ವಿಶ್ವೇಶ್ವರಯ್ಯತಾಂತ್ರಿಕವಿಶ್ವವಿದ್ಯಾಲಯ

ವಿಟಿಯುಅಧಿನಿಯಮ೧೯೯೪ ರಅಡಿಯಲ್ಲಿಕರ್ನಾಟಕಸರ್ಕಾರದಿಂದಸ್ಥಾಪಿತವಾದರಾಜ್ಯವಿಶ್ವವಿದ್ಯಾಲಯ

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

State University of Government of Karnataka Established as per the VTU Act, 1994 "JnanaSangama" Belagavi-590018, Karnataka, India

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REGISTRAR

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REF: VTU/BGM/Aca/BoS/2023/ 464

DATE: 18 APR 2023

CIRCULAR

Subject: 21BSS432 Soil and Water Chemistry regarding...
Reference: Chairperson BoS in Basic Science and Humanities approval dated: 18.04.2023

In IV semester syllabus of B.Sc(Hons) program the course "**21BSS432- Soil and Water Chemistry**" is missing, the chairperson Board of Studies have submitted the syllabus for the same subject.

All the Principals of the colleges where B.Sc(Hons) program being offered are hereby informed to bring the content of this circular to the notice of all concerned.

Encl: Syllabus of 21BSS432 Soil and Water Chemistry

Sd/-
REGISTRAR

To,

The Principals of Engineering Colleges where B.Sc(Hons) degree program being offered.

Copt to,

1. The Hon'ble Vice-Chancellor through secretary to VC for kind information
2. The Registrar(Evaluation) Examination Section VTU, Belagavi
3. The Director(I/c), ITI SMU, VTU Belagavi for information and make arrangement to upload the syllabus along with circular on VTU web portal.
4. The Special Officer, QPDS Examination section VTU Belagavi
5. Office Copy

18/04/23

REGISTRAR

SOIL AND WATER CHEMISTRY			
Course Code	21BSS432	CIE Marks	50
Teaching Hours/ Week(L:T:P:S)	2:1:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	2	Exam Hours	3

Course Learning objectives:

- The course will cover the basic principles of soil and water chemistry.
- The class will cover the fundamentals principles of the properties of soil components and soil reactions that affect environmental quality.
- It provides as elective understanding on the water quality parameters.
- This course provides information on the chemical analysis of soil and water.

Pedagogy (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to convince abstract concepts.
- Encourage collaborative (Group Learning) Learning in the class
- Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
- Topics will be introduced in a multiple representation.
- Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Soil Chemistry

Introduction to soil chemistry: Definition, soil formation, weathering, Soil Solution, soil colloids, inorganic and organic colloids, Phyllosilicates, Isomorphous Substitution, Phyllosilicate Minerals: Kaolinite, Montmorillonite and beidellite, Vermicullite, illite, Chlorite. Non-Phyllosilicates-Amorphous aluminosilicates, Oxy-hydroxide Minerals, Organic Colloids (Humus), Specific Surface of Soil Minerals, Surface Charge of Soil Minerals

Teaching-LearningProcess	Chalk and talk method / Power Point Presentation

Module-2

Sorption Phenomena on Soils: Introduction and Terminology, Surface Functional Groups, Surface Complexes Adsorption Isotherms, Equilibrium-based Adsorption Models-Freundlich Equation, Langmuir Equation

Ion Exchange Processes – Introduction, Characteristics of Ion Exchange, Cation exchange capacity (CEC).

Redox Chemistry of Soils - Oxidation–Reduction Reactions and Potentials, Eh vs pH and pevs pH Diagrams, Measurement and Use of Redox Potentials

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Module-3

The Chemistry of Soil Acidity : Definition of Soil Acidity, Forms of soil acidity, Solution Chemistry of Aluminum, Monomeric Al Species, Polymeric Al Species, Exchangeable and Nonexchangeable Aluminum. **The Chemistry of Saline and Sodic Soils:**Causes of Soil Salinity, Sources of Soluble Salts, important Salinity and Sodicity Parameters-Total dissolved Solids (TDS), Electrical Conductivity, Parameters for Measuring the Sodic Hazard, Classification and Reclamation of Saline and Sodic Soils	
Teaching-LearningProcess	Chalk and talk method / Power Point Presentation
Module-4	
Introduction to water chemistry: Introduction, Water Sources, water quality parameters: Hardness, alkalinity, TDS, pH, Chlorides, Sulfates, nitrites, nitrates, fluorides, Basic Drinking Water Treatment: Primary Settling, Aeration, Coagulation, Disinfection, Disinfection Procedures, Disinfection By-Products and Disinfection Residuals, Strategies for Controlling Disinfection By-Products, Chlorine Disinfection Treatment, Drawbacks to Use of Chlorine: Disinfection By-Products Trihalomethanes, Chlorinated Phenols, Chloramines, Chlorine Dioxide Disinfection Treatment, Ozone Disinfection Treatment, Ozone DBPs, Ultraviolet Disinfection Treatment, Membrane Filtration Water Treatment-Micro, ultra, nano filtrations, Reverse osmosis.	
Module-5	
Chemical analysis Soil and water: Water and soil sampling procedures, Measurement of soil pH (colorimetric and redox indicators), Determination of cation exchange capacity of soils, Determination of nitrogen (Total Kjeldhal Nitrogen) in water and soil, Determination of Hardness of water by complexometric method and Determination of alkalinity of water, Determination of dissolved oxygen by Winkler's method, Determination of Na and K by flame photometry	
Teaching-LearningProcess	Chalk and talk method / Power Point Presentation
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE). **Continuous Internal Evaluation:** **Three Unit Tests each of 20 Marks (duration 01 hour)** 1. First test at the end of 5thweek of the semester 2. Second test at the end of the 10thweek of the semester 3. Third test at the end of the 15thweek of the semester **Two assignments each of 10 Marks** 4.First assignment at the end of 4thweek of the semester 5. Second assignment at the end of 9thweek of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)** 6. At the end of the 13thweek of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). **CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per**	

the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. **Each question is set for 20 marks.**
2. There will be **2 questions from each module**. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The students have to answer 5 fullquestions, selecting one full question from each module.

Suggested Learning Resources:

Books:

1. Soil and Water Chemistry; An Integrative Approach: Michael E. Essington, CRC Press, Washington D.C., 2005
2. Hand Book of Water, Air and Soil Analysis (A Lab Manual) : SadhanaChaurasia&AnandDev Gupta, International E – Publication, India, 2014
3. Environmental Soil Chemistry: Donald L. Sparks, Second Edition, Academic Press, Amsterdam, 2003.
4. Applications of Environmental Aquatic Chemistry- A Practical Guide: Eugene R. Weiner, Second Edition, CRC Press, New York, 2008
5. Introduction to Soil Chemistry Analysis and Instrumentation: Alfred R. Conklin, Jr, Second Edition, Wiley, New Jersey, 2014
6. Soil Chemical Analysis: M. L. Jackson, Prentice Hall Inc, USA, 1958

WeblinksandVideoLectures(e-Resources):

1. Soil Chemistry Part 1 https://youtu.be/bhNWSpm4ygw
2. Soil Sampling for Chemical Analysis https://youtu.be/LuSNfuE4Xmc
3. Soil Mineralogy and Chemistry https://youtu.be/JmrhN3Ygsm0
4. Soil Organic Matter: https://youtu.be/5qR5d1uQnd8
5. Chemical Properties of Soil: https://youtu.be/CijD5qmeD_Y
6. Determination of Potassium : https://youtu.be/r-ThlPu96q4
7. Soil Mineralogy: https://youtu.be/Qh6wSfVN45s
8. Cation Exchange Capacity: https://youtu.be/8fJojcqF978
9. CEC Analysis: https://youtu.be/CyF_IyWT66U

Skill Development Activities Suggested

- Assignments
- Quizes
- Seminars

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

Sl. No.	Description	Blooms Level
CO1	Explain the classification of minerals present in the soil	Understand
CO2	Illustrate the chemical processes like Sorption, Ion-Exchange, oxidation and reduction involved in soil and water environment	Apply
CO3	Identify the water quality parameters and apply treatment procedures	Apply
CO4	Analyze the chemicals present in soil and water	Apply