SHIVAJI UNIVERSITY, KOLHAPUR

CENTER FOR COMMUNITY DEVELOPMENT

CERTIFICATE COURSE IN LABORATORY MANAGEMENT AND BASIC ANALYSIS OF SOIL, WATER & FOOD

COURSE DETAILS

OBJECTIVES:

1.To acquire skills for Laboratory management and routine analysis of Soil, Water and Food.

2.To improve working ability in analytical laboratory.

DURATION: 12 Months full time/ Three years vocational (for undergraduate and working students).

ELIGIBILITY: H.S.C (Science) Pass or Fail, B.Sc., M.Sc.

MEDIUM OF INSTRUCTION: English

MINIMUM STRENGTH: 15 students

FEES: Per Student Rs . 3000/- for full time one year course + 250 Evaluation charges

SCOPE:

The students after H.S.C. has one of the more exciting and rewarding turning time of life. Course is designed as a new non-conventional alternative for the future. The course can be completed either as full time or as part time along with the graduation. The certificate obtained will be helpful for obtaining jobs in various fields. The student can start his own business /laboratory or can associate with any kind of laboratory or associated jobs with confidence. There are opportunities in the field of analysis, analytical research, fundamental

research, quality control departments, governmental and non-governmental organizations etc. for the technical laboratory personnel. In addition to this the college conducting this course can avail the services to general public and industries and raise funds for development.

STAFF QUALIFICATION:

1. B.Sc. with 3year's experience in analytical laboratory

2. M.Sc or higher qualification in Microbiology, Chemistry, Zoology, Botany, Biochemistry,

Environmental science, Nutrition, Pollution, Management.

3. Laboratory attendant with H.S.C. (Science) Pass or Fail.

INFARASTRUCTURE & OTHER REQUIREMENTS :

1. Standard laboratory with required equipments with basic facilities of light, ventilation, water, gas connection, sinks, fire fighting equipments etc.
2. The following equipments are required in working condition : pH meter, Conductivity meter, Oven, Bacteriological incubator, Water still, Butyro refract meter, Muffle furnace, reflux apparatus, photo colorimeter or spectrophotometer, flame photometer, soxhlet apparatus, Kjeldahl's apparatus, Microscope with oil immersion lens. The apparatus not available in parent institute can be hired from other competent laboratory/college. The consent letters from the institute must be produced during inspection. Some of the particles can be conducted in other institutes with previous written M.O.A. between two institutes.
3. The minimum books included as reference books in syllabus must be available. Other books and journals, audio visuals etc. in the subject will be additional preference point for affiliation.
4. Preference will be given to the colleges having microbiology department along with chemistry department.

COURSE TIME TABLE

4 Lectures per week, **Practical's during Diwali & Summer Vocations.**

COURSE EVALUATION :

Tests and tutorials require to be taken during course period to evaluate the methodology.

Theory Multiple choice (50 Q) - 100 marks x 2 = 200

Journal + Practical + Viva - 100 marks x 1= 100

Attendance + Visit report - 50 marks x 1 = 50

Project report + Viva - 50 marks x 1 = 50

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Total=400

SYLLABUS :

PAPER I : Laboratory Quality Management

1. Basic fundamentals in Analysis – (4)
A. Analytical chemistry, Titrimetric, gravimetric, instrumental analysis
B. Analytical Physics, Physical tests
C. Analytical biology

2. Instrumentation – Types, Principles, Maintenance, Operation, Working (4)
G.C., H.P.L.C., G.L.C., A.A.S., Organic C analyzer, Protein analyzer

3. Fundamentals in sampling methods, Preparation of reagents & culture media(simple, (4) Differential & Special) sterilization, inoculation, microbial staining methods (wet mounting, Gram's staining, Monochrome staining).

4. Mathematical calculations in analysis – Concentration calculations, ppm, ppb, mg/l, (2) Kg/ha, %, Normal, Molar. Ug/100gm calculations

5. Analytical work in various laboratories like Soil, Water, Food, Industry, Pathological, (3) Environmental, Industrial, Fertilizer industry.

6. Quality control management in laboratory. Standardization of reagents, solutions, (2) cross analysis

7. Safety and precautions in laboratory. General safety, ventilation, equipment (2) arrangement, safety wares, first aid, handling and disposal of hazardous samples.

8. Accuracy and precision maintenance in laboratory. (2)

9. Report presentation and interpretation of results. (2)

10. Laboratory management and Personality development (2)

REFERANCE BOOKS :

1. Basic concepts of analytical chemistry By S.M. Khopkar.
2. Vogel's textbook of quantitative chemical analysis, (Longman) ELBS) Edn
3. Handbook of organic qualitative analysis, By Clarke
4. Vigel's text book of qualitative chemical analysis, (Longman) ELBS) Edn
5. Basic laboratory studies in college chemistry By herd & Nebergali
6. Instrumental methods of analysis By Dr. B.K. Sharma

PAPER I- PART II . SOIL ANALYSIS

1. **Soil development and Chemical composition-** Formation of clay minerals, soil forming process, composition of earth's crust, minerals in soil, contents of chemical elements of soil, physical chemistry of soil, **(3)**
2. **Soil organic matter, formation, importance, Organic fertilizers. (3)**
3. **Soil microbiology and biochemistry, Microorganisms in soil,** biochemical activities of microorganisms, enzymatic reactions, role of soil ecology in geo chemical cycles **(3)**
4. **Acid, Alkali, Saline and sodic soils** - Cause and prevention measures (2)
5. **Trace elements in soil –Biological importance.** Effects due to deficiency and excess quantity. **(2)**
6. **Standards of soil quality required for various crops (2)**
7. **Soil pollution cause and remedies. (3)**
8. **Soil borne Plant diseases and pests, their control, Bio pesticides (2)**

PRACTICALS :

1. **Collection and preservation of samples** from general field, horticultural field and green house.
2. **Study of Instruments in analysis** -pH meter, Conductivity meter, Flame photometer, Spectrophotometer, Atomic absorption spectrophotometer, Kjeldahl's apparatus, Soxhlet apparatus, Muffle furnace, Hot air oven, Bacteriological incubator, BOD incubator, Centrifuge, Autoclave.
3. **Determination of pH and Electrical Conductivity of soil**
4. **Determination of Water holding capacity**
5. **Determination of Lime and Gypsum requirement**
6. **Determination Nitrogen**
7. **Determination of Phosphorus**
8. **Determination of Potassium**
9. **Determination of Organic carbon**
10. **Determination of Total and differential count of microorganisms**
11. **Microscopic identification of nematodes from soil**

REFERANCE BOOKS :

1. Text book of soil chemical analysis by Murray Heses P.R.
2. Chemistry of soil by Firman E. Bear
3. A text book of analysis by T.C. Barua
4. Analytical agricultural chemistry by J.S. Kanwar, S.L. chopra
5. Practical methods in ecology & Environmental science by R.K. Trivedi, P.K. Goel, C.L. Trisal.
6. Handbook of agricultural sciences By I.C.A.R.

PAPER II ; WATER AND WASTE WATER ANALYSIS

1. **Chemistry of water development**, hydrology, precipitation, rain, snow fall, water availability, requirement of water, (2)
2. **Quality of surface water, ground water** (2)
3. **Impurities in water**, standards of water quality for various requirements like potable, domestic use, industrial purpose, agricultural purpose. (3)
4. **Water treatment technologies** – House hold water treatment, Municipal water treatment, , industrial treatment, softening of water, Disinfection of water (4)
5. **Water Chemistry** (1)
6. **Water Microbiology** – types and sources of contamination, prevention of water borne diseases, (3)
7. **Water management**, water harvesting, water recycling (2)
8. **Characteristics of waste water from industries** - Sugar factory, Pulp & Paper mill, Distillery, Textile, Engineering , Food Industry, Domestic waste (5)
9. **Waste water treatment plant types and quality control** (2)
10. **Water pollution causes and remedies.** (3)

PRACTICALS :

1.Collection and preservation of samples from open well, tap, bore well, river, water treatment plants, waste water treatment plants
2.Determination of pH and Electrical Conductivity of water
3.Determination of Alkalinity
4.Determination of Hardness (Total, Permanent & Temporary)
a. Determination of Calcium
b. Determination of Magnesium
c. Determination of Carbonates & Bi-carbonates
d. Determination of Chemical Oxygen demand (C.O.D.)
e. Determination of Biochemical Oxygen Demand (B.O.D.)
f. Determination of M.P.N. of water
5. Identification of fresh water algae & protozoa by Microscopy

REFERANCE BOOKS :

1. Standard Methods for Examination of Water & waste water APHA-AWWA-WPCF
2. Manual of Water & waste water analysis, NEERI, Nagpur
3. Text book of water and waste water engineering by H.K. Hussen
4. Water supply & sanitary engineering by Birdie
5. Practical methods in ecology & Environmental science by R.K. Trivedi, P.K. Goel, C.L. Trisal.

PAPER II (PART II) : FOOD ANALYSIS

1. Human nutrition, Basic food groups, Balanced diet (1)
2. Food processing, preservation and storage (2)
3. Physico-chemical properties of food, enzymes in food (2)
4. Food adulteration, toxication of food, prevention of food borne diseases (3)
5. Nutritional value of food (2)
6. AGMARK, ISI and FPO importance and license obtaining procedures (3)
7. Fermented food products (2)
8. Production of nutrient rich foods (2)
9. Agro-product preservation methods (2)
10. Quality of animal feed and poultry feed (2)
11. Quality control in food processing (2)
12. Quality control for exportable foods (1)
13. Food microbiology – contamination of food, spoilage of food & their prevention (4)

PRACTICALS :

1. Collection and preservation of food samples for routine analysis
2. Determination of protein from Biscuit
3. Determination of acidity of milk
4. Determination of Non Volatile Ether Extract of Chilli
5. Determination of B.R. of Groundnut oil
6. Determination of Ash and Acid Insoluble ash of Turmeric
7. Determination of fiber content of poultry feed
8. Qualitative detection of adulterants in Atta, Maida, Besan, Biscuit, Black pepper, Butter, Ghee, Chilli powder,, Honey, Tea, Turmeric powder, Soft drink.
9. M.B.R.T. of milk
10. Determination of Standard Plate Count of Milk Powder.

REFERANCE BOOKS :

1. A first course in food analysis By A.Y. Sathe
2. Hand book of analysis and quality control for fruit & vegetable products By S. Ranganathan
3. Handling and storage of food grains By S.V. Pingale
4. Food science chemistry & experimental food By Dr. M. swaminathan
5. Food chemistry by William Hogland Meyer
6. Food adulteration By Thankamma Jacob
7. Food Microbiology by William C. frazier
8. Preservation of Fruits and Vegetables By Giridhari lal

OTHER :

The course also includes preparation of reports on

1. Visits to different laboratories in the analytical field (at least three)
2. Project work
3. Visits to exhibition, conference, workshop (optional)