



RAFFLES  
UNIVERSITY

## TEACHING PLAN: Soil and Water Conservation Engineering

|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                       |                                             |           |
|---------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------|
| SCHOOL: (SOAS)<br>SCHOOL OF<br>AGRICULTURAL<br>SCIENCES |                   | ACADEMIC SESSION:<br>2023 – 2024                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                       | FOR STUDENTS’ BATCH:<br>2 <sup>nd</sup> sem |           |
| 1                                                       | Course No.        | AEN-T-101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                       |                                             |           |
| 2                                                       | Course Title      | Soil and Water Conservation Engineering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |                                             |           |
| 3                                                       | Credits           | 2 (1+1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |                                             |           |
| 4                                                       | Learning Hours    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contact Hours                                                                                                                         | 72                                          |           |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Assessment                                                                                                                            | 9                                           |           |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Guided Study                                                                                                                          | 9                                           |           |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Total hours                                                                                                                           | 90                                          |           |
| 5                                                       | Course Objective  | 1. To acquaint and equip the students with soil and water conservation techniques.<br>2. Soil erosion problems and control measures.<br>3. Design of irrigation channels, land surveying and levelling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |                                             |           |
| 6                                                       | Course Outcomes   | 1. To know about soil erosion via water various causes of soil erosion and forms of water erosion, classification of gully control measures or structures.<br>2. Course will give the knowledge of soil loss equation and it can estimate long – term annual soil loss and guide conservationists on proper cropping, management, and conservation practices.<br>3. This course will help the students to learn about Contour strip cropping designed to minimize soil erosion and Contour bunds which can save soils from erosion.<br>4. By this course students get the knowledge about Grassed waterways designed to move surface water across farmland without causing soil erosion and various water harvesting techniques.<br>5. Students will be able to understand the wind erosion, centrifugal pumps and various pressurized irrigation methods. So overall the importance of this technology in farm is given to students by teaching this course.<br>6. Basically this course provides knowledge about soil erosion, soil & water conservation and water harvesting and its measurement techniques. Prevention and management of soil degradation. Apart from this, we also study different methods of soil and water conservation. |                                                                                                                                       |                                             |           |
| 7                                                       | Outline syllabus: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                       |                                             |           |
| 7.01                                                    | Paper Code        | Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Introduction                                                                                                                          | Page Numbers <sup>1</sup>                   | Lect ures |
| 7.02                                                    | AEN-T-101         | Unit I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1: Introduction to Soil and Water Conservation                                                                                        | 215-224                                     | 1         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2: Definition and agents of soil erosion, Causes of soil erosion.                                                                     |                                             | 1         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3: Water erosion: Forms of water erosion                                                                                              |                                             | 2         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4: Gully classification and control measures                                                                                          |                                             | 1         |
|                                                         |                   | Unit II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1. Soil loss estimation by universal Loss Soil Equation                                                                               | 229-237                                     | 1         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2. Soil loss measurement techniques                                                                                                   |                                             | 2         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3. Principles of erosion control: Introduction to contouring,                                                                         |                                             | 1         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4. Strip cropping, Contour bund.                                                                                                      |                                             | 2         |
|                                                         |                   | Unit III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1. Graded bund and bench terracing.                                                                                                   | 268-277                                     | 1         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2. Grassed water ways and their design.                                                                                               |                                             | 2         |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3. Water harvesting and its techniques.                                                                                               |                                             | 2         |
|                                                         |                   | Unit IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1. Wind erosion: mechanics of wind erosion. Types of soil movement.<br>2. Principles of wind erosion control and its control measures | 241-243                                     | 1<br>2    |
|                                                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                       |                                             |           |

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|-------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8</b>    | <b>Course Evaluation</b>           |                                                                                                                                                                                                                                                                                                                                                                               |
| <b>8.1</b>  | <b>CA: 10%</b>                     |                                                                                                                                                                                                                                                                                                                                                                               |
| <b>8.11</b> | <b>Attendance</b>                  | 75%                                                                                                                                                                                                                                                                                                                                                                           |
| <b>8.12</b> | <b>Homework</b>                    | --                                                                                                                                                                                                                                                                                                                                                                            |
| <b>8.13</b> | <b>Quizzes</b>                     | --                                                                                                                                                                                                                                                                                                                                                                            |
| <b>8.14</b> | <b>Projects</b>                    | --                                                                                                                                                                                                                                                                                                                                                                            |
| <b>8.15</b> | <b>Presentation</b>                | --                                                                                                                                                                                                                                                                                                                                                                            |
| <b>8.16</b> | <b>Any other</b>                   | Practical examination 20%                                                                                                                                                                                                                                                                                                                                                     |
| <b>8.2</b>  | <b>MTE</b>                         | 30%                                                                                                                                                                                                                                                                                                                                                                           |
| <b>8.3</b>  | <b>End-term examination: 50%</b>   |                                                                                                                                                                                                                                                                                                                                                                               |
| <b>9</b>    | <b>Text Books &amp; References</b> |                                                                                                                                                                                                                                                                                                                                                                               |
| <b>9.1</b>  | <b>Text book</b>                   | 1. A HANDBOOK OF AGRICULTURE by S. Dutt  Oxford, Jaipur  2014                                                                                                                                                                                                                                                                                                                 |
| <b>9.2</b>  | <b>References</b>                  | 1. Principles of Agronomy, 5 <sup>th</sup> edition by Reddy S.R.   Kalyani Publication, Ludhiana  2021<br>2. Principles of Agronomy (H), by Arya R.L.  Scientific Publications (India), New Delhi   2017<br>3. Fundamentals of Soil by Sahai, V.N.  Kalyani Publication, Ludhiana  <br>4. <a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a> |
| <b>9.3</b>  | <b>Video References</b>            | 1. <a href="https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=18&amp;lesson=31">https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=18&amp;lesson=31</a><br>2. <a href="https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=18&amp;lesson=32">https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=18&amp;lesson=32</a>                                          |

### Mapping of Outcomes v. Topics

| Outcome no. →<br>Syllabus topic↓ | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------------------------|---|---|---|---|---|---|
| Paper Code. Unit I (1)           |   |   |   |   |   | ✓ |
| Paper Code. Unit I (2)           | ✓ |   |   |   | ✓ | ✓ |
| Paper Code. Unit I (3)           | ✓ |   |   |   |   | ✓ |
| Paper Code. Unit I (4)           | ✓ | ✓ |   |   |   | ✓ |
| Paper Code. Unit II(1)           |   | ✓ |   |   |   | ✓ |
| Paper Code. Unit II(2)           |   | ✓ |   |   |   | ✓ |
| Paper Code. Unit II (3)          |   |   | ✓ |   |   | ✓ |
| Paper Code. Unit II(4)           |   |   | ✓ |   |   | ✓ |
| Paper Code. Unit III(1)          |   |   | ✓ |   |   | ✓ |
| Paper Code. Unit III(2)          |   |   |   | ✓ |   | ✓ |
| Paper Code. Unit III(3)          |   |   |   | ✓ |   | ✓ |
| Paper Code. Unit IV(1)           |   |   |   |   | ✓ | ✓ |
| Paper Code. Unit IV (2)          |   |   |   |   | ✓ | ✓ |

### RELATED PROBLEMS

1. Problems on Contour Bunds- [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=19&lesson=44](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=19&lesson=44)
2. Problems on Graded Bunds- [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=19&lesson=46](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=19&lesson=46)
3. Problems on Bench Terraces- [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=20&lesson=51](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=20&lesson=51)
4. Problems on Broad Base Terraces- [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=20&lesson=53](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=20&lesson=53)
5. Problems on Grassed Water Ways- [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=21&lesson=56](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=21&lesson=56)
6. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=21&lesson=58](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=21&lesson=58)

## **Section A**

### **UNIT-I**

1. What is the modern concept of soil conservation?
2. Define and classify soil erosion.
3. What are the causes of soil erosion?
4. Describe the agents of soil erosion.
5. Describe the natural and accelerated erosion.

### **UNIT-II**

6. What do mean by water erosion?
7. What are the types of water erosion?
8. Classify the gully erosion.
9. What is the mechanism of water erosion?
10. Describe the formula for calculating the total soil detached.
11. Write a short note on
  - Splash erosion
  - Sheet erosion

### **UNIT-III**

12. What is the principle of water erosion control?
13. Write the short note on contour bunding.
14. Write a short note on contour strip cropping.
15. Define the grass water way. How it helps to control water erosion.
16. Draw Hydrologic cycle.
17. What is gully plugging? Describe the technique of gully plugging.

### **UNIT-IV**

18. L Define water harvesting. Describe the need and advantage of water harvesting.
19. Describe about the potential area of water harvesting.
20. What is wind erosion? Describe the effect of wind erosion on soil fertility.
21. Describe the mechanism of wind erosion. What is the minimum wind speed required to initiate movement of soil particle.
22. Write a short note on water logging and chemical degradation.
23. Write a short note on land degradation.
24. Describe the mass movement and on-site and off-site effects.
25. What are the factors influencing wind erosion?

## **Section 2**

### **UNIT-I**

1. Describe the factors influencing soil erosion.
2. Give the formula for measurement of run-off and soil loss.
3. Write a short note on desertification.
4. What is shifting cultivation?

### **UNIT-II**

5. What are the agronomical practices to control water erosion?
6. What are the central measures of gully erosion?
7. Describe the soil loss equation. How the soil loss is completed by this formula.
8. Mention the list of cover crops, soil erosion permitting and soil loss resisting crops.

### **UNIT-III**

9. What are the engineering practices to control water erosion?
10. Describe the design of graded bunding.
11. Describe the design of grass water way and its advantages.
12. What do you mean by bench terracing? Give the design of bench terracing

### **UNIT-IV**

13. What are the methods and techniques for water harvesting in urban areas?
14. Describe the cropping system which can control wind erosion.
15. Write a short note on wind breaks and shelter belts.

## Section C

### UNIT-I

1. What is wind erosion equation? How the soil loss is computed by this equation?
2. Describe the techniques of rain water harvesting through contour bunds and gully plug.
3. How the rain water harvesting is done by gabion structure & percolation tank?
4. Describe the techniques of rain water harvesting through check-dam/cement plugs.
5. What are the harmful effects of water erosion? Describe the techniques of water erosion control.
6. What are the different processes of soil movements by wind erosion?
7. Describe the factors affecting wind erosion.
8. What are the factors affecting water erosion?
9. What are the mechanisms of crust formation? Describe about the structural crust.
10. Describe in details about the erosion and depositional crusts. How does it effect on productivity of soil.  
What are the central measures of soil crusting?

### ASSIGNMENTS

1. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=18&assessment=103](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=18&assessment=103)
2. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=27&assessment=104](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=27&assessment=104)
3. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=19&assessment=107](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=19&assessment=107)
4. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=20&assessment=108](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=20&assessment=108)
5. [https://onlinecourses.nptel.ac.in/noc22\\_ag01/unit?unit=21&assessment=109](https://onlinecourses.nptel.ac.in/noc22_ag01/unit?unit=21&assessment=109)