



Kot Bhalwal, Jammu



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

Department of Civil

Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Geosynthetics Engineering
2.	Course Code	CE-702(B)
3.	Academic Year	2024-25
4.	Semester	VII
5.	Number of Lesson plans	55
6.	Faculty Assigned	Dr. Arvind Dewangan

Faculty Signature



Version 1.1

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Kot Bhalwal, Jammu

Model Institute of Engineering
& Technology (Autonomous)
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Lesson Plan No. 1	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 concept of geosynthetics and their role in civil engineering.Learn about the early history and development of geosynthetic materials.Identify key milestones in the evolution of geosynthetics.
Teaching Aids (if any)	<ol style="list-style-type: none">Video of NPTELUse of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">Begin with a discussion about traditional methods used in civil engineering for soil reinforcement and drainage.Introduce the concept of geosynthetics as a modern solution to engineering challenges.Highlight the importance of understanding the historical development of geosynthetics to appreciate their current applications. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none">Early Use of Geosynthetic-like Materials (10 minutes):<ul style="list-style-type: none">Discuss historical examples of materials with geosynthetic-like properties (e.g., textiles, woven fabrics).Explain how these materials were used in ancient and medieval engineering practices.Highlight the limitations of these early materials.Birth of Modern Geosynthetics (10 minutes):<ul style="list-style-type: none">Introduce the concept of synthetic materials in the mid-20th century.Discuss the development of early geosynthetic products (e.g., geotextiles, geomembranes).Explain the initial applications of geosynthetics in civil engineering projects.Advancements in Geosynthetics (10 minutes):<ul style="list-style-type: none">Discuss the evolution of geosynthetics from basic to complex products.Highlight the role of research and development in improving geosynthetic performance.



	<ul style="list-style-type: none">• Explain the increasing use of geosynthetics in various engineering fields. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are some examples of early materials with geosynthetic-like properties?2. When did the development of modern geosynthetics begin?3. What factors contributed to the advancements in geosynthetic technology? <p>URLs for Reference:</p> <ul style="list-style-type: none">• The Geosynthetic Institute:
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading https://en.wikipedia.org/wiki/Geosynthetics https://www.youtube.com/watch?v=UveFyGKwayE3. Homework: Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 2	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic classification of geosynthetics. b. Learn the nomenclature used for different types of geosynthetics. c. Identify the key properties influencing geosynthetic nomenclature.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of geosynthetics and their applications.• Introduce the concept of nomenclature as a system of naming and classifying geosynthetics.• Highlight the importance of standardized nomenclature for effective communication and project implementation. Development of the Lesson (30 minutes): 1. Basic Classification of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Explain the primary categories of geosynthetics: geotextiles, geomembranes, geonets, geogrids, geocomposites.• Discuss the general functions of each category.• Provide examples of common applications for each type of geosynthetic. 2. Nomenclature for Geotextiles (10 minutes): <ul style="list-style-type: none">• Introduce the basic structure of geotextiles (warp, weft, aperture).• Explain the use of terms like woven, nonwoven, knitted, and slit film for geotextiles.• Discuss the role of yarn type and weight in geotextile nomenclature. 3. Nomenclature for Other Geosynthetics (10 minutes): <ul style="list-style-type: none">• Briefly explain the naming conventions for geomembranes, geonets, geogrids, and geocomposites.• Highlight key properties used in the nomenclature of these geosynthetics (e.g., thickness, aperture size, polymer type).• Emphasize the importance of considering specific product names and manufacturer standards.



	<p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are the five primary categories of geosynthetics?2. Explain the difference between woven and nonwoven geotextiles.3. What factors influence the nomenclature of geomembranes? <p>Note: Visual aids like diagrams and images of different geosynthetics can enhance understanding. Real-world examples of geosynthetic applications can be used to illustrate the importance of correct nomenclature.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Industry publications on geosynthetic terminology• Manufacturer's product data sheets
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://airport.dot.gov/6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 3	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the primary functions of geosynthetics in civil engineering. b. Identify specific applications of geosynthetics in various engineering projects. c. Explain the mechanisms by which geosynthetics improve engineering performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about common engineering challenges related to soil and water.• Introduce geosynthetics as innovative materials used to address these challenges.• Highlight the versatility of geosynthetics in various civil engineering applications. Development of the Lesson (30 minutes): 1. Primary Functions of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Explain the five primary functions of geosynthetics:<ul style="list-style-type: none">○ Separation: preventing intermixing of soil layers.○ Reinforcement: improving soil strength and stability.○ Filtration: allowing water to pass while retaining soil particles.○ Drainage: collecting and transporting water.○ Protection: shielding geomembranes or other materials from damage.• Provide examples of each function. 2. Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Discuss the use of geosynthetics in different engineering fields (e.g., roads, railways, dams, landfills).• Provide specific examples of geosynthetic applications (e.g., geotextiles for soil reinforcement, geomembranes for landfill liners).• Explain how geosynthetics improve project performance and cost-effectiveness.



	<p>3. Mechanisms of Function (10 minutes):</p> <ul style="list-style-type: none">• Discuss the basic mechanisms by which geosynthetics work.<ul style="list-style-type: none">○ Stress-strain behavior of geotextiles○ Hydraulic conductivity of geonets○ Tensile strength of geogrids○ Permeability of geomembranes• Explain how these mechanisms contribute to the overall performance of geosynthetic systems. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary function of a geotextile?2. How do geosynthetics improve the stability of a soil embankment?3. What is the role of a geomembrane in a landfill? <p>Note: Use visual aids like diagrams and images to illustrate the functions and applications of geosynthetics. Real-world examples of geosynthetic projects can be used to enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute website• Industry publications on geosynthetic applications• Case studies of successful geosynthetic projects
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://en.wikipedia.org/wiki/Geosynthetics4. https://www.youtube.com/watch?v=UveFyGKwayE5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 4	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the diverse applications of geosynthetics in civil engineering. b. Identify specific geosynthetic products used in different engineering projects. c. Explain the benefits of using geosynthetics in various applications.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about common engineering challenges related to soil and water.• Introduce geosynthetics as versatile materials used to solve these challenges.• Highlight the economic and environmental benefits of using geosynthetics. Development of the Lesson (30 minutes): 1. Geosynthetics in Transportation Engineering (10 minutes): <ul style="list-style-type: none">• Discuss the use of geotextiles in road construction (subgrade stabilization, separation, reinforcement).• Explain the application of geogrids for pavement reinforcement and slope stabilization.• Introduce the use of geomembranes in landfill liners and drainage systems for highways. 2. Geosynthetics in Water Resources Engineering (10 minutes): <ul style="list-style-type: none">• Discuss the role of geotextiles in erosion control and bank protection.• Explain the use of geomembranes in dams, canals, and reservoirs.• Introduce the application of geonets for drainage in embankments and landfills. 3. Geosynthetics in Environmental Engineering (10 minutes): <ul style="list-style-type: none">• Discuss the use of geosynthetics in landfill construction and capping.• Explain the application of geotextiles in soil remediation and containment.• Introduce the use of geosynthetics in coastal protection and erosion



	<p>control.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary function of geotextiles in road construction?2. How are geomembranes used in water resources engineering?3. What is the role of geosynthetics in environmental protection? <p>Note: Use visual aids like diagrams and images to illustrate the applications of geosynthetics. Real-world case studies can be used to enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute website• Industry publications on geosynthetic applications• Case studies of successful geosynthetic projects•
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=UveFyGKwayE5. https://airport.dot.gov/6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 5	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the history of geosynthetics in India. b. Identify key milestones in the development of geosynthetics in India. c. Analyze the factors influencing the growth of geosynthetics in India.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of the construction industry in India.• Introduce the concept of geosynthetics and their increasing use in India.• Highlight the importance of understanding the historical development of geosynthetics in India. Development of the Lesson (30 minutes): <ol style="list-style-type: none">1. Early Stages of Geosynthetic Use (10 minutes):<ul style="list-style-type: none">• Discuss the initial introduction of geosynthetics in India.• Explain the challenges faced in the early adoption of geosynthetics.• Highlight the role of research institutions and government agencies in promoting geosynthetics.2. Growth and Acceptance (10 minutes):<ul style="list-style-type: none">• Discuss the factors driving the growth of the geosynthetics market in India.• Explain the role of successful case studies in promoting geosynthetics.• Highlight the increasing awareness of geosynthetics among engineers and contractors.3. Current Trends and Future Prospects (10 minutes):<ul style="list-style-type: none">• Discuss the current status of the geosynthetics industry in India.• Identify emerging trends and applications of geosynthetics.• Explore the potential for growth and development of the geosynthetics market in India. Quiz (5 minutes):



	<ol style="list-style-type: none">1. When were geosynthetics first introduced in India?2. What factors contributed to the growth of the geosynthetics market in India?3. What are some emerging trends in the Indian geosynthetics industry? <p>Note: Incorporate case studies of successful geosynthetic projects in India to enhance understanding. Discuss the role of government policies and regulations in promoting the use of geosynthetics.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Indian Geotechnical Society publications• Case studies on geosynthetic applications in India• Reports on the geosynthetics market in India
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://www.youtube.com/watch?v=qV_9jz-Q1js6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 6	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of durability in relation to geosynthetics. b. Identify the factors affecting the durability of geosynthetic materials. c. Learn about testing methods to assess the durability of geosynthetics.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the long-term performance of civil engineering structures.• Introduce the concept of durability as a critical property of geosynthetic materials.• Highlight the importance of ensuring the long-term performance of geosynthetic applications. Development of the Lesson (30 minutes): 1. Factors Affecting Durability (10 minutes): <ul style="list-style-type: none">• Discuss the environmental factors affecting geosynthetic durability (e.g., temperature, UV radiation, moisture, chemicals).• Explain the role of mechanical stresses (e.g., load, deformation) in affecting durability.• Introduce the concept of biological degradation and its impact on geosynthetics. 2. Durability Testing (10 minutes): <ul style="list-style-type: none">• Discuss the importance of laboratory testing to assess durability.• Explain common durability tests for geosynthetics (e.g., accelerated aging, hydrolysis, microbial attack).• Highlight the role of field testing in evaluating long-term performance. 3. Design Considerations for Durability (10 minutes): <ul style="list-style-type: none">• Discuss the importance of selecting appropriate geosynthetic materials for specific applications.• Explain the concept of design life and its relationship to durability.• Introduce the role of quality control in ensuring the durability of



	<p>geosynthetic products.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are the main factors affecting the durability of geosynthetics?2. Why is it important to test the durability of geosynthetic materials?3. How can the design life of a geosynthetic product be increased? <p>Note: Use real-world examples of geosynthetic failures due to durability issues to emphasize the importance of the topic. Discuss the role of proper installation and maintenance in prolonging the life of geosynthetics.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Case studies on the long-term performance of geosynthetic projects• Research papers on durability testing of geosynthetics
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://airport.dot.gov/6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 7	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the factors that cause degradation of geosynthetic materials.b. Identify the different types of degrading agencies affecting geosynthetics.c. Explain the mechanisms of degradation and their impact on geosynthetic performance.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a discussion about the long-term performance of materials in outdoor environments.• Introduce the concept of degradation as the deterioration of geosynthetic properties over time.• Highlight the importance of understanding degrading agencies to ensure the successful application of geosynthetics. <p>Development of the Lesson (30 minutes):</p> <p>1. Physical Degrading Agencies (10 minutes):</p> <ul style="list-style-type: none">• Discuss the impact of mechanical stresses (tension, shear, puncture) on geosynthetics.• Explain the effects of ultraviolet radiation and temperature extremes on material properties.• Introduce the concept of fatigue and its influence on geosynthetic life. <p>2. Chemical Degrading Agencies (10 minutes):</p> <ul style="list-style-type: none">• Discuss the role of chemicals (acids, bases, salts) in degrading geosynthetics.• Explain the mechanisms of chemical attack on different geosynthetic materials.• Highlight the importance of material compatibility with the surrounding environment. <p>3. Biological Degrading Agencies (10 minutes):</p> <ul style="list-style-type: none">• Discuss the impact of microorganisms on geosynthetic materials.• Explain the conditions favoring microbial growth and degradation.



	<ul style="list-style-type: none">Introduce methods to protect geosynthetics from biological attack. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">What are the main types of degrading agencies affecting geosynthetics?How does ultraviolet radiation affect geosynthetic materials?What measures can be taken to protect geosynthetics from biological degradation? <p>Note: Use real-world examples of geosynthetic failures due to degradation to emphasize the importance of the topic. Visual aids like diagrams and images can be used to illustrate the degradation mechanisms.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">Geosynthetic Institute standards and guidelinesResearch papers on geosynthetic durabilityCase studies of geosynthetic failures due to degradation
Closure	<ol style="list-style-type: none">Summarize the Lesson Learning Outcomes and get affirmation from students on these.Suggested Readinghttps://www.youtube.com/watch?v=UveFyGKwayEhttps://www.youtube.com/watch?v=SMJrXhjDfKMHomework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">Reflective Questions (What, Why, Who?). Allow students to answer and discuss.Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 8	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the concept of biodegradation in geosynthetics. b. Identify the types of microorganisms affecting geosynthetics. c. Learn about methods to enhance the biological resistance of geosynthetics.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Begin with a discussion about the natural environment and its impact on materials. • Introduce the concept of biodegradation as a form of material degradation caused by living organisms. • Highlight the importance of biological resistance in ensuring the long-term performance of geosynthetics. <p>Development of the Lesson (30 minutes):</p> <p>1. Microorganisms Affecting Geosynthetics (10 minutes):</p> <ul style="list-style-type: none"> • Discuss the types of microorganisms that can degrade geosynthetics (bacteria, fungi, algae). • Explain the conditions favoring microbial growth (moisture, temperature, nutrients). • Describe the mechanisms of microbial attack on geosynthetic materials. <p>2. Factors Affecting Biodegradation (10 minutes):</p> <ul style="list-style-type: none"> • Identify factors influencing the rate of biodegradation (geosynthetic material type, soil conditions, climate). • Discuss the role of additives and coatings in enhancing biological resistance. • Explain the concept of biocompatibility and its importance in geosynthetic selection. <p>3. Mitigation Strategies (10 minutes):</p> <ul style="list-style-type: none"> • Discuss methods to prevent or reduce biological degradation (e.g., material selection, UV stabilization, biocides). • Explain the importance of proper installation and maintenance.





	<ul style="list-style-type: none">• Introduce the concept of bio-based geosynthetics as a potential solution. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are the primary microorganisms that affect geosynthetics?2. How does moisture contribute to biodegradation?3. What are some methods to enhance the biological resistance of geosynthetics? <p>Note: Use visual aids like images of microorganisms and degraded geosynthetic materials to enhance understanding. Real-world case studies of biodegradation issues can be used to illustrate the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on biodegradation of geosynthetics• Case studies of successful mitigation strategies <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfvadA5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 9	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the concept of chemical resistance in geosynthetics. b. Identify common chemicals that can affect geosynthetics. c. Explain the mechanisms of chemical degradation in geosynthetics.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Begin with a discussion about the various environmental conditions where geosynthetics are used. • Introduce the concept of chemical resistance as a crucial property for geosynthetic performance. • Highlight the importance of selecting chemically resistant geosynthetics for specific applications. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none"> 1. Types of Chemicals Affecting Geosynthetics (10 minutes): <ul style="list-style-type: none"> • Discuss common chemicals encountered in geosynthetic applications (acids, bases, salts, organic solvents). • Explain the sources of these chemicals (industrial effluents, landfills, agricultural runoff). • Highlight the potential impact of chemical exposure on geosynthetic properties. 2. Mechanisms of Chemical Degradation (10 minutes): <ul style="list-style-type: none"> • Explain the different types of chemical attack on geosynthetics (hydrolysis, oxidation, dissolution). • Discuss the role of pH and temperature in chemical degradation. • Introduce the concept of chemical compatibility testing. 3. Factors Affecting Chemical Resistance (10 minutes): <ul style="list-style-type: none"> • Identify factors influencing the chemical resistance of geosynthetics (polymer type, additives, manufacturing process). • Discuss the importance of material selection based on expected chemical exposure. • Explain the concept of chemical compatibility testing to assess material



	<p>resistance.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are the main types of chemicals that can affect geosynthetics?2. How does pH affect the chemical resistance of geosynthetics?3. What is the importance of chemical compatibility testing? <p>Note: Use visual aids like diagrams and images to illustrate the chemical degradation process. Real-world examples of geosynthetic failures due to chemical exposure can be used to emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on chemical resistance of geosynthetics• Case studies of geosynthetic failures due to chemical attack
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 10	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the concept of weathering and its impact on geosynthetics. b. Identify the key weathering factors affecting geosynthetics. c. Learn about methods to enhance the weathering resistance of geosynthetics.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Begin with a discussion about the outdoor environment and its harsh conditions. • Introduce the concept of weathering as the deterioration of materials due to exposure to environmental factors. • Highlight the importance of weathering resistance for the long-term performance of geosynthetics. <p>Development of the Lesson (30 minutes):</p> <p>1. Weathering Factors (10 minutes):</p> <ul style="list-style-type: none"> • Discuss the primary weathering factors affecting geosynthetics (e.g., ultraviolet radiation, temperature extremes, moisture, wind, and erosion). • Explain the mechanisms by which these factors degrade geosynthetic materials. • Introduce the concept of weathering cycles and their impact on material properties. <p>2. Material Properties and Weathering Resistance (10 minutes):</p> <ul style="list-style-type: none"> • Discuss the role of polymer type and additives in determining weathering resistance. • Explain the importance of fiber orientation and density in geotextiles. • Highlight the impact of manufacturing processes on weathering resistance. <p>3. Testing and Evaluation (10 minutes):</p> <ul style="list-style-type: none"> • Introduce standard weathering tests for geosynthetics (e.g., accelerated weathering, outdoor exposure). • Explain the importance of evaluating material properties before and after



	<p>weathering.</p> <ul style="list-style-type: none">• Discuss the role of weathering data in geosynthetic design and selection. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What are the main factors affecting the weathering of geosynthetics?2. How does ultraviolet radiation degrade geosynthetics?3. What is the importance of weathering resistance testing? <p>Note: Use visual aids like images of weathered geosynthetic materials and graphs to illustrate the concepts. Real-world examples of geosynthetic failures due to weathering can be used to emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on weathering of geosynthetics• Case studies of geosynthetic projects in challenging environments
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 11	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic manufacturing processes for geosynthetics. b. Identify the key factors influencing the properties of geosynthetic materials. c. Learn about the relationship between manufacturing methods and geosynthetic performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. Development of the Lesson (30 minutes): 1. Manufacturing of Geotextiles (10 minutes): <ul style="list-style-type: none">• Explain the primary methods for producing geotextiles:<ul style="list-style-type: none">○ Weaving○ Knitting○ Nonwoven (needle punched, spunbond, meltblown)• Discuss the impact of manufacturing process on geotextile properties (strength, permeability, durability). 2. Manufacturing of Geomembranes (10 minutes): <ul style="list-style-type: none">• Explain the basic process of geomembrane production (extrusion, calendaring).• Discuss the importance of polymer type and additives in geomembrane properties.• Highlight the quality control measures in geomembrane manufacturing. 3. Manufacturing of Other Geosynthetics (10 minutes): <ul style="list-style-type: none">• Briefly introduce the manufacturing processes for geogrids, geonets, and geocomposites.



	<ul style="list-style-type: none">• Explain the unique characteristics of each manufacturing process.• Discuss the role of technology in the development of new geosynthetic products. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the most common manufacturing method for geotextiles?2. How does the manufacturing process affect the properties of a geomembrane?3. What is the importance of quality control in geosynthetic manufacturing? <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 12	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic manufacturing processes for geosynthetics. b. Identify the key factors influencing the properties of geosynthetic materials. c. Learn about the relationship between manufacturing methods and geosynthetic performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. Development of the Lesson (30 minutes): 1. Manufacturing of Geotextiles (10 minutes): <ul style="list-style-type: none">• Explain the primary methods for producing geotextiles:<ul style="list-style-type: none">○ Weaving○ Knitting○ Nonwoven (needle punched, spunbond, meltblown)• Discuss the impact of manufacturing process on geotextile properties (strength, permeability, durability). Quiz (5 minutes): <ol style="list-style-type: none">1. What is the most common manufacturing method for geotextiles?2. How does the manufacturing process affect the properties of a geomembrane?3. What is the importance of quality control in geosynthetic manufacturing? Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.



	Additional Resources: <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 13	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic manufacturing processes for geosynthetics. b. Identify the key factors influencing the properties of geosynthetic materials. c. Learn about the relationship between manufacturing methods and geosynthetic performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. <p>Development of the Lesson (30 minutes):</p> <p>Manufacturing of Geomembranes (10 minutes):</p> <ul style="list-style-type: none">• Explain the basic process of geomembrane production (extrusion, calendaring).• Discuss the importance of polymer type and additives in geomembrane properties.• Highlight the quality control measures in geomembrane manufacturing. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the most common manufacturing method for geotextiles?2. How does the manufacturing process affect the properties of a geomembrane?



	<p>3. What is the importance of quality control in geosynthetic manufacturing?</p> <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 14	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic manufacturing processes for geosynthetics. b. Identify the key factors influencing the properties of geosynthetic materials. c. Learn about the relationship between manufacturing methods and geosynthetic performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. Development of the Lesson (30 minutes): Manufacturing of Other Geosynthetics (30 minutes): <ul style="list-style-type: none">• Briefly introduce the manufacturing processes for geogrids, geonets, and geocomposites.• Explain the unique characteristics of each manufacturing process.• Discuss the role of technology in the development of new geosynthetic products. Quiz (5 minutes): <ol style="list-style-type: none">1. What is the most common manufacturing method for geotextiles?2. How does the manufacturing process affect the properties of a geomembrane?3. What is the importance of quality control in geosynthetic manufacturing? Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products



	<p>can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 15	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the importance of testing geogrids before and after installation. b. Identify the key properties of geogrids evaluated through testing. c. Learn about common geogrid testing methods.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the importance of material quality in construction.• Introduce the concept of geogrid testing as a quality control measure.• Highlight the need for ensuring geogrid performance in real-world conditions. Development of the Lesson (30 minutes): 1. Importance of Geogrid Testing (10 minutes): <ul style="list-style-type: none">• Explain the role of testing in verifying geogrid properties.• Discuss the impact of testing on project design and construction.• Highlight the relationship between test results and geogrid performance. 2. Geogrid Properties Evaluated through Testing (10 minutes): <ul style="list-style-type: none">• Identify key geogrid properties evaluated through testing (e.g., tensile strength, elongation, aperture size).• Explain the significance of these properties in geogrid applications.• Discuss the relationship between geogrid properties and project requirements. 3. Common Geogrid Testing Methods (10 minutes): <ul style="list-style-type: none">• Introduce standard testing methods for geogrids (e.g., tensile strength, creep, puncture resistance).• Explain the purpose of each test and the information it provides.• Discuss the importance of laboratory and field testing for geogrids. Quiz (5 minutes):



	<ol style="list-style-type: none">1. Why is geogrid testing important?2. What are the two main types of geogrid properties evaluated through testing?3. Name a common test method for determining the tensile strength of a geogrid. <p>Note: Use visual aids like diagrams and images of geogrid testing equipment to enhance understanding. Real-world examples of geogrid testing failures can be used to emphasize the importance of quality control.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Case studies on geogrid performance evaluation
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=FatE08CFCow&t=25s5. https://www.youtube.com/watch?v=oXUaNfveadA6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 16	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the factors that affect geogrid testing results. b. Identify the importance of proper test specimen preparation. c. Learn about environmental conditions influencing geogrid test results.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the significance of accurate test results in engineering.• Introduce the concept of factors influencing geogrid testing outcomes.• Highlight the importance of controlling these factors for reliable test data. Development of the Lesson (30 minutes): 1. Test Specimen Preparation (10 minutes): <ul style="list-style-type: none">• Explain the importance of proper specimen size and shape.• Discuss the impact of specimen orientation on test results.• Highlight the need for conditioning specimens before testing. 2. Testing Environment (10 minutes): <ul style="list-style-type: none">• Discuss the influence of temperature and humidity on test results.• Explain the importance of controlled testing conditions.• Introduce the concept of standard test environments. 3. Test Method and Procedures (10 minutes): <ul style="list-style-type: none">• Discuss the impact of different test methods on results.• Explain the significance of following standardized test procedures.• Highlight the role of operator skill in test accuracy. Quiz (5 minutes): 1. What is the importance of specimen preparation in geogrid testing? 2. How does temperature affect geogrid test results? 3. Why is it important to follow standard test procedures? Note: Use visual aids like diagrams and images to illustrate the concepts. Real-



	<p>world examples of test errors due to improper conditions can be used to emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Research papers on geogrid testing methodologies
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 17	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the importance of geogrid sampling for quality control. b. Identify the different sampling methods for geogrids. c. Learn about the factors affecting sample size and location.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a discussion about the importance of material quality in construction.• Introduce the concept of geogrid sampling as a quality control measure.• Highlight the need for representative samples to assess geogrid properties. <p>Development of the Lesson (30 minutes):</p> <p>1. Importance of Geogrid Sampling (10 minutes):</p> <ul style="list-style-type: none">• Explain the role of sampling in ensuring geogrid quality.• Discuss the impact of defective geogrids on project performance.• Highlight the legal and contractual requirements for geogrid sampling. <p>2. Sampling Methods (10 minutes):</p> <ul style="list-style-type: none">• Describe different sampling methods for geogrids (random, systematic, stratified).• Explain the advantages and disadvantages of each method.• Discuss the factors influencing the choice of sampling method. <p>3. Sample Size and Location (10 minutes):</p> <ul style="list-style-type: none">• Explain the concept of sample size determination.• Discuss the factors affecting sample size (e.g., project scale, material variability).• Highlight the importance of selecting representative sample locations. <p>Quiz (5 minutes):</p> <p>1. Why is geogrid sampling important?</p>



	<ol style="list-style-type: none">2. What are the different methods of geogrid sampling?3. What factors influence the sample size for geogrid testing? <p>Note: Use visual aids like diagrams and images to illustrate the sampling process. Real-world examples of sampling plans for geosynthetic projects can be used to enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid sampling• Case studies on geogrid quality control
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=SMJrXhjDfKM4. https://www.youtube.com/watch?v=qV_9jz-Q1js5. https://www.youtube.com/watch?v=oXUaNfveadA6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 18	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the key physical properties of geogrids. b. Learn how physical properties influence geogrid performance. c. Identify the testing methods used to determine geogrid properties.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the role of materials in engineering structures.• Introduce geogrids as a type of geosynthetic material used for reinforcement.• Highlight the importance of understanding geogrid properties for effective application. Development of the Lesson (30 minutes): 1. Tensile Strength and Stiffness (10 minutes): <ul style="list-style-type: none">• Explain the concept of tensile strength and stiffness in geogrids.• Discuss the importance of these properties for reinforcement applications.• Introduce different types of tensile tests (uniaxial, biaxial). 2. Aperture Size and Shape (10 minutes): <ul style="list-style-type: none">• Define aperture size and shape.• Explain the role of aperture size in soil-geogrid interaction.• Discuss the impact of aperture shape on geogrid performance. 3. Other Physical Properties (10 minutes): <ul style="list-style-type: none">• Introduce other important properties like creep, fatigue, and chemical resistance.• Explain the significance of these properties in different geogrid applications.• Discuss the relationship between physical properties and geogrid durability. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the most important physical property of a geogrid for reinforcement applications?2. How does aperture size affect geogrid performance?3. What other physical properties should be considered besides tensile strength and aperture size? <p>Note: Use visual aids like diagrams and images to illustrate the concepts. Real-world examples of geogrid applications can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Manufacturer's technical data sheets <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it .</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Model Institute of Engineering
& Technology (Autonomous)
Lesson Plan

Kot Bhalwal, Jammu



Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1



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Lesson Plan No. 19	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 key mechanical properties of geogrids.Learn how mechanical properties influence geogrid performance.Identify the testing methods used to determine geogrid mechanical properties.
Teaching Aids (if any)	<ol style="list-style-type: none">Video of NPTELUse of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">Begin with a discussion about the role of reinforcement in civil engineering structures.Introduce geogrids as a reinforcement material with specific mechanical properties.Highlight the importance of understanding these properties for effective geogrid applications. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none">Tensile Strength and Stiffness (10 minutes):<ul style="list-style-type: none">Explain the concept of tensile strength and stiffness in geogrids.Discuss the importance of these properties for reinforcement applications.Introduce different types of tensile tests (uniaxial, biaxial).Creep and Relaxation (10 minutes):<ul style="list-style-type: none">Define creep and relaxation in the context of geogrids.Explain the impact of these properties on long-term geogrid performance.Discuss the factors influencing creep and relaxation behavior.Other Mechanical Properties (10 minutes):<ul style="list-style-type: none">Introduce other relevant mechanical properties (e.g., puncture resistance, tear strength).Explain the importance of these properties in specific geogrid applications.Discuss the relationship between mechanical properties and geogrid durability.



	<p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary mechanical property required for geogrid reinforcement?2. How does creep affect geogrid performance over time?3. Why is puncture resistance important for geogrids used in certain applications? <p>Note: Use visual aids like diagrams and graphs to illustrate the mechanical properties and testing methods. Real-world examples of geogrid applications can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Manufacturer's technical data sheets
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. https://airport.dot.gov/6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 20	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of creep in geogrids. b. Learn about the importance of creep testing for geogrid design. c. Explain the methods used for creep testing of geogrids.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">Begin with a discussion about the long-term behavior of materials under load.Introduce the concept of creep as the time-dependent deformation of a material under constant load.Highlight the significance of creep testing for geogrids used in long-term applications. Development of the Lesson (30 minutes): 1. Creep in Geogrids (10 minutes): <ul style="list-style-type: none">Explain the creep phenomenon in relation to geogrid structure.Discuss the factors influencing creep behavior (load level, temperature, time).Highlight the impact of creep on geogrid performance in engineering structures. 2. Creep Testing Methods (10 minutes): <ul style="list-style-type: none">Introduce standard creep testing methods for geogrids.Explain the equipment and procedures involved in creep testing.Discuss the importance of test parameters (load level, temperature, time). 3. Creep Data Analysis (10 minutes): <ul style="list-style-type: none">Explain how creep data is analyzed to determine creep characteristics.Introduce creep models used to predict long-term behavior.Discuss the application of creep data in geogrid design. Quiz (5 minutes): 1. What is creep in the context of geogrids?



	<ol style="list-style-type: none">2. Why is creep testing important for geogrid design?3. How is creep data used in predicting geogrid performance? <p>Note: Use visual aids like graphs and diagrams to illustrate creep behavior and test results. Real-world examples of geogrid applications where creep is a concern can be used to enhance understanding.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 21	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the role of geosynthetics in water resource projects.b. Learn about the specific application of geosynthetics in the Dharoi Dam project.c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. <p>Development of the Lesson (30 minutes):</p> <p>1. Dharoi Dam Project Overview (10 minutes):</p> <ul style="list-style-type: none">• Provide a brief background of the Dharoi Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. <p>2. Specific Applications of Geosynthetics (10 minutes):</p> <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Dharoi Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. <p>3. Benefits and Challenges (10 minutes):</p> <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. <p>Quiz (5 minutes):</p>



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Dharoi Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 22	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Dharoi Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. Quiz (5 minutes): <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Dharoi Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? URLs for Reference: <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects YouTube Video Reference:



	<ul style="list-style-type: none">• [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 23	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Dharoi Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Dharoi Dam Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Dharoi Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Dharoi Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. Quiz (5 minutes):



	<ol style="list-style-type: none"> 1. What is the primary function of geosynthetics in the Dharoi Dam project? 2. What are the benefits of using geosynthetics in such projects? 3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none"> • Gujarat Water Resources Development Corporation Limited (GWRDCL) website • Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none"> • [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none"> • Geosynthetic Institute publications on water resource applications • Research papers on geosynthetics in dams and reservoirs
<p>Closure</p>	<ol style="list-style-type: none"> 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s 4. https://www.youtube.com/watch?v=sj-py_9yz8 5. https://airport.dot.gov/ 6. Homework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<p>Evaluation</p>	<ol style="list-style-type: none"> 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 24	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Hiran 2 Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Hiran 2 Dam Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Hiran 2 Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Hiran 2 Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Hiran 2 Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Hiran 2 Dam project. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Hiran 2 Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Hiran 2 Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Hiran 2 Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Hiran 2 Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs <p>Note: As information about the specific application of geosynthetics in the Hiran 2 Dam project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant dam projects or case studies if necessary.</p> <ul style="list-style-type: none">•
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 25	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in irrigation projects. b. Learn about the specific application of geosynthetics in the Meda Creek Irrigation Scheme. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of irrigation challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Meda Creek Irrigation Scheme Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Meda Creek Irrigation Scheme.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Meda Creek Irrigation Scheme (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Meda Creek Irrigation Scheme (e.g., water conservation, soil erosion control, crop yield improvement).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Meda Creek Irrigation Scheme.



	<p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Meda Creek Irrigation Scheme?2. What are the benefits of using geosynthetics in irrigation projects?3. What challenges were faced during the implementation of geosynthetics in the Meda Creek Irrigation Scheme? <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Meda Creek Irrigation Scheme and geosynthetics in irrigation]• Government websites related to irrigation projects• Research papers on geosynthetics in irrigation <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Meda Creek Irrigation Scheme or geosynthetics in irrigation] <p>Note: Incorporate visual aids like images and diagrams of the Meda Creek Irrigation Scheme and geosynthetic applications. Encourage class discussion on the potential for similar applications in other irrigation projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in irrigation systems <p>Note: As information about the specific application of geosynthetics in the Meda Creek Irrigation Scheme might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant irrigation projects or case studies if necessary.</p>
<p>Closure</p>	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. Homework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<p>Evaluation</p>	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Quiz Questions



Model Institute of Engineering & Technology (Autonomous) Lesson Plan

Kot Bhalwal, Jammu

	Spend 5 minutes to evaluate student assimilation of the lesson contents
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Lesson Plan No. 26	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in irrigation projects. b. Learn about the specific application of geosynthetics in the Meda Creek Irrigation Scheme. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a brief overview of irrigation challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. <p>Development of the Lesson (30 minutes):</p> <p>1. Meda Creek Irrigation Scheme Overview (10 minutes):</p> <ul style="list-style-type: none">• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. <p>2. Specific Applications of Geosynthetics (10 minutes):</p> <ul style="list-style-type: none">• Discuss the placement and installation methods of geosynthetics. <p>3. Benefits and Challenges (10 minutes):</p> <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Meda Creek Irrigation Scheme (e.g., water conservation, soil erosion control, crop yield improvement).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Meda Creek Irrigation Scheme. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Meda Creek Irrigation Scheme?2. What are the benefits of using geosynthetics in irrigation projects?



	<p>3. What challenges were faced during the implementation of geosynthetics in the Meda Creek Irrigation Scheme?</p> <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Meda Creek Irrigation Scheme and geosynthetics in irrigation]• Government websites related to irrigation projects• Research papers on geosynthetics in irrigation <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Meda Creek Irrigation Scheme or geosynthetics in irrigation] <p>Note: Incorporate visual aids like images and diagrams of the Meda Creek Irrigation Scheme and geosynthetic applications. Encourage class discussion on the potential for similar applications in other irrigation projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in irrigation systems <p>Note: As information about the specific application of geosynthetics in the Meda Creek Irrigation Scheme might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant irrigation projects or case studies if necessary.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 27	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in canal lining. b. Learn about the specific application of geosynthetics in the Kakarpar Canal lining project. c. Analyze the benefits and challenges of using geosynthetics in canal lining projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water loss issues in canal irrigation systems.• Introduce geosynthetics as a solution to reduce water losses.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Kakarpar Canal Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Kakarpar Canal project.• Discuss the challenges faced due to water losses in the canal.• Explain the decision to use geosynthetics for canal lining. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Kakarpar Canal lining project (e.g., geomembranes, geotextiles).• Explain the functions of these geosynthetics in the project (e.g., water retention, filtration, protection).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Kakarpar Canal lining project (e.g., water savings, increased efficiency, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Kakarpar Canal project. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Kakarpar Canal lining project?2. What are the benefits of using geosynthetics in canal lining projects?3. What challenges were faced during the implementation of geosynthetics in the Kakarpar Canal lining project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Kakarpar Canal project and geosynthetics in canal lining]• Government websites related to irrigation projects• Research papers on geosynthetics in canal lining <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Kakarpar Canal project or geosynthetics in canal lining] <p>Note: Incorporate visual aids like images and diagrams of the Kakarpar Canal and geosynthetic applications. Encourage class discussion on the potential for similar applications in other canal lining projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in canal lining systems <p>Note: As information about the specific application of geosynthetics in the Kakarpar Canal project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant canal lining projects or case studies if necessary.</p> <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading



	<ol style="list-style-type: none">3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. https://airport.dot.gov/6. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 27	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in canal lining. b. Learn about the specific application of geosynthetics in the Kakarpar Canal lining project. c. Analyze the benefits and challenges of using geosynthetics in canal lining projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water loss issues in canal irrigation systems.• Introduce geosynthetics as a solution to reduce water losses.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Kakarpar Canal Project Overview (10 minutes): <ul style="list-style-type: none">• Explain the decision to use geosynthetics for canal lining. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Kakarpar Canal lining project (e.g., water savings, increased efficiency, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Kakarpar Canal project. Quiz (5 minutes): <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Kakarpar Canal lining project?2. What are the benefits of using geosynthetics in canal lining projects?3. What challenges were faced during the implementation of geosynthetics



	<p>in the Kakarpar Canal lining project?</p> <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Kakarpar Canal project and geosynthetics in canal lining]• Government websites related to irrigation projects• Research papers on geosynthetics in canal lining <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Kakarpar Canal project or geosynthetics in canal lining] <p>Note: Incorporate visual aids like images and diagrams of the Kakarpar Canal and geosynthetic applications. Encourage class discussion on the potential for similar applications in other canal lining projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in canal lining systems <p>Note: As information about the specific application of geosynthetics in the Kakarpar Canal project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant canal lining projects or case studies if necessary.</p> <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it</p>
<p>Closure</p>	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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. Quiz Questions <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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Lesson Plan No. 29	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the concept of Bearing Capacity Improvement with Geogrids b. Identify the type of Erosion (Wind / Water)
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Video of NPTEL b. Use of Video
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Begin with a discussion about function and application of Geogrids • Introduce the concept of geosynthetics as a modern solution to erosion control • Highlight the importance of understanding the Bearing capacity improvements . <p>Development of the Lesson (20 minutes):</p> <ol style="list-style-type: none"> 1. Early Use of Geosynthetic-like Materials (10 minutes): <ul style="list-style-type: none"> • Discuss the reason of erosion • Explain how these materials were used in recent engineering practices. • Highlight the limitations of these early materials. 2. Geogrid -Geosynthetics (10 minutes): <ul style="list-style-type: none"> • Introduce the concept of synthetic materials in the mid-20th century. • Discuss the development of early geosynthetic products (e.g., geotextiles, geomembranes). • Explain the initial applications of geosynthetics in civil engineering projects. 3. Advancements in Geosynthetics (5 minutes): <ul style="list-style-type: none"> • Discuss the evolution of geosynthetics from basic to complex products. • Highlight the role of research and development in improving geosynthetic performance. • Explain the increasing use of geosynthetics in various engineering fields. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none"> 1. What are some examples of erosion place?



	<ol style="list-style-type: none">2. When did the development of modern geosynthetics begin?3. What factors contributed to the advancements in geosynthetic technology with special reference to geogrid <p>URLs for Reference:</p> <ul style="list-style-type: none">• The Geosynthetic Institute:
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading https://en.wikipedia.org/wiki/Geosynthetics https://www.youtube.com/watch?v=UveFyGKwayE3. Homework: Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Quiz Slide <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 30	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	<p>At the end of the lesson the student shall be able to:</p> <ol style="list-style-type: none"> Assess and increase the bearing capacity of soil foundations by reinforcing them with geogrids, enabling them to support heavier loads effectively. Analyze the mechanisms by which geogrids improve soil stability, including load distribution, confinement effects, and frictional resistance. Highlight the advantages of using geogrids in construction, such as reduced foundation settlement, cost efficiency, improved stability, and longer infrastructure life.
Teaching Aids (if any)	<ol style="list-style-type: none"> Video of NPTEL Use of PPT and Video
Teaching Development	<p>Introduction (5 minutes):</p> <ol style="list-style-type: none"> Demand for Soil Stabilization: Weak soil in construction limits bearing capacity and stability, increasing focus on advanced methods to strengthen soil. Role of Geogrids: Geogrids, as synthetic materials, reinforce soil by interlocking with particles to create a load-distributing grid. Advantages of Geogrids: Geogrids provide cost savings, reduce settlement, improve load support, and increase structure durability for sustainable projects. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none"> Types of Erosion Control (10 minutes): <ul style="list-style-type: none"> Two types of Erosion Control Introduce the basic structure of geotextiles (warp, weft, aperture). Explain the use of terms like woven, nonwoven, knitted, and slit film for geotextiles. Agent of Erosion Control (10 minutes): <ul style="list-style-type: none"> Wind Erosion Water Erosion



	<p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the definition of Erosion?2. What do you mean by staple geogrid?3. What factors influence the nomenclature of geomembranes? <p>Note: Visual aids like diagrams and images of different geosynthetics can enhance understanding. Real-world examples of geosynthetic applications can be used to illustrate the importance of correct nomenclature.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Industry publications on geosynthetic terminology• Manufacturer's product data sheets
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://airport.dot.gov/6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 31	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the primary functions of geosynthetics in civil engineering. b. Identify specific applications of geosynthetics in various engineering projects. c. Explain the mechanisms by which geosynthetics improve engineering performance.
Teaching Aids (if any)	a. Video of NPTEL b. Use of PPT slide for quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Rainwater Erosion• Definition: Caused by the impact of raindrops on exposed soil, followed by surface runoff that washes away soil layers.• Impacts: Can lead to significant topsoil loss, land degradation, and sedimentation in water bodies.• Geogrid Application: Geogrids help stabilize slopes and embankments by providing a structured reinforcement that limits soil erosion from rainwater. Development of the Lesson (30 minutes): <ol style="list-style-type: none">1. Erosion Control (10 minutes):<ul style="list-style-type: none">• Explain the action of Erosion:2. Applications of Geosynthetics (10 minutes):<ul style="list-style-type: none">• Discuss the use of geosynthetics in different engineering fields (e.g., roads, railways, dams, landfills).• Provide specific examples of geosynthetic applications (e.g., geotextiles for soil reinforcement, geomembranes for landfill liners).• Explain how geosynthetics improve project performance and cost-effectiveness.3. Mechanisms of Function (10 minutes):<ul style="list-style-type: none">• Discuss the basic mechanisms by which geosynthetics work.<ul style="list-style-type: none">○ Stress-strain behavior of geotextiles○ Hydraulic conductivity of geonets○ Tensile strength of geogrids



	<ul style="list-style-type: none">○ Permeability of geomembranes● Explain how these mechanisms contribute to the overall performance of geosynthetic systems. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is water erosion2. Define the placement of Geogrid3. What is the role of a geomembrane in a landfill? <p>Note: Use visual aids like diagrams and images to illustrate the functions and applications of geosynthetics. Real-world examples of geosynthetic projects can be used to enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">● Geosynthetic Institute website● Industry publications on geosynthetic applications● Case studies of successful geosynthetic projects
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://en.wikipedia.org/wiki/Geosynthetics4. https://www.youtube.com/watch?v=UveFyGKwayE5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 32	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 Role of Geogrids in Soil Reinforcement.Identify Working Mechanism of GeogridsExplain the benefits of using geosynthetics in various applications.
Teaching Aids (if any)	<ol style="list-style-type: none">Video of NPTELUse of ppt slides for quiz
Teaching Development	<p>Introduction (5 minutes):</p> <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none">Introduction to Bearing Capacity and Geogrids(10 minutes): Explain how geogrids interlock with soil particles, creating a structure that helps distribute loads and reduces soil movement. Use visuals to illustrate the grid pattern and soil interaction for clearer understanding.Geosynthetics in Water Resources Engineering (10 minutes):<ul style="list-style-type: none">Discuss the role of geotextiles in erosion control and bank protection.Explain the use of geomembranes in dams, canals, and reservoirs.Introduce the application of geonets for drainage in embankments and landfills.Wrap-Up and Discussion(10 minutes):<ul style="list-style-type: none">Summarize the role of geogrids in enhancing soil bearing capacity and the advantages they provide in civil engineering.Short quiz on bearing capacity, geogrid functions, and benefits.Quiz (5 minutes):<ol style="list-style-type: none">What is Yarn?Define DSF?<p>how geogrids could be applied in different types of construction projects they might encounter in the field.</p><ol style="list-style-type: none">Note: Use visual aids like diagrams and images to illustrate the applications of geosynthetics. Real-world case studies can be used to



	<p>enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute website• Industry publications on geosynthetic applications• Case studies of successful geosynthetic projects
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=UveFyGKwayE5. https://airport.dot.gov/6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 33	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand mechanism of geosynthetics in India. b. Identify key milestones in the development of geosynthetics in India. c. Analyze the factors affecting erosion control
Teaching Aids (if any)	a. Video of NPTEL b. Use of ppt slide for quiz
Teaching Development	Introduction (5 minutes): Interlocking: Soil particles interlock within the geogrid's apertures, which creates a stabilizing effect and improves load distribution. Load Transfer: Geogrids transfer loads to a broader soil mass, reducing pressure points. Development of the Lesson (30 minutes): 1. Mechanism of Geogrid (10 minutes): Membrane Effect: When subjected to loads, geogrids develop tension, which provides additional support and reinforces the subgrade. Discuss how geogrids increase the lifespan of structures, reducing maintenance needs by providing a stable foundation that adapts to environmental conditions Growth and Acceptance (10 minutes): 3. Current Trends and Future Prospects (10 minutes): <ul style="list-style-type: none">• Discuss the current status of the geosynthetics industry in India.• Identify emerging trends and applications of geosynthetics.• Explore the potential for growth and development of the geosynthetics market in India. Quiz (5 minutes): What is the primary mechanism by which geogrids improve soil bearing capacity?



	<p>How does the grid structure of geogrids contribute to stabilizing loose soil?</p> <p>Note: Incorporate case studies of successful geosynthetic projects in India to enhance understanding. Discuss the role of government policies and regulations in promoting the use of geosynthetics.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Indian Geotechnical Society publications• Case studies on geosynthetic applications in India• Reports on the geosynthetics market in India
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://www.youtube.com/watch?v=qV_9jz-Q1js6. Homework <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. Quiz on PPT slides <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 34	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of durability in relation to geosynthetics. b. Identify the factors affecting the durability of geosynthetic materials. c. Learn about testing methods to assess the durability of geosynthetics.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): • Proper placement of geogrids is essential for optimal erosion control. Understanding placement techniques is key to successful soil stabilization.. Development of the Lesson (30 minutes): 1. Placement of Geogrid for Erosion Control (10 minutes): • Identify factors affecting geogrid placement. • Explain the role of mechanical stresses (e.g., load, deformation) in affecting durability. • Understand placement techniques for geogrids in erosion control.. 2. Durability Testing (10 minutes): • Discuss the importance of laboratory testing to assess durability. • Explain common durability tests for geosynthetics (e.g., accelerated aging, hydrolysis, microbial attack). • Highlight the role of field testing in evaluating long-term performance. 3. Design Considerations for Durability (10 minutes): • Discuss the importance of selecting appropriate geosynthetic materials for specific applications. • Explain the concept of design life and its relationship to durability. • Introduce the role of quality control in ensuring the durability of geosynthetic products. Quiz (5 minutes): 1. Why is correct placement important for geogrids' effectiveness in erosion



	<p>control?</p> <p>2. What are some key considerations during geogrid placement?</p> <p>Note: Use real-world examples of geosynthetic failures due to durability issues to emphasize the importance of the topic. Discuss the role of proper installation and maintenance in prolonging the life of geosynthetics.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Case studies on the long-term performance of geosynthetic projects• Research papers on durability testing of geosynthetics
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. https://airport.dot.gov/6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 35	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Recognize the advantages of using geogrids to improve bearing capacity. b. Understand when to select geogrids over other materials.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the long-term performance of materials in outdoor environments.• Introduce the concept of degradation as the deterioration of geosynthetic properties over time.• Highlight the importance of understanding degrading agencies to ensure the successful application of geosynthetics. Development of the Lesson (30 minutes): <ol style="list-style-type: none">1. Enhanced Load-Bearing Capacity: Geogrids improve the load-bearing capacity of soils by distributing loads more evenly, making them suitable for various construction applications, such as roads, embankments, and foundations.2. Cost-Effective and Sustainable Solution: Using geogrids reduces the need for extensive soil excavation and replacement, lowering construction costs and minimizing environmental impact.3. Improved Stability and Reduced Settlement: By reinforcing the soil, geogrids increase stability, reduce the risk of differential settlement, and enhance the overall longevity and performance of engineering structures. Quiz (5 minutes): <ol style="list-style-type: none">1. What is one key advantage of using geogrids for bearing capacity improvement?2. How do geogrids differ from traditional reinforcement materials in enhancing bearing capacity? Note: Use real-world examples of geosynthetic failures due to degradation to emphasize the importance of the topic. Visual aids like diagrams and



	<p>images can be used to illustrate the degradation mechanisms.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on geosynthetic durability• Case studies of geosynthetic failures due to degradation
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 36	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	<p>At the end of the lesson the student shall be able to:</p> <p>Explain the mechanisms by which geogrids improve soil bearing capacity.</p> <ul style="list-style-type: none">- Describe how geogrid-soil interaction distributes loads effectively.- Illustrate the role of geogrids in preventing soil deformation and settlement.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <p>Discuss the role of geogrids in construction projects, especially for improving soil bearing capacity.</p> <ul style="list-style-type: none">- Load Distribution: How geogrids help distribute loads over a wider area, reducing pressure on weaker soils.- Reinforcement Mechanism: Explanation of the mechanical reinforcement provided by geogrids and how they increase soil's resistance to deformation.- Importance in Engineering: Relevance of geogrids in modern civil engineering, especially in soil stabilization for infrastructure resilience. <p>Development of the Lesson (30 minutes):</p> <ul style="list-style-type: none">- Load Transfer Mechanism: How geogrids enhance load distribution by creating a tensile layer that spreads the applied load.- Interlocking and Friction: The role of geogrids' open grid structure in creating interlocking with soil particles, improving overall stability.- Confined Reinforcement: How confinement within the grid structure improves resistance to lateral spreading and soil displacement. <p>Diagram Analysis of Load Distribution (15 minutes)</p> <ul style="list-style-type: none">- Description: Students will examine a series of diagrams showing geogrid-reinforced and non-reinforced soil under a load.- Steps:<ul style="list-style-type: none">- Present diagrams comparing load distribution in soil with and without geogrids.



	<p>- Facilitate a discussion on how load distribution differs between reinforced and non-reinforced setups.</p> <p>- Expected Outcome: Students will visually understand how geogrids distribute load more effectively than non-reinforced soils.</p> <p>Quiz (5 minutes):</p> <p>What role does the open grid structure of geogrids play in soil stability?</p> <ol style="list-style-type: none">1.- Answer: It allows soil particles to interlock within the grid structure, enhancing load distribution and preventing lateral displacement.2. Explain how geogrids improve load distribution in weak soil foundations. <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on biodegradation of geosynthetics• Case studies of successful mitigation strategies <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 37	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: <ul style="list-style-type: none">• Identify and describe common modes of failure in geogrid-reinforced systems• Understand the role of the friction coefficient in geogrid applications and how it affects soil-geogrid interaction.• Recognize the importance of experimental studies in validating geogrid performance and understanding failure mechanisms.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <p>Introduce the concepts of modes of failure, friction coefficient, and experimental studies, which are crucial for understanding and optimizing geogrid-reinforced structures.</p> <p>Modes of Failure : Overview of common types of failures in geogrid applications, such as pull-out failure, bearing failure, and tensile failure.</p> <p>Friction Coefficient : Importance of the friction coefficient in soil-geogrid interaction and its impact on geogrid effectiveness.</p> <p>Experimental Studies : How laboratory and field experiments provide data to evaluate and improve geogrid applications.</p> <p>Development of the Lesson (30 minutes):</p> <p>Modes of Failure :</p> <ul style="list-style-type: none">• Pull-Out Failure: Occurs when the geogrid is pulled out of the soil, often due to inadequate anchoring.• Bearing Failure: Happens when the soil beneath the geogrid collapses due to excessive load.• Tensile Failure: Occurs when the geogrid itself breaks or tears under high tension.• Friction Coefficient : Defines the resistance to sliding between soil and geogrid surfaces and determines stability.• Experimental Studies : Research and testing methods used to study



	<p>geogrid-soil behavior, friction coefficients, and failure mechanisms.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is pull-out failure in the context of geogrid applications?2. How does the friction coefficient affect the performance of geogrid-reinforced structures? <p>Note: Use visual aids like diagrams and images to illustrate the chemical degradation process. Real-world examples of geosynthetic failures due to chemical exposure can be used to emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on chemical resistance of geosynthetics• Case studies of geosynthetic failures due to chemical attack
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 38	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of weathering and its impact on geosynthetics. b. Identify the key weathering factors affecting geosynthetics. c. Learn about methods to enhance the weathering resistance of geosynthetics.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Introduce the concept of geogrids and their applications in soil reinforcement, focusing on how they improve soil stability, load distribution, and overall structure resilience.• Definition of Geogrids : Discuss the structure and material composition of geogrids, emphasizing their open, grid-like pattern.• Purpose of Soil Improvement : Highlight the challenges with weak or unstable soils in construction and how geogrids can address these issues.• Applications in Civil Engineering : Explain how geogrids are used in infrastructure projects, such as roads, embankments, and retaining walls. <p>Development of the Lesson (30 minutes):</p> <p>Define geogrids and understand their role in soil improvement.</p> <p>Explain the mechanisms by which geogrids improve soil bearing capacity, reduce settlement, and distribute loads.</p> <p>Identify key applications and benefits of using geogrids in construction.</p> <p>Concepts (10 minutes):</p> <p>Load Distribution : How geogrids distribute loads over a larger area, reducing stress on soil and enhancing stability.</p> <p>Interlocking Mechanism : The role of geogrid's open structure in locking soil particles and preventing displacement.</p> <p>Reduced Settlement : How geogrids minimize vertical settlement by</p>



	<p>reinforcing the soil structure and enhancing its resistance to deformation.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary purpose of using geogrids in soil improvement?2. How do geogrids help in reducing soil settlement under heavy loads? <p>Note: Use visual aids like images of weathered geosynthetic materials and graphs to illustrate the concepts. Real-world examples of geosynthetic failures due to weathering can be used to emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Research papers on weathering of geosynthetics• Case studies of geosynthetic projects in challenging environments
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 39	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the basic manufacturing processes for geosynthetics.b. Identify the key factors influencing the properties of geosynthetic materials.c. Learn about the relationship between manufacturing methods and geosynthetic performance.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. <p>Development of the Lesson (30 minutes):</p> <p>1. Manufacturing of Geotextiles (10 minutes):</p> <ul style="list-style-type: none">• Explain the primary methods for producing geotextiles:<ul style="list-style-type: none">○ Weaving○ Knitting○ Nonwoven (needle punched, spunbond, meltblown)• Discuss the impact of manufacturing process on geotextile properties (strength, permeability, durability). <p>2. Manufacturing of Geomembranes (10 minutes):</p> <ul style="list-style-type: none">• Explain the basic process of geomembrane production (extrusion, calendaring).• Discuss the importance of polymer type and additives in geomembrane properties.• Highlight the quality control measures in geomembrane manufacturing. <p>3. Manufacturing of Other Geosynthetics (10 minutes):</p> <ul style="list-style-type: none">• Briefly introduce the manufacturing processes for geogrids, geonets, and geocomposites.• Explain the unique characteristics of each manufacturing process.



	<ul style="list-style-type: none">• Discuss the role of technology in the development of new geosynthetic products. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the most common manufacturing method for geotextiles?2. How does the manufacturing process affect the properties of a geomembrane?3. What is the importance of quality control in geosynthetic manufacturing? <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=UveFyGKwayE4. https://www.youtube.com/watch?v=SMJrXhjDfKM5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 40	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none">1. Define geosynthetics and explain their applications in soil reinforcement.2. Understand the basic types of geosynthetic materials (geotextiles, geogrids).3. Discuss the role of geosynthetics in stabilizing structures.
Teaching Aids (if any)	<ol style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <p>Overview of geosynthetics and their function in reinforcing soil for structural support. Geosynthetics play a crucial role in modern construction by reinforcing soil, thus enabling safe construction on challenging soils.</p> <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none">1. Introduction to Geosynthetics Reinforced Soil Structures (10 minutes):<ul style="list-style-type: none">• Explain the primary methods for producing geotextiles:<ul style="list-style-type: none">○ Weaving○ Knitting○ Nonwoven (needle punched, spunbond, meltblown)• Discuss the impact of manufacturing process on geotextile properties (strength, permeability, durability).• Introduction to types, materials, and characteristics of geosynthetics and their application areas in civil engineering. <p>Quiz (5 minutes):</p> <p>What are the primary types of geosynthetics?</p> <p>Name two applications of geosynthetics in civil engineering.</p> <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines



	<ul style="list-style-type: none">• Manufacturer's technical data sheets• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 41	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> 1. Explain the function of geosynthetic-reinforced retaining walls. 2. Understand load distribution in geosynthetic-reinforced walls.
Teaching Aids (if any)	<ol style="list-style-type: none"> a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes): Basics of retaining walls and the role of geosynthetics in their design.</p> <p>Development of the Lesson (30 minutes):</p> <p style="padding-left: 40px;">Design of Geosynthetic-Reinforced Soil Retaining Walls (10 minutes):</p> <ul style="list-style-type: none"> • Explain the basic concept of retaining wall (extrusion, calendaring). • Discuss the importance of Retaining wall. • Highlight the components of of Geosynthetic-Reinforced Soil <p>Quiz (5 minutes):</p> <ol style="list-style-type: none"> 1. How do geosynthetics contribute to the stability of retaining walls? 2. What is one design consideration for reinforced retaining walls? <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none"> • Geosynthetic Institute standards and guidelines • Manufacturer's technical data sheets • Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none"> 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://www.youtube.com/watch?v=UveFyGKwayE 4. https://www.youtube.com/watch?v=SMJrXhjDfKM 5. Homework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to



	<p>answer and discuss.</p> <p>2. Nearpod Quiz</p> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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Lesson Plan No. 42	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	<p>At the end of the lesson the student shall be able to:</p> <p>Describe the process of constructing reinforced soil slopes.</p> <p>Understand how geosynthetics prevent slope failure.</p> <p>Learn about the selection of materials for slope reinforcement.</p>
Teaching Aids (if any)	<p>a. Video of NPTEL</p> <p>b. Use of Nearpod tool for online quiz</p>
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none">• Begin with a discussion about the production of everyday materials like fabrics and plastics.• Introduce the concept of geosynthetics as manufactured products with specific properties.• Highlight the importance of understanding manufacturing processes to appreciate geosynthetic performance. <p>Development of the Lesson (30 minutes):</p> <p>Construction of Geosynthetic-Reinforced Soil Slopes (30 minutes):</p> <ul style="list-style-type: none">• Briefly introduce the development processes for Construction of Geosynthetic-Reinforced Soil Slopes• Explain the unique characteristics of Reinforced Soil Slopes• Discuss the significance of Geosynthetic-Reinforced Soil Slopes. <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is a benefit of using geosynthetics in slope construction?2. Why is material selection critical in slope reinforcement? <p>Note: Use visual aids like diagrams and images to illustrate the manufacturing processes. Real-world examples of geosynthetic products can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• Manufacturer's technical data sheets



	<ul style="list-style-type: none">• Videos on geosynthetic manufacturing processes
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 43	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	<p>At the end of the lesson the student shall be able to:</p> <ul style="list-style-type: none">Identify key codes related to geosynthetic-reinforced structures.Understand the role of codal provisions in safe construction practices.Learn how to apply standards in design and construction.
Teaching Aids (if any)	<ul style="list-style-type: none">a. Video of NPTELb. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <p>Codal provisions for geosynthetic-reinforced soil structures are essential as they establish standardized guidelines ensuring safety, quality, and reliability in construction. By following these codes, engineers can design structures that meet regulatory requirements, optimize material performance, and withstand environmental stresses. These provisions also provide a framework for consistent practices across projects, facilitating effective quality control and reducing the risk of structural failures. Adhering to codal provisions ensures efficient, long-lasting infrastructure, especially in critical applications like retaining walls and embankments.</p> <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none">Codal Provisions for Geosynthetic-Reinforced Soil Structures (10 minutes):<ul style="list-style-type: none">Explain the codal reading process..Discuss the impact of codes during structures.Highlight the relationship between Codal Provisions and Geosynthetic-Reinforced Soil Structures.Importance of Codal connection (10 minutes):<p>To read codal provisions for geosynthetic-reinforced soil structures effectively, start by identifying the relevant codes (such as ASTM or ISO standards) specific to your project. Review each section systematically, focusing on design, material requirements, installation practices, and testing protocols. Pay attention to specifications regarding load-bearing capacity, environmental conditions, and safety guidelines. Take notes on key criteria and cross-reference them with your project needs to ensure compliance. This methodical approach helps ensure accurate and</p>



	<p>thorough adherence to standards.</p> <p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. Name one standard code related to geosynthetic applications.2. Why are codal provisions essential in design? <p>Note: Use visual aids like diagrams and images of geogrid testing equipment to enhance understanding. Real-world examples of geogrid testing failures can be used to emphasize the importance of quality control.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Case studies on geogrid performance evaluation
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://www.youtube.com/watch?v=FatE08CFCow&t=25s5. https://www.youtube.com/watch?v=oXUaNfveadA6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 44	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: Define bearing capacity and its significance in construction. Explain how geosynthetics improve bearing capacity. Discuss design methods for bearing capacity enhancement
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): The study of bearing capacity improvement using geosynthetics is crucial for advancing construction practices on weak or compressible soils. Geosynthetics enhance soil stability by distributing loads more effectively, reducing settlement, and increasing the strength of foundations. This is particularly significant for infrastructure projects on challenging soils, as it enables safe construction without extensive soil replacement or deep foundations. Understanding this application leads to cost-effective, sustainable solutions that extend the longevity of roads, embankments, and retaining walls, ensuring resilience and safety in civil engineering projects. Development of the Lesson (30 minutes): 1. Bearing Capacity Improvement Using Geosynthetics (10 minutes): <ul style="list-style-type: none">• Explain the Bearing Capacity.• Discuss the role of Geosynthetics• Highlight the components of Bearing Capacity 2. Testing Environment (10 minutes): 3. The testing environment for bearing capacity improvement using geosynthetics typically involves controlled laboratory or field settings to assess the performance of geosynthetics in soil reinforcement. Key factors to consider include: Soil type and Geosynthetics Materials Quiz (5 minutes): 1. Explain how geosynthetics improve bearing capacity. 2. Discuss design methods for bearing capacity enhancement. Note: Use visual aids like diagrams and images to illustrate the concepts. Real-world examples of test errors due to improper conditions can be used to



	<p>emphasize the importance of the topic.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Research papers on geogrid testing methodologies
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=FatE08CFCow&t=25s4. https://www.youtube.com/watch?v=oXUaNfveadA5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 45	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: 1. Describe the difficulties of building on soft soils. 2. Explain how geosynthetics reinforce embankments. 3. Identify techniques for constructing stable embankments.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the importance of material quality in construction.• Introduce the concept of geogrid sampling as a quality control measure.• Highlight the need for representative samples to assess geogrid properties. Development of the Lesson (30 minutes): <p>Embankments on Soft Soils with Geosynthetics (10 minutes):</p> <p>Embankments on soft soils present significant challenges due to the low load-bearing capacity and high compressibility of the soil, leading to excessive settlement and potential instability.</p> <p>Geosynthetics, such as geogrids and geotextiles, are widely used to reinforce these embankments, improving their stability and performance. By providing additional tensile strength and load distribution, geosynthetics help prevent excessive settlement and reduce the risk of failure.</p> <p>They also enhance drainage and reduce pore water pressure within the soil, which is critical in soft soils prone to liquefaction.</p> <p>The use of geosynthetics in embankments allows for the construction of stable, durable structures on otherwise unsuitable ground, making it possible to build on soft soils that would otherwise require expensive soil replacement or deep foundation systems.</p> <ul style="list-style-type: none">• of selecting representative sample locations.



	<p>Quiz (5 minutes):</p> <p>Why is basal reinforcement necessary for embankments on soft soils?</p> <p>Name one technique for improving embankment stability.</p> <p>Note: Use visual aids like diagrams and images to illustrate the sampling process. Real-world examples of sampling plans for geosynthetic projects can be used to enhance understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid sampling• Case studies on geogrid quality control
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=SMJrXhjDfKM4. https://www.youtube.com/watch?v=qV_9jz-Q1js5. https://www.youtube.com/watch?v=oXUaNfveadA6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Model Institute of Engineering & Technology (Autonomous) Lesson Plan

Kot Bhalwal, Jammu



Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1



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Lesson Plan No. 46	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the key mechanical properties of geogrids. b. Learn how mechanical properties influence geogrid performance. c. Identify the testing methods used to determine geogrid mechanical properties.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the role of reinforcement in civil engineering structures.• Introduce geogrids as a reinforcement material with specific mechanical properties.• Highlight the importance of understanding these properties for effective geogrid applications. Development of the Lesson (30 minutes): 1. Tensile Strength and Stiffness (10 minutes): <ul style="list-style-type: none">• Explain the concept of tensile strength and stiffness in geogrids.• Discuss the importance of these properties for reinforcement applications.• Introduce different types of tensile tests (uniaxial, biaxial). 2. Creep and Relaxation (10 minutes): <ul style="list-style-type: none">• Define creep and relaxation in the context of geogrids.• Explain the impact of these properties on long-term geogrid performance.• Discuss the factors influencing creep and relaxation behavior. 3. Other Mechanical Properties (10 minutes): <ul style="list-style-type: none">• Introduce other relevant mechanical properties (e.g., puncture resistance, tear strength).• Explain the importance of these properties in specific geogrid applications.• Discuss the relationship between mechanical properties and geogrid durability.



	<p>Quiz (5 minutes):</p> <ol style="list-style-type: none">1. What is the primary mechanical property required for geogrid reinforcement?2. How does creep affect geogrid performance over time?3. Why is puncture resistance important for geogrids used in certain applications? <p>Note: Use visual aids like diagrams and graphs to illustrate the mechanical properties and testing methods. Real-world examples of geogrid applications can be used to reinforce understanding.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute standards and guidelines• ASTM standards for geogrid testing• Manufacturer's technical data sheets
<p>Closure</p>	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py__9yz85. https://airport.dot.gov/6. Homework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<p>Evaluation</p>	<ol style="list-style-type: none">1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.2. Nearpod Quiz <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 47	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of creep in geogrids. b. Learn about the importance of creep testing for geogrid design. c. Explain the methods used for creep testing of geogrids.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a discussion about the long-term behavior of materials under load.• Introduce the concept of creep as the time-dependent deformation of a material under constant load.• Highlight the significance of creep testing for geogrids used in long-term applications. Development of the Lesson (30 minutes): 1. Creep in Geogrids (10 minutes): <ul style="list-style-type: none">• Explain the creep phenomenon in relation to geogrid structure.• Discuss the factors influencing creep behavior (load level, temperature, time).• Highlight the impact of creep on geogrid performance in engineering structures. 2. Creep Testing Methods (10 minutes): <ul style="list-style-type: none">• Introduce standard creep testing methods for geogrids.• Explain the equipment and procedures involved in creep testing.• Discuss the importance of test parameters (load level, temperature, time). 3. Creep Data Analysis (10 minutes): <ul style="list-style-type: none">• Explain how creep data is analyzed to determine creep characteristics.• Introduce creep models used to predict long-term behavior.• Discuss the application of creep data in geogrid design. Quiz (5 minutes): 1. What is creep in the context of geogrids?



	<ol style="list-style-type: none">Why is creep testing important for geogrid design?How is creep data used in predicting geogrid performance? <p>Note: Use visual aids like graphs and diagrams to illustrate creep behavior and test results. Real-world examples of geogrid applications where creep is a concern can be used to enhance understanding.</p>
Closure	<ol style="list-style-type: none">Summarize the Lesson Learning Outcomes and get affirmation from students on these.Suggested Readinghttps://planrva.org/transportation/https://airport.dot.gov/Homework <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
Evaluation	<ol style="list-style-type: none">Reflective Questions (What, Why, Who?). Allow students to answer and discuss.Nearpod Quiz <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 48	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Dharoi Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Dharoi Dam Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Dharoi Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Dharoi Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Dharoi Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOO&t=13s4. https://www.youtube.com/watch?v=sj-py__9yz85. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 49	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Dharoi Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1.Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. Quiz (5 minutes): <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Dharoi Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? URLs for Reference: <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects YouTube Video Reference:



	<ul style="list-style-type: none">• [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 50	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Dharoi Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Dharoi Dam Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Dharoi Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Dharoi Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Dharoi Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Dharoi Dam project. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Dharoi Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Dharoi Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Dharoi Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Dharoi Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOO&t=13s4. https://www.youtube.com/watch?v=sj-py__9yz85. https://airport.dot.gov/6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 51	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in water resource projects. b. Learn about the specific application of geosynthetics in the Hiran 2 Dam project. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water resource challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Hiran 2 Dam Project Overview (10 minutes): <ul style="list-style-type: none">• Provide a brief background of the Hiran 2 Dam project.• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Detail the specific geosynthetic products used in the Hiran 2 Dam project (e.g., geotextiles, geomembranes).• Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement).• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Hiran 2 Dam project (e.g., cost-effectiveness, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Hiran 2 Dam project. Quiz (5 minutes):



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Hiran 2 Dam project?2. What are the benefits of using geosynthetics in such projects?3. What challenges were faced during the implementation of geosynthetics in the Hiran 2 Dam project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• Gujarat Water Resources Development Corporation Limited (GWRDCL) website• Case studies on geosynthetics in dams and water resource projects <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Hiran 2 Dam project or geosynthetics in water resource projects] <p>Note: Incorporate visual aids like images and diagrams of the Hiran 2 Dam and geosynthetic applications. Encourage class discussion on the potential for similar applications in other water resource projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on water resource applications• Research papers on geosynthetics in dams and reservoirs <p>Note: As information about the specific application of geosynthetics in the Hiran 2 Dam project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant dam projects or case studies if necessary.</p> <ul style="list-style-type: none">•
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 52	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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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 the role of geosynthetics in irrigation projects. b. Learn about the specific application of geosynthetics in the Meda Creek Irrigation Scheme. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	<ul style="list-style-type: none"> a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Begin with a brief overview of irrigation challenges. • Introduce geosynthetics as innovative materials for addressing these challenges. • Highlight the importance of case studies in understanding geosynthetic applications. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none"> 1. Meda Creek Irrigation Scheme Overview (10 minutes): <ul style="list-style-type: none"> • Provide a brief background of the Meda Creek Irrigation Scheme. • Discuss the project's objectives and challenges. • Explain the role of geosynthetics in addressing these challenges. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none"> • Detail the specific geosynthetic products used in the Meda Creek Irrigation Scheme (e.g., geotextiles, geomembranes). • Explain the functions of these geosynthetics in the project (e.g., filtration, drainage, reinforcement). • Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none"> • Analyze the benefits of using geosynthetics in the Meda Creek Irrigation Scheme (e.g., water conservation, soil erosion control, crop yield improvement). • Discuss the challenges faced during the implementation of geosynthetics. • Highlight the lessons learned from the Meda Creek Irrigation Scheme. <p>Quiz (5 minutes):</p>



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Meda Creek Irrigation Scheme?2. What are the benefits of using geosynthetics in irrigation projects?3. What challenges were faced during the implementation of geosynthetics in the Meda Creek Irrigation Scheme? <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Meda Creek Irrigation Scheme and geosynthetics in irrigation]• Government websites related to irrigation projects• Research papers on geosynthetics in irrigation <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Meda Creek Irrigation Scheme or geosynthetics in irrigation] <p>Note: Incorporate visual aids like images and diagrams of the Meda Creek Irrigation Scheme and geosynthetic applications. Encourage class discussion on the potential for similar applications in other irrigation projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in irrigation systems <p>Note: As information about the specific application of geosynthetics in the Meda Creek Irrigation Scheme might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant irrigation projects or case studies if necessary.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py_9yz85. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 53	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in irrigation projects. b. Learn about the specific application of geosynthetics in the Meda Creek Irrigation Scheme. c. Analyze the benefits and challenges of using geosynthetics in such projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of irrigation challenges.• Introduce geosynthetics as innovative materials for addressing these challenges.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): <ol style="list-style-type: none">1. Meda Creek Irrigation Scheme Overview (10 minutes):<ul style="list-style-type: none">• Discuss the project's objectives and challenges.• Explain the role of geosynthetics in addressing these challenges.2. Specific Applications of Geosynthetics (10 minutes):<ul style="list-style-type: none">• Discuss the placement and installation methods of geosynthetics.3. Benefits and Challenges (10 minutes):<ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Meda Creek Irrigation Scheme (e.g., water conservation, soil erosion control, crop yield improvement).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Meda Creek Irrigation Scheme. Quiz (5 minutes): <ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Meda Creek Irrigation Scheme?2. What are the benefits of using geosynthetics in irrigation projects?



	<p>3. What challenges were faced during the implementation of geosynthetics in the Meda Creek Irrigation Scheme?</p> <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Meda Creek Irrigation Scheme and geosynthetics in irrigation]• Government websites related to irrigation projects• Research papers on geosynthetics in irrigation <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Meda Creek Irrigation Scheme or geosynthetics in irrigation] <p>Note: Incorporate visual aids like images and diagrams of the Meda Creek Irrigation Scheme and geosynthetic applications. Encourage class discussion on the potential for similar applications in other irrigation projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in irrigation systems <p>Note: As information about the specific application of geosynthetics in the Meda Creek Irrigation Scheme might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant irrigation projects or case studies if necessary.</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 54	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	<p>At the end of the lesson the student shall be able to:</p> <ol style="list-style-type: none"> Understand the role of geosynthetics in canal lining. Learn about the specific application of geosynthetics in the Kakarpar Canal lining project. Analyze the benefits and challenges of using geosynthetics in canal lining projects.
Teaching Aids (if any)	<ol style="list-style-type: none"> Video of NPTEL Use of Nearpod tool for online quiz
Teaching Development	<p>Introduction (5 minutes):</p> <ul style="list-style-type: none"> Begin with a brief overview of water loss issues in canal irrigation systems. Introduce geosynthetics as a solution to reduce water losses. Highlight the importance of case studies in understanding geosynthetic applications. <p>Development of the Lesson (30 minutes):</p> <ol style="list-style-type: none"> Kakarpar Canal Project Overview (10 minutes): <ul style="list-style-type: none"> Provide a brief background of the Kakarpar Canal project. Discuss the challenges faced due to water losses in the canal. Explain the decision to use geosynthetics for canal lining. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none"> Detail the specific geosynthetic products used in the Kakarpar Canal lining project (e.g., geomembranes, geotextiles). Explain the functions of these geosynthetics in the project (e.g., water retention, filtration, protection). Discuss the placement and installation methods of geosynthetics. Benefits and Challenges (10 minutes): <ul style="list-style-type: none"> Analyze the benefits of using geosynthetics in the Kakarpar Canal lining project (e.g., water savings, increased efficiency, environmental impact). Discuss the challenges faced during the implementation of geosynthetics. Highlight the lessons learned from the Kakarpar Canal project. <p>Quiz (5 minutes):</p>



	<ol style="list-style-type: none">1. What is the primary function of geosynthetics in the Kakarpar Canal lining project?2. What are the benefits of using geosynthetics in canal lining projects?3. What challenges were faced during the implementation of geosynthetics in the Kakarpar Canal lining project? <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Kakarpar Canal project and geosynthetics in canal lining]• Government websites related to irrigation projects• Research papers on geosynthetics in canal lining <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Kakarpar Canal project or geosynthetics in canal lining] <p>Note: Incorporate visual aids like images and diagrams of the Kakarpar Canal and geosynthetic applications. Encourage class discussion on the potential for similar applications in other canal lining projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in canal lining systems <p>Note: As information about the specific application of geosynthetics in the Kakarpar Canal project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant canal lining projects or case studies if necessary.</p> <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it</p>
Closure	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading



	<ol style="list-style-type: none">3. https://www.youtube.com/watch?v=Doj6VKigbOQ&t=13s4. https://www.youtube.com/watch?v=sj-py__9yz85. https://airport.dot.gov/6. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



Lesson Plan No. 55	Course Name: Geosynthetics Engineering	Course No.: CE-702(B)
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Objectives	At the end of the lesson the student shall be able to: a. Understand the role of geosynthetics in canal lining. b. Learn about the specific application of geosynthetics in the Kakarpar Canal lining project. c. Analyze the benefits and challenges of using geosynthetics in canal lining projects.
Teaching Aids (if any)	a. Video of NPTEL b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes): <ul style="list-style-type: none">• Begin with a brief overview of water loss issues in canal irrigation systems.• Introduce geosynthetics as a solution to reduce water losses.• Highlight the importance of case studies in understanding geosynthetic applications. Development of the Lesson (30 minutes): 1. Kakarpar Canal Project Overview (10 minutes): <ul style="list-style-type: none">• Explain the decision to use geosynthetics for canal lining. 2. Specific Applications of Geosynthetics (10 minutes): <ul style="list-style-type: none">• Discuss the placement and installation methods of geosynthetics. 3. Benefits and Challenges (10 minutes): <ul style="list-style-type: none">• Analyze the benefits of using geosynthetics in the Kakarpar Canal lining project (e.g., water savings, increased efficiency, environmental impact).• Discuss the challenges faced during the implementation of geosynthetics.• Highlight the lessons learned from the Kakarpar Canal project. Quiz (5 minutes): 1. What is the primary function of geosynthetics in the Kakarpar Canal lining project? 2. What are the benefits of using geosynthetics in canal lining projects? 3. What challenges were faced during the implementation of geosynthetics



	<p>in the Kakarpar Canal lining project?</p> <p>URLs for Reference:</p> <ul style="list-style-type: none">• [Insert relevant URLs for Kakarpar Canal project and geosynthetics in canal lining]• Government websites related to irrigation projects• Research papers on geosynthetics in canal lining <p>YouTube Video Reference:</p> <ul style="list-style-type: none">• [Insert a link to a video about the Kakarpar Canal project or geosynthetics in canal lining] <p>Note: Incorporate visual aids like images and diagrams of the Kakarpar Canal and geosynthetic applications. Encourage class discussion on the potential for similar applications in other canal lining projects.</p> <p>Additional Resources:</p> <ul style="list-style-type: none">• Geosynthetic Institute publications on irrigation applications• Case studies on geosynthetics in canal lining systems <p>Note: As information about the specific application of geosynthetics in the Kakarpar Canal project might be limited, consider using this lesson plan as a template and replacing the details with information from other relevant canal lining projects or case studies if necessary.</p> <p>Upload an image</p> <p>This prompt requires an image that you need to add. Tap the image button to upload an image.</p> <p>Got it</p> <p>Need a little help with this prompt?</p> <p>Power up your prompt and Gemini will expand it to get you better results</p> <p>Got it</p>
<p>Closure</p>	<ol style="list-style-type: none">1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.2. Suggested Reading3. https://planrva.org/transportation/4. https://airport.dot.gov/5. Homework <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 <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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