

**B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024
Semester III**

**Course syllabus for
Single Major and Single Minor
B.Sc. in Microbiology Syllabus
(Semester III)
(FYUGP Regulation 2024-25)
University of North Bengal**

**B.Sc. Syllabus in Microbiology according to the Course syllabus for Single Major and Single
Minor together with allied courses (FYUGP 2024)**



University of North Bengal

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

UG Syllabus scheme in microbiology for 3rd Semester

Scheme of the 3rd Semester Syllabus under Single major and Single minor Combination**

Papers	No. Of Courses	Credit Distribution in each paper		Total Credit
		Theory	Practical	
Major	2	3	1	2x4=8
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 Major and Microbiology Minor Papers, University of North Bengal.

*Minor subject will be chosen by the students who have major 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 3rd Semester

Courses	Code	Course Type	Course Name	Credit
Major Paper 5	MICRMAJ305	Theory	Biochemistry	3
		Practical	Biochemistry	1
Major Paper 6	MICRMAJ306	Theory	Microbial physiology and metabolism	3
		Practical	Microbial physiology and metabolism	1
Minor Paper 3	MICRMIN303	Theory	Biochemistry and microbial metabolism	3
		Practical	Biochemistry and microbial metabolism	1

**B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024
Semester III**

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	Practical	5X1=5
3.	01	05	Viva	5X1=5
4.	01	02	Lab records	2X1=2
All questions are compulsory			Total	20

**B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024
Semester III**

MAJOR

Paper: 5 (MAJOR) Paper code: MICRMAJ305 Paper level: 200

BIOCHEMISTRY

(Paper type: Theory)

Semester III

Lecture Hours: 45 h Marks: 60 CREDITS: 3

Unit1: Bioenergetics

No. of Hours: 4

First and second laws of Thermodynamics. Definitions of Gibb's Free Energy, enthalpy, and Entropy and mathematical relationship among them, Standard free energy change and equilibrium constant Coupled reactions and additive nature of standard free energy change, Energy rich compounds: Phosphoenolpyruvate, ATP

Unit 2: Carbohydrates

No. of Hours: 9

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, galactosamine, muramic acid, N- acetyl neuraminic acid, Disaccharides; concept of reducing and non-reducing sugars, occurrence and Haworth projections of maltose, lactose, and sucrose, Polysaccharides, storage polysaccharides, starch and glycogen. Structural Polysaccharides, cellulose, peptidoglycan and chitin

Unit 3: Lipids

No. of Hours: 9

Definition and major classes of storage and structural lipids. Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification, Iodine number, Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine and phosphatidylcholine, Sphingolipids: building blocks, structure of sphingosine, ceramide. Special mention of sphingomyelins, cerebrosides and gangliosides Introduction of lipid micelles, monolayers, bilayers

Unit 4: Proteins

No. of Hours: 10

Functions of proteins, Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion. Titration curve of amino acid and its Significance, Classification, biochemical structure and notation of standard protein amino

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

acids Ninhydrin reaction. Natural modifications of amino acids in proteins hydrolysine, cystine and hydroxyproline, Non protein amino acids: D-alanine Oligopeptides: Structure and functions of naturally occurring insulin, Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins, Tertiary and quaternary structures of proteins. Forces holding the polypeptide together. Human haemoglobin structure, Quaternary structures of proteins

Unit 5: Enzymes

No. of Hours: 9

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis. Significance of hyperbolic, double reciprocal plots of enzyme activity, K_m , V_{max} , and allosteric mechanism: Aspartate Trans Carbamoylase Definitions of terms – enzyme unit, specific activity and turnover number, Buffer and buffer capacity Effect of pH and temperature on enzyme activity. Enzyme inhibition: competitive- sulfa drugs; non-competitive-heavy metal salts.

Unit 6: Vitamins

No. of Hours: 1

Classification and characteristics

Unit 7: Nucleic Acid

No. of Hours: 3

Miescher to Watson and Crick- historic perspective Purine, pyrimidine - definition and structure. Nucleoside, nucleotide: definition and structure. DNA & RNA: Chargaff's rule, Double helical structure. A-DNA, B-DNA & Z-DNA (structure and differences). Chemical Properties of DNA & RNA: Hydrolysis (acid, alkali)

Paper: 5 (MAJOR) Paper code: MICRMAJ305 Paper level: 200

BIOCHEMISTRY

(Paper type: Practical)

Semester III

Lecture Hours: 30 h Marks: 20 CREDITS: 1

1. Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts
2. Numerical problems on calculations of Standard Free Energy Change and Equilibrium constant
3. Qualitative/Quantitative tests for carbohydrates, Total sugar (Anthrone method) reducing sugars (Di nitro salicylic acid method), non reducing sugars
4. Qualitative/Quantitative tests for lipids and proteins
5. Study of protein secondary and tertiary structures with the help of models

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

6. Assessment of enzyme kinetics – calculation of V_{max} , K_m , K_{cat} values
7. Assessment the effect of temperature and pH on enzyme activity
8. Colorimetric estimation of DNA using Diphenylamine (DPA)

SUGGESTED READING

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H. Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company,
6. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGrawHill
7. Voet, D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons

Paper: 6 (MAJOR) Paper code: MICRMAJ306 Paper level: 200

MICROBIAL PHYSIOLOGY AND METABOLISM

(Paper type: Theory)

Semester III

Lecture Hours: 45 h Marks: 60 CREDITS: 3

Unit 1: Microbial Growth and Effect of Environment on Microbial Growth No. of Hours: 10

Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy – Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, hemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

Unit 2: Nutrient uptake and Transport

No. of Hours: 5

Passive and facilitated diffusion Primary and secondary active transport, concept of uniport, symport and antiport Group translocation Iron uptake

Unit 3: Chemoheterotrophic Metabolism - Aerobic Respiration

No. of Hours: 10

Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, electron transport phosphorylation, uncouplers and inhibitors

Unit 4 Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation No. of Hrs: 5

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate/nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

Unit 5: Chemolithotrophic and Phototrophic Metabolism

No. of Hours: 10

Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction) Introduction to phototrophic metabolism – groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria

Unit 6 Nitrogen Metabolism - an overview

No. of Hours: 5

Introduction to biological nitrogen fixation Ammonia assimilation Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification

Paper: 6 (MAJOR) Paper code: MICRMAJ306 Paper level: 200

MICROBIAL PHYSIOLOGY AND METABOLISM

(Paper type: Practical)

Semester III

Lecture Hours: 30 h Marks: 20 CREDITS: 1

1. Prepare the growth curve of *E. coli* by turbidometric and standard plate count methods.

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the data obtained in experiment 1.
3. Effect of temperature on growth of *E. coli*
4. Effect of pH on growth of *E. coli*
5. Effect of carbon and nitrogen sources on growth of *E. coli*
6. Effect of salt on growth of *E. coli*
7. Determination of absorption spectra of chlorophyll.

SUGGESTED READINGS

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. PrenticeHall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
4. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
6. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
7. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition

**B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024
Semester III**

MINOR

Paper: 3 (MINOR) Paper Code: MICRMIN303 Paper Level: 300

BIOCHEMISTRY AND MICROBIAL METABOLISM

(Paper Type: Theory)

Semester –III

Lecture Hours : 45h Marks: 60 Credits: 3

Unit 1: Bioenergetics

No. of Hours: 3

First and second laws of Thermodynamics.

Unit 2 Carbohydrates

No. of Hours: 8

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, Disaccharides; concept of reducing and non-reducing sugars, sucrose, Polysaccharides, storage polysaccharides, starch and glycogen.

Unit 3 Lipids

No. of Hours: 8

Definition and major classes of storage and structural lipids. Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine

Unit 4 Proteins

No. of Hours: 8

Functions of proteins, Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion. Classification, Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins, Tertiary and quaternary structures of proteins. Forces holding the polypeptide together. Human haemoglobin structure, Quaternary structures of proteins

Unit 5 Microbial Growth and Effect of Environment on Microbial Growth No. of Hrs: 8

Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles,

B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy: Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.

Unit 6: Microbial Respiration

No. of Hours: 10

Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. Glycolysis, Pyruvate oxidation, TCA and Electron transport chain: components of respiratory chain, mitochondrial and bacterial ETC, electron transport phosphorylation.

Paper: 3 (MINOR) Paper Code: MICRMIN303 Paper Level: 300

BIOCHEMISTRY AND MICROBIAL METABOLISM

(Paper Type: Theory)

Semester –III

Lecture Hours : 30h Marks: 20 Credits: 1

1. Qualitative/Quantitative tests for carbohydrates, reducing sugars (Di nitro salicylic acid method).
2. Qualitative/Quantitative tests for lipids and proteins
3. Prepare the growth curve of *E. coli* by turbidometric and standard plate count methods.
4. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the data from experiment no 3.

SUGGESTED READING

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
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B.Sc. in Microbiology Syllabus (Single Major and Single Minor), NBU, 2024 Semester III

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**Course syllabus for
Three Discipline specific multidisciplinary Course
B.Sc. in Microbiology Syllabus
(Semester III)
(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), Semester III, NBU, 2024

UG Syllabus scheme in microbiology for 3rd 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.

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

Courses for 3rd Semester

Courses	Code	Course Type	Course Name	Credit
DSC Subject A/B Paper 3	MICRDSC303	Theory	Biochemistry and microbial metabolism	3
		Practical	Biochemistry and microbial metabolism	1
Minor Paper 3	MICRMIN303	Theory	Biochemistry and microbial metabolism	3
		Practical	Biochemistry and microbial metabolism	1

DISCIPLINE SPECIFIC COURSE
(DSC) Subject A/B

Paper: 3 (DSC) Paper code: MICRDSC303 Paper level: 200

BIOCHEMISTRY AND MICROBIAL METABOLISM

(Paper type: THEORY)

Semester: III

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1: Bioenergetics

No. of Hours: 3

First and second laws of Thermodynamics.

Unit 2 Carbohydrates

No. of Hours: 8

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, Disaccharides; concept of reducing and non-reducing sugars, sucrose, Polysaccharides, storage polysaccharides, starch and glycogen.

Unit 3 Lipids

No. of Hours: 8

Definition and major classes of storage and structural lipids. Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine

Unit 4 Proteins

No. of Hours: 8

Functions of proteins, Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion. Classification, Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins, Tertiary and quaternary structures of proteins. Forces holding the polypeptide together. Human haemoglobin structure, Quaternary structures of proteins

Unit 5 Microbial Growth and Effect of Environment on Microbial Growth No. of Hrs: 8

Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles,

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

extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy: Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.

Unit 6: Microbial Respiration

No. of Hours: 10

Concept of aerobic respiration, anaerobic respiration and fermentation, Sugar degradation pathways i.e. Glycolysis, Pyruvate oxidation, TCA and Electron transport chain: components of respiratory chain, mitochondrial and bacterial ETC, electron transport phosphorylation.

Paper:3 (DSC) Paper code: MICRDSC303 Paper level: 200

Biochemistry and microbial metabolism

(Paper type: Practical)

Semester: III

Lecture Hours: 30 h Marks: 20 Credits: 1

1. Qualitative/Quantitative tests for carbohydrates, reducing sugars (Di nitro salicylic acid method).
2. Qualitative/Quantitative tests for lipids and proteins
3. Prepare the growth curve of *E. coli* by turbidometric and standard plate count methods.
4. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the data from experiment no 3.
5. Determination of absorption spectra of chlorophyll.

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

6. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology. 9th Ed., McGrawHill
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MINOR

Paper: 3 (MINOR) Paper code: MICRMIN303 Paper level: 200

BIOCHEMISTRY AND MICROBIAL METABOLISM

(Paper type: THEORY)

Semester: III

Lecture Hours: 45 h Marks: 60 Credits: 3

Unit 1: Bioenergetics

No. of Hours: 3

First and second laws of Thermodynamics.

Unit 2 Carbohydrates

No. of Hours: 8

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, Disaccharides; concept of reducing and non-reducing sugars, sucrose, Polysaccharides, storage polysaccharides, starch and glycogen.

Unit 3 Lipids

No. of Hours: 8

Definition and major classes of storage and structural lipids. Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine

Unit 4 Proteins

No. of Hours: 8

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Unit 5 Microbial Growth and Effect of Environment on Microbial Growth No. of Hrs: 8

Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture,

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

generation time and specific growth rate, synchronous growth, diauxic growth curve Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy: Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.

Unit 6: Microbial Respiration

No. of Hours: 10

Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. Glycolysis, Pyruvate oxidation, TCA and Electron transport chain: components of respiratory chain, mitochondrial and bacterial ETC, electron transport phosphorylation.

Paper: 3 (MINOR) Paper code: MICRMIN303 Paper level: 200

BIOCHEMISTRY AND MICROBIAL METABOLISM

(Paper type: Practical)

Semester: III

Lecture Hours: 30 h Marks: 20 Credits: 1

1. Qualitative/Quantitative tests for carbohydrates, reducing sugars (Di nitro salicylic acid method).
2. Qualitative/Quantitative tests for lipids and proteins
3. Prepare the growth curve of *E. coli* by turbidometric and standard plate count methods.
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5. Determination of absorption spectra of chlorophyll.

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

11. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company,
12. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology. 9th Ed., McGrawHill
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10. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
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12. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition

Inter Disciplinary (IDC) Course

Life Science Group 2

Paper: 2 (IDC) Paper Code: LSC2IDC303

ENVIRONMENTAL MICROBIOLOGY

(Paper type: Theory)

(Semester: III)

Lecture Hours: 30 h Marks: 40 Credits:2

Unit 1 Microorganisms and their Habitats

No. of Hours: 8

Structure and function of ecosystems Terrestrial Environment: Soil profile and soil microflora Aquatic Environment: Microflora of fresh water and marine habitats Atmosphere: Aeromicroflora and dispersal of microbes, Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.

Unit 2 Microbial Interactions

No. of Hours: 6

Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, Predation

Unit 3 Biogeochemical Cycling

No. of Hours: 5

Carbon cycle: Microbial degradation of cellulose, Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction Phosphorus cycle: Phosphate immobilization and solubilisation Sulphur cycle: Microbes involved in sulphur cycle

Unit 4 Liquid Waste Management

No. of Hours: 5

Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiarysewage treatment

Unit 5 Microbial Bioremediation

No. of Hours: 3

Principles and degradation of common pesticides (2,4, -D), organic (aliphatic hydrocarbons,) and inorganic(Mercury) matter,

Unit 6 Water Potability

No. of Hours: 3

Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests forfaecal coliforms

Life Science Group 2
Paper: 2 (IDC) Paper Code: LSC2IDC303
ENVIRONMENTAL MICROBIOLOGY
(Paper type: Tutorial)
(Semester: III)
Lecture Hours: 15 h Marks: 20 Credits:1

Evaluation of the students will be done as suggested in the FYUGP, NBU regulation 2024-25.

SUGGESTED READINGS

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
2. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York
5. Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Heidelberg
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA
Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
7. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
8. Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
9. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
10. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.
11. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
12. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.