

Department of Chemistry and Geology

**Govt. V.Y.T. PG Autonomous College,
Durg (C.G.)**



CSWA: Certificate Course in Soil and Water Analysis

2023-24

**Govt. V. Y. T. PG Autonomous College, Durg
Department of Chemistry and Geology**

CSWA: Certificate Course in Soil and Water Analysis

DIRECTIVES FOR STUDENTS

GENERAL INFORMATION

1. Duration of Course: 6 months
2. Eligibility: UG/PG regular students of science stream
3. No. of Seats: 30
4. Fee Structure: Rs. 1500 per student at the time of admission.

TEACHING METHODOLOGY

Teaching Mode: Synchronous (Online live)/Asynchronous (Online videos/ PDFs)
Some of the following methods of delivery may be adopted:

- A) Lecture
- B) Pdf/ Video
- C) Demonstration Video/Experimental
- D) Group Discussion

ASSESSMENT & CERTIFICATE

Assessment:

The assessment will be done by the department. Both theory and practical examinations will be conducted online/offline using synchronous and asynchronous modes based on suitable LMS

Pass regulation:

Minimum passing marks for Practical: 40%

Minimum pass marks for Theory: 40%

Certificate:

Successful candidates will be issued certificate by the College

PREAMBLE

Water and soil are essential for sustenance of life. No living being on the planet earth can survive without it. It is a prerequisite for human health and well-being as well as for the preservation of the environment. Every year millions of people die from diseases associated with the consumption of contaminated drinking water, inadequate water supply, sub-optimal or poor sanitation and hygiene and diseases related to adulterated food because of excessive of fertilizers. Diseases transmitted through water and food contaminated with chemicals is the leading cause of death among children worldwide.

This course will discuss analytical methods and theories to determine water and soil quality of different water and soil resources of Chhattisgarh state and factors and processes affecting the quality of soil and water. We will also discuss the approaches that may be taken to improve the quality of drinking water, soil and water conservation. The course will also cover water and soil remediation and safeguard techniques for the improvement of soil and water quality for sustainable development of our state.

The training aims at employability in the water/soil analytical lab as analyst and supervisors. The certificate will be authorized by the Principal of Govt V.Y.T. PG Autonomous College Durg, Head of the Department of Chemistry & Geology and Coordinator of the programme.

Aims and Objectives of the Course-

Aims:

- To promote awareness for judicious use of fertilizers.
- To promote use of organic manure.
- To promote analysis of quality of water for drinking and agriculture.
- To know about status of available water from sources like well, bore-wells and dams with particular stress on quality of water of various parts of Chhattisgarh.
- To know effect of quality of water on human beings, live-stock and agriculture.
- To promote awareness on judicious use of drinking water.

Objectives:-

- To inculcate scientific temperament among the students to take up farming with scientific approach.
- To promote awareness amongst the students to take agriculture as industry by applying scientific measures.
- To identify water quality of different water resources using different analytical methods.
- To improve quality of water by using suitable purification techniques.
- To provide a broad, in-depth overview of important relationship between water quality and human health.
- To understand the impact of water and water related issues in an environmental and societal context.

Learning Outcomes

This course examines the current approaches to soil and water quality analysis. Specific topics covered in the course include different water sources, water quality standards of drinking water and its analysis, types of water pollution and simple approaches to water quality management. The course will also deal with a broad overview of geochemistry and fertility status of soils, soil deficiency with respect to macro and micro nutrient components and soil –water relationship.

Course Outcome

After completion of the course, students will be able:

CO1: To use the techniques and skills necessary for water resource management.

CO2: To apply knowledge of Chemistry and Geology.

CO3: To have knowledge of contemporary issues.

CO4: To identify, formulate and solve environmental problems.

CO5: To recognize the need for, and an ability to engage in life-long learning.

CSWA: Certificate Course in Soil and Water Analysis

Paper- I

CSWA-01: Fundamentals of Soil Analysis

Unit- I

Definition of Soil, Concept of Lithosphere, Soil as a natural body, Soil Components: Air, Water, inorganic and organic solids,

Unit- II

Formation of Soil, Types & Basic Concepts of Soils. Soil Profile & Classification.

Unit-III

Physical and Chemical Properties:-

Soil Separates, Texture, Aggregation and Structure, Temperature, Colour, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships.

Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification.

Biological Properties of soil :-

Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation. Importance of Soil Testing and Analysis

Unit-IV

Sample Collection and Processing Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection & processing, Preservation labeling and Storage of soil samples. Preparation of Soil analysis and test report.

CSWA: Certificate Course in Soil and Water Analysis

Paper- II

CSWA-02: Fundamentals of Water Analysis

Unit- I

Introduction: Water and its Quality Parameters – Chemistry of water – Water resources – Hydrological cycle – Water quality parameters and drinking standard – Physical, Chemical quality of drinking water – Biological quality of drinking water.

Unit- II

Water Analysis – Water composition analysis – Hardness testing – pH- Salinity- Turbidity – TDS – Conductivity testing – Minerals – BOD, COD, DO, Coli forms – Culture identification – MPN test -Microscopy: principles and practices – Staining methods. Water borne pathogen: Types and Detection – Potability of water.

Unit- III

Water treatment – Treatment of water: Flowchart of water treatment plant, Treatment methods (Theory and Design) – Physico-chemical treatments: Sedimentation, Coagulation-flocculation, Settling tanks, Disinfection systems: Chemicals- Chlorination and other disinfection methods, Reverse osmosis technologies.

Unit-IV

Practical Analytical Methods – Introduction to analytical laboratory – Safety, Equipments and techniques used in laboratory, Determination of hardness, pH, turbidity, conductivity, DO, BOD and COD, Analysis of metals and ions, Microbiological analysis.

CSWA-03: Laboratory Course

PRACTICALS

1. Determination of pH of soil and classification as acidic or basic soils.
2. Determination of electrical conductance of soil and hence total soluble salt contents.
3. Determination of Calcium Carbonate (CaCO_3) content of soils.
4. Determination of Gypsum requirement of alkaline soils.
5. Determination of available Phosphorous from soils by Colorimetric method
6. Determination of Potassium from soil by flame photometer.
7. Determination of Potassium from soil by flame photometer.
8. Determination of Sodium from soil by flame photometer.
9. Determination of Calcium from soil by flame photometer.
10. Determination of Nitrate from soil .
11. Determination of pH of water samples.
12. Determination of electrical conductance of water samples and hence total soluble salt contents.
13. Determination of COD of water samples.
14. Determination of BOD of water samples.
15. Determination of TDS of water samples.
16. Determination of turbidity of water samples

Field visit and preparation of field report.

References

1. Hydrology – Principles, analysis and Design – H. M Ragunath, New age International Publications.(1996)
2. Standard Methods for the examination of water and waste water – APHA (American Public Health Association), AWWA (American Water Works Association), WEF (Water Environmental Federation)
3. Low cost waste water treatment technologies – R. K. Trivedy and Siddharth Kaul
4. Pollution and Bioremediation- P. C. Trivedi
5. An Introduction to Environmental pollution- B. K. Sharma and H. Kaur
6. Environmental Chemistry – A. K. De
7. Microbiology – Micheal J. Pelczar, E. C. S. Chan, Noel R. Krieg.
8. Textbook of Microbiology – R. Ananthanarayan and C. K. Jayaram Paniker.
9. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
10. Soil Sampling and methods of analysis, carter M.R. and E.G.Gregorich, 2007, 2nd Ed..

11. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986.

Scheme of Marks

S. No.	Title of Paper / Practical	Maximum Marks	Passing Marks
1	Paper- I Fundamentals of Soil Analysis	50	20
2	Paper- II Fundamentals of Water Analysis	50	20
3	Lab Course	40	20
4	Fieldwork	10	

NAME and SIGNATURE:

	Departmental members	
	1.....	8.....
Chairperson /H.O.D	2.....	9.....
Subject Expert (University Nominee)	3.....	10.....
Subject Expert.....	4.....	11.....
Representative (Industry)	5.....	12.....
Representative (Alumni)	6.....	13.....
Representative (Professor Science Faculty Other Dept.)	7.....	14.....

Department of Chemistry and Geology

**Govt. V.Y.T. PG Autonomous College,
Durg (C.G.)**



CSWA: Certificate Course in Soil and Water Analysis

2023-24

**Govt. V. Y. T. PG Autonomous College, Durg
Department of Chemistry and Geology**

CSWA: Certificate Course in Soil and Water Analysis

DIRECTIVES FOR STUDENTS

GENERAL INFORMATION

1. Duration of Course: 6 months
2. Eligibility: UG/PG regular students of science stream
3. No. of Seats: 30
4. Fee Structure: Rs. 1500 per student at the time of admission.

TEACHING METHODOLOGY

Teaching Mode: Synchronous (Online live)/Asynchronous (Online videos/ PDFs)

Some of the following methods of delivery may be adopted:

- A) Lecture
- B) Pdf/ Video
- C) Demonstration Video/Experimental
- D) Group Discussion

ASSESSMENT & CERTIFICATE

Assessment:

The assessment will be done by the department. Both theory and practical examinations will be conducted online/offline using synchronous and asynchronous modes based on suitable LMS

Pass regulation:

Minimum passing marks for Practical: 40%

Minimum pass marks for Theory: 40%

Certificate:

Successful candidates will be issued certificate by the College

PREAMBLE

Water and soil are essential for sustenance of life. No living being on the planet earth can survive without it. It is a prerequisite for human health and well-being as well as for the preservation of the environment. Every year millions of people die from diseases associated with the consumption of contaminated drinking water, inadequate water supply, sub-optimal or poor sanitation and hygiene and diseases related to adulterated food because of excessive of fertilizers. Diseases transmitted through water and food contaminated with chemicals is the leading cause of death among children worldwide.

This course will discuss analytical methods and theories to determine water and soil quality of different water and soil resources of Chhattisgarh state and factors and processes affecting the quality of soil and water. We will also discuss the approaches that may be taken to improve the quality of drinking water, soil and water conservation. The course will also cover water and soil remediation and safeguard techniques for the improvement of soil and water quality for sustainable development of our state.

The training aims at employability in the water/soil analytical lab as analyst and supervisors. The certificate will be authorized by the Principal of Govt V.Y.T. PG Autonomous College Durg, Head of the Department of Chemistry & Geology and Coordinator of the programme.

Aims and Objectives of the Course-

Aims:

- To promote awareness for judicious use of fertilizers.
- To promote use of organic manure.
- To promote analysis of quality of water for drinking and agriculture.
- To know about status of available water from sources like well, bore-wells and dams with particular stress on quality of water of various parts of Chhattisgarh.
- To know effect of quality of water on human beings, live-stock and agriculture.
- To promote awareness on judicious use of drinking water.

Objectives:-

- To inculcate scientific temperament among the students to take up farming with scientific approach.
- To promote awareness amongst the students to take agriculture as industry by applying scientific measures.
- To identify water quality of different water resources using different analytical methods.
- To improve quality of water by using suitable purification techniques.
- To provide a broad, in-depth overview of important relationship between water quality and human health.
- To understand the impact of water and water related issues in an environmental and societal context.

Learning Outcomes

This course examines the current approaches to soil and water quality analysis. Specific topics covered in the course include different water sources, water quality standards of drinking water and its analysis, types of water pollution and simple approaches to water quality management. The course will also deal with a broad overview of geochemistry and fertility status of soils, soil deficiency with respect to macro and micro nutrient components and soil –water relationship.

Course Outcome

After completion of the course, students will be able:

CO1: To use the techniques and skills necessary for water resource management.

CO2: To apply knowledge of Chemistry and Geology.

CO3: To have knowledge of contemporary issues.

CO4: To identify, formulate and solve environmental problems.

CO5: To recognize the need for, and an ability to engage in life-long learning.

CSWA: Certificate Course in Soil and Water Analysis

Paper- I

CSWA-01: Fundamentals of Soil Analysis

Unit- I

Definition of Soil, Concept of Lithosphere, Soil as a natural body, Soil Components: Air, Water, inorganic and organic solids,

Unit- II

Formation of Soil, Types & Basic Concepts of Soils. Soil Profile & Classification.

Unit-III

Physical and Chemical Properties:-

Soil Separates, Texture, Aggregation and Structure, Temperature, Colour, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships.

Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification.

Biological Properties of soil :-

Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation. Importance of Soil Testing and Analysis

Unit-IV

Sample Collection and Processing Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection & processing, Preservation labeling and Storage of soil samples. Preparation of Soil analysis and test report.

CSWA: Certificate Course in Soil and Water Analysis

Paper- II

CSWA-02: Fundamentals of Water Analysis

Unit- I

Introduction: Water and its Quality Parameters – Chemistry of water – Water resources – Hydrological cycle – Water quality parameters and drinking standard – Physical, Chemical quality of drinking water – Biological quality of drinking water.

Unit- II

Water Analysis – Water composition analysis – Hardness testing – pH- Salinity- Turbidity – TDS – Conductivity testing – Minerals – BOD, COD, DO, Coli forms – Culture identification – MPN test -Microscopy: principles and practices – Staining methods. Water borne pathogen: Types and Detection – Potability of water.

Unit- III

Water treatment – Treatment of water: Flowchart of water treatment plant, Treatment methods (Theory and Design) – Physico-chemical treatments: Sedimentation, Coagulation-flocculation, Settling tanks, Disinfection systems: Chemicals- Chlorination and other disinfection methods, Reverse osmosis technologies.

Unit-IV

Practical Analytical Methods – Introduction to analytical laboratory – Safety, Equipments and techniques used in laboratory, Determination of hardness, pH, turbidity, conductivity, DO, BOD and COD, Analysis of metals and ions, Microbiological analysis.

CSWA-03: Laboratory Course

PRACTICALS

1. Determination of pH of soil and classification as acidic or basic soils.
2. Determination of electrical conductance of soil and hence total soluble salt contents.
3. Determination of Calcium Carbonate (CaCO_3) content of soils.
4. Determination of Gypsum requirement of alkaline soils.
5. Determination of available Phosphorous from soils by Colorimetric method
6. Determination of Potassium from soil by flame photometer.
7. Determination of Potassium from soil by flame photometer.
8. Determination of Sodium from soil by flame photometer.
9. Determination of Calcium from soil by flame photometer.
10. Determination of Nitrate from soil .
11. Determination of pH of water samples.
12. Determination of electrical conductance of water samples and hence total soluble salt contents.
13. Determination of COD of water samples.
14. Determination of BOD of water samples.
15. Determination of TDS of water samples.
16. Determination of turbidity of water samples

Field visit and preparation of field report.

References

1. Hydrology – Principles, analysis and Design – H. M Ragunath, New age International Publications.(1996)
2. Standard Methods for the examination of water and waste water – APHA (American Public Health Association), AWWA (American Water Works Association), WEF (Water Environmental Federation)
3. Low cost waste water treatment technologies – R. K. Trivedy and Siddharth Kaul
4. Pollution and Bioremediation- P. C. Trivedi
5. An Introduction to Environmental pollution- B. K. Sharma and H. Kaur
6. Environmental Chemistry – A. K. De
7. Microbiology – Micheal J. Pelczar, E. C. S. Chan, Noel R. Krieg.
8. Textbook of Microbiology – R. Ananthanarayan and C. K. Jayaram Paniker.
9. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
10. Soil Sampling and methods of analysis, carter M.R. and E.G. Gregorich, 2007, 2nd Ed..

11. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986.

Scheme of Marks

S. No.	Title of Paper / Practical	Maximum Marks	Passing Marks
1	Paper- I Fundamentals of Soil Analysis	50	20
2	Paper- II Fundamentals of Water Analysis	50	20
3	Lab Course	40	20
4	Fieldwork	10	

NAME and SIGNATURE:

	Departmental members	
Chairperson /H.O.D <u>A. K. Singh</u>		
Subject Expert <u>M. M. Mehta</u> (University Nominee)	1. <u>[Signature]</u>	8. <u>[Signature]</u>
Subject Expert..... <u>S. R. Singh</u>	2.	9. <u>[Signature]</u>
Representative (Industry)	3.	10. <u>[Signature]</u>
Representative <u>[Signature]</u> (Alumni)	4. <u>[Signature]</u>	11.
Representative <u>[Signature]</u> (Professor Science Faculty Other Dept.)	5. <u>[Signature]</u>	12. <u>[Signature]</u>
	6.	13. <u>[Signature]</u>
	7. <u>[Signature]</u>	14.