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: Agricultural Microbiology

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	CA	ESE	Total Marks	Credits
III	CCAMB III (Section A)	Applied Agricultural Microbiology (P-VI)	03	45	10	40	50	2
	CCAMB III (Section B)	Microbes in Agriculture (P-VII)	03	45	10	40	50	2
	CCAMBP II [CCAMB III & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03		05 05	20 20	25 25	01 01
	SECAMB I	SEC I (ONE Skill from any optional)	03	45	25	25	50	2
IV	CCAMB IV (Section A)	Food, Soil Microbiology, and Microbial Ecology (P-VIII)	03	45	10	40	50	2
	CCAMB IV (Section B)	Management of crop plant diseases (P-IX)	03	45	10	40	50	2
	CCAMBP III [CCMB III & IV	Practical's based on P-VII & P-IX (P-XI)	03 03	08 08	05 05	20 20	25 25	01 01
	SECAMB II	SEC II (1 Skill from any optional)	03	45	25	25	50	2

Total credits semester III and IV: 16

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Choice Based Credit System (CBCS) Course Structure
B. Sc. second year (Semester- III)
Semester Pattern effective from June -2017

Agricultural Microbiology

CCAMB III (Section A)

APPLIED MICROBIOLOGY (P-VI)

Credits: 02 (Marks: 50) Periods: 45

Unit-I : Air Microbiology **12**

Definition and composition of air, sources of microorganisms in air, significance of microorganisms in air, droplet, droplet nuclei and droplet infection, air borne diseases, enumeration of microorganisms in air, control of microorganisms in air, air pollution.

Unit-II: Water Microbiology **10**

Types of water, Sources of microorganisms in water, Significance of microorganisms in water, Fecal contamination of water, Index of water pollution, Different indicator microorganisms, Coliform bacteria, Microbial examination of water, Water borne diseases

Unit-III: Sewage Microbiology **10**

Definition of sewage, composition and strength of sewage (BOD and COD), Microbiology of sewage, Domestic sewage treatment, Municipal sewage treatment, Water purification, Water reclamation.

Unit-IV: Milk Microbiology **13**

Definition and composition of milk, sources of contamination of milk, desirable and undesirable changes in milk, milk borne diseases, bacteriological examination of milk, reductase test, pasteurization of milk, application of microorganisms in dairy industry (examples and microflora).

References:

1. Air Microbiology An environment And Health Prospective by Aithal, Wakte & Manwar. Cinnamonteal print and publishing Margao, Goa-403601.
2. Fundamental principles of bacteriology by A.J. Salle.
3. Fundamentals of Microbiology by Martin Frobisher.
4. General Microbiology by Stanier. Ingraham, Wheelis, Painter: Macmillan Press Ltd. London.
5. General Microbiology Vol. II by Power C.H and H.F. Daginawala. Himalaya Publishing House,Mumbai.
6. Microbiology by Pelczar and Crick.
7. Text book of Microbiology by Dubey and Maheshwari.
8. Text of Applied Microbiology by Dr. B.M Sandikar.
9. Modern Approaches in Soil, Agriculture and environmental Microbiology, by Shiva Aithal and Kulkarni N.S., Himalaya publishing house, Nagpur

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Agricultural Microbiology

CCAMB III (Section B)

MICROBES IN AGRICULTURE (P-VII)

Credits: 02 (Marks: 50) Periods: 45

Unit I: Disease Inciting Organisms **12**

Pathogens:

a) Characteristic Features of Plant Pathogenic Fungi.
b) General Symptoms of Fungal Diseases.
c) Characteristic Features of Bacterial Pathogens.
d) General Symptoms of Bacterial Diseases
e) Characteristic Features of Mycoplasmal Pathogens
f) General Symptoms of Mycoplasma Diseases
g) Characteristic Features of Plant Pathogenic Viruses
h) General Symptoms of Viral Diseases

Unit II: Pathogenesis **13**

a) Penetration activities of pathogens on host surface
b) Direct Penetration
c) Entry through Natural openings
d) Entry through wounds, root hairs, Buds.
e) Enzymes, in Plant Diseases-Pectic Enzymes, Celluolytic enzymes, lignolytic enzymes, proteolytic enzymes and lipolytic enzymes.

Unit III : Diseases Caused by Bacteria and Viruses **10**

a) Citrus canker
b) Black Arm of Cotton
c) Bacterial leaf spot of mango
d) Yellow vein mosaic of Bhendi
e) Yellow bean mosaic
f) Leaf curl of tomato
g) Papaya mosaic disease

Unit IV: Diseases Caused by Fungi and Mycoplasma **10**

a) Leaf spot of tomato

b) Stem rust of wheat
c) Green ear of Bajra
d) Powder Mildew of Pea
e) Grain Smut of Jowar
f) Little leaf of Brinjal
g) Sesamum phylloidy

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Agricultural Microbiology

CCAMB IV (Section A)

FOOD MICROBIOLOGY, SOIL MICROBIOLOGY, AND MICROBIAL ECOLOGY (P-VIII)

Credits: 02 (Marks: 50) Periods: 45

Unit-I **Food Microbiology** **12**

Definition and composition of food, Sources of contamination in food, Microbial examinations of food, Significance of microorganisms in food, Spoilage and its types (Different types of spoilages with suitable examples) Preservation of food, food poisoning (Botulinum, Staphylococcal intoxication and Salmonellosis).

Unit-II **Soil Microbiology** **11**

Definition and composition of soil, types of soil, significance of microorganisms in soil, soil as a culture medium, microbiological examination of soil.

Unit-III **Elemental transformation in soil** **13**

Carbon cycle,

Nitrogen cycle,

Sulfur cycle,

Phosphorus cycle.

Unit-IV **Microbial interaction, association and ecology**. **09**

Symbiosis, antibiosis, mutualism, parasitism (rhizosphere, rumen, lichens, mycorrhiza, bioluminescence)

Concept of Population, community, Microbial succession, climax and adaptation.

References:

1. A Manual of Environmental Microbiology. 2nd Edition. 2001 by Christon J. Hurst (Chief Editor), ASM Publications.
2. Environmental Biotechnology. Edited by C. F. Forster and D.A., John Wase. Ellis Horwood Ltd. Publication.

3. Environmental Microbiology edited by Ralph Mitchell. A John Wiley and Sons. Inc.
4. General microbiology Vol. I and II by Power C.H and H.F. Daginawala. Himalaya Publishing House,Mumbai
5. Microbiology by Pelczar and Crick.
6. General Microbiology by Stanier. Ingraham, Wheelis,Painter: Macmillan Press Ltd. London
7. Fundamental principles of bacteriology by A.J. Salle
8. Food microbiology by Frazier.
9. Soil microbiology by Alexander.
10. Soil microbiology by Subba Rao.
11. Fundamentals of Microbiology by Martin Frobisher.
12. Text book of Microbiology by Dubey and Maheshwari

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Choice Based Credit System (CBCS) Course Structure
B. Sc. second year (Semester- IV)
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Agricultural Microbiology

CCAMB IV (Section B)

Management of Crop plant Diseases (P-IX)

Credits: 02 (Marks: 50) Periods: 45

Unit: I **Prophylaxis** **10**

a) Quarantine Exclusion of Inoculum
b) Inspection and Certification.
c) Eradication of Pathogens, Crop Rotations, Sanitation
d) Soil Treatment Improved Cultural Practices.

Unit: II **Control of Diseases by Chemicals** **13**

a) Copper Fungicides:- Bordaux mixture, Burgundy mixture
b) Chestnut compound,
c) Sulphur, Fungicides:- Inorganic Sulphur compounds: Lime Sulphur and Elemental Sulphur, Organic Sulphur Compounds
d) Mercury Fungicides
e) Systemic Fungicides
f) Antibiotics

Unit: III **Biological Control** **10**

a) Definition and aim of biological control.
b) The mechanism of biological control
c) Antagonism, Competition, Predation, Mycoparasitism
d) Nematophagy, Mycophagy
e) Applications of biological control.

Unit: IV **Biocides in Crop Protection** **12**

a) Definition of Biocides, Kinds of Biocides, ,Microbial Biocides
b) Bioinsecticides, Viral Insecticides, Bacterial Insecticides
c) Fungal Insecticides, Bioherbicides
d) Use of Botanicals in Plant Disease Control.

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AGRICULTURAL MICROBIOLOGY

Practical Paper X: CCAMBP II [CCMB III & IV (Section A)]

Credits: 02 (Marks: 50)

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1. Assessment of air quality by solid, liquid impingement techniques and enumeration using plating and turbidity.
2. Bacteriological examination of water for potability (Qualitative and Quantitative analysis): a) MPN method
   b) Presumptive, confirmatory, completed test,
   c) IMViC test
3. Determination of R: S ratio.
4. Demonstration of i) Ammonification
   ii) Nitrification
   iii) Denitrification
   iv) Nitrate reduction
   v) Sulfate reduction
   vi) Phosphate solubilization
5. Isolation and study of *Rhizobium* species from root nodules of leguminous plants.
6. Isolation and study of *Azotobacter sp.* from soil
7. Winogradsky's column for study of soil microflora
8. Bacteriological analysis of milk: i) Reductase tests
   ii) Phosphatase test.
9. Bacteriological examination of food. i) SPC
   ii) DMC

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AGRICULTURAL MICROBIOLOGY

Practical Paper XI: CCAMBP III [CCMB III & IV (Section B)]

Credits: 02 (Marks: 50)

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1) Isolation of fungal pathogen from diseased plant parts.
2) Isolation of bacterial pathogen from diseased plant parts.
3) Measurement of pectolytic enzymes by viscometry method.
4) Measurement of cellulolytic enzymes by viscometry method.
5) Assay of proteases/ lipases.
6) Study of symptoms of following plant disesases:
7) Citrus canker and Black Arm of Cotton.
8) Yellow vein mosaic of Bhendi and Leaf curl of tomato.
9) Study of symptoms of following plant disesases:
10) Leaf spot of tomato and Stem rust of wheat.
11) Green ear of Bajra and Grain Smut of Jowar.
12) Little leaf of Brinjal and Sesamum phylloidy.
13) Effect of fungicides on spore germination of fungal pathogens.
14) Effect of fungicides on growth of fungal pathogen.
15) Effect of plant extracts on growth of fungal pathogen.
16) Study of antagonism.
17) Study of Biocides available in market.
18) Study tour to visit Agriculture University, Research institutes and industries.

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Choice Based Credit System (CBCS) Course Structure
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AGRICULTURAL MICROBIOLOGY
Skill Enhancement Course SECAMB-I (A)

2 CREDIT (30 HRS)

SOIL CONDITIONEER

Ojectives :

- To make the student aware of soil and its health.
- To develop the skill of preparation of soil conditioner
- To highlight the importance of organic farming amongst the students

Unit-I : INTRODUCTION TO SOIL AND ITS TYPES

- Soil health
- Economical and ecological importance of soil
- Soil types
- Impact of soil loss and soil degradation on agriculture and food security.

Unit II: **FUNDAMENTALS OF SOIL**

- Process of soil formation , Need for soil conservation, Restoration of soil fertility

Unit III: **SOIL PROPERTIES**

- Soil arctitecture, Physical properties of soil, soil texture, Water holding capacity
- Soil temperature, Soil colloids, Chemical properties of soil: Soil acidity, Soil alkalinity,Soil salinity,Soil sodicity

Unit IV: **SOIL COMPOSITON**

- Soil organic matter, Micronutrients in soil, Nitrogen, Sulphur, potassium, phosphorous,Soil biodiversity

References:

1) The nature and Properties of Soils 13rd edition, Brady N.c. and Well R.R.(2007)Pearson Education Inc
2) JohanD.L.(2006) Land Degradation, 2nd edition, Rowman and Littlefield Publishers
3) Scheer S.J. (1999) Soil degradation : A Threat To developing Country by Food Security by 2020? (vol-27). International Food Policy Research Institute.
4) Oldman L.R. (1994) The Global Extent of Soil Degradation. Soil Resilence and Sustainable Land use.

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AGRICULTURAL MICROBIOLOGY
Skill Enhancement Course SECAMB-I (B)

2 CREDIT (30 HRS)

BIOLOGICAL CONTROL

Ojectives :

- To impart the knowledge of Agrochemicals used in farming practices
- To study and know the importance of biological control
- To develop the skill for mass production of biocontrol agents
- To study the methods for effective application of biocontrol agents.

Unit I : Introduction to Pesticides:

- General introduction to pesticides, Benefits and adverse effects of chemical pesticides ,Changing concepts of pesticides.

Unit II: Biopeaticides:

Introduction to biopesticides, Biopesticides as environment friendly alternative, Biocontrol agents/ Biopesticides a list.

Unit III: Biocontrol and Soil Health:

Biocontrol mechanisms

Unit –IV: Applied Mycology:

Fungi as biocontrol agents , Mycofungicides , Mycoherbicides, Mycoinsecticides, Myconematosides

References:

1. Alexopoules C.J., Mims C.W. Blackwell M (1996) Introductory Mycology, John Wiley & sons (Asia) Singapore, 4th edition
2. Sethi J.K.and Walia S.K. (2011) Text Book of Fungi and Their Allies, Macmillan Publishers India Limited.

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Choice Based Credit System (CBCS) Course Structure
B. Sc. second year (Semester- IV)
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AGRICULTURAL MICROBIOLOGY
Skill Enhancement Course SECAMB-II (A)

2 CREDIT (30 HRS)

FOOD QUALITY ANALYSIS

Objectives:

- To introduce to the students to the field of Food Technology
- To familiarize the students about processing and quality of food
- To introduce skill for analysis methods for food samples

Unit I : Introduction to food science and technology, Definition of food, Food groups, nutrition, nutrient, health concept and balanced diet, Macro and micro-nutrients

Unit II: Food Quality, Common foods, Cereals and pulses, Processing of cereals and pulses.

Unit III : Fruits and vegetables, Classification of fruits and vegetables, Composition, Nutritive value, Processing on pigments

Unit IV: Meat, fish, poultry, eggs and Milk

- Composition and nutritive values of foods
- Egg quality and deterioration of eggs
- Preservation of eggs
- Role of eggs in cookeries
- Dairy products

Practice

- Enzymatic browning of fruits and vegetables, Nonenzymatic browning, MBRT, DMC

References:

1. Potter N.,Hotchkiss J. H.(2007) Food Science 5th edition, Delhi, CBS Publisher.
2. Srilakshmi B. (2012) Food Science, Delhi. New age International Private limited.
3. Sandikar B.M. Applied Microbiology, Himalaya Publishing House, Nagpur
4. Shethi P and Lakra P. (2015) Ahaar Vigyan , Poshan evam Suraksha, Elite Publishing house.
5. Suri and Malhotra (2014) Nutrition and Safety, Peason India limited.

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B. Sc. second year (Semester- IV)
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AGRICULTURAL MICROBIOLOGY
Skill Enhancement Course SECAMB-II (B)

2 CREDIT (30 HRS)

PLANT PATHOLOGY

Ojectives :

- To spread awareness regarding plant diseases and plant health
- To develop the skill of identifying plant diseases on common plants
- To isolate and study important phytopathogens

Unit I: Phytopathology, General symptoms of common diseases of plant,Geographical distribution of diseases, Etiology, Symptomatology of common fungal diseases (Early blight of potato, black stem rust of wheat)

Unit II: Host pathogen relationship, Host pathogen relationship between common fungal and bacterial diseases, Disease cycle and environmental relation, Prevention and control of plant diseases

Unit III: Bacterial plant diseases, Citrus canker, Angular leaf spot of cotton

Unit IV: Viral Diseases, TMV, Vein cleaning

Skill : Herbarium specimens of bacterial diseases,

References:

1. Agrios G. N. (1997) Plant pathology, 4th edition Academic Press U.K.
2. Webster J. and Weber R. (2007) Introduction to fungi, Cambridge University Press, Cambridge, 3rd edition.
3. Sharma P. D. (2011) Plant Pathology, Rastogi Publications, Meerut, India.