

SEMESTER ONE

Course MB 101: Introduction to Microbiology and microbial diversity
Total hours: 60 Credits: 4

1. DIVERSE TYPES OF MICROBES 15H

1. MEMBERS OF THE MICROBIAL WORLD :
GENERAL CHARACTERS, CELL STRUCTURE, DISTRIBUTION/HABITATS,
SIGNIFICANCE
 - A. PROCARYOTES:**
 - a) INTRODUCTION OF BACTERIA
 - b) INTRODUCTION OF ARCHEAE
 - B. EUCARYOTES**
 - a) INTRODUCTION OF FUNGI
 - b) INTRODUCTION OF ALGAE
 - c) INTRODUCTION OF PROTOZOA
 - C. ACELLULAR MICROBES**
 - a) INTRODUCTION OF VIRUS
 - b) INTRODUCTION OF SUBVIRAL PARTICLES
2. THE SCOPE AND RELEVANCE OF MICROBIOLOGY

2. THE HISTORY AND SCOPE OF MICROBIOLOGY 15H

- A. THE DISCOVERY OF MICROORGANISMS
- B. THE CONFLICT OVER SPONTANEOUS GENERATION
- C. DEVELOPMENTS IN THE AREA OF MEDICAL MICROBIOLOGY:
 - a) DISEASES AND KOCH'S MOLECULAR POSTULATES
 - b) PURE CULTURE TECHNIQUES
 - c) ANTIBIOTICS
 - d) ASEPTIC SURGERY
 - e) IMMUNOLOGY AND PROPHYLAXIS
- D. THE DEVELOPMENT OF INDUSTRIAL MICROBIOLOGY
- E. THE DEVELOPMENTS IN MICROBIAL ECOLOGY
- F. THE DEVELOPMENTS IN GENETICS AND BIOTECHNOLOGY
- G. DEVELOPMENTS IN BIOINFORMATICS AND NANOBIOTECHNOLOGY

3. THE STUDY OF MICROBIAL STRUCTURE: MICROSCOPY AND SPECIMEN PREPARATION 15H

- A. LENSES AND THE BENDING OF LIGHT
- B. THE LIGHT MICROSCOPE :**
 - a) THE BRIGHT-FIELD MICROSCOPE AND MICROSCOPE RESOLUTION
 - b) THE DARK-FIELD MICROSCOPE

- c) THE PHASE-CONTRAST MICROSCOPE
- d) THE FLUORESCENCE MICROSCOPE

C. ELECTRON MICROSCOPY

- a) THE TRANSMISSION ELECTRON MICROSCOPE
- b) THE SCANNING ELECTRON MICROSCOPE

D. NEWER TECHNIQUES IN MICROSCOPY

- a) CONFOCAL MICROSCOPY
- b) SCANNING PROBE MICROSCOPY
- c) THE DIFFERENTIAL INTERFERENCE CONTRAST MICROSCOPE

E. PREPARATION AND STAINING OF SPECIMENS FOR LIGHT MICROSCOPE AND ELECTRON MICROSCOPE

- a) FIXATION
- b) DYES
- c) SIMPLE STAINING
- d) DIFFERENTIAL STAINING
- e) STAINING SPECIFIC STRUCTURES
- f) SPECIAL STAINING TECHNIQUES FOR ELECTRON MICROSCOPE

4. BIOMOLECULES:

15H

A. ATOMS, MOLECULES AND CHEMICAL BONDS

B. STRUCTURAL ASPECTS, CLASSIFICATION AND SIGNIFICANCE OF:

1. CARBOHYDRATES
2. LIPIDS
3. NUCLEIC ACID
4. AMINO ACIDS AND PROTEINS

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HOURS: 60**CREDITS: 2****MB 102 PRACTICALS (MICROBIOLOGY)**

- A. MICROBIOLOGY GOOD LABORATORY PRACTICES AND BIOSAFETY
- B. INTRODUCTION TO VARIOUS INSTRUMENTS USED IN MICROBIOLOGY LABORATORY: DESIGN AND APPLICATION OF: BALANCES
LIGHT MICROSCOPE – SIMPLE AND COMPOUND MICROSCOPE, STERILIZERS: HOT AIR OVEN, AUTOCLAVE, WATERBATH UV CHAMBER, LAMINAR AIR FLOW (BIOLOGICAL SAFETY CABINETS), BACTERIOLOGICAL FILTERS, REFRIGERATOR FOR PRESERVATION, INCUBATOR.
- C. PREPARATION OF STAINS
- D. STAINING TECHNIQUES FOR LIGHT MICROSCOPE:
 - a) SIMPLE STAINING: POSITIVE MOCHROME
 - b) NEGATIVE STAINING
 - c) GRAM STAINING
 - d) ACID FAST STAINING
 - e) SPIROCHETE STAINING
- E. WET MOUNT METHOD: HANGING DROP TECHNIQUE FOR MOTILITY STUDIES.
- F. QUALITATIVE ANALYSIS OF BIOMOLECULES: PROTEINS, LIPIDS, CARBOHYDRATES
- A. PERMANENT SLIDE/PHOTOGRAPHS OF: BACILLUS, STAPHYLOCOCCUS, YEAST, RHIZOPUS, GRAM NEGATIVE SHORT RODS, PARAMECIUM, SPIROGYRA, EUGLENA, TAPE WORM

REFERENCE :

LIST OF MICROBIOLOGY BOOKS AUTHORED BY:

- 1) ANANTHANARAYAN AND PANIKER'S TEXTBOOK OF MICROBIOLOGY, 2013 BY ANANTHANARAYAN AND PANIKER
- 2) MICROBIOLOGY MARJORIE KELLY COWAN
- 3) MICROBIOLOGY GERARD J. TORTORA
- 4) MICROBE HUNTERS: THE CLASSIC BOOK ON THE MAJOR DISCOVERIES OF THE MICROSCOPIC WORLD PAUL DE KRUIF
- 5) FOUNDATIONS IN MICROBIOLOGY KATHLEEN PARK TALARO
- 6) GENERAL MICROBIOLOGY ROGER Y. STANIER MACMILLAN, 1987 MICROBIOLOGY MICHAEL J. PELCZAR
- 7) INSTRUCTOR'S MANUAL TO ACCOMPANY ELEMENTS OF MICROBIOLOGY BY MICHAEL J. PELCZAR

- 8) PRESCOTT'S MICROBIOLOGY, EIGHTH EDITION REVIEWED BY JOANNE J. DOBBINS JOANNE M. WILLEY , LINDA M. SHERWOOD , AND CHRISTOPHER J. WOOLVERTON . 2011. MCGRAW-HILL HIGHER EDUCATION, NEW YORK, NY.
- 9) H.A.MODI'S :ELEMENTS OF MICROBIOLOGY
- 10) H.A.MODI'S : INTRODUCTION TO MICROBIAL WORLD

SCHEME OF EXAMINATION (SEMESTER ONE)

- A. GENERAL EXERCISE: VARIOUS INSTRUMENTS USED IN MICROBIOLOGY LABORATORY: DESIGN AND APPLICATION, STAIN PREPARATION, WET MOUNT, QUALITATIVE ANALYSIS OF BIOMOLECULES
- B. STAINING TECHNIQUES FOR LIGHT MICROSCOPE
- C. SPOTTING
- D. VIVA
- E. JOURNAL AND SLIDES

HOURS: 60

CRDEITS: 4

SEMESTER TWO (MICROBIOLOGY)

Course MB 103: (TAXANOMY AND BACTERIOLOGY)

1. CLASSIFICATION OF MICROBES

15H

- a) AIMS AND PRINCIPLES OF CLASSIFICATION
- b) CONCEPT OF SPECIES, TAXA, STRAIN
- c) CONVENTIONAL METHODS OF TAXANOMY
- d) BINOMIAL NOMENCLATURE
- e) WHITTAKERR'S FIVE KINGDOM CLASSIFICATION
- f) CARL WOESE'S THREE KINGDOM CLASSIFICATION NUMERICAL TAXONOMY
- g) MOLECULAR TECHNIQUES FOR CLASSIFICATION OF MICROBES
- h) DIFFERENCES BETWEEN EUBACTERIA AND ARCHAEBACTERIA

2. PROCARYOTIC CELL STRUCTURE AND FUNCTION

15H

A. AN OVERVIEW OF PROCARYOTIC CELL STRUCTURE, SHAPES, SIZE ARRANGEMENT AND ITS DIVERSITY

B. PROCARYOTIC CELL SURFACE LAYERS

1. PLASMA MEMBRANES AND PROTEIN SECRETION IN PROCARYOTES
2. BACTERIAL CELL WALL
3. ARCHAEOAL CELL WALLS
4. CAPSULES, GLYCOCALYX, S LAYER SLIME LAYER
5. THE BACTERIAL ENDOSPORE

C. THE CYTOPLASMIC MATRIX, THE NUCLEOID, PLASMIDS, CYTOPLASMIC INCLUSIONS STRUCTURES, ORGANIC AND INORGANIC INCLUSIONS

D. COMPONENTS EXTERNAL TO THE CELL WALL: FLAGELLA, PILI, FIMBRIE, PROTHICA, STALK

3. MICROBIAL NUTRITION AND GROWTH

15H

- A. REQUIREMENT OF BIOELEMENTS, GROWTH FACTORS FOR GROWTH
- B. NUTRITIONAL TYPES OF MICROBES
- C. MODES OF NUTRITIONAL UPTAKE
- D. CULTURE MEDIA: TYPES OF MEDIA
- E. METHODS OF OBTAINING PURE CULTURE-STREAKING, SERIAL DILUTION AND PLATING METHODS
- F. MODES OF MICROBIAL REPRODUCTION
- G. GROWTH CURVES- NORMAL, DIAUXIC, SYNCHRONOUS
- H. THE MATHEMATICS OF GROWTH, SPECIFIC GROWTH RATE, GENERATION TIME
- I. EFFECT OF ENVIRONMENT FACTORS ON MICROBIAL GROWTH : TEMPERATURE, PH, OSMOTIC PRESSURE, PH, GASES

SHRI GOVINDGURU UNIVERSITY, GODHRA

(Estd 2016)

MICROBIOLOGY SYLLABUS (APRIL 2016)

4. . CONTROL OF MICROBES: PHYSICAL METHODS & CHEMICAL METHODS

15H

- A. DEFINITIONS OF TERMS
- B. CONDITIONS INFLUENCING THE EFFECTIVENESS OF ANTIMICROBIAL AGENTS
- C. PHYSICAL METHODS OF MICROBIAL CONTROL:**
 - 1. HEAT: DRY AND MOIST HEAT, LOW TEMPERATURES
 - 2. RADIATION
 - 3. ULTRASONICATION
 - 4. FILTRATION
- D. CHEMICAL METHODS OF MICROBIAL CONTROL**
 - 1. PHENOLICS AND DETERMINATION OF PHENOL COEFFICIENT OF DISINFECTANT
 - 2. ALCOHOLS
 - 3. HALOGENS
 - 4. HEAVY METALS
 - 5. ACIDS AND ALKALIES
 - 6. QUATERNARY AMMONIUM COMPOUNDS
 - 7. GASEOUS AGENTS
 - 8. ALDEHYDES.

E. PRESERVATION OF CULTURES

MB 202 PRACTICALS (MICROBIOLOGY)

TOTAL HOURS :60

CREDITS:2

- B. SPECIAL STRUCTURE STAINING TECHNIQUES
 - 1. CELL WALL STAINING
 - 2. CAPSULE STAINING
 - 3. ENDOSPORE STAINING
 - 4. GRANULE STAINING
- C. PREPARATION OF NUTRIENT AGAR, NUTRIENT BROTH, MC CONKEY AGAR, EMB AGAR
- D. ISOLATION OF FUNGI BY SPREAD PLATE METHOD
- E. MOUNTING OF FUNGI- RHIZOPUS, ASPERGILLUS, MUCOR, PENICILLIUM
- F. ISOLATION OF YEAST AND BACTERIA BY FOUR FLAME METHOD
- G. STUDY OF COLONY FORMING UNIT BY POUR PLATE METHOD
- H. STUDY OF EFFECT OF CHEMICAL ON MICROBIAL GROWTH-BACTERIA
- I. STUDY OF EFFECT OF TEMPERATURE ON MICROBIAL GROWTH-BACTERIA
- J. STUDY OF PHENOL COEFFICIENT OF ALDEHYDE
- K. MEASUREMENT OF GROWTH BY TURBIDOMETRIC METHOD
- L. DETECTION OF PRESENCE OF MICROFLORA IN ENVIRONMENT BY EXPOSING NUTRIENT AGAR PLATES TO AIR

REFERENCE:

LIST OF MICROBIOLOGY BOOKS AUTHORED BY:

- 1) PRINCIPLES OF MICROBIOLOGY , ATLAS R.M.
- 2) MICROBIOLOGY MARJORIE KELLY COWAN
- 3) MICROBIOLOGY GERARD J. TORTORA
- 4) MICROBE HUNTERS: THE CLASSIC BOOK ON THE MAJOR DISCOVERIES OF THE MICROSCOPIC WORLD PAUL DE KRUIF
- 5) FOUNDATIONS IN MICROBIOLOGY KATHLEEN PARK TALARO
- 6) GENERAL MICROBIOLOGY ROGER Y. STANIER MACMILLAN, 1987
- 7) MICHAEL J. PELCZAR Jr. CHAN ECS AND KRIEG NR (2004) MICROBIOLOGY , 5TH EDITION. TATA MCGRAW HILL.

- 8) INSTRUCTOR'S MANUAL TO ACCOMPANY ELEMENTS OF MICROBIOLOGY BY MICHAEL J. PELCZAR
- 9) PRESCOTT'S MICROBIOLOGY, EIGHTH EDITION REVIEWED BY JOANNE J. DOBBINS JOANNE M. WILLEY , LINDA M. SHERWOOD , AND CHRISTOPHER J. WOOLVERTON . 2011. MCGRAW-HILL HIGHER EDUCATION, NEW YORK, NY.
- 10) H.A.MODI'S :ELEMENTS OF MICROBIOLOGY
- 11) H.A.MODI'S : INTRODUCTION TO MICROBIAL WORLD

- 12) BLACK JG (2008), MICROBIOLOGY : PRINCIPLES AND EXPLORATIONS 7TH EDITION, PRENTICE HALL.
- 13) MEDIGAN MT AND MARTINKO JM (2014), BROCK BIOLOGY OF MICROORGANISMS, 14TH EDITION. PARKER J. PRENTICE HALL INTERNATIONAL INC
- 14) CAPPUCCINO J AND SHERMAN N (2010) MICROBIOLOGY: A LABORATORY MANUAL, 9TH EDITION. PEARSON EDUCATION LIMITED

SCHEME OF EXAMINATION (SEMESTER TWO)

- A. SPECIAL STRUCTURE STAINING TECHNIQUES
- B. ISOLATION OF FUNGI OR ISOLATION OF YEAST OR ISOLATION OF BACTERIA BY POUR PLATE METHOD
- C. GENERAL EXERCISE:
1. EFFECT OF ENVIRONMENTAL FACTORS CHEMICAL ON MICROBIAL GROWTH
 2. STUDY OF EFFECT OF TEMPERATURE ON MICROBIAL GROWTH- BACTERIA
 3. MEASUREMENT OF GROWTH BY TURBIDOMETRIC METHOD
 4. STUDY OF PHENOL COEFFICIENT OF ALDEHYDE
 5. DETECTION OF PRESENCE OF MICROFLORA IN ENVIRONMENT BY EXPOSING NUTRIENT AGAR PLATES TO AIR
- D. SPOTTING
- E. VIVA
- F. JOURNAL SLIDE
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