

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

**Course syllabus for
Three Discipline specific multidisciplinary Course
B.Sc. in Microbiology Syllabus
(Semester I)
(FYUGP Regulation 2024-25)
University of North Bengal**

**B.Sc. Syllabus in Microbiology according to the Course syllabus for
Three Discipline specific multidisciplinary Course 2024-25,
University of North Bengal**

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

UG Syllabus scheme in microbiology for 1st Semester**

Papers	No. Of Courses	Credit Distribution in each paper		Total Credit
		Theory	Practical	
DSC Subject A	1	3	1	1x4=4
DSC Subject B	1*	3	1	1x4=4
MINOR*	1*	3	1	1x4=4
AEC#	0	0	0	0
VAC#	1	4	0	1x4=4
IDC#	0	0	0	0
SEC#	1	2	1	1x3=3
Total Courses	5		Total Credit	19

** This course structure only depicts the syllabus for Microbiology as DSC Subject A and Microbiology Minor Papers.

*DSC Subject B and Minor subject will be chosen by the students who have DSC subjects other than microbiology and as decided in the combination list provided by University of North Bengal.

Course structure as decided/recommended and listed centrally by university of North Bengal.

Courses for 1st Semester

Courses	Code	Course Type	Course Name	Credit
DSC Subject A/B Paper 1	MICRDSC101	Theory	Microbial diversity	3
		Practical	Microbial diversity	1
Minor Paper 1	MICRMIN101	Theory	Microbial diversity	3
		Practical	Microbial diversity	1

DISCIPLINE SPECIFIC COURSE

(DSC) Subject A/B

Paper:1 (DSC) Paper code: MICRDSC101 Paper level: 100

MICROBIAL DIVERSITY

(Paper type: THEORY)

Semester: I

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1 History of Development of Microbiology

No. of Hours: 20 h

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Antonie 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 Microscopy

No. Of Hours: 8 h

Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry.

Unit 3 Diversity of Microbial World

No. of Hours: 8 h

General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance.

Unit 4 Systems of classification

No. Of Hours: 5 h

Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms evolutionary chronometers, rRNA oligonucleotide sequencing. Differences between eubacteria and archaeobacteria.

Unit 5 Bacteriological techniques

No. Of Hours: 4 h

Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures. Culture media: complex media, synthetic media, selective media and differential media.

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

Paper:1 (DSC) Paper code: MICRDSC101 Paper level: 100

DSC Subject A/B

MICROBIAL DIVERSITY

(Paper type: Practical)

Semester: I

Total Hour:30h Marks : 20 Credits: 1

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, Autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the Microbiology laboratory.
3. Preparation of different media and isolation of microorganism in the preaperd media: synthetic media simon citrate agar, Complex media-McConkey agar, EMB agar.
4. Sterilization of medium using Autoclave and assessment for sterility.
5. Study of *Rhizopus* using scoth tape method
6. Preservation of bacterial cultures by various techniques.
7. Estimation of CFU count by spread plate method/pour plate method.
8. Isolation of pure cultures of bacteria by streaking method.

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. 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.

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

MINOR

Paper: 1 (MINOR) Paper code: MICRMIN101 Paper level: 100

MICROBIAL DIVERSITY

(Paper type: THEORY)

Semester: I

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1 History of Development of Microbiology

No. of Hours: 20 h

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Antonie 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 Microscopy

No. Of Hours: 8 h

Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry.

Unit 3 Diversity of Microbial World

No. of Hours: 8 h

General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance.

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No. Of Hours: 5 h

Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms, evolutionary chronometers, rRNA oligonucleotide sequencing. Differences between eubacteria and archaebacteria.

Unit 5 Bacteriological techniques

No. Of Hours: 4 h

Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures. Culture media: complex media, synthetic media, selective media and differential media.

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

Paper:1 (Minor) Paper code: MICRMIN101 Paper level: 100

MICROBIAL DIVERSITY

(Paper type: Practical)

Semester: I

Total Hour:30 h Marks : 20 Credits: 1

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, Autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the Microbiology laboratory.
3. Preparation of different media and isolation of microorganism in the preaperd media: synthetic media simon citrate agar, Complex media-McConkey agar, EMB agar.
4. Sterilization of medium using Autoclave and assessment for sterility.
5. Study of *Rhizopus* using scoth tape method
6. Preservation of bacterial cultures by various techniques.
7. Estimation of CFU count by spread plate method/pour plate method.
8. Isolation of pure cultures of bacteria by streaking method.

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3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. 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.

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

Format of question papers for semester end examination

1. For 60 Marks (Theory papers)

Sl.No	Question to be answered	Out of	Marks of each question	Total Marks
1.	06	08	01	1X6=6
2.	05	07	06	6X5=30
3.	02	04	12	12X2=24
			Total	60

2. For 20 Marks (Practical Papers)

Sl.No	Question to be answered	Marks of each question	Question type	Total Marks
1.	01	08	Practical	8X1=8
2.	01	05	Parctical	5X1=5
3.	01	05	Viva	5X1=5
4.	01	02	Lab recods	2X1=2
All questions are compulsory			Total	20

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

**Course syllabus for
Three Discipline specific multidisciplinary Course
B.Sc. in Microbiology Syllabus
(Semester II)
(FYUGP Regulation 2024-25)
University of North Bengal**

**B.Sc. Syllabus in Microbiology according to the Course syllabus for Three Discipline
specific multidisciplinary Course 2024-25,
University of North Bengal**

B.Sc. in Microbiology Syllabus (DSC), NBU, 2024

UG Syllabus scheme in microbiology for 2nd Semester**

Papers	No. Of Courses	Credit Distribution in each paper		Total Credit
		Theory	Practical	
DSC Subject A	1	3	1	1x4=4
DSC Subject B	1*	3	1	1x4=4
MINOR*	1*	3	1	1x4=4
AEC#	1	4	0	1x4=4
VAC#	0	0	0	0
IDC#	1	3	0	1x3=3
SEC#	1	2	1	1x3=3
Total Courses	6		Total Credit	22

** This course structure only depicts the syllabus for Microbiology as DSC Subject A and Microbiology Minor Papers.

*DSC Subject B and Minor subject will be chosen by the students who have DSC subjects other than microbiology and as decided in the combination list provided by University of North Bengal.

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Courses for 2nd Semester

Courses	Code	Course Type	Course Name	Credit
DSC Subject A/B Paper 2	MICRDSC202	Theory	Bacterial morphology and growth	3
		Practical	Bacterial morphology and growth	1
Minor Paper 2	MICRMIN202	Theory	Bacterial morphology and growth	3
		Practical	Bacterial morphology and growth	1

**DISCIPLINE SPECIFIC COURSE
(DSC) Subject A/B**

Paper:2 (DSC) Paper code: MICRDSC202 Paper level: 100

BACTERIAL MORPHOLOGY AND GROWTH

(Paper type: THEORY)

Semester: II

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1 Cell organization

No. of Hours: 20h

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS), sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids Endospore: Structure, formation, stages of sporulation.

Unit 2 Microbial Control

No. of Hours: 10 h

Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation *Chemical methods of microbial control:* disinfectants, types and mode of action

Unit 3 Reproduction in Bacteria

No. of Hours: 5 h

Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate

Unit 4 Important archaeal and eubacterial groups

No. of Hours: 10 h

General characteristics and Morphology, metabolism, ecological significance and economic importance of thermophiles and Halophiles, actinobacteria, cyanobacteria

Paper: 2 (DSC) Paper code: MICRDSC202 Paper level: 100

BACTERIAL MORPHOLOGY AND GROWTH

(Paper type: Practical)

Semester II

Lecture Hours: 45 h Marks: 60 CREDITS: 3

1. Simple staining
2. Negative staining
3. Gram's staining
4. Capsule staining
5. Endospore staining.
6. Autoclaving and assessment of sterility.
7. Phenol coefficient
8. Motility by hanging drop method.

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SUGGESTED READINGS

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2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill.
5. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
6. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
7. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
8. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
9. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited

MINOR

Paper:2 (MINOR) Paper code: MICRMIN202 Paper level: 100

BACTERIAL MORPHOLOGY AND GROWTH

(Paper type: THEORY)

Semester: II

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1 Cell organization

No. of Hours: 20 h

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS), sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids Endospore: Structure, formation, stages of sporulation.

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