

GOVERNMENT COLLEGE FOR WOMEN (A) SRIKAKULAM

Accredited with NAAC 'A' GRADE



DEPARTMENT OF MICROBIOLOGY

BOARD OF STUDIES MEETING

2023(Modified Final year courses for 2021-24 batch)

CURRICULUM DESIGN

**(SYLLABUS, MODEL PAPER, BLUE PRINT, SKILL COMPONENTS, OUTCOMES,
VALUE ADDED COURSE)**

GOVERNMENT DEGREE COLLEGE FOR WOMEN(AUTONOMOUS)**SRIKAKULAM****B.Sc. MICROBIOLOGY (CBCS)****W.E.F 2021-24 BATCH**

Semester	Course	Title	Hours	IA	EA	Credits
I	1(T)	Introductory Microbiology and Microbial Techniques	4/week	25	75	4
	1(P)	Introductory Microbiology and Microbial Techniques	3	0	100	1
II	2(T)	Microbial Biochemistry, metabolism & analytical techniques	4	25	75	4
	2(P)	Microbial Biochemistry, metabolism & analytical techniques	3	0	100	1
	INT-1	1 st Internship - Community Service Project (CSP)	100	50	50	4
III	3(T)	Microbial Genetics and Recombinant DNA Technology	4	25	75	4
	3(P)	Microbial Genetics and Recombinant DNA Technology	3	0	100	1
IV	4(T)	Immunology & Medical Microbiology	4	25	75	4
	4(P)	Immunology & Medical Microbiology	3	0	100	1
	5(T)	Agricultural and Environmental Microbiology	4	25	75	4
	5(P)	Agricultural and Environmental Microbiology	3	0	100	1
	INT-2	2 nd Internship – Industry training	100	50	50	4
V/VI SEC Set-A	6A(T)	Industrial Microbiology	4	25	75	4
	6A(P)	Industrial Microbiology	3	0	100	1
	7A(T)	Food Microbiology	4	25	75	4
	7A(P)	Food Microbiology	3	0	100	1
		(OR)				
V/VI SEC Set-B	6B(T)	Microbial quality control and techniques	4	25	75	4
	6B(P)	Microbial quality control and techniques	3	0	100	1
	7B(T)	Drug design, discovery and Intellectual Property Rights	4	25	75	4
	7B(P)	Drug design, discovery and Intellectual Property Rights	3	0	100	1
V/VI	INT-3	3 rd Internship – On Job Training (OJT)	200	0	300	12

GOVERNMENT DEGREE COLLEGE FOR WOMEN(AUTONOMOUS)
SRIKAKULAM
B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR
SEMESTER – V (for 2021-24 BATCH)
COURSE 6A – INDUSTRIAL MICROBIOLOGY

No. of Hours: 60

Credits:4

Course Outcomes: At the end of the course the students are able to

- CO 1: Identify and describe the different types of microorganisms used in industrial microbiological processes.
- CO 2: Compare and contrast the different types of fermentation processes (solid state, liquid-state, batch, fed-batch, and continuous).
- CO 3: discuss the microbial production of industrial products such as alcohols, beverages, vitamins, and biofuels & their downstream processing techniques.
- CO 4: Learn the microbial production of lactic acid, vinegar, amino acids, baker's yeast, penicillin, citric acid, and enzymes .
- CO 5: Perform a microbiological assay of antibiotics.
- CO 6: emphasize the analytical, therapeutic, and industrial applications of immobilized enzymes.
- CO 7: Explore the use of microbial enzymes in the textile, leather, wood, detergent industries, in clinical diagnostics and therapeutic agents.

UNIT 1

12 hours

Microorganisms used in industrial microbiological processes;
Screening methods – Primary screening methods (Crowded plate technique, auxanography, enrichment culture techniques, use of indicator dye) and outlines of Secondary screening methods (outlines). Starin improvement. Raw materials used in production media - molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates.
Antifoaming agents.

UNIT 2

12 hours

Design of a stirred tank reactor fermenter.
Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (e.g. baker's yeast) and continuous fermentations.
Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration.

UNIT 3

12 hours

Down-stream processing; Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray drying. Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses)- of alcohols (ethyl alcohol), beverages (beer), vitamins (B12), biofuels (biogas - methane).

UNIT 4**12 hours**

Industrial uses of bacteria – Lactic acid, vinegar and amino acid production
(L-lysine & glutamic acid)

Industrial uses of yeasts – baker's yeast

Industrial uses of molds – Penicillin, citric acid and enzymes production

Microbiological assay of antibiotics – (agar diffusion, serial dilution and photometric assay).

UNIT 5**12 hours**

Immobilization of microbial enzymes - Methods - adsorption, covalent bonding, entrapment & membrane confinement. Analytical, therapeutic & industrial applications of immobilized enzymes. Applications of microbial enzymes in textile, leather, wood industries and detergents. Enzymes in clinical diagnostics. Enzymes as therapeutic agents.

PRACTICAL-6A**CREDITS-1****INDUSTRIAL MICROBIOLOGY**

1. Production of Ethanol by fermentation and recovery.
2. Estimation of Ethanol by dichromate method.
3. Production and characterization of citric acid using *A.niger*.
4. Preparation of Wine from grapes by fermentation.
5. Study different parts of fermenter

SUGGESTED READINGS:

1. Madigan, M.T., Martinko, J. M. and Parker, J. Brock Biology of Microorganisms. Pearson Education Inc. , New York
2. Alexander, M John. Microbial ecology. Wiley & Sons, Inc., New York.
3. Alexander, M John. Introduction to soil microbiology. Wiley & Sons Inc., New York. 4. Barker, KH, and Herson, D.S. Bioremediation. Mc Craw Hill Inc., New York.
5. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.
6. Willey, Sherwood, Woolverton. Prescott, Harley, and Klein's Microbiology McGraw-Hill publication.
7. Tortora, Funke, Case. Microbiology. Pearson Benjamin Cummings.
8. JACQUELYN G. BLACK. Microbiology Principles and explorations. JOHN WILEY & SONS, INC.
9. Madigan Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson 10. Tom Besty,D.C Jim Koegh. Microbiology Demystified McGRAW-HILL.

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B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR
SEMESTER – V (for 2021-24 BATCH)
COURSE 6A – INDUSTRIAL MICROBIOLOGY
MODEL PAPER

TOTAL MARKS:75

TIME:3 HRS

SECTION –A

Answer ALL questions (Draw the diagrams wherever necessary) (10 x 5 = 50 M)

1. Explain the primary screening methods for isolating industrially important microorganisms.

or

Write about the raw materials used in production media.

2. Explain the design of stirred tank fermenter.

or

Discuss the fermentation parameters and their control.

3. Discuss the industrial production of ethyl alcohol.

Or

Explain the methods of downstream processing.

4. Discuss the industrial uses of bacteria.

or

Write about the microbiological assay of antibiotics.

5. Discuss the analytical, therapeutic and industrial applications of immobilized enzymes.

or

Write about the uses of microbial enzymes in various fields.

SECTION –B

Answer any FIVE questions (Draw the diagrams wherever necessary) 5 x 5 = 25 M

- 6. Strain improvement
- 7. Aerobic and anaerobic fermentations
- 8. Industrial Production of beer
- 9. Industrial production of lactic acid
- 10. Semi-synthetic penicillins
- 11. Baker's yeast
- 12. Entrapment of immobilized enzymes
- 13. Enzymes as therapeutic agents.
- 14. Antifoaming agents
- 15. Enrichment media

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SEMESTER – V (for 2021-24 BATCH)
COURSE 6A – INDUSTRIAL MICROBIOLOGY

TOTAL MARKS: 75

TIME: 3HRS

BLUE PRINT FOR QUESTION PAPER SETTER

Units	10 M Questions	5 M Questions	Marks allotted to the Unit
Unit 1	2	2	30
Unit 2	2	2	30
Unit 3	2	2	30
Unit 4	2	2	30
Unit 5	2	2	30
Total No. of Questions	10	10	150

Note:

1. The question paper setter are requested to kindly adhere to the format given in the above table.
2. The question paper setter are also requested to set the questions in the following way:
 - a. 70 % of questions – Remembering and Understanding type questions
 - b. 30 % of questions – Applying, Evaluating, Analyzing and Creating type questions

GOVERNMENT DEGREE COLLEGE FOR WOMEN(AUTONOMOUS)

SRIKAKULAM

B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR

SEMESTER – V (for 2021-24 BATCH)

COURSE 7A – FOOD MICROBIOLOGY

No. of Hours: 60

Credits:4

Course Outcomes: At the end of the course the students will be able to

CO 1: Understand the different types of microbial spoilage of foods and the food materials that are most susceptible to each type of spoilage.

CO 2: Develop awareness on food intoxication and food poisoning.

CO 3: Classify foods based on their shelf life and identify the most appropriate food preservation methods for each food category.

CO 4: Learn the preparation methods of fermented foods such as cheese, sausage, pickles, soy products, sauerkraut, bread, idli, and yogurt.

CO 5: develop knowledge on the concept of probiotics.

CO 6: identify the sources and types of microorganisms that contaminate milk.

CO 7: Perform the microbiological examination methods used to assess the quality of milk.

CO 8: Understand the standards of foods, HACCP and rapid detection methods.

UNIT 1

12 hours

Microbial spoilage of foods – putrefaction, fermentation and rancidity

Spoilage of different food materials - fruits, vegetables, meat, fish and Canned foods.

Spoilage of milk. Food intoxication – botulism and staphylococcal food poisoning

Food-borne diseases – Study of agent, symptoms and treatment of Salmonellosis and Shigellosis

UNIT 2

12 hours

Types of foods based on Shelf life – perishable, semi-perishable and non-perishable foods

Food preservation – Physical methods of food preservation - Aseptic handling, refrigeration and freezing, dehydration, osmotic pressure

Chemicals – organic acids, nitrates, nitrites and cresols; Radiation – UV light, γ -irradiation.

Food packaging - Food containers, bags, pouches, wrappers, cartons and Tetra packs.

UNIT 3

12 hours

Preparation of fermented foods – Cheese; Fermented meat product – Sausage; Fermented vegetable products – Pickles, soy product, Sauerkraut; Bread and Idli; Preparation of yoghurt.

Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw).

Concept of probiotics.

UNIT 4

12 hours

Sources of microorganisms in milk. Microorganisms contaminating milk. Biochemical activities of microbes in milk. Microbiological examination of milk. (Test for acidity, standard plate count, reduction test, Phosphatase test and turbidity test). Pasteurization of milk (Low temperature method, flash method and UHT milk).

UNIT 5**12 hours**

Food sanitation and control; HACCP, Indices of food sanitary quality and sanitizers. Cultural and rapid detection methods of food borne pathogens in foods. Genetically modified foods, Nutraceuticals, Biosensors in food, Applications of microbial enzymes in dairy industry [Protease, Lipases]. Fortified milk.

PRACTICAL – 7A**CREDIT-1****FOOD MICROBIOLOGY**

1. Determination of microbiological quality of milk – MBRT
2. Isolation of fungi and bacteria from spoiled fruits and vegetables.
3. Determination of acidity in curd.
4. Alkaline phosphatase test to check the efficiency of pasteurization of milk.

SUGGESTED READINGS:

1. Stanbury, PF., Principles of Fermentation Technology. Whittaker, A and Hall, S.J 2nd Edition. Pergamon Press (1995).
2. Banwart, GJ. Basic Food Microbiology. CBS Publishers and Distributors, Delhi. (1989).
3. Hobbs BC and Roberts D. Food poisoning and Food Hygiene. Edward Arnold (A division of Hodder and Stoughton) London.
4. Joshi. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2.
5. John Garbult. Essentials of Food Microbiology. Arnold International.
6. John C. Ayres. J. Orwin Mundt. William E. Sandinee. Microbiology of Foods. W.H. Freeman and Co.
7. D. J. Bagyaraj and G. Rangaswami. AGRICULTURAL MICROBIOLOGY. Prentice Hall of India Pvt Ltd.2005
8. N S Subba Rao. Soil Microbiology. Oxford and IBH publishing Company 2009
9. Photis Papademas. Dairy Microbiology: A Practical Approach. CRC Press
10. Rao M.K..Food and Dairy Microbiology. Manglam Publishers
11. William Frazier. Food Microbiology. McGraw Hill Education
12. Jay, James M., Loessner, Martin J., Golden, David A. Modern Food Microbiology. Springer .

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COURSE 7A – FOOD MICROBIOLOGY
MODEL PAPER

TOTAL MARKS:75

TIME:3 HRS

SECTION –A

Answer ALL questions (Draw the diagrams wherever necessary) (10 x 5 = 50 M)

1. Discuss the spoilage of various food materials.
or
Explain the food borne diseases with reference to Salmonellosis and Shigellosis.
2. Write about the physical methods of food preservation.
or
Discuss the food packaging methods.
3. Explain the process of preparation of yoghurt.
OR
Discuss various the role of microbes in fermented foods.
4. Explain the microbiological examination of milk.
OR
Discuss the methods of pasteurization.
5. Write about the food sanitation and control methods.
OR
Discuss the applications of microbial enzymes in dairy industry.

SECTION –B

Answer any FIVE questions (Draw the diagrams wherever necessary) 5 x 5 = 25 M

6. Food intoxication
7. Microbial spoilage of foods
- 8.Types of foods
9. Radiation methods of food preservation
10. Preparation of cheese
11. Edible mushrooms
- 12.Biochemical activities of milk
- 13.Microorganisms contaminating milk.
14. Nutraceuticals
15. Genetically modified foods

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COURSE 7A – FOOD MICROBIOLOGY

TOTAL MARKS: 75

TIME: 3HRS

BLUE PRINT FOR QUESTION PAPER SETTER

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Unit 4	2	2	30
Unit 5	2	2	30
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B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR
SEMESTER – V (for 2021-24 BATCH)
COURSE-6B: MICROBIAL QUALITY CONTROL AND TECHNIQUES

TOTAL HOURS: 60

CREDITS: 4

Course outcomes: Upon completion of the course, the student will be able to achieve the following outcomes:

- CO1 - Understand good laboratory practice and quality control.
- CO2 - Isolate bacteria from food such as fruits/vegetables and pharmaceutical sources such as tablets.
- CO3 - Study various equipment and their operation.
- CO4 - Prepare culture media that are important for Quality Assurance and quality control.
- CO5 - Know about isolation, enumeration, identification of bacteria and fungi.
- CO6 - Isolate fungi and identify using lactophenol staining.
- CO7 - Study the principles and applications of microscopy and labelling.
- CO8 - Separate cell components using centrifugation technique.
- CO9 - Able to learn the type of chromatography & electrophoresis techniques.
- CO10 - Perform radial immunodiffusion and Immuno electrophoresis

UNIT – I

No. of hours: 12

MICROBIAL QUALITY CONTROL: Microbial quality control definition, history and introduction. Standard Methods involved in assessment of microbial quality control. Q.A and Q.C definitions and importance. Traditional Microbiological Quality Controlling methods: Sampling methods, TVC, APC and serial dilution techniques. Microbiological criteria. Laboratory facility design for quality control: Sterilization, disinfection and decontamination. Personnel training: Hygiene and handling techniques. Documentation. Good laboratory practices (GLP).

UNIT – II

No. of hours: 12

GOOD LABORATORY PRACTICES: Culture media used in QC and QA: Design of specialized media for identification of pathogens. Good laboratory practices in culture media preparation: raw material, water, pH. Uses of media – Selective and indicator media used in pharmaceutical and food industries. Instruments associated in QC and QA: Principle involved, working conditions, uses and precautions of Laminar Air Flow (LAF), Autoclave, Incubator, pH meter, Colony counter, Hot air oven, Centrifuges and storage devices.

UNIT – III

No. of hours: 12

MICROBIAL TECHNIQUES: Techniques for enumeration of microorganisms: sample preparation from Aqueous, soluble, insoluble, medical and pasteurized materials. Counting methods: pour plate, spread plate, membrane filtration. Most Probable Number (MPN) and MIC. Turbidimetric methods. Staining techniques for identification bacteria and Fungi.

UNIT – IV

No. of hours: 12

Microscopy – Principles of light, phase, fluorescent & electron microscopes; Microscopic techniques: Basic principles and applications of phase – contrast microscopy, fluorescent microscopy and electron microscopy, types of electron microscopy– scanning and transmission. Radio isotopes: radiometric analysis, stable and radioactive isotopes, preparation, labeling, detection and measurement of isotope.

UNIT – V

No. of hours:7

Principles of Centrifugation – Centrifugation techniques – preparative and analytical methods, density gradient centrifugation. General principles and applications of chromatography – Paper, Column, Thin layer, Gas, Ion exchange, Affinity chromatography, HPLC, FPLC, GCMS and Gel filtration. Electrophoresis – moving boundary, zone (Paper Gel) electrophoresis. Immunoelectrophoresis. Immunoblotting. Isoelectric focusing, 2-Delectrophoresis, Principles of colorimetry

Practical – 6B: MICROBIAL QUALITY CONTROL AND TECHNIQUES **CREDIT-1**

1. Isolation and enumeration of bacteria from one food / one pharmaceutical source.
2. Quality Assurance of water by MPN method.
3. Preparation of culture media important for Q.A and Q.C - McConkey Agar, Mannitol Salt Agar and EMB Agar.
4. Microbial quality of in and around laboratory conditions.
5. Isolation and Identification of fungi by using PDA and lactophenol staining.
6. Identification of MIC of any one antibiotic by broth dilution method.
7. Colorimetric estimation of DNA.
8. Microscopic observations of bacteria and fungi.
9. Separation of cell components by centrifugation technique with reference to a plant leaf.
10. Demonstration of radial Immunoelectrophoresis.

Suggested readings:

1. **Hand book of Microbial Quality control** by Rosamund. M, Baird Norman. A, Hodges and Stephen. P, Denyer. CRC press.
2. **The Microbiological Quality of Food**, 1st Edition, **Editors:** Antonio Bevilacqua Maria Rosaria Corbo Milena Sinigaglia **eBook ISBN:** 9780081005033 **Imprint:** Wood head Publishing.
3. **Guide to Microbiological Control in Pharmaceuticals and Medical Devices**, Second Edition, Stephen P. Denyer, Rosamund M. Baird, CRC Press.
4. WILSON & WALKER, **Practical Biochemistry: Principles and techniques**, Academic publishers.
5. UPADHYAY, UPADHYAY & NATH, **Biophysical Chemistry: Principles and techniques**, Himalaya Publishers.

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B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR
SEMESTER – V (for 2021-24 BATCH)
COURSE-6B: MICROBIAL QUALITY CONTROL AND TECHNIQUES

Model Paper

Max Marks: 75M

Time: 3 hours

PART – A

Answer **ALL** the questions. Each question carries 8 Marks: (10 x 5 = 50 Marks)

- 1 a). Discuss about the methods of traditional quality control methods.
(OR)
- 1 b) Explain the criteria for laboratory design for quality control.
- 2 a) Elaborate on good laboratory practices in Media preparation.
(OR)
- 2 b) Different types of media used in pharmaceutical and food industries.
- 3 a) Discuss the techniques for enumeration of microorganisms.
(OR)
- 3 b) Describe about the staining techniques for identification of bacteria.
- 4 a) Elaborate on the principle, instrumentation and uses of Scanning electron microscope.
(OR)
- 4 b) Explain the role and applications of radioisotopes in industry.
- 5 a) Write about the principle, types and applications of centrifugation techniques.
(OR)
- 5 b) Discuss the principle, instrumentation and working of HPLC.

PART – B

Answer any **FIVE** questions. Each question carries 4 Marks: (5 x 5 = 25 Marks)

6. Documentation in industry
7. Serial dilution
8. Laminar air flow
9. Hot air oven
10. Membrane filtration
11. Fluorescent microscope
12. Gas chromatography
13. Immunoblotting
14. MPN
15. Thin Layer Chromatography

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SEMESTER – V (for 2021-24 BATCH)
COURSE-6B: MICROBIAL QUALITY CONTROL AND TECHNIQUES

TOTAL MARKS: 75

TIME: 3HRS

BLUE PRINT FOR QUESTION PAPER SETTER

Units	10 M Questions	5 M Questions	Marks allotted to the Unit
Unit 1	2	2	30
Unit 2	2	2	30
Unit 3	2	2	30
Unit 4	2	2	30
Unit 5	2	2	30
Total No. of Questions	10	10	150

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SRIKAKULAM

B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR

SEMESTER – V (for 2021-24 BATCH)

COURSE-7B: DRUG DESIGN, DISCOVERY AND INTELLECTUAL PROPERTY

RIGHTS

TOTAL HOURS: 60

CREDITS: 4

Course outcomes: Upon completion of the course, the student will be able to achieve the following outcomes:

- CO1 - Acquire knowledge on drug and types of drugs.
- CO2- Isolate antibiotic producing bacteria from soil.
- CO3 - Study the drug discovery at molecular level and manufacturing of drugs
- CO4 - Identify fungi producing antibiotic and the antagonistic activity.
- CO5 - Understand vaccines and gene therapy.
- CO6 - Determine Minimum Inhibitory Concentration of antibiotics.
- CO7 - Aware of Intellectual Property Rights and their applications
- CO8 - Understand the Biosafety Lab and its standards.
- CO9 - Able to explain biosafety management.
- CO10 - Learn about patents and process to acquire a patent.

Unit – I

No. of Hours: 12

Introduction- History of drug design, Current approaches and philosophies in drug design, Molecular mechanisms of diseases and drug action with examples. Pharmaceutical products of microbial origin (antibiotics) animal origin (sex hormones), plant origin (Alkaloids & Morphine). Sources of Drugs- Microbial drugs, Plants as a source of drugs, *E. coli* as a source of recombinant therapeutic proteins.

Unit – II

No. of Hours: 12

Expression of recombinant proteins in yeasts, animal cell culture systems. Rational drug design and Combinatorial approaches to drug discovery. Drug development process- Impact of genomics and related technologies upon drug discovery: Gene chips, Proteomics, Structural genomics and Pharmacogenetics. Drug manufacturing process- Guides to good manufacturing practice.

Unit – III

No. of Hours: 12

Vaccines and adjuvant- Traditional vaccine preparations, Attenuated and inactivated viral and bacterial vaccines, Toxoids. Peptide vaccines. Adjuvant technology. Nucleic acid as drugs- Gene therapy: Basic approach to gene therapy, Vectors used in gene therapy - Manufacture of viral vectors, Non-viral vectors. Gene therapy and genetic disease, cancer, Gene therapy and AIDS. Gene based vaccines.

Unit – IV

No. of Hours: 12

INTELLECTUAL PROPERTY RIGHTS: Introduction: general introduction to IPR (parent, plant breeder's right). Trademarks, industrial design, trade secrets (or) undisclosed information integrated circuit designs.

Patenting principle, international – standards and patent validity (neem and relaxins), recent developments in patent system and patentability of biotechnology, invention IPR issues of the Indian context. Copy right and rights related to copy right, international standards as per WHO, ISI, biosafety and validation.

Unit – V

No. of Hours: 12

Biotechnology and hunger: challenges for the Indian biotechnological research and industries. Bio safety: the Cartagena protocol on bio safety.

Bio safety management: key to the environmentally responsible use of biotechnology, ethical implications of biotechnology product techniques, social and ethical implications of biological weapons.

Practical-7B: DRUG DESIGN, DISCOVERY AND INTELLECTUAL PROPERTY RIGHTS

CREDITS: 1

1. Isolation of antibiotic producing bacteria from soil samples.
2. Identification of antibacterial activity of fungi.
3. Identification of antagonistic activity of any two fungal species.
4. Assay of any one antibiotic (Penicillin).
5. Determination of MIC of any one antibiotic (penicillin / streptomycin).
6. Study of components and design of a BSL – III laboratory
7. Filing applications for approval from bio safety committee
8. Filing primary applications for patents
9. Study of steps of patenting process
10. A case study of patent.
11. Study of bio safety measures in pharmaceutical industry.
12. Study on QA & QC parameters followed in R&D laboratory.

SUGGESTED READINGS:

1. W.B. Hugo & A.D.Russell, **Pharmaceutical Microbiology** edited, 6th Edition, Black Well science.
2. Shanson D.C., **Microbiology in clinical practice**, 2nd edition, London; Wright.
3. T Sammes Ellis Horwood, opicsin **Antibiotic chemistry** Vol I to V.
4. Wulf Crueger, Biotechnology – **A text book of Industrial Microbiology**, 2nd Edition, Panima publishers
5. A.H. Patel, 1984, **Industrial Microbiology**, Macmilan India Limited.
6. Coulson C.J., London; Taylor and Francis, **Molecular mechanisms of drug action**.
7. Denyes S.P.& Baird R.M. Chichester, Ellis Horwood, **Guide to microbiological Control in Pharmaceuticals**.
8. Murray S.Cooper, **Quality control in the Pharmaceutical Industry** - Edt., Vol-II, Academic press, New York.
9. Sydney H.Willin, Murray M.Tuckerman, William S. Hitchings IV, **Good Manufacturing practices of pharmaceuticals**, second Edt., Mercel Dekker NC New York.
10. Rajesh Bhatia, Rattanlal Ihhpunjani, Quality assurance in Microbiology, CBS Publisher & Distributors, New Delhi.

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SRIKAKULAM

B.Sc. MICROBIOLOGY (CBCS) FINAL YEAR

SEMESTER – V (for 2021-24 BATCH)

COURSE-7B: DRUG DESIGN, DISCOVERY AND INTELLECTUAL PROPERTY

RIGHTS

Model Paper

Max Marks: 75

Time: 3 hours

SECTION –A

Answer ALL questions (Draw the diagrams wherever necessary) (10 x 5 = 50 M)

1. a) Write about the Pharmaceutical products of Alkaloids in plant origin.
(Or)
1. b) Write about the *E. coli* as a source of recombinant therapeutic proteins.
2. a) Explain the Expression of recombinant proteins in animal cell culture systems.
(Or)
2. b) Write about the Structural genomics and Pharmacogenetics.
3. a) Write about the Attenuated and inactivated viral vaccines.
(Or)
3. b) Explain about the various Vectors used in gene therapy.
4. a) Explain the recent developments in patent system and patentability of biotechnology.
(Or)
4. b) Briefly Write on International standards as per WHO.
5. a) Describe the challenges for the Indian biotechnological research and industries.
(Or)
5. b) Write about the social and ethical implications of biological weapons.

SECTION –B

Answer any FIVE questions (Draw the diagrams wherever necessary) 5 x 5 = 25 M

6. Microbial origin
7. Plants as a source of drugs
8. Rational drug design
9. Gene chips
10. Toxoids
11. Gene based vaccines
12. IPR
13. Bio safety
14. Rights related to copyright
15. Biological weapons

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SEMESTER – V (for 2021-24 BATCH)
COURSE-7B: DRUG DESIGN, DISCOVERY AND INTELLECTUAL PROPERTY
RIGHTS

TOTAL MARKS: 75

TIME: 3HRS

BLUE PRINT FOR QUESTION PAPER SETTER

Units	10 M Questions	5 M Questions	Marks allotted to the Unit
Unit 1	2	2	30
Unit 2	2	2	30
Unit 3	2	2	30
Unit 4	2	2	30
Unit 5	2	2	30
Total No. of Questions	10	10	150

Note:

1. The question paper setter are requested to kindly adhere to the format given in the above table.
2. The question paper setter are also requested to set the questions in the following way:
 - a. 70 % of questions – Remembering and Understanding type questions
 - b. 30 % of questions – Applying, Evaluating, Analyzing and Creating type questions

MICROBIOLOGY LIST OF EXAMINERS

S.NO.	Name of the Examiner	College	Contact Number
1.	Dr.Ch.Shanthi Devi	Dr.V.S.Krishna Govt Degree College(A), Visakhapatnam	9052177822
2.	Dr.K.Prakash Narayana Reddy	Dr.V.S.Krishna Govt Degree College(A), Visakhapatnam	9482357349
3.	Dr.K.Aruna	SRR CVR Degree College(A), Vijayawada	9490040657
4.	A.Jyothi	Visakha Govt Degree College for Women Visakhapatnam	8179393442
5.	Dr.T.Varalakshmi	Visakha Govt Degree College for Women Visakhapatnam	8639452669
6.	D.Jayashree	ASD Government Degree College for Women(A), Kakinada	8121000338
7.	P.Aruna	Government College for Women(A), Guntur	9298558440

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)
SRIKAKULAM
DEPARTMENT OF MICROBIOLOGY
(W.E.F. 2023-24)
VALUE ADDED COURSE
FOOD, NUTRITION AND HEALTH EDUCATION SYLLABUS

Total: 30 hours

Module-I Nutrition for the community

Unit-I Basic concepts in nutrition

Unit-II Meal planning

Unit-III Food storage, preservation, and safety

Unit-IV Nutrition related disorders

Unit-V Nutrient deficiency control and supplementary feeding programme.

Activity : 1. Meal planning for adolescents as per the regional standards

Module-II Public Health and Hygiene

Unit-I Health indicators

Unit-II Environmental sanitation and safety

Unit-III Dietary Management of disease

Unit-IV Food borne disease, infections, and intoxications.

Unit-V Common infections and infectious diseases

Activity: 2.Isolation of bacteria and fungi from contaminated foods

Module-III Nutrition and health education

Unit-I Primary health care

Unit-II Health Programmes

Unit-III Nutrition and Health status of the community

Unit-IV Themes, messages and their communication in nutrition and health education

Unit-V Nutrition programmes

Activity: 3.Promoting nutritional values of food in community using different themes