



GOVERNMENT DEGREE COLLEGE SIDDIPET (AUTONOMOUS)

RE-ACCREDITED WITH 'A' GRADE BY NAAC

FACULTY OF SCIENCES

Department of Microbiology

Academic year 2021-22



SUBJECT: MICROBIOLOGY

ACADEMIC YEAR 2021-2022

Department of Microbiology





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Department of Microbiology

Academic year 2021-22



Board of studies meeting in Department of Microbiology

Venue: Department of Microbiology

Government Degree College Siddipet (autonomous)

Date & Time: 28-12-2021 & 11.00 a.m.

The Board of Studies Meeting was convened in the Department of Microbiology, on 28-12-2021 (Tuesday), at 11.00 a.m, under the Chairmanship of Dr.P.Pallavi, Head, Department of Microbiology, Govt. Degree College Siddipet (A), Telangana State, for the approval of the newly introduced syllabus under CBCS curriculum of III year (V & VI Semesters) and ratification of I,II,III,& IV Semesters of UG, of Microbiology with effect from the academic year 2021-2022 onwards. Discussed on the following agenda & resolutions were made during the meeting:

AGENDA

- Welcome address and opening remarks by Chairman, Board of Studies of the Department of Botany.
- To seek approval for the continuation of UG I year & II-year Syllabus of Microbiology with effect from 2020-2021.
- To seek approval for the Continuation of *Ability Enhancement Courses* for the academic year 2021-2022.
 1. Environmental Science
 2. English/MIL Communication
- To seek approval for the Continuation of *Skill Enhancement Courses* for the academic year 2021-2022.
 - i. Mushroom cultivation syllabus under CBCS curriculum w.e.f. 2020-2021.
 - ii. Haemtology



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- To seek approval for introduction of new DSE courses of UG III year under CBCS curriculum of V & VI Semester which was already approved in previous BoS meeting with effect from 2021-2022.
- To seek approval for the introduction of new Generic Elective courses Microbiology & Human health for UG III-year under CBCS curriculum of V Semester with effect from 2021-2022 and it's paper pattern.
- To seek approval for the introduction of new courses DSE (Project work) & DSE (Applied Microbiology) syllabus under CBCS curriculum of VI Semester w.e.f 2021-2022.
- To seek approval for the introduction of new *certificate courses*
Microbial instrumentation techniques
 - To seek approval for the introduction of new *Value-added courses & Add on courses.*
- To seek approval for number of credits allotted to all Semesters – Theory and Practical Syllabi of UG Microbiology with effect from the academic year 2021-2022.
- To approve for conduct of Semester – End Theory Examinations for a maximum mark of 100 in 70 + 30 pattern for External and Internal Exams respectively.
- To seek approval for conduct of Semester – End Practical Examinations for a maximum Marks of 50 with Duration of 3 Hours.

To seek approval for marks breakup of Internal Examination for 30 Marks as follows:

- i. Best of the Two Internal Exams of 20 Marks each - 20 Marks
- ii. Assignment - 05 Marks
- iii. Student Seminar (or) Project Work - 05 Marks

Note: Each Internal Exam for 20 Marks consists of the following composition:

- a. 05 Multiple Choice Questions @ 1 mark = 05 Marks
- b. 10 'Fill in the blank' questions @ 1 mark = 10 Marks
- c. 05 'Short Answer questions or Definitions'

@ 1 mark = 05 Marks.

- To approve the changes in the syllabus in respective papers with 20% modification as per the Bos Members suggestions and based on the feedback of the stakeholders.



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- Suggestions given by BoS Members

- Any other things related academics



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MINUTES OF THE MEETING

The meeting of the Board of studies of the Department of Microbiology was held on 28th December 2021 at 11.00a.m.

RESOLUTIONS

The members had a discussion and interaction among themselves on all the Agenda points. After fruitful discussion the following resolution were made.

1.	The Chairman BOS of the Department of Microbiology welcomed and introduced the members of Board of studies and thanked each of them for sparing their valuable time to attend the meeting.
2.	It was unanimously resolved and approved for the continuation of UG I year & II-year Syllabus of Microbiology with effect from 2020-2021.
3.	It was unanimously resolved and approved the Continuation of <i>Ability Enhancement Courses</i> for the academic year 2021-2022. <ol style="list-style-type: none">1. Environmental Science2. English/MIL Communication
4.	It was unanimously resolved and approved for the Continuation of <i>Skill Enhancement Courses</i> for the academic year 2021-2022. <ol style="list-style-type: none">1. Haematology2. Microbial quality control in pharmaceutical industry.3. Mushroom cultivation w.e.f. 2020-20214. Microbial diagnosis in health clinic syllabus under CBCS curriculum w.e.f. 2021-2022.
5.	It was unanimously resolved and approved for the introduction of new Generic Elective course <ol style="list-style-type: none">1. <i>Introduction and scope of Microbiology</i> UG III-year Microbiology under CBCS curriculum of V Semester



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	<p>with effect from 2021-2022</p> <ol style="list-style-type: none">2. Microbiology and Human health UG III-year Microbiology under CBCS curriculum of V Semester with effect from 2021-2022.3. Question paper pattern for the sem end exam theory will be to with the DSE paper.
6.	<p>It was unanimously resolved and approved for the introduction of new courses DSE (Project work) & DSE (Applied Microbiology) syllabus under CBCS curriculum of VI Semester w.e.f 2021-2022 With 20% change in syllabus to the parent university excluding practical and including a unit in the theory syllabus.</p>
7.	<p>It was unanimously resolved and approved for the introduction of new <i>certificate course</i> w.e.f 2021-2022</p> <ol style="list-style-type: none">1. Microbial Instrumentation techniques <p>End Theory Examinations for a maximum mark 35</p> <ol style="list-style-type: none">d. 30 Multiple Choice Questions @ 1 mark = 30 Markse. Assignment 1@5 marks = 5Marks
8.	<p>It was unanimously resolved and approved for the introduction of new <i>Value-added course</i></p> <ol style="list-style-type: none">1. Introduction to Biostatistics With effect from the academic year 2021-2022.
9.	<p>It was unanimously resolved and approved for the introduction of new <i>Add on course</i></p> <ol style="list-style-type: none">1. Introduction to Bioinformatics With effect from the academic year 2021-2022.
10.	<p>It was unanimously resolved and approved for number of credits allotted to all Semesters – Theory and Practical Syllabi of UG Microbiology with effect from the academic year 2021-2022.</p>
11.	<p>It was unanimously resolved and approved for conduct of</p>



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	Semester – End Theory Examinations for a maximum mark of 100 in 70 + 30 pattern for External and Internal Exams respectively.
12.	It was unanimously resolved and approved for conduct of Semester – End Practical Examinations for a maximum Marks of 50 with Duration of 3 Hours.
13.	<p>It was unanimously resolved and approved for marks breakup of Internal Examination for 30 Marks as follows:</p> <ul style="list-style-type: none">iv. Best of the Two Internal Exams of 20 Marks each - 20 Marksv. Assignment - 05 Marksvi. Student Seminar (or) Project Work - 05 Marks <p><u>Note:</u> Each Internal Exam for 20 Marks consists of the following composition:</p> <ul style="list-style-type: none">f. 05 Multiple Choice Questions @ 1 mark = 05 Marksg. 10 'Fill in the blank' questions @ 1 mark = 10 Marksh. 05 'Short Answer questions or Definitions' @ 1 mark = 05 Marks.
14.	It was unanimously resolved and approved the panel list of Examiner w.e.f. 2020-2021
15.	Concluded the meeting with vote of thanks

Based on the Suggestions given by the members, BOS resolved to recommend the above resolutions to the Academic Council for further approval.



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PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN

B.Sc. MICROBIOLOGY (With effect from 2021-22)

Code	Course Title	Course Type	HPW	Credits
FIRST YEAR-SEMESTER-1				
BS	AEC-1 (Environmental Science)			2
BS	English			4
BS	Second Language			4
BS	General Microbiology	DSC-1A	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-2				
BS	AEC-2 (English/MIL Communication)			2
BS	English			4
BS	Second Language			4
BS	Microbial Diversity	DSC-1B	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SECOND YEAR-SEMESTER-3				
BS	Haematology	SEC-1	2	2
BS	Microbial quality control in Pharamaceutical industry	SEC-2	2	2
BS	English			3
BS	Second Language			3
BS	Food & Environmental Microbiology	DSC-1C	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-4				
BS	Mushroom Cultivation	SEC-3	2	2
BS	Microbial Diagnosis in health clinic	SEC-4	2	2
BS	English			3
BS	Second Language			3
BS	Medical Microbiology & Immunology	DSC-1D	4+2	5
BS	Optional-II			5
BS	Optional-III			5
THIRD YEAR-SEMESTER-5				
BS	English			3
BS	Second language			3
BS	1A.Microbiology and Human Health (or)	GE	4	4



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BS	1A.Molecular Biology & Microbial Genetics or	DSE-I	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER- 6				
BS	English			3
BS	Second language			3
BS	2A. Industrial Microbiology	DSE-II	4+2	5
BS	2B. Pharmaceutical Microbiology			
BS	Project work/ Applied Microbiology		4	4
BS	Optional –II A/B/C			5
BS	Optional –III A/B/C			5
BS	Total			150



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B.Sc. MICROBIOLOGY (With effect from 2021-22)

Code	Course Title	Course Type	HPW	Credits
FIRST YEAR-SEMESTER-1				
BS	General Microbiology	DSC-1A	4+2	5
SEMESTER-2				
BS	Microbial Diversity	DSC-1B	4+2	5
SECOND YEAR-SEMESTER-3				
BS	Haematology	SEC-1	2	2
BS	Microbial quality control in pharmaceutical industry	SEC-2	2	2
BS	Food & Environmental Microbiology	DSC-1C	4+2	5
SEMESTER-4				
BS	Mushroom Cultivation	SEC-3	2	2
BS	Microbial Diagnosis in health clinic	SEC-4	2	2
BS	Medical Microbiology & Immunology	DSC-1D	4+2	5
THIRD YEAR-SEMESTER-5				
BS	Microbiology and Human Health	GE	4	4
BS	1A.Molecular Biology & Microbial Genetics or	DSE-I	4+2	5
SEMESTER -6				
BS	2A. Industrial Microbiology	DSE-II	4+2	5
BS	2B. Pharmaceutical Microbiology			
BS	Project work/ Applied Microbiology		4	4
	Total (Microbiology)			34



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B.Sc. I year: I semester

Code: BS- DSC -1A

Title: GENERAL MICROBIOLOGY

4HPW- Credits-4

Unit-1 Introduction to Microbiology

Meaning, Definition and scope. History of Microbiology: Contribution of Louis Pasteur and Robert Koch. Importance and application of Microbiology

Principles of Microscopy- Bright field, Dark Field, Phase contrast, Fluorescent and Electron Microscopy- SEM and TEM. Principles and types of stains- Simple stain, Differential stain, Negative stain. Structural stain- Spore, capsule, flagella, Bacterial motility- Hanging drop method.

Unit 2- Structure of bacteria, Viruses and pure culture concept

Prokaryotes- Ultra structure of eubacteria

General characteristics and classification of virus

Morphology and structure of TMV and HIV. Structure and multiplication of Lambda phage

Isolation of pure culture techniques- Enrichment culturing, Dilution plating, Streak plate, Spread plate, Micromanipulator. Preservation of Microbial cultures- Sub culturing, Overlaying culture with mineral oils, lyophilisation, sand cultures, storage at low temperature.

Unit 3: Microbial Nutrition and metabolism

Microbial nutrition- Nutritional requirement, Uptake of nutrients by cell. Nutritional groups of microorganisms – Autotrophs, Heterotrophs, Mixotrophs. Components and types of bacterial growth media.

Respiration- Glycolysis, HMP pathway, ED Pathway, TCA cycle and anapleurotic reaction.

Electron Transport, Oxidative and substrate level phosphorylation.



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Unit- 4: Sterilization techniques and microbial growth

Sterilization and disinfection techniques- Physical methods- Autoclave, Hot air oven, Laminar air flow, Filter sterilization. Radiation methods- U.V rays, Gamma rays, Ultrasonic methods.

Chemical methods- Alcohols, Aldehydes, Phenol, Halogens and hypochlorides.

Microbial growth- Different phases of growth in batch culture. Factors influencing microbial growth. Synchronous, continuous, Biphasic growth. Methods for measuring microbial growth- Direct Microscopic, Viable count, Turbidometry, Biomass.

References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harley, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker, J. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube. R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.
5. Anthanarayan and Panicker, Medical Microbiology.

General Microbiology

PRACTICALS

2HPW-Credits-1

- Handling and calibration of light microscope.
- Simple and differential staining (Gram staining), Spore staining.
- Microscopic observation of cyanobacteria (Nostoc, Spirulina), algae and fungi (Saccharomyces, Rhizopus, Aspergillus, Pencillium, Fusarium).
- Isolation of T2 bacteriophage from sewage sample.
- Preparation of media for culturing autotrophic and heterotrophic microorganisms — algal medium, mineral salts medium, nutrient agar medium, McConkey agar and blood agar.
- Sterilization techniques: Autoclave, Hot air oven and filtration.
- Enumeration of bacterial numbers by serial dilution and plating (viable count)
- Isolation of pure cultures by streak, spread and pour plate techniques



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- Preservation of microbial cultures- Slant, Stab, Sand cultures, mineral oil overlay and glycerol stocks
- Turbidometric measurement of bacterial growth and plotting growth curve.

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.



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B.Sc. I year: II Semester

Code: BS, DSC-1B

Title: MICROBIAL DIVERSITY

4HPW- Credits-4

UNIT 1: CONCEPT OF BIODIVERSITY

Basic concept of Biodiversity and Conservation. Elements of Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance & Diversity. Economic Value of Biodiversity & Legal, Ethical and Conservation issues related to uses of biodiversity.

Classification of living organisms; Haeckel, Whittaker and Carl Woese systems. Differentiation of prokaryotes and eukaryotes.

Classification of bacteria as per the second edition of Bergey's manual of systematic bacteriology.

UNIT 2: PROKARYOTIC MICROBIAL DIVERSITY

General characteristics of eubacteria, Rickettsia and Mycoplasma.

Microbial richness: Exploration, significance, conservation and applications. Structural and physiological diversity of Archaea bacteria, Metabolic characteristics of extremophiles (Methanogens, Halophiles, Thermoacidophiles).

Gram negatives: Cyanobacteria and Proteobacteria, Gram positives and heterogenous members including Firmicutes, Actinobacteria, Bacteroides, Acidobacteria and Planctomycetes

UNIT 3: EUKARYOTIC MICROBIAL DIVERSITY

Eukaryotic microbial diversity. Structural, physiological and metabolic characteristics of Algae - Cyanophyta, Chlorophyta, Bacillariophyta, Phacophyta, Rhodophyta; Fungi -Phycomycetis, Basidiomycetis, Zygomycetes, Oomycetes, Ascomycetes, Deuteromycetes (imperfect and perfect stages) and Protozoa - Giardia, Entamoeba and Plasmodium.

UNIT 4: MICROBIAL ECOSYSTEMS

Microbial interactions: Symbiosis, neutralism, commensalism, competition, antagonism, synergism, parasitism.

Understanding microbial diversity with Cultivated vs Uncultivated microorganisms.



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The Great Plate count anomaly. Cultivation independent methods to assess microbial diversity. Preserved and perturbed microbial ecosystems, microbiome for sustainable agroecosystems,

References:

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig.N.R (2006)."Microbiology"- 5th Edition McGraw Hill Inc. New York.
- David, B.D., Delbecco,. **R.**, Eisen, H.N and Ginsburg, H.S (1990) "Microbiology" 5 Edition. Harper & Row, New York.
3. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R. (1986). "General Microbiology" -Mac Milan Education Ltd. London.
4. Brown J.W. (2015) Principles of Microbial Diversity, ASM Press
5. Epstein S.S. (2009) Uncultivated microorganisms, Springer-Verlag Publishers
6. Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15th Edn. (Global Edn.)Pearson Education

MICROBIAL DIVERSITY

PRACTICALS2HPW-Credits-1

- Isolation of Methanogenic bacteria from manure by anaerobic culturing
- Isolation and enumeration of halophiles from saline environment
- Isolation of bacteria from diversified habitats to demonstrate antagonism, commensalism and synergism
- Isolation of *Cyanobacteria* and fungi from different habitats
- Identification of fungi by staining techniques
- Microscopic observation of soil algae and Protozoa
- Winogradsky's column to demonstrate microbial diversity
- Visit and observe any nearby unique ecosystems to understand the role of microorganisms
- Demonstration of the great plate count anomaly

References:

1. Aneja. K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
2. Dubey, R.C. and Maheswari. D.K. (2002). Practical Microbiology, S. Chand Sz. Co., New Delhi.
3. Burns. R.G. and Slater, **J.H.** (1982). Experimental Microbiology and Ecology. Blackwell Scientific Publications, USA.
4. Peppier, I.L. and Gerba, C.P. (2004). Environmental Microbiology — A Laboratory Manual.Academic Press. New York.
5. Gupte, S. (1995). Practical Microbiology. Jaypee Brothers Medical Publishers Pvt. Ltd.



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6. Kannan, N. (2003). Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers. Panima Publishing Co., New Delhi.
7. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, 2nd edition. Himalaya Publishing House, Mumbai.
8. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3rd Edition, Sri Padmavathi Publications, Hyderabad



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SKILL ENHANCEMENT COURSE-1 (SEC-I)

B.Sc II year: III Semester

Code: BS, SEC-1

Title: HAEMATOLOGY

2HPW-Credits-2

UNIT-1: INTRODUCTION TO BLOOD

Blood: definition, characters, composition. Collection of blood — capillary blood: from adults and infants, examinations employed. Venous blood: from adults and infants, examinations employed. Composition of blood (RBC, WBC, Plasma, Serum, Platelet cells), Staining of blood films. Total blood picture, Differential count. Blood grouping. Rh-typing. Haemoglobin: composition and normal values. haemoglobin estimation Anti-coagulants.

UNIT-2: BLOOD TRANSFUSION

Principles of blood transfusion, Donor screening cross matching, collection of blood, preservation and storage. Precautions of handling blood and its products. Challenges in management of Hemophilia and Anaemia. General account on spread of diseases through blood and blood products. Coagulation mechanism: factors, bleeding time, clotting time. Haematological

indices: packed cell volume. Erythrocyte sedimentation: principle — determination.

References:

1. Kawthalkar.Essentials of Haematology Paperback — 2013
2. Lokwani.D.P.The ABC of CBC Interpretation of Complete Blood Count and HistogramsPaperback — 2013
3. RamnikSood . Medical Laboratory technology Methods and Interpretation Jaypee Publications.
4. ShirishMKawthalkar, Essential Of Hematology. Jaypee Publication



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B.Sc. II year: III Semester

Code: BS, DSC-1C

Title: FOOD AND ENVIRONMENTAL MICROBIOLOGY 4 HPW-Credits-4

UNIT 1: FERMENTED FOODS

Introduction to fermented foods; Health aspects of fermented foods; Fermented vegetables: Processing and fermentation of Sauerkraut and pickles, idly. Dairy Microbiology - Types of microorganisms in milk, significance of microorganisms in milk, Microbial products of milk- Bulgarian milk, Kefir, cheese, yogurt; Microorganisms as food; Probiotics and Prebiotics.

UNIT 2: MICROBIAL FOOD SPOILAGE AND POISONING

Microbial Spoilage of foods; Microbial Food poisoning, risks and hazards; Mycotoxins and their poisoning/toxicity; Food preservation methods and food safety issues. Food Quality: Importance and functions of quality control. Methods of quality assessment of foods; Screening and Enumeration of spoilage microorganisms, Detection of pathogens in food.

UNIT 3: AIR AND WATER MICROBIOLOGY

Microorganisms in air and their importance (brief account); Microorganisms and water pollution Water-borne pathogenic microorganisms and their transmission; Sanitary quality of water; Water pollution due to degradation of organic matter; Aerobic and Anaerobic sewage treatment,

UNIT 4: SOIL MICROBIOLOGY

Soil properties (physical, chemical and biological), Soil microorganisms, Methods of enumeration and activity of microbes in environment/soil; Microbes and plant interactions — Rhizosphere, Phyllosphere and Mycorrhizae; Introduction to Microbial Bioremediation, Microbial degradation of organic pollutants; Carbon and Nitrogen cycle.

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.



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2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers. ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York
5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Rangaswami, G. and Bhagyarai, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
7. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA
8. Paul, E.A. and Clark, F.E. (1989). Soil Microbiology and Biochemistry, Academic Press, USA.

FOOD AND ENVIRONMENT MICROBIOLOGY

PRACTICALS

2HPW-Credits-1

- Determination of microbiological quality of milk by MBRT method.
- Isolation of fungi & bacteria from spoiled fruits/vegetables/Milk/Meat products.
- Isolation of microorganisms from air by impingement method.
- Microbiological examination of water by coliform test.
- Determination of biological oxygen demand.
- Extraction of Mycotoxins from contaminated grains/foods.
- Detection of Mycotoxins
- Isolation and identification of probiotic Microorganisms
- Isolation of Rhizosphere and phyllosphere Microorganisms

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers. ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.
5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA



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SKILL ENHANCEMENT COURSE-III (SEC-3)

B.Sc. II year: IV Semester

Code: BS, SEC-3

Title: MUSHROOM CULTIVATION

2HPW-Credits-2

UNIT-1

- Introduction to mushroom cultivation
- Importance and history of mushroom cultivation in India
- Global status of mushroom production
- Edible mushrooms (white button oyster, Paddy straw).
- Nutritional value and health benefits of mushrooms

UNIT-2

- Steps in mushroom cultivation
 - a. Selection of site and types of mushroom
 - b. Mushroom farm structure, design layout
 - c. Principle and techniques of compost and composting
 - d. Principle of spawn production
 - e. Casing and crop production
 - f. Harvesting and marketing
 - g. Entrepreneurship development in Mushroom cultivation
- Pest and pathogens of mushrooms
- Post harvest handling and preservation of mushrooms

Reference:

1. Mushroom cultivation in india by B.C.Suman and V.P. Sharma Published by Daya publishing house New Delhi.
2. Mushrooms Cultivation, Marketing and Consumption Manjit Singh Bhuvnesh Vijay Shwet Kamal G.C. Wakchaure Directorate of Mushroom Research (Indian Council of Agricultural Research) Chambaghat, Solan —173213 (HP)



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B.Sc II year: IV Semester

Code: BS, DSC-1D

Title: MEDICAL MICROBIOLOGY & IMMUNOLOGY 4 HPW-Credits-4

UNIT-1: MEDICAL BACTERIOLOGY

History of Medical Microbiology. Normal flora of human body,

Host pathogen interactions. Bacterial toxins, virulence and attenuation. Antimicrobial resistance. Air borne diseases - Tuberculosis.

Food and waterborne diseases- Cholera, Typhoid.

Contact diseases - Syphilis, Gonorrhoea. General account of nosocomial infections.

UNIT-2: MEDICAL VIROLOGY AND PARASITOLOGY

Food and waterborne diseases - Poliomyelitis, Amoebiasis.

Insect borne diseases- Malaria, Dengue fever.

Zoonotic diseases — Rabies

Viral diseases- Hepatitis B, HIV, SARS, INTERS; Air borne diseases- Influenza.

UNIT-3: INTRODUCTION TO IMMUNOLOGY

History of immunology. Cells and organs of immune system- Primary and Secondary lymphoid organs. Functions of B&T Lymphocytes, Natural killer cells, Polymorphonuclear cells.

Structure and classification of Antigens, Factors affecting antigenicity.

Antibodies- Basic structure, Types, properties and functions of immunoglobulins.

Types of immunity- Innate and Acquired; Humoral and cell mediated immune response.

UNIT-4: IMMUNOLOGICAL DISORDERS AND AG-AB REACTIONS

Types of hypersensitivity - Immediate and delayed.

Systemic and localized autoimmune disorders



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Types of Antigen-Antibody reactions- Agglutination, blood groups, precipitation, neutralization, complement fixation test. Labeled antibody based techniques-ELISA, RIA and Immunofluorescence; Polyclonal and monoclonal antibodies production and application



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References:

1. Gottschalk, G. (1986). Bacterial Metabolism, Springer-Verlag, New-York.
2. Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications, Iowa, USA.
3. Moat. A.G. and Foster, J.W. (1995). Microbial Physiology, John-Wiley, New York.
4. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.
5. Reddy, S.R. and Reddy, S.M. (2004). Microbial Physiology, Scientific Publishers, Jodhpur, India.
6. Lehninger, Al., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
7. Elliot, W.H. and Elliot, D.C. (2001). Biochemistry and Molecular Biology, 2nd Edition, Oxford University Press, U.S.A.

MEDICAL MICROBIOLOGY & IMMUNOLOGY

PRACTICALS

2HPW- Credits-1

- Determination of blood grouping and RH typing.
- Total count of RBC and WBC.
- Differential count of blood leucocytes.
- WIDAL test for typhoid(slide test)by Ag-Ab reactions
- VDRL test for syphilis (slide test) by Ag-Ab reactions.
- Ouchterlony double diffusion test
- Separation of serum and plasma
- IMViC test - Indole test, Methyl red test, VogesProskauer test, Citrate utilization test.
- Oxidase test.
- Catalase test.
- Antibiotic sensitivity testing — Disc diffusion method

References:1.Gopal Reddy, M., Reddy, M.N., Saigopal, **DVR and** Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, .Himalaya Publishing House, Mumbai.

2.Experiments in Microbiology by K.R. Aneja.



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B.Sc III year: V semester

Code: BS, GE

Title: MICROBIOLOGY AND HUMAN HEALTH

4 HPW-credits-4

UNIT-1: INTRODUCTION

Historic developments of Microbiology, contributions of Van Leeuwenhoek, Edward Jenner, Louis

Pasteur, Robert Koch.

Types of microorganisms. Morphological characteristics of bacteria, Staining, cultivation methods

of bacteria, Culture Media used for the growth of microorganisms.

UNIT-2: MICROORGANISMS: GOOD AND BAD

Microorganisms related to human health. Normal microbial flora, Human microbiome concept. Bacterial disease: Typhoid, Tuberculosis, Syphilis

Viral diseases: Flu, SARS, MERS, SARS-CoV-2,

HIV Insect borne: Malaria and Dengue

UNIT-3: IMMUNITY AND HEALTH

Introduction to immune system; Understanding the terms: Disease, Infection, Pathogenicity.

Prophylaxis, Host resistance, Innate immunity and acquired immunity, Epidemics, Endemics and

Pandemics; Importance of probiotics and vaccines for human health

UNIT-4: WASTE MANAGEMENT AND HEALTH HAZARDS

Health hazards associated with dumpage of Industrial and Biomedical waste.

National and international guidelines for the disposal of waste. Guidelines of Central Pollution Control Board (CPCB). Safe disposal and pretreatment of wastes. Mechanical and chemical treatment of the waste. Autoclaving, incineration.

References:



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1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw-Hill Publisher.
2. Prescott, M.J., Hariy, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, UT., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press. England.
4. Dube, R.C. and 1Vlaheshwari, D.K. General Microbiology S Chand, New De ii.
5. Ananthanarayan and Panikar. Text book of Microbiology. Universities Press



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B.Sc III year: V Semester

Code: BS, DSE-1A

Title: MOLECULAR BIOLOGY & MICROBIAL GENETICS 4HPW-credits-4

UNIT-1: MICROBIAL GENETICS

Fundamentals of Genetics — Mendelian laws, Alleles, Crossing over and Linkage

DNA and RNA as genetic material

Structure of DNA — Watson and Crick model

Extra chromosomal genetic elements — Plasmids and Transposons

Replication of DNA- Semi conservative mechanism

UNIT-2: MUTATIONS AND GENETIC RECOMBINATION

Mutations — Spontaneous and induced, Base pair changes, Frameshift, Deletion, Inversion, Tandem duplication, Insertion

Various physical and chemical mutagens

Outline of DNA damage and repair mechanism

Brief account on gene transfer among bacteria — Transformation, Transduction and

Conjugation

UNIT-3-GENE EXPRESSION

Concept of gene — Muton, Recon and Cistron

One gene — one enzyme , One gene — one Poly peptide , One gene — one product hypothesis

Types of RNA and their functions

Outline of RNA transcription in Prokaryotes

Genetic code, Structure of Ribosomes and brief account on protein synthesis

Type of genes — Structural, Constitutive, Regulatory



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Operon concept.Regulation of gene expression in bacteria — Lac

Operon.

UNIT-4-RECOMBINANT DNA TECHNOLOGY

Basic principles of genetic engineering —Restriction endonucleases,

DNA polymerases and Ligases, vectors

Outline of gene cloning methods.

Genomic and cDNA libraries

General account on application of genetic engineering in industry, agriculture and medicine.

References:

1. Freifelder. D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
2. Crueger, W. and Crueger, A. (2000). Biotechnology: A Text Book of Industrial Microbiology, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
4. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
5. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.
6. Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5th Edition. McGraw Hill, New York.
7. Glazer, A.N. and Nikaido,, H. (1995). Microbial Biotechnology — Fundamentals of Applied Microbiology, W.H. Freeman and company, New York.
8. Old, R.W. and Primrose, S.B. (1994) Principles of Gene Manipulation, Blackwell Science Publication, New York.
9. Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology. Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.



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MOLECULAR BIOLOGY & MICROBIAL GENETICS

PRACTICALS

2HPW- credits-I

- Colorimetric estimation of proteins by Biuret method.
- Colorimetric estimation of DNA by Diphenyl amine method.
- Colorimetric estimation of RNA by Orcinol method
- Extraction of genomic DNA
- Isolation of UV mutants
- Problems related to DNA characteristics
- Problems related to RNA characteristics
- Problems related to Genetic code and translation

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA
5. Mahy, B.W.J. and Kangro, H.O. Virology — Methods Manual Academic Press, USA.
6. Burleson et al Virology — A Laboratory Manual Academic Press, US



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B.Sc III year: 5th semester

Code: BS, DSE-1B

Title: MICROBIAL OMICS

4 HPW-Credits-4

UNIT 1: INTRODUCTION TO OMICS

Introduction to molecular biology. Structure of DNA, RNA. Multi omics approach for analysis of Microbial biology: Genomics, Transcriptomics (RNA-Seq), Proteomics, Metabolomics, Metagenomics and their applications; Basic Concepts in high throughput sequencing or Next-Generation Sequencing methods for use in food-microbiology, diagnostics and Human health.

UNIT 2: PROTEOMICS

Protein structure — Different levels of protein structure, Protein Folding and unfolding. Protein secondary and 3D structure prediction methods. X-ray crystallography, NMR and homology modeling. Protein micro arrays- Protein Markers, Clinical Proteomics, Protein engineering, Proteomic strategies in Cancer, Prions.

UNIT 3: GENOMICS

An introduction of functional genomics; Site-directed mutagenesis, Transposon mutagenesis. DNA microarray, RNA interference, and Chromatin immune precipitation.

Genome annotation, Applications of functional genomics in vaccine and drug designing, Genome editing tools such as CRISPR/Cas9. Databases of Microbial Genomics; Microbial genome projects

UNIT 4: BIOINFORMATICS

Introduction to Bioinformatics and Molecular Databases, Primary Databanks — NCBI, EMBL, DDB,J; Secondary Databases — UNIPROT; Structural Database —PDB; Database similarity search (FASTA, BLAST); Alignment: Pairwise and Multiple sequence alignment; Whole genome sequence; Genome Annotation and Gene Prediction; Primer Designing; Phylogenetic analysis and Tree construction.



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References

1. Principles of Protein structure, Schultz, G. E., and Schirmer, R. H. Dr. ShaktiSahi
2. Proteomics, Daniel C. Leibler
3. Microbial Proteomic, MarjoPoutanen
4. Proteins: Structures and Molecular Principles (2d ed.), TE Creighton
5. Organic spectroscopy, William Kemp
6. Proteome Research: Two-Dimensional Gel Electrophoresis and DetectionMethods (Principles andPractice), T. Rabilloud (Editor), 2000, Springer Verlag
7. Introduction to Protein Architecture: The Structural Biology of Proteins, M.Lesk, 2001, Oxford University Press.
8. Molecular Biotechnology by Bernard R. Glick and Jack J Pasternak
9. DNA Microarrays Ed. M. Schena.

MICROBIAL OMICS

PRACTICALS

2HPW-credits-1

1. Protein isolation from *E. coli*.
2. Sequence analysis of proteins (by BLAST, ClustalW and Phylip).
3. Protein structure prediction by Homology modeling.
4. Isolation of Genomic DNA from *Exoli* and its demonstration by OD and agarose electrophoresis
5. Isolation of plasmid DNA from *Exoli* and its demonstration by OD and agarose electrophoresis
6. DNA molecular size determination
7. Primer designing using online software
8. PCR amplification of genes and detection of amplicon by agarose gel electrophoresis

References:

1. Molecular biotechnology by Chanarayappa
2. Methods in Molecular Cloning by Sambrook.
3. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, 2nd edition. Himalaya Publishing House, Mumbai.



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B.Sc III year:VI Semester

Code: DSE-2A

Title: INDUSTRIAL MICROBIOLOGY

4 HPW-Credits-4

UNIT-1: MICROORGANISMS AND SELECTION

Introduction to Industrial Microbiology, Microorganisms of industrial importance -Yeast, Molds, Bacteria, Actinomycetes. Screening and selection of industrially useful microbes. Steps to maintain seed culture and inoculation strategies for enhanced product yield. Strain improvement strategies. Immobilization methods — adsorption and entrapment.

UNIT-2: FERMENTATION

Design of bioreactor. Physico-chemical standards used in bioreactors. Limitations of bioreactor, Fermentation equipment and its use. Design of fermentor, type of fermenter, agitation, aeration, antifoam, pH and temperature control. Stages of fermentation process. Inoculation media and fermentation media ; Raw materials used in fermentation industry and their processing, Downstream processing.

Unit-3: TYPES OF FERMENTATION

Types of fermentations: Batch, Fed batch, continuous types . Submerged, surface, solid state, dual and multiple fermentations. Advantages and disadvantages of solid substrate and liquid fermentations. Fermentation. Common Microbial fermentation, alcohol and lactic acid fermentation.

UNIT-4: MICROBIAL PRODUCTS

Industrial products derived from microbes: vitamins: B12; Vaccines: recombinant vaccines. production of beverages (beer and wine), biofuels (biogas and methane), enzymes (amylase), antibiotics (penicillin), aminoacids (glutamic acid), organic acid (citric acid).

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology — A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi



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4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology. Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA

INDUSTRIAL MICROBIOLOGY

PRACTICALS

2HPW-Credits-I

1. Screening for amylase producing microorganisms
2. Screening for organic acid producing microorganisms
3. Estimation of Ethanol by potassium dichromate method.
4. Production of citric acid by submerged fermentation
5. Estimation of Citric acid by titrimetry method.
6. Estimation of penicillin.
7. Bacterial slides- Bacillus, Lactobacillus, Yeast, Aspergillus, Pencillium

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology. Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA.



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B.Sc III year: VI Semester

Code: DSE-2B

Title: PHARMACEUTICAL MICROBIOLOGY

4 HPW-Credits-1

Unit-1: INTRODUCTION TO CHEMOTHERAPY

History of chemotherapy — plants and arsenicals as therapeutics, Paul Ehrlich and his contributions, selective toxicity and target sites of drug action in microbes. Development of synthetic drugs — Sulphanamides, antitubercular compounds, nitrofurans, nalidixic acid, metronidazole group of drugs.

Unit-2: ANTIBIOTICS

The origin, development and definition of antibiotics as drugs, types of antibiotics and their classification. Non-medical uses of antibiotics. Principles of chemotherapy — Clinical and lab diagnosis, sensitivity testing, choice of drug, dosage, route of administration, combined/mixed multi drug therapy, control of antibiotic/drug usage.

Unit-3: DRUG RESISTANCE

The phenomenon of drug resistance, clinical basis of drug resistance, biochemistry of drug resistance, genetics of drug resistance in bacteria.

Mode of action of important drugs — Cell wall inhibitors (Betalactam eg. Penicillin), membrane inhibitors (polymyxins), macromolecular synthesis inhibitors (streptomycin), antifungal antibiotics (nystatin)

Unit-4: MICROBIOLOGICAL ASSAYS

Assays for growth promoting substances, nutritional mutants and their importance. Drug sensitivity testing methods and their importance. Assay for antibiotics — Determination of MIC, the liquid tube assay, solid agar tube assay, agar plate assay (disc diffusion, agar well and cylinders cup method).

References:

1. Ananthanarayana, R. and Panicker, C.K.S. (2000). Text Book of Microbiology, 6th Edition, Oriental Longman Publications, USA.
2. Gupte, S. (1995). Short Text Book of Medical Microbiology, 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
3. Biochemistry of antimicrobial action. Franklin, DJ. and Snow, G. Pub: Chapman & Hall. Antibiotics and Chemotherapy. Garrod, L.P., Lambert, HP. And Cady, F. (eds). Publ: Churchill Livingstone.



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4. Antibiotics. Lancini, G. and Parenti, F. publ: Springer-Verlag.

The Molecular Basis of antibiotic action. Ga.e, EF.Et al.Publ: Wiley, New York.

Antimicrobial Drug action. Williams, RAD., Lambart, PA.& Singleton, P. Pub:Bios

Sci. Microbiological Assays.Hewitt.

PHARMACEUTICAL MICROBIOLOGY (CBCS)

PRACTICALS

2 HPW- Credits-I

I. Tests for disinfectants (Phenol coefficient/RWC)

2. Determination of antibacterial spectrum of drugs/antibiotics
3. Chemical assays for antimicrobial drugs
4. Testing for antibiotic/drug sensitivity/resistance
5. Determination of MIC for antimicrobial compounds
6. Microbiological assays for antibiotics (Liquid tube assay, agar tube assay, agar plate assays)

Reference/Recommended Books for MB Pharmaceutical Microbiology

1. Disinfection, sterilization and preservation. Block, S.S. (ed). Lea and Febigor, Baltimore
2. Pharmaceutical Microbiology. Huger, W.B. and Russel, AD.Blackwell Scientific, Oxford
3. Inhibition and destruction of microbial cell by Hugo, WB. (ed). Pub: Academic Press,NY
4. Manual of Clinical Microbiology. Lennette, EH. (ed).Pub: American Society for Microbiology, Washington.
5. Principles and Practices of disinfection. Russell, AP.,Hugo,WB., and Ayliffe, GAJ.(eds). Publ. Blackwell Sci.
6. Biochemistry of antimicrobial action. Franklin,DJ. and Snow, GA.Pub:Chapman& Hall.
7. Antibiotics and Chemotherapy. Garrod, L.P., Lambert, HP. And C'Grady, F. (eds). Publ: Churchill Livingstone.
8. The Molecular Basis of antibiotic action. Ga.e, EF. Et al. Publ: Wiley, New York.
9. Antimicrobial Drug action. Williams, RAD., Lambart, PA. & Singleton, P. Pu :Bios Sci.



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Elective Against Project

B.Sc III year: VI Semester

Code: BS

Title: APPLIED MICROBIOLOGY

3 HPW-Credits-3

UNIT-1: MICROBIAL PRODUCTS FOR SMALL SCALE ENTREPRENEURS

Maintenance of **type strains or** reference strain of microorganisms: culture collection centres (MTCC, ATCC). Patenting process and IPR. Microorganisms in agriculture. Nitrogen fixation and phosphate solubilization. Biofertilizers- Production of azolla, rhizobium and mycorrhizae. Biofungicides- Mass production of Trichoderma and Pseudomonas. Biopesticides- Bacterial, fungal and viral.

UNIT-2: METABOLIC ENGINEERING FOR MICROBIAL PRODUCTS

Production of microbial pigments (prodigiosin, violacein, monascin). Bacterial and algal carotenoids. Microorganisms for flavor and aroma production. Biotransformation and metabolic engineering of microorganisms to produce compounds such as esters, terpenes, aldehydes, lactones, geosmin, vanillin and coumarin.

UNIT-3: MICROBIAL DIAGNOSTICS AND HEALTH

Diagnostic microbiology: collection, transport and culturing of clinical samples. Preparation and use of culture media for detection of microbial pathogens. Examination of sample by staining -Gram stain, Ziehl-Neelsen staining for tuberculosis, Blood smear for malarial parasite. Serological methods for rapid detection of bacterial, fungal and viral pathogens.

Techniques used for the diagnosis of hospital acquired infections and multi drug resistant microorganisms. Monitoring of sanitation in community —Biohazard disposal.



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UNIT- 4: APPLICATION OF GENETIC ENGINEERING AND BIOTECHNOLOGY

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral- mediated delivery, Agrobacterium - mediated delivery

Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH. Bt transgenic - cotton, brinjal, Gene therapy, recombinant vaccine.

References:

- Stanbury, P.F., Whitaker, A. and Hall, Si. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
- Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
- Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA.
- 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 etzner:AF n-(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.



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Project

Code: BS

B.Sc III year: 6th semester

Title: PROJECT

5 HPW-Credits-4

1. Number of students who will be offered project work will vary batch to batch depending upon the infrastructural facilities and may vary each year (Not exceeding 5 students per group).
2. Project work will involve experimental work and the student will have to complete this in stipulated time.
3. The final evaluation of the project work will be through a Panel involving internal and external examiners.
4. Students will be asked their choice for Project work at the beginning of VI semester and all formalities of topic and mentor selection **will** be completed.

Project work will be offered in lieu of expertise and infrastructural facilities of the department and will be evaluated for 4 credits.

5. The distribution of marks for project work will be:

Project work: 100 Marks (50 marks for dissertation + 25 marks for research skills + 25 marks for research work presentation).



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FACULTY OF SCIENCES

B.Sc., I,II,III YEAR, ALL SEMESTERS – (2020-2021)

SUBJECT: MICROBIOLOGY

INTERNAL EXAMINATION MODEL PAPER

Time: 30 Minutes

Max. Marks: 20

-
- | | | | | |
|-------------|---|-----------------|----|-----|
| I. | Multiple choice questions: (5 questions) @ 1mark | 5 Marks | | |
| 1. | () | | | |
| a) | b) | c) | d) | |
| 2. | | | | () |
| a) | b) | c) | d) | |
| 3. | | | | () |
| a) | b) | c) | d) | |
| 4. | | | | () |
| a) | b) | c) | d) | |
| 5. | | | | () |
| a) | b) | c) | d) | |
| II. | Fill in the blanks: (10 questions) @ 1 mark | 10 Marks | | |
| 1. | | | | |
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| III. | Short answer questions: (05 questions) @ 1 mark | 5 Marks | | |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |
| 14. | | | | |
| 15. | | | | |



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B.Sc., I,II,III YEAR, ALL SEMESTERS – (2020-2021)

SUBJECT: MICROBIOLOGY

SEMESTER END THEORY EXAM - MODEL QUESTION PAPER

Max. Time: - 2:30 Hrs

Max. Marks:

70

Note: Draw neat and labelled diagrams wherever necessary.

SECTION – A

Answer all the questions:

5 X 2 =

10

- 1.
- 2.
- 3.
- 4.
- 5.

SECTION – B

Answer any four (4) questions from the following:

4 X 5 =

20

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.

SECTION – C

Answer all the questions.

4 X 10 =

40

12 a)

OR

b)

13 a)

OR

b)

14 a)

OR

b)

15 a)

OR

b)



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B.Sc., I,II,III YEAR, ALL SEMESTERS – (2020-2021)

DEPARTMENT OF MICROBIOLOGY

SUBJECT: MICROBIOLOGY

SCHEME OF EVALUATION – PAPER – I -VII

A. **THEORY:** SEMESTER WISE EXAMS MAX. MARKS: 100

SPLIT:

1. SEMESTER END EXAMINATION : 70
MARKS

2. INTERNAL PERIODICAL EXAMINATION – 1 : -----

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3. INTERNAL PERIODICAL EXAMINATION - 2 : -----

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(Best of the two Internal Exams of 20 Marks each) : 20

MARKS

4. CO-CURRICULAR ACTIVITIES : 10 MARKS

(Assignment – 05 M, Seminar/ Project Work – 05 M)

TOTAL: 100 MARKS

B. **PRACTICALS:** SEMESTER WISE EXAMS MAX. MARKS: 50

C. **PROJECT:** SEMESTER VI END MAX. MARKS: 100

DISSERTATION :50 MARKS, 25 MARKS FOR RESEARCH SKILLS AND 25
MARKS FOR RESEARCH WORK PRESENTATION

&&&&&



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GOVERNMENT DEGREE COLLEGE (A), SIDDIPET

B.Sc., I-III YEAR – SEMESTER – I -VI

SUBJECT: MICROBIOLOGY

PRACTICAL EXAMINATIONS - MODEL QUESTION PAPER

Max. Time: - 2 Hrs

Max. Marks:

50

Answer all the questions

- | | |
|-----------------------------|---------------|
| 1. Major Practical question | 1x20=20 Marks |
| 2. Minor Practical question | 1x10=10 Marks |
| 3. Specimen for spotters | 5x3=15 Marks |
| a) | |
| b) | |
| c) | |
| d) | |
| e) | |
| 4. Record | 5 Marks |



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B.Sc., CBCS (MICROBIOLOGY)

CERTIFICATE COURSE

MICROBIAL INSTRUMENTATION TECHNIQUES

Theory syllabus

HPW:03hours

UNIT – I (15 Hours)

1. Microscopy: Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy. Electron Microscopy (Scanning and Transmission Electron Microscopy).
2. Chromatography: Principles and applications of paper chromatography (including Descending and 2-D), Thin layer chromatography. Column packing and fraction collection.
3. GLC, HPLC.

UNIT – II (15 Hours)

1. Electrophoresis: Principle and applications of native polyacrylamide gel electrophoresis.
2. SDS- polyacrylamide gel electrophoresis, 2D gel electrophoresis, Agarose gel electrophoresis.
3. Spectrophotometry: Principle and use of study of absorption spectra of biomolecules. Analysis of biomolecules using UV and visible range.

Certificate course practical paper

MICROBIAL INSTRUMENTATION TECHNIQUES

Practicals: (10 hours)

1. Paper chromatography- Separation of aminoacids
2. Thin layer chromatography
3. Column chromatography
4. Spectrophotometry- Verification of Beer's Law
5. Spectrophotometry- Verification of Lambert's Law

References:



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1. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, 2nd edition. Himalaya Publishing House, Mumbai.
2. Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
3. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co.,
New Delhi.

CERTIFICATE COURSE

Subject: MICROBIAL INSTRUMENTATION TECHNIQUES

SCHEME OF EVALUATION OF PAPER

1.THEORY:

EXAMS MAX. MARKS: 35

SPLIT:

1.Theory Exam (MCQs) : 30MARKS

2.CO-CURRICULAR ACTIVITIES : 05 MARKS

(Assignment – 05 M)

TOTAL: 35MARKS



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*******END*******



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Certificate Course Microbial Instrumentation Techniques

Student Name:

H.T. NO.:.....course.....

Marks:30

Time: 45min

I. Multiple choice questions

30×1=30marks

1. Which of the following wavelength ranges is associated with UV spectroscopy []
a. 200- 400nm b. 200 – 800 nm c. 400 – 800 nm d. None of the above
2. The light with Single wavelengths is called as []
a. Mono chromatic light b. Polychromatic light c. dichromatic light d. trichromatic light
3. The sample in UV spectroscopy interacted with []
a. Infra Red light b. Microwave light c. Ultra violet light d. X- ray light
4. UV- VIS spectroscopy is an []
a. Absorption spectra b. Adsorption spectra c. Emission spectra d. Atomic spectra
5. UV-VIS spectroscopy works based on _____ law []
a. Beer-Lambert b. Beer's law c. Lambert's law d. None
6. Any atom or group which is responsible for the absorption of light is called as []
a. Auxochrome b. Chromophore c. Both d. chromatography
7. Shift of absorption towards greater wavelength []
a. Bathochromic shift b. Hipsochromic shift c. hyperchromic shift d. Hyperchromic shift
8. Which of the following is the strength of UV-VIS spectroscopy []
a. Inexpensive technique b. Non-destructive c. Easy to use d. All



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9. Which one among the following is not an application of UV-VIS spectroscopy []
a. DNA analysis b. Concentration c. Protein unfolding d. None of these
10. UV- spectrum contains _____ & _____ values []
a. Wave length & Absorbance b. Wave length & Transmittance
c. Wave length & Frequency d. Wave length & Adsorbance
11. In electron microscope source of electrons is from []
a. Mercury lamp c. Both a and b
b. Tungsten metal d. None of these
12. Source of light in fluorescence microscopy is from []
a. Mercury lamp c. Both a and b
b. Sunlight d. None of these
13. What is lens used to observe the image []
a. objective lens b. ocular lens
c. condenser lens d. all
14. Living cells can be observed by []
a. light microscope b. bright field microscope
c. electron microscope d. none
15. fluorescence microscope uses stains[]
a. crystal violet b. flurochromes
c. metal ions d. all
16. Separation of molecules based on charge in electricfield is []
a. Chromatography b. electrophoresis
c. HPLC d. all
17. Solvent used in chromatography is called []
a. stationary phase b. mobile phase
c. a & b d. none
18. Separation of DNA is done by []



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- a. PAGE b. HPLC
- c. GLC d. all
19. TLC means []
- a. gas chromatography b. column chromatography
- c. thin layer chromatography d. none
20. mobile phase in HPLC is []
- a. gas b. liquid
- c. solid d.all
21. Which is more effective paper chromatography? []
- a) Ascending. b) Descending. c) Circular. d) Two dimensional
- 22.. Which paper used in paper chromatography? []
- a) Tissue paper. b) Normal paper. c)Whatman paper d) Above all
- 23..In HPLC which is used as mobile phase? []
- a)Gas. b) Liquid. c)Solid d) Above all
- 24.In Gas Chromatography which gas is used for Create inert atmosphere? []
- a)O₂ b) N₂. c)H₂. d) Cl₂
25. How to check purity of the components ? []
- a)KD b) E% c) Rf d) none
26. Which Chromatography is more useful for the identification of purity of the components?
- []
- a)TLC. b) HPLC c) Gas d) paper
- 27.n-hexane act as []
- a) Stationary phase. b) Mobile phase c)Both d) none
28. wet package method used in which Chromatography? []
- a) paper. b)TLC. c) Column d)HPLC
29. Which is used as stationary phase in Column chromatography? []
- a) Alumina. b)Silica gel C)Starch d) Above all
30. Chromatography is... []
- a) Chemical method. b) Qualitative analysis. c) Physical method d) Chemical and physical method



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SEMESTER- III & IV (w.e.f. 2020-2021)

Skill Enhancement Course

Internal Examination – Model Question Paper

Name of the Student:

Class :

Name of the SEC :

H.T.No:

Sign.of the Invigilator:

Time: 30Min.

Max.Marks:10

I. Choose the correct answer

5×1=5Marks

1.Mushrooms are belongs to

[]

- a) Ascomycotina b)Basidiomycotina c)Zygomycotina d)a and b

2.Most popular edible mushrooms

[]

- a)A.bispours b)A.compestris c)A.arvensis d)all are above

3.The seed material of mushroom fungi is called

[]

- a)Spawn b)Casing c)Crop d)All are above

4.Which is the richest vitamin in Mushrooms

[]

- a) D b) E c) C d) K

5. Milky white mushroom

[]

- a)Morchella esculenta b)Pleurotus velutips c)Calocybe indica d)None of these

II. Fill in the Blanks

5×1=5Marks

6.Mushroom means.....

7. Mushrooms are harvested when they are in.....



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8. An example of poisonous mushroom.....

9. Oyster mushrooms are

10. Puff balls are belonging to.....



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Proposed New Grading System

SGPA (SEMESTER GRADE POINT AVERAGE)			
S. No.	Grade Point	Range of marks	Grade Letter
1	10	Equal to and above 90 Marks	A+
2	9	More than or equal to 80 and less than 90 Marks	A
3	8	More than or equal to 70 and less than 80 Marks	B+
4	7	More than or equal to 60 and less than 70 Marks	B
5	6	More than or equal to 55 and less than 60 Marks	C+
6	5	More than or equal to 50 and less than 55 Marks	C
7	4	More than or equal to 40 and less than 50 Marks	D
8	0	Below 40 Marks	F



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B.Sc III year: V semester

Code: BS, GE

GE-1B: INTRODUCTION AND SCOPE OF MICROBIOLOGY (THEORY)

CREDITS: 4

Unit 1 History of Development of Microbiology

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman. Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit 2 Diversity of Microorganisms

Systems of classification : Binomial nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Prokarya: Archaea and Bacteria, Eukarya)

Unit 3 Microscopy

Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

Unit 4 Microbes in Human Health & Environment

Medical microbiology and immunology: List of important human diseases and their causative agents of various human systems. Definitions of immunity (active/passive), primary and secondary immune response, antigen, antibody and their types.

Environmental microbiology: Definitions and examples of important microbial interactions – mutualism, commensalism, parasitism, Definitions and microorganisms used as biopesticides, biofertilizers, biodegradation, bioremediation (e.g. hydrocarbons in oil spills)

SUGGESTED READING

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition.



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Pearson Education Limited

4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition.

McGraw Hill International.

5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers.

6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.

7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.



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SKILL ENHANCEMENT COURSE-II (SEC-2)

B.Sc. II year: III Semester

Code: BS, SEC-2

SEC-2: Microbial Quality Control in Food and Pharmaceutical Industries

CREDITS: 2

Unit 1 Microbiological Laboratory and Safe Practices

Good laboratory practices - Good laboratory practices, Good microbiological practices
Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3. Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

Unit 2 Determining Microbes in Food / Pharmaceutical Samples

Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products
Molecular methods - Nucleic acid probes, PCR based detection, biosensors.

SUGGESTED READING

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press
2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
4. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc



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SKILL ENHANCEMENT COURSE-IV (SEC-4)

B.Sc. II year: IV Semester

Code: BS, SEC-4

SEC-4: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

SEMESTER – IV

CREDITS: 2

Unit 1 Importance of Diagnosis of Diseases and Collection of Clinical Samples.

Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.

Unit 2 Direct Microscopic Examination and Culture and Serological

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria

Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

Serological Methods - Agglutination, ELISA, immunofluorescence.

SUGGESTED READING

1. Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
2. 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
3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd
4. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby
5. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.



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3.	Dr. E. SUJATHA Department of Microbiology Kakatiya University, Warangal.	Subject Expert	
4.	Dr. G. RENUKA HOD, Assistant Prof. of Microbiology SRR College, Karimnagar.	Subject Expert	
5.	Prof. S. JEEVAN CHANDRA Department of Microbiology Chaitanya Deemed to be University Warangal.	Member	
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