegetation cover, which influence the rate and extent of infiltration. - Introduce the infiltration process as a significant factor contributing to water losses in distribution systems. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Infiltration Process Overview: Begin by explaining the infiltration process, emphasizing its significance in water distribution systems and its role in contributing to water losses. b. Factors Influencing Infiltration: Delve into the various factors that influence infiltration, including soil type, land use, vegetation cover, and slope, highlighting their impact on infiltration rates. c. Real-world Examples: Provide real-world examples or case studies illustrating how infiltration affects water losses in different environments or regions, fostering a deeper understanding of the concept.





	<p>d. Discussion on Mitigation Techniques: Conclude by introducing mitigation techniques used to manage infiltration-related water losses, such as soil management practices, vegetation control, and engineering solutions.</p> <p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none">- Prompt students to brainstorm factors influencing infiltration within a 5-minute timeframe, encouraging rapid recall and engagement.- List common mitigation techniques for infiltration-related water losses. In small groups, students discuss and identify the advantages and limitations of each technique within the 5-minute period. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/IP3jj1T6a_s?si=y1X2T1Cje8caVye03. Homework<ul style="list-style-type: none">- Investigate and identify the key factors influencing infiltration in water distribution systems. Discuss their significance and potential impact on water losses. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Infiltration Process <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 20	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Understand its Importance in Hydrology. b. Introduce Common Measurement Techniques. c. Explore Applications in Water Management.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. What factors influence infiltration measurement accuracy? How does infiltration measurement contribute to agriculture? Discuss the role of infiltration measurement in hydrology. What is a tension infiltrometer?- Introduce the importance of measuring infiltration, emphasizing its role in understanding and managing water movement in soils.- Provide an overview of common techniques used to measure infiltration, preparing students for an in-depth exploration of these methods.- Highlight the practical applications of infiltration measurement in water management, setting the stage for discussions on its relevance in addressing water losses.- Place the topic within a hydrological context, discussing how accurate measurement of infiltration is essential for effective water resource management.2. Development (30 minutes)<ol style="list-style-type: none">a. Exploration of Infiltration Measurement: Embark on an exploration of the measurement of infiltration, underscoring its pivotal role in understanding and managing water movement in soil.b. Diverse Measurement Techniques: Delve into various measurement techniques such as infiltrometers and soil moisture sensors, offering insights into their applications and advantages.c. Practical Applications in Water Management: Explore real-world applications of infiltration measurement, emphasizing its significance in optimizing irrigation, managing groundwater resources, and addressing environmental challenges.



	<p>d. Anticipation of Practical Skills: Conclude by expressing the anticipation for students to acquire practical skills in measuring infiltration, aligning theoretical knowledge with hands-on applications for effective water resource management.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- List factors influencing infiltration measurement. In pairs, students discuss and identify how each factor can impact the accuracy of infiltration measurements within the 5-minute period.- Challenge students to brainstorm real-world applications of infiltration measurement in diverse fields. Encourage quick thinking and collaborative discussions within the time constraint.- Prepare a brief quiz on various infiltration measurement techniques. Encourage students to provide concise explanations within a 5-minute timeframe. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/NlkByUnGcZg?si=WC6X-AQWYZXMzJX3. Homework<ul style="list-style-type: none">- Investigate two different techniques for measuring infiltration rates. Compare their principles, advantages, and limitations, and discuss which might be more suitable in different scenarios. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Measurement of Infiltration <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 21	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> a. Understand its Importance in Hydrology. b. Introduce Common Measurement Techniques. c. Discuss Applications in Water Management.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none"> 1. Introduction (5 minutes) <ul style="list-style-type: none"> - Ask questions. Discuss the role of infiltration measurement in hydrology. What is a tension infiltrometer? Explain the difference between steady-state and transient infiltration. How do soil moisture sensors measure infiltration? - Introduce various techniques used to measure infiltration rates, including double-ring infiltrometers, tension infiltrometers, and the use of soil moisture sensors. - Discuss practical applications of infiltration measurement in fields such as agriculture, hydrology, and environmental engineering, emphasizing its role in optimizing irrigation practices and mitigating water-related risks. - Conclude by outlining the expected learning outcomes, setting the stage for students to gain a deeper understanding of infiltration measurement techniques and their significance in water management. 2. Development (30 minutes) <ol style="list-style-type: none"> a. Measurement Techniques Overview: Provide an overview of various techniques used to measure infiltration, such as double-ring infiltrometers, tension infiltrometers, and the use of soil moisture sensors. b. Factors Influencing Measurement: Discuss factors that influence infiltration measurement, including soil type, vegetation cover, and antecedent soil moisture conditions, to provide context for understanding variability in results. c. Practical Applications: Explore practical applications of infiltration measurement in agriculture, hydrology, and environmental engineering, demonstrating its importance in optimizing irrigation practices, managing water resources, and assessing soil health.



	<p>d. Hands-on Activities: Incorporate hands-on activities or demonstrations to allow students to gain practical experience with infiltration measurement techniques, enhancing their understanding and skills in this area.</p> <p>3. Exercise (5 minutes) – Give different use-cases and make students select appropriate cloud deployment models.</p> <ul style="list-style-type: none">- List factors influencing infiltration measurement accuracy. In small groups, students discuss and identify how each factor may impact measurement results within the 5-minute period.- Share a real-world scenario where accurate infiltration measurement was crucial. Students discuss the implications and propose potential strategies within the time constraint. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/zAm9mvLz3es?si=hetTfNXHzsSOIZKc3. Homework<ul style="list-style-type: none">- Investigate two different techniques for measuring infiltration rates. Compare their principles, advantages, and limitations, and discuss which might be more suitable in different scenarios. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Measurement of Infiltration <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 22	Course Name: Hydrology And Irrigation Engineering	Course No.: CE-601
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Objectives	At the end of the lesson the student shall be able to: a. Explore their Role in Hydrology. b. Introduce Common Infiltration Indices. c. Discuss Applications in Water Management.
Teaching Aids (if any)	a. Chalk and talk b. Use of Nearpod tool for online quiz
Teaching Development	<ol style="list-style-type: none">1. Introduction (5 minutes)<ul style="list-style-type: none">- Ask questions. Discuss the role of infiltration measurement in hydrology. What is a tension infiltrometer? Explain the difference between steady-state and transient infiltration. How do soil moisture sensors measure infiltration?- Provide an overview of common infiltration indices such as the Horton, Philip, and Green-Ampt models, highlighting their theoretical foundations and applications.- Discuss the role of infiltration indices in hydrology and agriculture, emphasizing how they aid in predicting soil water movement, optimizing irrigation practices, and managing water resources.- Conclude by outlining the expected learning outcomes, setting the stage for students to grasp the applications and nuances of infiltration indices in subsequent lessons.2. Development (30 minutes)<ol style="list-style-type: none">a. Infiltration Indices Overview: Provide an overview of infiltration indices, emphasizing their role in quantifying and characterizing soil water movement, crucial for effective water management.b. Theoretical Foundations: Delve into the theoretical foundations of common infiltration indices such as the Horton, Philip, and Green-Ampt models, elucidating their mathematical principles and applications.c. Practical Applications: Explore practical applications of infiltration indices in hydrology and agriculture, showcasing how they facilitate predictions of soil water movement, optimization of irrigation strategies, and sustainable water resource management.



	<p>d. Hands-on Exercises or Simulations: Consider incorporating hands-on exercises or simulations to allow students to apply infiltration indices, enhancing their understanding through practical application.</p> <p>3. Exercise (5 minutes) –</p> <ul style="list-style-type: none">- List factors influencing the choice of infiltration indices. In pairs, students discuss and identify how these factors may impact the selection process within the 5-minute period.- Share a real-world scenario where the use of infiltration indices played a crucial role. Students discuss the implications and propose potential adjustments within the time constraint. <p>Use Nearpod to collect responses and discuss the answers.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading<ul style="list-style-type: none">- https://youtu.be/cakIKXXrHW4?si=MDadfniURcbzLjrL3. Homework<ul style="list-style-type: none">- Investigate recent advancements and emerging trends in infiltration indices. Write a summary discussing how new developments contribute to improved accuracy and efficiency in water management. <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.2. Nearpod Quiz on Infiltration Indices <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

