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: Microbiology

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	CA	ESE	Total Marks	Credits
III	CCMB III (Section A)	Applied Microbiology (P-VI)	03	45	10	40	50	2
	CCMB III (Section B)	Immunology (P-VII)	03	45	10	40	50	2
	CCMBP II [CCMB III & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03	practical 08 08	05 05	20 20	25 25	1 1
	SECMB I	SEC I (Anyone Skill from optional)	02+ 01	45	25	25	50	(02)*
IV	CCMB IV (Section A)	Food, Soil Microbiology and Microbial Ecology (P-VIII)	03	45	10	40	50	2
	CCMB IV(Section B)	Medical Microbiology (PIX)	03	45	10	40	50	2
	CCMBP III [CCMB III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	03 03	practical 08 08	05 05	20 20	25 25	1 1
	SECMB II	SEC II (Anyone Skill from optional)	02+ 01	45	25	25	50	(02)*
Total credits semester III and IV								**12(04)***

Note – ESE of CCMBPII, CCMBPIII & SECMBI , SECMBII should be evaluated at annual

Swami Ramanand Teerth Marathwada University Nanded

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

Microbiology

CCMB III (Section A)

APPLIED MICROBIOLOGY (P-VI)

Credits: 02 (Marks: 50) Periods: 45

Unit-I Air Microbiology 10

Definition and composition of air, sources of microorganisms in air, significance of microorganisms in air (beneficial and harmful), droplet, droplet nuclei and aerosol, enumeration of microorganisms in air, control of microorganisms in air.

Unit-II Water Microbiology 12

Types of water, Sources of microorganisms in water, Index of water pollution, Different indicator microorganisms, coliform bacteria, Microbial examination of water, water borne diseases.

Unit- III Sewage Microbiology 13

Definition of sewage, composition and strength of sewage (BOD and COD), Microbiology of sewage, Domestic sewage treatment, Municipal sewage treatment (Primary, secondary, Tertiary sewage treatment) and Composting.

Unit-IV Milk Microbiology 10

Definition and composition of milk, sources of contamination of milk, desirable and undesirable changes in milk, milk born diseases, Microbial examination of milk, pasteurization of milk, Application of microorganisms in dairy industry (examples and microflora).

Reference Books:-

1. Air microbiology an environment and Health Prospective by Aithal, Wakte & Manwar.
2. Cinnamonteal print and publishing Margao, Goa -403601.
3. Fundamental principles of bacteriology by A. J. Salle.
4. Fundamentals of Microbiology by Martin Frobisher.
5. General microbiology by Stanier, Ingraham,Wheelis,Pinter: Macmillan press Ltd. London.
6. General Microbiology Vol. II by Power C.H and H.F. Daginawala. Himalaya Publishing
7. House, Mumbai.
8. Microbiology by Pelczar and Crick.
9. Text book of Microbiology by Dubey and Maheshwari.
10. Text book of Applied Microbiology by Dr. B. M. Sandikar.

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

Microbiology

CCMB III (Section B)

IMMUNOLOGY (P-VII)

Credits: 02 (Marks: 50) Periods: 45

Unit- I Infection, Immunity and Immune response. 13

Infection: Definition, types of infections, sources of infection, modes of transmission, Microbial pathogenicity, Aggressive factors of pathogens.

Immunity: Definition and classification with suitable examples.

Unit- II Antigens, Antibodies and Immune Response 12

Antigen: Definition, general properties, antigen specificity, bacterial antigens with reference to *S. typhi.*

Antibody: Definition, properties, structure of immunoglobulin, immunoglobulin classes.

Immune response: Definition, types and mechanism- Humoral and cellular, list of effector Molecules, Theories of antibody production.

Unit –III Antigen antibody reactions 10

Mechanism and applications of the following reaction with suitable examples:
Agglutination, precipitation, complement fixation, virus neutralization, toxin neutralization reaction

Principle and applications of recent techniques: Enzyme linked immunosorbent assay, Radioimmunossay, Immunofluorescence test.

Unit-IV Hypersensitivity 10

Definition, classification on the basis of time (Delayed and immediate) and mechanism (Type I, II, III and IV) with one example of each.

Reference Books:

1. Basic Immunology by Joshi and Osarano. Agrobotanical publishers Ltd. Bikaner.
2. Elementary Microbiology Vol. I and II Dr. A. H Modi. Akta Prakashan. Nadiad.
3. Medical Microbiology. N. C. Dey and T. K. Dey. Allied agency, Culcutta.
4. Microbiology by Davis, Dulbecco, Eisen Harper and Row Maryland.
5. Molecular biology by David Frifelder, Narosa Publishing house, New Delhi.
6. Immunology by B. S. Nagoba and D. V. Vedpathak. BI publications, New Delhi.
7. Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman, Mumbai.

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

Microbiology

CCMB IV (Section A)

Food, 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, Factors affecting kind and number of microorganisms in 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 and carbon cycle **11**

Definition and composition of soil, types of soil, signification of microorganisms in soil, soil as culture medium. Carbon cycle (with respect to cellulose and starch).

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

Nitrogen cycle, Sulfur cycle, Phosphorus cycle.

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

Symbiosis, antibiosis, mutualism, parasitism.
Microbe –microbe interaction-Lichen
Plant-microbe interaction: Mycorrhiza, Rhizosphere.
Animal - microbe interaction: Rumen, bioluminescence
Concept of population, community, Microbial succession, climax and adaptation (Phenotypic and genotypic adaptations).

Reference Books:

1. A Manual of Environmental Microbiology. Second Edition .2001 by Christion J. Hurst (Chief Editor), ASM Publications.
2. Environmental Biology. Edited by C. F. Foster 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. & 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 Subba Rao.
10. Soil microbiology by Alexander.
11. Fundamentals of Microbiology by Martin Frobisher.
12. Text book of Microbiology by Dubey Maheshwari.
13. Prescott Microbiology by Prescott, Harley and Klein (TMH Publication)

Swami Ramanand Teerth Marathwada University Nanded

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

Microbiology

CCMB IV (Section B)

Medical Microbiology (P-IX)

Credits: 02 (Marks: 50) Periods: 45

Unit-I Bacterial infection **12**

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

a. Cholera
b. Typhoid

Unit - II Bacterial infection **10**

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

a. Diphtheria
b. Pulmonary Tuberculosis
c. Syphilis

Unit- III Viral infections **13**

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

a. AIDS
b. Hepatitis A and B only.

Unit - VI Infection by other Microorganisms **10**

a. Morphology, life cycle, pathogenicity, etiology, laboratory diagnosis, treatment and prophylaxis of Malaria.
b. Etiology, pathogenesis, Clinical features, laboratory diagnosis and treatment of Candidiosis.

Reference Books:

1. Medical Microbiology. N.C.Dey and T.K. Dey. Allied agency, Culcutta.
2. Microbiology by Davis, Dulbecco, Eisen Harper and Row Maryland.
3. Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar, Orient
4. Longman, Mumbai.
5. Medical microbiology by Chakraborthy.
6. Medical Microbiology: Prep Manual for Under Graduates by Nagoba, Elsevier.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

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

MICROBIOLOGY

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

Credits: 02 (Marks: 50)

(Annual practical Based on [CCMB III & IV (Section A)] (Practical syllabus requires four periods per batch per week for 2 consecutive days B.Sc. Second year practical includes studies of growth of microorganisms and life activities of Microorganisms. These studies need two consecutive days for completion of practical.)

1. Bacteriological examination of air by solid impingement techniques.
2. Bacteriological examination of water: Quantitative analysis: MPN method
3. Bacteriological examination of water: Qualitative analysis: Presumptive, confirmatory, completed test,
4. Differentiation between fecal and non-fecal coliforms by IMViC test
5. Elevated temperature test (Ejeckman test).
6. Determination of R: S ratio.
7. Demonstration of Ammonification
8. Demonstration of Nitrification
9. Demonstration of Phosphate solubilization
10. Isolation and study of *Rhizobium* species from root nodules of leguminous plants.
11. Isolation and study of *Azotobacter sp.* from soil
12. Bacteriological analysis of milk: MBRT
13. Bacteriological examination of food by SPC method
14. Bacteriological examination of food by DMC method

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

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

MICROBIOLOGY

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

Credits: 02 (Marks: 50)

(Annual practical Based on CCMBP III [CCMB III & IV (Section B)] (Practical syllabus requires four periods per batch per week for 2 consecutive days B.Sc. Second year practical includes studies of growth of microorganisms and life activities of Microorganisms. These studies need two consecutive days for completion of practical.)

1. Blood staining by Leishman's / Giemasa's method.
2. Metachromatic granule staining (Albert's Method)
3. Acid fast staining.
4. RBC counting.
5. WBC counting.
6. Blood grouping.
7. Widal test: Qualitative and Quantitative by slide method.
8. RPR test.
9. Gel diffusion test (Demonstration).
10. Isolation and Study of morphology, cultural and biochemical characteristics of the *Salmonella spp.*
11. Isolation and Study of morphology, cultural and biochemical characteristics of the *Vibrio cholerae.*
12. Antibiotic sensitivity tests for above pathogens by disc diffusion method.

Swami Ramanand Teerth Marathwada University Nanded

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

Skill Enhancement Course SECMB-I (A)

Public Health Microbiology **2 Credits**

Objectives :

- To create awareness about the spread of infectious diseases.
- To impart the essential skills for public health laboratory practices
- To increase the employability

Unit I **Scope of Public Health Microbiology**

Definition, areas covered in Public Health Microbiology,
Overview of disease process

Unit II **Water Microbiology**

Water borne pathogens & water borne diseases
Bacteria: *E.coli, Salmonella, Shigella, Vibrio cholerae*
Viruses : Enteroviruses, Hepatitis virus
Protozoa : *Entamoeba histolytica*, Giardia

Practice 1) Isolation of Coliforms 2) Identificationof fecal coliforms by IMViC tests.

Unit III **Skill in water quality monitoring**

Sources of water, Potable water ,Importance of potable water, Indicator organisms of water pollution, standard tests for determination of potability of water, Quantitative: TC, FC, Membrane Filter count. Qualitative: Presumptive, Confirmed, Completed.

Practice MPN: TC & FC

Unit IV Skill in food and milk quality monitoring .

Enrichment culture technique, Detection of specific microorganisms on selective media : XLD agar, Wilson and Blair agar, Manitol Salt agar, MacConckey's agar Pathogenic microorganisms: Salmonella, Coliforms, *Staphylococcus aureus*,

Practice Enrichment culture technique for *Salmonella*, *S.aureus*.
Determination of Microbiological quality of Milk by MBRT, Resazurin Test.

References:

Da SIlvaN. Taniwaki M.H. Junqueria V.C. Microbiological Examination of food and Water- A Laboratory Manual

Harrigan W F. Laboratory Methods in Food Microbiology

Garg N ,Garg K.L. A Laboratory Manual in Food Microbiology

Jay J M and Loeswer M. J. Modern Food Microbiology

OR

Skill Enhancement Course SECMB-I (B)

Microbial Biofertilizers **2 Credits**

Objectives

- To create awareness about organic farming.
- To impart the essential skill for mass production of biofertilizers
- To develop entrepreneurial skills

Unit I Biofertilizers

General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.

Unit II Nitrogen fixing bacteria

Symbiotic N2 fixers: Rhizobium - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants

Non - Symbiotic N2 fixers

Free living Azotobacter - isolation, characteristics, mass inoculum production and Field application.

Practice Isolation of Azotobacter from soil and Rhizobium from leguminous nodule

Unit III Mycorrhizal & Algal Biofertilizer

Importance of mycorrhizal inoculums, types of mycorrhizae and associated plants, Mass inoculums. Production of VAM, field applications of Ectomycorrhizae and VAM, Cyanobacteria,, Role in rice cultivation, , field application.

Practice Azolla - Isolation, characterization, mass multiplication

Unit IV Phosphate solubilizers

Phosphate solubilizing microbes -, mass inoculum production, field Application

Practice Isolation and characterization of phosphate solubilizing bacteria

References

Kannaiyan, S. (2003). Bioetchnology of Biofertilizers, CHIPS, Texas.

Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.

Reddy, S.M. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.

Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.

Aggarwal SK (2005) Advanced Environmental Biotechnology, APH Publications

Verma, A. (1999). Mycorrhiza. Springer Verlag, Berlin.

Wallanda, T. *et al*. (1997). Mycorrhizae. Backley's Publishers,

Swami Ramanand Teerth Marathwada University Nanded

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

Microbiology

Skill Enhancement Course SECMB-II (A)

Diagnostic Microbiology **2 Credits**

Objectives

- To create awareness about infectious diseases.
- To develop the essential skills among students in diagnostic laboratory techniques
- To increase the job opportunities.

Unit I **Importance of diagnosis of diseases**

Common Bacterial, Viral , Fungal and Protozoal diseases.

Unit II **Collection and Examination of clinical samples**.

Collection of clinical samples and precautions required (oral cavity, throat ,skin , blood, Urine, Feces). Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa stained thin blood film for malaria.

Practice 1) Clinical sample collection from throat & Skin, 2) Blood staining for Malarial parasite (MP).

Unit III **Diagnosis of pathogen using culture media**

MacConkey's agar, Blood agar, Chocolate agar, Lowenstein-Jensen agar.

Practice 1) Preparation of Blood agar. 2) Preparation of Chocolate agar

Unit IV **Serological methods for diagnosis**

Agglutination , Precipitation, ELISA, Immuno fluorescence ,Kits for rapid detection of Pathogens

Practice 1. Detection of Typhoid by WIDAL 2. Detection of Syphillis by RPR.

References

Ananthanarayan R and Paniker CKJ (2009)Textbook of Microbiology, 8th edition, Universities Press Private Ltd.

Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd

Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby

Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical Medical Microbiology, 14th edition, Elsevier.

OR

Skill Enhancement Course SECMB-II (B)

Medical Laboratory Techniques **2 Credits**

Objectives

- To develop interest in paramedical sciences
- To train students for the essential skills in Medical laboratory techniques
- To increase the job opportunities

Unit I Importance of Hematology

Components of Blood and Their functions. Study of Blood groups: ABO, Rh blood groups. Importance of Blood group, Blood collection and Anticoagulants in hematology.

Practice 1) Blood grouping 2) DLC

Unit II Routine Hematological techniques.

Hemoglobin estimation. Acid Hematin method (Sahilis method) ESR, Cynometho hemoglobin Method, Wintrobs method, Capillary methods.

Practice 1) TLC, 2) TEC

Unit III Routine Diagnostic techniques.

Preparation of serum Plasma, Serum Immunoglobins and their significance.

Practice 1) Blood sugar. 2) Serum Cholesterol

Unit IV Urine analysis

Physical analysis: Importance of physical parameters colour , quantity, odour in diagnosis of disease Chemical Analysis: Urine Sugar/Albumin/Bile pigment/bile salt/occult blood/ketone bodies /keto urea and its importance in diagnosis of disease

Practice Physical and chemical analysis of urine

References

Ananthanarayan R and Paniker CKJ (2009)Textbook of Microbiology, 8th edition, Universities Press Private Ltd.

Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

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