SYLLABUS OF COURSES TO BE OFFERED

Skill Enhancement Course

Preamble

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students. Presently the performance of the students is reported using the conventional system of marks secured in the examinations or grades or both. The conversion from marks to letter grades and the letter grades used vary widely across the HEIs in the country. This creates difficulty for the academia and the employers to understand and infer the performance of the students graduating from different universities and colleges based on grades. The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Swami Ramanand Teerth Marathwada University, Nanded

CBCS Pattern

B. Sc. Second Year
(Semester III & IV)

ENVIRONMENTAL SCIENCE

w.e.f: June, 2017

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure

Faculty of Science

B. Sc. Second Year Syllabus

Semester Pattern effective from June 2017

Subject: Environmental Science

Semester	**Course No.**	**Name of the Course**	**Instruction Hrs/ week**	**Total period**	**CA**	**ESE**	**Total Marks**	**Credits**
III	CCENV III (Section A)	Basic concepts in Environmental Microbiology (P-VI)	03	45	10	40	50	2
	CCENV III (Section B)	Air pollution and Meteorology (P-VII)	03	45	10	40	50	2
	CCENV II [CCENV III & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03	Practical's 08 08	05 05	20 20	25 25	1 1
	CCENV I	SEC I (Anyone Skill from optional)	02	02	25	25	50	(02)*
IV	CCENV IV (Section A)	Applied Environmental Microbiology (P-VIII)	03	45	10	40	50	2
	CCENV IV(Section B)	Air and Noise pollution control (PIX)	03	45	10	40	50	2
	CCENV III [CCENV III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	03 03	Practical's 08 08	05 05	20 20	25 25	1 1
	CCENV II	SEC II (Anyone Skill from optional)	02	02	25	25	50	(02)*
Total credits semester III and IV								**12(04)***

Note: ESE of CCENV PII, CCENV PIII & CCENV I, CCENV II should be evaluated at annual.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester - III

Effective From- June -2017

CCENV III (Section A)

Basic Concepts in Environmental Microbiology (P- VI)

Credits: 02 (Marks: 50) Periods: 45

Unit I **History** , Diversity and Scope of Microbiology: Beginning of Microbiology, Scope of Microbiology, Importance of microbiology, Contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming, The theory of spontaneous generation, Whitteker s Five kingdom concept. General characteristics, Morphological Features and Significance: Virus, Bacteria Algae, Fungi and Protozoa Branches of microbiology: Food Microbiology, Dairy Microbiology, Industrial Microbiology, Pharmaceutical Microbiology, Microbial Ecology, Medical Microbiology, Agricultural Microbiology, Geo-microbiology.

Unit II **Growth and Reproduction of Bacteria**: Concept of Growth and reproduction, Mechanism of binary Fission, Growth, Growth rate and Generation time, Growth curve of bacterial population and its practical applications, Quantitative measurement of bacterial growth, Structure & Function of: Glycocalyx, Flagella, Pilli, Cell Wall (Gram positive, Gram negative and Acid fast), Cytoplasmic membrane, Mesosomes, Nucleoid, Plasmid, Ribosomes (70S), Cytoplasmic inclusions, PHB granule, glycogen, carbohydrates, Magnetosomes, gas vesicles, chromosome, sulphur granules and endospore (germination, sporulation) Anatomy of Eukaryotic cell: Ultra-structure of Fungal, Algal and Protozoa Cell

Structure, Function and Chemical Composition of: Flagella, Cell wall (Fungi and algae), Nucleus, Mitochondria, Chloroplast, Golgi bodies, Ribosome(80S), Lysosome, comparison: pro & eukaryotes.

Unit III **Microscopy and Staining:** Microscope, Types (Light and Electron Overview), Magnification, Resolution, Numerical Aperture, Use of Oil immersion objective,

Compound Microscope: Principle, Working and Significance, Concept and Types of Stains (Acidic and Basic stain, Mordant), Smear Preparation, Simple (Monochrome and Negative) and Differential staining Gram and Acid fast staining. Nutritional Requirements

Classification of bacteria based on: Nutrition, Physical Factors: pH, Temperature, water activity, aeration (Oxygen) Chemical factors: Media, Types of media, Media Ingredients (water, Malt extract, Meat extract, Yeast extract, Trace elements).

References

01. General microbiology Volume I & II: C. B. Powar & H. F. Daginawala (Himalaya publishing House, Mumbai), 2002
02. Fundamental principles of Bacteriology: A. J. Salle, (Tata McGraw-Hill Publishing Company, New Delhi), 1974
03. Microbiology: P. D. Sharma (Rastogi publication Meerut)
04. Microbiology: Pelczer, Reid & Chan (Tata McGraw-Hill Publishing Company Limited, New Delhi),
05. Hand book of Microbiology: Yu. S. Krivashein (Mir Publishers Moscow)
06. Microbiology for Environmental Engineering: M. C. Kinnery (Tata McGraw-Hill Publishing Company New Delhi),
07. Introduction to Virology: S. B. Biswas
08. General microbiology: Stainier
09. Applied Microbiology: Kale & Kishore Bhusari (Himalaya Publishing House, Mumbai) 10. Medical Microbiology: Day & Day and Anantnarayan

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester-III

Effective From- June -2017

CCENV III (Section B)

Air Pollution and Meteorology (P- VII)

Credits: 02 (Marks: 50) Periods: 45

Unit I : Atmosphere & Meteorology : Structure of Atmosphere, Wind speed, direction and their vertical profiles, turbulence (mechanical and thermal), atmospheric stability characteristics and classes, Plume behavior, effects of micrometeorology on point source emission, wind-valley effects, land/sea breeze-effects, heat island effect, mixing height-boundary layer definition, temperature inversions, factors affecting on dispersion of air pollutants, micro meteorological instruments (10)

Unit II : **Types of Air Pollutants and Their Sources**: Natural contaminants: Aerosols, Dust, Smoke, Mist, Fog, Fumes, Particulate matter (PM), Suspended particulate matter (SPM), Respirable suspended particulate matter (RSPM), Fly ash, Photochemical smog;

Gaseous air pollutants: Sulphur dioxide, hydrogen sulphide, Hydrogen fluorides, Chlorine, Oxides of nitrogen, Carbon monoxide, Aldehydes, Organic vapors, Tetra ethyl lead, Radioactive gases. Natural sources: Volcano, Accidental fires in forests, Dust storms, Oceans; **Bio pollutants**: Pollen bio pollutants, Algal bio pollutants, Fungal bio pollutants, Combustion; **Stationary sources**: Fertilizer complex, Cement industries, Thermal power stations, Sulphuric acid industry, Fluoride industry, Nitric acid plants, Soap and detergent industry, Petroleum and Coal industry, Iron and steel industry, Stone and Clay products, Kraft pulp manufacturing, Incineration of refuse and solid wastes; Mobile sources: Automobiles, Aero planes. , HAPs (hazardous air pollutants), Indoor pollution- different sources. (20)

Unit III : Air Pollution Effects: Effects of air pollution on human health: Mechanism of action of air pollutants, Human health effects, Specific air pollutants and their health effects, Major Disasters showing health effects: Meuse Valley (Belgium disaster, Donora (USA) disaster, London disaster, Los Angeles disaster, Effects of air pollution on Animals: Effects of Fluorine, Arsenic, Lead, Pests, Ionizing radiation. Effects of Air pollution on Plants: Structure of normal leaf, Air pollutants affecting plants, Forms of damages to leaves, Kinds of injuries to plants, Effects of specific pollutants on plants: HF, Ozone, Chlorine, Hydrogen chloride, Nitric oxides, Ammonia, Hydrogen cyanide, Herbicides.

Economic effects of Air Pollution: Mechanism of deterioration in polluted atmosphere, Factors influencing atmospheric deterioration, Material damage : Effects on Building materials, Paints,

Textiles, Rubber, Leather, Paper, Glass and ceramics, Effects on art treasure, Long term effects on the planet : Green house effects, Ozone layer depletion, Acid rain (15)

References:

01. Air Pollution and its control: Sumit Malhotra (Pointer Publishers, Jaipur)
02. Air Pollution: M. N. Rao (Tata McGraw – Hill publishing company, New Delhi)
03. Air Pollution: B. K. Sharma, H. Kaur (Krishna Prakashan media, Meerut)
04. Pollution of our Atmosphere: B. Henderson, (Sellers Adam Hilger Limited, Bristol)
05. Fundamentals of Air Pollution: Richard W. Bowel, Donald L. Fox, D. Bruce Tunner and Arthur C. Stern (Academic Press, California)
06. Air Pollution Control Engineering: Noel De Nevers (McGraw – Hill Intl, New York)
07. Air Pollution: S. K. Agarawal (A. P. H. Publishing Corporation, New Delhi)
08. Air Pollution: V. P. Kudesia Pragati Prakashan, Meerut)
09. General climatology: Critichfield H. J.
10. Climatology: Fundamentals and Applications: Mater J. R.
11. Climatology: Selected Applications: Henry D. Foth
12. Introduction to weather and climate: Trewartha
13. The Atmosphere: An Introduction to Meterology: Fedrik K. Lutgen, E. J. Tarbuck
14. Air Pollution (Volume I to X): A. C. Stern (Academic Press)
15. General Meteorology: H. R. Byers (Tata Mc Grew – Hill Publications, New Delhi)

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester- III

Effective From- June -2017

CCENV IV (Section A)

Applied Environmental Microbiology (P-VIII)

Credits: 02 (Marks: 50) Periods: 45

Unit I: Methods in Microbiology: Pure culture technique: Streak plate, Pour plate, spread plate and Roll tube method. Slide culture techniques for fungi, Isolation and Cultivation of Algae.

Unit II: Sterilization Methods: Concept of Sterilization, Micro-biocide, Micro-biostatic, Sterilization by Physical agents –Dry heat (Hot air oven, Incineration) and Moist heat (Autoclave, Tyndalization), Radiation- (X-rays, Gamma rays,

Chemical Sterilization : Ethylene oxide, Formaldehyde, Sterilization by Filtration Membrane filter, Control of Microbes: Disinfection Concept of Disinfectant, Antiseptic, Sanitizer, Germicide, Antibiotics, Significance of following in control of microorganisms: Pasteurization, Ultraviolet light, Low Temperature, Desiccation, Osmotic pressure, Surface tension, Characteristics of an ideal antimicrobial chemical agent, Mode of action and application of Phenol and Phenolic compounds, Alcohols, Halogens, Heavy metals and their compounds, Dyes, Detergents, Quaternary ammonium compounds, H_2O_2.

Unit III: Air Microbiology, Microflora of air, Enumeration of bacteria in air: Liquid impingement, Solid impingement, Water microbiology, Microbial indicators of water pollution. Bacteriological examination of potable water (Presumptive, Confirmative and Completed tests) Soil Microbiology Soil Microflora, Rhizosphere. Role of microbes in carbon cycle; Role of microbes in Nitrogen cycle: Ammonification, Nitrification, Nitrate reduction, Denitrification, Nitrogen fixation, Symbiotic nitrogen fixation, Non symbiotic nitrogen fixation,; Role of microbes in Sulphur cycle. Food Microbiology: Initial contamination of fresh food, Microbial spoilage of foods, Preservation of foods, Microbiological examination of foods, Fermented foods, Food poisoning. Microbiology of milk: Sources of microorganisms in milk, Types of microorganisms in milk, Microbial examination of milk, Pasteurization of milk

References:

01. General microbiology, Volume I & II: C. B. Powar & H. F. Daginawala (Himalaya Publishing House, Mumbai), 2002

02. Fundamental principles of Bacteriology: A. J. Salle, (Tata McGraw-Hill Publishing Company, New Delhi), 1974

03. Microbiology: P. D. Sharma (Rastogi publication Meerut)

04. Microbiology: Pelczer, Reid & Chan (Tata McGraw-Hill Publishing Company Ltd, New Delhi),

05. Hand book of Microbiology: Yu. S. Krivashein (Mir Publishers Moscow)

06. Microbiology for Environmental Engineering: M. C. Kinnery (Tata McGraw-Hill Publishing Company New Delhi),

07. Introduction to Virology: S. B. Biswas

08. General Microbiology: Stainier

09. Applied Microbiology: Kale and Kishore Bhusari (Himalaya Publishing House, Mumbai)

10. Medical Microbiology: Day & Day and Anantnarayan

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester- III

Effective From- June -2017

CCENV IV (Section B)

Air and Noise Pollution Control (P-IX)

Credits: 02 (Marks: 50) Periods: 45

Unit I: Ambient Air Pollutants Sampling, Analysis and Measurement: Sampling methods: Sedimentation, Filtration, Impingement method, Electrostatic precipitation, Thermal precipitation, Centrifugal method, Particulate matter sampling and analysis: Dust fall measurement, SPM and RSPM sampling using High volume air sampler; Gaseous pollutants sampling and analysis: Carbon monoxide, Ozone, Hydrogen sulphide, Nitrogen dioxide, Sulphur dioxide, Hydrogen cyanide, Ammonia, Aldehydes. (15)

Unit II:

Air Pollution Control: Particulate emission control: Gravity settlers, Cyclone separators, Fabric filters, Electrostatic precipitators, Wet scrubbers; Gaseous emission control: Principles of absorption and adsorption; Packed towers, Plate towers, Spray towers; Odour control: Combustion: Removal methods: removal of Sulfur dioxide, Nitrogen oxides, Hydrocarbons.

(15)

Unit III: Noise Pollution:

Introduction, Mechanism of hearing, Physiological response to noise, Sources of Noise, Effects of Noise Pollution :Speech interference, Physiological effects, Behavioral effects, Annoyance, Effects on efficiency, Fatigue, Mental health effects, Hearing loss, Biological effects, Noise level measurement, Noise and vibration Control: Barrier and enclosures, Silencers, Vibration dumping, Vibration isolation.

(15)

References:

01. Air Pollution and its control: Sumit Malhotra (Pointer publishers, Jaipur)
02. Air Pollution: M. N. Rao (Tata McGraw – Hill publishing company, New Delhi)
03. Air Pollution: B. K. Sharma, H. Kaur (Krishna Prakashan Media, Meerut)
04. Pollution of our Atmosphere: B. Henderson, (Sellers Adam Hilger Limited, Bristol)

05. Fundamentals of Air Pollution: Richard W. Bowel, Donald L. Fox, D. Bruce Tunner and Arthur C. Stern (Academic Press, California)
06. Air Pollution control Engineering: Noel De Nevers (McGraw – Hill Intl, New York)
07. Air Pollution: S. K. Agarawal (A. P. H. Publishing Corporation, New Delhi)
08. Air Pollution: V. P. Kudesia (Pragati Prakashan, Meerut)
09. Introduction to weather and climate: Trewartha
10. Air Pollution (Volume I to X): A. C. Stern (Academic Press)

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New Scheme)
B. Sc. (Second year) Semester Pattern effective from June -2017
Environmental Science
Practical Paper: CCENV **II [**CCENV **III & IV (Section A)]**
Credits: 02 (Marks: 50)

(Annual practical Based on [CCENV III & IV (Section A)] (Practical syllabus requires four periods per batch per week for 2 consecutive days.

01. Study of Microscope.
02. Study of Laboratory equipments (Incubator, Hot air oven, Autoclave Inoculating chamber, Centrifuge).
03. Acquainting basic microbiology tools: Cleaning and washing of Glassware, Wrapping the items prior Sterilization, Cotton Plugging, Aseptic handling (LAF/Bunsen burner), Inoculation of bacterial culture, Biological Waste Disposal
04. Preparation and sterilization of culture media.
05. Study of Bacteria (Types).
06. Isolation of bacteria from Soil.
07. Isolation of Fungi from Soil.
08. Observation of motility of organisms by hanging drop technique.
09. Monochrome staining.
10. Differential (Gram's) staining.
11. Negative staining.
12. Isolation of bacteria by Streak plate, Pour plate, Spread plate method.
13. Total Viable Count of Water.
14. Determination of Total Coliforms from water.
15. Differentiation between Fecal and non fecal Coliforms by IMViC test.
16. Determination of Quality of Milk by Methylene Blue Reductase test.
17. Effect of pH on growth of bacteria
18. Qualitative test for protein by Biuret test.
19. Qualitative test for carbohydrate by Benedict's test.
20. Effect of temperature on grown of bacteria

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New Scheme)
B. Sc. (Second year) Semester Pattern effective from June -2017
Environmental Science
Practical Paper: CCENV III [CCENV III & IV (Section B)]

(Annual Practical Based on CC**ENV** III [CC**ENV** III & IV (Section B)] (Practical syllabus requires four periods per batch per week for 2 consecutive days

Credits: 02 (Marks: 50)

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01. Study of High Volume Air Sampler.
02. Study of Rotorod Air Sampler and Tilak Air Sampler.
03. Dust Fall measurement by tiles exposure method.
04. Determination of Carbon Di Oxide (CO_2) by Zincondroff Technique.
05. Determination of Carbon monoxide (CO_2) by Co detector.
06. Detection of SO_2 from ambient air.
07. Detection of $H2_S$ from ambient air.
08. Detection of Ammonia from ambient air.
09. Interpretation of wind rose diagram.
10. Determination of wind velocity.
11. Determination of Air pollution index.
12. Determination of Suspended Particulate Matter by HVAS.
13. Determination of Respirable Suspended Particulate Matter by HVAS.
14. Estimation of SO_X from air by High Volume Air Sampler and Spectrophotometer.
15. Estimation of NO_X from air by High Volume Air Sampler and Spectrophotometer.
16. Estimation of Ammonia from air by High Volume Air Sampler and Spectrophotometer.
17. To Study the effects of SO_2 on plant.
18. To Study the effects of $H2_S$ on plant.
19. To Study the effects of Ammonia on plant.
20. Determination of Noise Level by dB meter

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second year) Semester Pattern effective from June -2017

Practical Paper: CCENVP-I (P-V)

(Annual practical Based on [CCENVP VIII (Section A)]

(Practical syllabus requires four periods per batch per week. Second Year Practical's based on Microbiology)

Credits: 02 **(Marks: 50)**

Q. 1: Stain the bacterial culture by Monochrome / Gram's / Negative staining Technique. 10

Q. 2: Determine number of Total Coliforms / Fecal Coliforms from provided sample. 10

OR

Differentiate between Fecal Coliforms and Non fecal Coliforms by IMViC test

OR

Determine Total Viable Count of Bacteria from provided water sample

Q.3: Determine the quality of milk by Methylene blue Reductase test. 10

OR

Isolate Azatobacter species from provided soil sample.

OR

Observe the motility of the microorganisms by hanging drop technique.

OR

Isolate bacteria / Fungi from provided soil sample.

Q. 4: Isolate Bacteria from provided sample by Streak / Pour / Spread plate method. 10

OR

Test protein qualitatively by Biuret test.

OR

Test carbohydrates qualitatively by Benedict's test.

Q. 5: a) Record Book submission 05

b) Viva Voce 05

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second year) Semester Pattern effective from June -2017

Practical Paper: CCENVP-I (P-V)

(Annual practical Based on [CCENVP IX (Section B)]

(Practical syllabus requires four periods per batch per week. Second Year Practical's based on Microbiology)

Credits: 02 **(Marks: 50)**

Q. 1: Determine Suspended Particulate Matter / Respirable Suspended Particulate Matter by High Volume Air Sampler (HVAS). 10

OR

Estimate SO_X / NO_X from air by High Volume Air Sampler and Spectrophotometer

Q. 2: Determine Dust Fall rate by tiles exposure method. 10

OR

Determine Carbon Di Oxide (Co2) from air by Zincondroff Technique.

Q 3 : Detect of SO_2 / H_2S / Ammonia from ambient air by Qualitative tests. 10

OR

Interpret wind rose diagram / Determine wind velocity.

OR

Determine Co by Co detector from ambient air.

Q. 4: Determine Noise Level of the ambient air by dB meter. 10

OR

Determine Air pollution index.

OR

Study the Effects of SO_2 / H_2S / Ammonia on plant material.

Q. 5: a) Record Book submission 05

b) Excursion Report 05

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure
Faculty of Science
B. Sc. (Second Year) Environmental Science, Syllabus
Semester Pattern effective from June 2017

Salient features of the skill:

The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, and examination and evaluation systems. The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India.

Environmental science is multidisciplinary subject, various areas are there where students can serve for nature and society, the skill courses can provide the specific and scientific knowledge in environmental science. The course will help to assess prior basic knowledge at U.G. level. The main aim of the skill based course is to trend the students in wide range of environmental sciences based skills that provide the learning base of future career in various discipline in the subject.

Utility: At the end of the course, student should be –

1. Able to analyze study report on material learned
2. Able to assess the scope of environmental sciences and select appropriate area for further study
3. Able to integrate related topics from separate part of the course

Learning Objectives:

1. The prime aim to provide and acquainted various courses in environmental sciences.
2. To promote for training in practical and conceptual skills in the subject
3. To improve students for global competition and their chances of employment.
4. To equip students with adequate practical knowledge, that will enable them be self reliant in various allied courses
5. To equip students with adequate techniques that will enable them towards the perfections for national and global economics.

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure (New Scheme)
B. Sc. (Second Year) Semester- III
Effective From- June -2017

1. Skill Enhancement Course CCENV-I (A)

Soil Testing Analyst **2 Credits**

Theory (Lectures: 30)

Objectives of Course: Soil testing analyst work like laboratory technician, who is responsible for collecting and analyzing soil samples to determine whether the soil is suitable for agricultural practices, gardening or plantation or natural uses. Students can also find courses in soil testing or similar topics that provide information about soil

The main objective of the course is to provide the student with a formalized way to build their fundamental knowledge and skills within the different areas of soil science to enhance their professional skills

Syllabus to be covered:

Physical properties of Soil: Density, Porosity, Permeability, Temperature, Soil water, Soil atmosphere;

Chemical properties of Soil: Hydrogen ion concentration, Organic matter, Inorganic elements; Soil fauna and Soil flora;

Agents of soil Erosion: Running water, Glaciers, Wind, Sea water, Deforestation and Overgrazing;

Types of erosion: Sheet erosion, Rill erosion, Gully erosion, Slip erosion (land slide), Wind erosion;

Soil conservation practices: chemical and physical characteristics of soils, Classification and Morphology, how soil is formed and soil conservation.

Context:

- Soil testing analyst are often responsible for setting up testing equipment
- Need to be able to make their way through different types of ground to get to their testing sites.
- Practical's to be covered are justifying the syllabus like colour, temperature, density, consistency, micro and macro nutrients with N.P.K.
- Need to be able to meet with clients or team members at the site or testing facility
- Soil testing technicians must be able to work well as part of a team of other technicians and scientists. They must also be good listeners so they can carefully follow directions to help them avoid making procedural mistakes. Coursework in written and oral communication can also help students gain the skills they need to file written reports on their findings.

Analyst is expected to writing reports, maintaining libraries and databases of information, preparing notes and surveying for natural resources, and these tasks are carried out in offices and labs, as well as in the field. On-site work can take extended periods of time and may need to be conducted regardless of weather conditions.

References:

The Nature and Properties of Soils (Brady and Weil; Pierson/Prentice Hall Publisher) The current edition is the 14th edition

website: https://www.soils.org/files/certifications/fundamentals-exam-objectives.pdf

Hand Book of Methods in Env. Studies by S.K. MAITI ABD Publishers, Jaipur, India

81-85771-58-8

Environmental Science Principle & Pract. R.C. Das & Behera Prentice Hall of India Pvt. ltd. New Delhi 978-81-203-3330-7

Swami Ramanand Teerth Marathwada University, Nanded.

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester- III

Effective From- June -2017

CCENV III (Section B)

2. **Skill Enhancement Course CCENV-I (A)**

Training Course for Water Quality Assessment 2 Credits

Theory Lectures: 30

Objectives: The main objective of course is to improve the awareness and skills of the students in modern techniques of analysis of water for research and extension activities. Use of instruments and their general upkeep/maintenance, interpretation of analytical data and formulation of reports/recommendations...

Syllabus to be covered: The course is designed to cover water characteristics, testing techniques and methods of interpretation of data, so as to make it more useful in the context of global competition in quality and precision of analysis

The course contents: Sources of water, distributions and types of water, various physic-chemical and biological characteristics of water, water conservation practices, water Acts etc

The course context:

- Collect samples in scientific way from residential plumbing and municipal distribution systems for analysis
- Take physical tests like (Colour, pH, Temp etc) at the spot and use preservatives for further analysis
- Conduct chemical tests of samples in lab (e.g. Alkalinity, Hardness, TDS, DO, COD, fluoride and some heavy metals as possible as.
- Conduct biological tests of samples like MPN, SPC, Faecal and non-faecal coliform
- To conduct chlorine residual or turbidity tests
- Compare the obtained values with WHO, CPCB or BSI standards

References:

- Hand Book of Methods in Env. Studies by S. K. MAITI, ABD Publishers, Jaipur, India.
- Instrumental Methods of Chemical Analysis G. R. Chatwal and Anand Himalaya Publishing house, New Delhi
- Environmental Science Principle & Pract. R. C. Das & Behera Prentice Hall of India Pvt. Ltd. New Delhi

Swami Ramanand Teerth Marathwada University, Nanded.

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester-IV

Effective From- June -2017 CCENV III (Section B)

3. **Skill Enhancement Course CCENV-II (B)**

Composting from Solid Waste **2 Credits**

Theory Lectures: 30

Objectives: The main objective of course is to improve the awareness and skills of the students with modern techniques of collections, transportations and analysis of solid waste materials for production of organic manure and research activities. Use of instruments and their general maintenance, interpretation of analytical data and formulation of reports/recommendations

Syllabus to be covered: The course is designed to covered sources, types, solid waste collection methods and testing techniques and methods of interpretation of data, so as to make it more useful

The course contents: Definition of solid waste , sources types , solid waste collection methods and Introduction to vermiculture, definition, meaning, history, The species of earthworms; local species of earthworms, choosing the right and useful earthworm. Economic importance and its role in maintaining soil status. Role of earthworms in production of organic fertilizers, what are the environmental factors require. The matter and humus cycle (product, qualities), Ground population, transformation process in organic matter.

The course context:

- Collect samples in scientific way from residential , municipal and agricultural areas for systematic analysis
- Use appropriate technique for segregation of the material
- Study the construction of pits to be used for the composting
- Give the scientific treatment to the solid waste
- Study the marketing technique

Books Recommended:

1. Verms and Vermitechnology by Arvind Kumar, A. P. H. Pub., New Delhi-110002.
2. Earthworms-Vermiculture &Vermicomposting by R. K. Bhatnagar & R. K. Palta, Kalyani Pub, New Delhi, Kolkata, Hyderabad.
3. A hand book of organic farming by A. K. Sharma, Agrobios (India), Jodhpur
4. A handbook of soil, fertilizer and manure by P. K. Gupta, Agrobios (India), Jodhpur
5. Organic farming in India-problems and practice by U. Thapa & P. Tripathy, Agro Pub. Aca, Udaipur.
6. Organic Farming for sustainable agriculture by A. K. Dahama, Agrobios (India), Jodhpur

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester-IV

Effective From- June -2017 CCENV III (Section B)

4. **Skill Enhancement Course CCENV-II (B)**

Advanced study in Soil Science

Theory Lectures: 30

Objectives: The course is designed to give the student an in-depth understanding of the soil. A basic knowledge of soil science and soil physics as a discipline is assumed. On this basis, the main aim is to trend the students to run the consultancy for farmers. The course will give a fundamental understanding of the methods used to describe soil properties and soil physical processes.

The course contents: The course starts with a review of soil structure, including the interaction between mineral particles, organic material and soil biomass in a self-organizing system.

Soil pore structure is described in relation to its water and air content and includes a thorough review of the concept of water potential. There is focus on describing and understanding soil water-holding and water-transporting properties and their importance for soil physical characteristics and also as a medium for plant growth.

The latest knowledge on diffusive and convective transport of water and air is presented in relation to both pore characterization and important transport processes in soil,

The course context:

- Collect different types of soil samples in scientific way from the region by identifying the structural and morphological differences in soil.
- Determine the physical properties of soil (color, texture, density, porosity , permeability)
- Check the fertility based characters by analyzing (nutrient status, NPK, Minerals etc)
- Consult farmers and suggest remedy accordingly.
- Study the marketing technique

Books recommended:

1. A handbook of soil, fertilizer and manure by P. K. Gupta, Agrobios (India), Jodhpur
2. Organic farming in India-Problems and Practice by U. Thapa & P. Tripathy, Agro pub. Academy, Udaipur.
3. Organic Farming for Sustainable Agriculture by A. K. Dahama, Agrobios (India), Jodhpur
4. Environmental Science Principle & Pract. R. C. Das & Behera Prentice Hall of India Pvt. Ltd. New Delhi.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester- III

Effective From- June -2017

Skill Enhancement Course -01

Soil Testing Analyst

Theory Lectures: 30

Soil testing analyst work like laboratory technician, who is responsible for collecting and analyzing soil samples to determine whether the soil is suitable for agricultural practices, gardening or plantation or natural uses.

Students can also find courses in soil testing or similar topics that provide information about the chemical and physical characteristics of soils, Classification and Morphology, how soil is formed and soil conservation.

- Soil testing analyst are often responsible for setting up testing equipment
- Need to be able to make their way through different types of ground to get to their testing sites.
- Need to be able to meet with clients or team members at the site or testing facility
- Soil testing technicians must be able to work well as part of a team of other technicians and scientists. They must also be good listeners so they can carefully follow directions to help them avoid making procedural mistakes. Coursework in written and oral communication can also help students gain the skills they need to file written reports on their findings.

Analyst is expected to writing reports, maintaining libraries and databases of information, preparing notes and surveying for natural resources, and these tasks are carried out in offices and labs, as well as in the field. On-site work can take extended periods of time and may need to be conducted regardless of weather conditions.

The main objective of the course is to provide the student with a formalized way to build their fundamental knowledge and skills within the different areas of soil science to enhance their professional skills.

References:

The Nature and Properties of Soils (Brady and Weil; Pierson/Prentice Hall Publisher) The current edition is the 14th edition.

website: https://www.soils.org/files/certifications/fundamentals-exam-objectives.pdf

Hand Book of Methods in Env. Studies by S.K. MAITI ABD Publishers, Jaipur, India

81-85771-58-8

Environmental Science Principle & Pract. R. C. Das & Behera Prentice Hall of India Pvt. Ltd.

New Delhi978-81-203-3330-7

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc. (Second Year) Semester - III

Effective From- June -2017

CCENV III (Section B)

Skill Enhancement Course -02

Training course for Water Quality Assessment

Theory Lectures: 30

The main objective of course is to improve the awareness and skills of the students in modern techniques of analysis of water for research and extension activities. Use of instruments and their general upkeep/maintenance, interpretation of analytical data and formulation of reports/recommendations. The course is designed to cover water characteristics, testing techniques and methods of interpretation of data, so as to make it more useful in the context of global competition in quality and precision of analysis..

About the Course:

The course will cover some theory lectures on topics most relevant to the subject along with appropriate number of practical exercises with greater emphasis on analytical techniques adopting a demonstration and learning-by-doing type of approach. Interpretation of test results and formulation of recommendations and/or reports will be a vital component.

The course context:

- Collect samples in scientific way from residential plumbing and municipal distribution systems for analysis
- Take physical tests like (Colour, pH, Temp etc) at the spot and use preservatives for further analysis
- Conduct chemical tests of samples in lab (e.g. Alkalinity, Hardness, TDS. DO, COD etc with biological tests) as possible as.
- To conduct chlorine residual or turbidity tests
- Compare the obtained values with WHO, CPCB or BSI Standards

References:

Hand Book of Methods in Env. Studies by S.K. MAITI ABD Publishers, Jaipur, India.

Instrumental methods of chem. Analysis G. R. Chatwal and Anand Himalaya publishing house, New Delhi.

Environmental Science Principle & Pract. R. C. Das & Behera Prentice Hall of India pvt. Ltd. New Delhi.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B. Sc.(Second Year) Semester-III

Effective From- June -2017

CCENV III (Section B)

Skill Enhancement Course -03

Composting From Solid Waste (Waste Managee)

Theory Lectures: 30

Unit I:

Definition of solid waste, sources types, solid waste collection methods. Introduction to vermiculture, definition, meaning, history, the species of earthworms; local species of earthworms, choosing right and useful earthworm, economic important, their value in maintenance of soil status.

Unit II:

Role of earthworms in production of organic fertilizers, what are the environmental factors requires

Unit III:

The matter and humus cycle (product, qualities), Ground population, transformation process in organic matter.

Books recommended:

1. Verms &Vermitechnology by Arvind Kumar, A. P. H. Pub., New Delhi-110002.
2. Earthworms-Vermiculture &Vermicomposting by R. K. Bhatnagar & R. K. Palta, Kalyani Pub, New Delhi, Kolkata, Hyderabad.
3. A hand book of organic farming by A. K. Sharma, Agrobios (India), Jodhpur
4. A handbook of soil, fertilizer and manure by P. K. Gupta, Agrobios (India), Jodhpur
5. Organic farming in India-problems and practice by U. Thapa and P. Tripathy, Agro Pub. Academy, Udaipur.
6. Organic Farming for sustainable agriculture by A. K. Dahama, Agrobios (India), Jodhpur.

Swami Ramanand Teerth Marathwada University, Nanded.
Choice Based Credit System (CBCS) Course Structure
B. Sc. (Second Year) Semester-III
Effective From- June -2017
Environmental Science

Skill Enhancement Course 4

Environmental Audit **2 Credits**

Objectives:

- To provide students with information in order to obtain competencies for environmental auditing
- To develop ability to plan, execute and document the environmental audit.
- To develop entrepreneurial skills

Unit I Understanding Pollution:

Definition; pollution, Air Pollution: Air pollutants —Sources, primary and secondary pollutants and particulate matter, HAPs (hazardous air pollutants), Indoor pollution- different sources. Water Pollution: Sources- direct and indirect, impact of pollution on water bodies groundwater pollution – sources and effects. Wastes: Source, characteristics, types, and fate of solid wastes. Metal pollution: Metals in soil, food and water, elementary idea on metal pollution. Noise Pollution: General features, sources, noise classification, effects of sound pollution. Radiation Pollution: Man-made radiation, radiation hazards, nuclear accidents. Pesticide Pollution: Definition; sources, categories, pesticides in water and effects; elementary idea on IPM. Soil Pollution: Sources, types, effects of soil pollution

Unit II Protection of Environment:

International concerns and efforts for environmental protection; role of United Nations; Stockholm summit; priority issues; Rio Summit: Sustainable Development; Earth day; Environment day; ecotourism

Unit IV Environmental Audit:

Introduction: Definition; types of auditing, Features of Effective Auditing, Programme planning and organization of Auditing Programme, Pre visit data collection, Auditing Protocol, Onsite Audit; Data Sampling; Inspection and

Evaluation and Presentation, Audit Report; Action plan, Management of Audit, Benefits of Environmental Audit, Environmental Audit Programme in India.

Practice: Any one industries case study from following:-

Construction, Metal Processing, Pharmaceutical, Electrical, Electronic, Fertilizer, Pesticide, any regional Industry.

References:

Environmental science by S. C. Santra, New Central Book Agency London, Third Edition, 2015.

Humphrey N, Hadley M (2000) Environmental Auditing, Palladian Law Publishing Ltd, Cambridge, Isle of Wight.

Hunt D, Johnson C (1995) Environmental Management Systems, McGraw Hill, London.

International Chamber of Commerce (1989), *Environmental Auditing,* June 1989, ICC Publication No 468, International Chamber of Commerce (ICC), Paris.

International Chamber of Commerce (1991), *ICC Guide to Effective Environmental Auditing*. ICC Publication No 483, International Chamber of Commerce (ICC), Paris

Smets H (1988) The cost of accidental pollution.
