ORDINANCES, TEST OUTLINES, SYLLABI and READING COURSES

For

B.Sc. (Honours) Multidisciplinary PART I
(SEMESTER I & II)

Academic Sessions
2025–26,2026-27

Under
Choice-Based Credit System (CBCS)
Scheme of

NEP 2020

PROGRAMME CODE: BCHE

Department of Science
GURU NANAK COLLEGE BUDHLADA
AN AUTONOMOUS COLLEGE
NAAC Accredited 'A++'Grade
College with Potential for Excellence Status by
UGC, Star College Status-DBT
E-mail :gncbudhlada@yahoo.co.in
Website: www.https://www.gncbudhlada.org
Under Punjabi University, Patiala

SYLLABI, OUTLINES OF PAPERS AND TESTS FOR
B.Sc. (HONOURS) MULTIDISCIPLINARY Part-I
(SEMESTER I)
2025-26, 2026-27

Semester-I							
Paper Code	**Title of Paper**	**Credits**	**Hours (Per Week)**	**Max Marks**	**External Exam**	**Internal Assessment**	**Time allowed**
BBOT1101T	**MAJ:** Cell Biology and Genetics	03	03	100	70	30	03hrs
BBOT1102P	**MAJ- LAB**: Cell Biology and Genetics	01	02	50	35	15	03hrs
BBOT1103T	**MIN :** * Cell Biology and Genetics	03	03	100	70	30	03hrs
BBOT1104P	**MIN-LAB**: Cell Biology and Genetics	01	02	50	35	15	03hrs
BBOT1105T	**IDC/MDC**: Plant Morphology	03	03	100	70	30	03hrs
BBOT1106T	**SEC**: Organic Farming	02	02	50	35	15	1.5hrs
BBOT1107P	**SEC LAB:** Organic Farming	01	02	50	35	15	1.5hrs

Note:

1. MAJ: Discipline Specific Core Course; **MAJ-LAB**: Discipline Specific Core Practical Course; **MIN**: Minor Core Courses; **MIN-LAB**: Minor Core Practical Course **IDC/MDC:** Inter Disciplinary Courses; **AEC**: Ability Enhancement Course; **VAC**: Value Added Course; **SEC**: Skill Enhancement Course

2. *The credit of the minor will be 04 (03 credit for theory and 01 credit for Practicals). The contact hours of the minor will be 05 hours (03 hours Theory and 02 hours Practical).

3. Weightage of different components in internal assessment of theory papers is as: Attendance-20%, Assignment/Project/Seminar/Lab Work-40% and Internal Examination (Mid Semester Written Exam)-40%.

4. Students who wish to exit after First year will have to complete their summer internship/vocational course of 04 credits before the exit in order to be eligible for a UG Certificate Course.

SYLLABI, OUTLINES OF PAPERS AND TESTS FOR
B.Sc. (HONOURS) MULTIDISCIPLINARY Part-I
(SEMESTER II)
2025-26 , 2026-27

Semester-II							
Paper Code	**Title of Paper**	**Credits**	**Hours (Per Week)**	**Max Marks**	**External Exam**	**Internal Assessment**	**Time allowed**
BBOT1201T	**MAJ**: Diversity of Microbes	03	03	100	70	30	03 hrs.
BBOT1202P	**MAJ-LAB**: Diversity of Microbes	01	02	50	35	15	03 hrs.
BBOT1203T	**MIN**: * Diversity of Microbes	03	03	100	70	30	03hrs.
BBOT1204P	**MIN LAB**: Diversity of Microbes	01	02	50	35	15	03 hrs.
BBOT1205T	**IDC/MDC**: Biofertilizers	03	03	100	70	30	03 hrs
BBOT1206T	**SEC**: Mushroom Cultivation	02	02	50	35	15	1.5 hrs
BBOT1207P	**SEC LAB:** Mushroom Cultivation	01	02	50	35	15	1.5 hrs

Note:

1. MAJ: Discipline Specific Core Course; **MAJ-LAB**: Discipline Specific Core Practical Course; **MIN**: Minor Core Courses; **MIN-LAB**: Minor Core Practical Course; **IDC/MDC:** Inter Disciplinary Courses; **AEC**: Ability Enhancement Course; **VAC**: Value Added Course; **SEC**: Skill Enhancement Course

2. *The credit of the minor will be 04 (03 credit for theory and 01 credit for Practicals). The contact hours of the minor will be 05 hours (03 hours Theory and 02 hours Practical).

3. Weightage of different components in internal assessment of theory papers is as: Attendance-20%, Assignment/Project/Seminar/Lab Work-40% and Internal Examination (Mid Semester Written Exam)-40%.

4. Students who wish to exit after First year will have to complete their summer internship/vocational course of 04 credits before the exit in order to be eligible for a UG Certificate Course

B.SC 1 SEMESTER -I
BBOT1101T: CELL BIOLOGY AND GENETICS (MAJ)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 45 hours
3 hours/week

COURSE OBJECTIVE
1. To study the basics of genetics, chromosomes, genes etc.
2. Students learn about the functional role of cell organelles.

COURSE OUTCOMES- On completion of the course, students are able to:
1. Understand the structures and basic components of prokaryotic and eukaryotic cells, membranes and cell organelles.
2. Acquire knowledge about the structure of chromosomes and role of cellular components

INSTRUCTIONS TO THE PAPER SETTER-
The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES
Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Structural organisation of cell: Prokaryotic and Eukaryotic cells; Plant and Animal cells. Structure and function of cell organelles: Mitochondria, Plastids, Endoplasmic reticulum, Ribosomes, Golgi Bodies, Lysosomes, Vacuoles and Peroxisomes.
2. Cell envelops: Structure, composition and functions of cell wall in Bacteria, fungi and plants. Plasma membrane: Structure and function; various models proposed, fluid mosaic model; transport across membrane.
3. Structure and function of nucleus; organisation of nuclear membrane, nucleolus and chromosomes.
4. Genetic material: Structure of DNA and RNA, elucidation of DNA and RNA as genetic materials. Organisation of DNA into chromosomes, nucleosome structure. Organisation of genetic material in eukaryotes, prokaryotes and viruses.

SECTION-B

5. Replication of DNA in prokaryotes and eukaryotes, Mitosis and Meiosis.
6. Transcription and Translation in eukaryotes and prokaryotes, genetic code.
7. Mutations – spontaneous and induced; Chromosome alterations – deletions, duplications, translocations, inversions. Variations in chromosome number – aneuploidy, polyploidy.
8. Genetic inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; allelic and non-allelic interactions.

RECOMMENDED READINGS:

1..Cooper, G.M. and Hausman, R.E. 2007. The Cell a Molecular Approach, 4th Edition. Sinauer Associates, MA, USA.
2.. De Roberts, E.D.P. and De Robertis, Jr. E.M.F. 2006. Cell and Molecular Biology, Lippincott Williams & Wilkins, USA.
3. Gupta, P.K. 2014. Cytogenetics. Rastogi Publications, Meerut.
4.. Singh, B.D. 2006. Genetics. Kalyani Publishers, New Delhi.
5. Singh, R.J. 2017. Plant Cytogenetics, 3rd Edition. CRC Press.

BBOT1102P: CELL BIOLOGY AND GENETICS (MAJ-LAB)

Max Marks: 50
End Semester Exam: 35
Internal Assessment: 15
Passing Marks: 35%

Credits: 01
Time allowed: 3hrs
2 hours/week

COURSE OUTCOMES

1. Students will be able to critically examine the cell structure, its components and pigments.
2. Students will gain knowledge on staining and fixation of specimens on slides.
3. Prepare karyotypes and gain knowledge on special chromosomes.
4. Understand the concept of inheritance and linked genes.

SUGGESTED LABORATORY EXCERCISES

Teachers may select plants/material available in their locality/institution.

1. To study cell structure from onion leaf peels.
2. Examination of electron micrographs of eukaryotic cells with special reference to organelle
3. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
4. Preparation of karyotypes from dividing root tip cells of Allium.
5. Study of special types of chromosomes from slides/photographs.
6. Working out the Mendelian laws of inheritance using seed mixture/ data provided

INSTRUCTIONS TO THE PAPER SETTER

1. Preparation of squash mount to show a cell division stage from onion root tip/flower.
2. Experiment on law of inheritance using the seed mixtures.
3. Preparation of temporary slide of onion peel to study cell structure.
4. Identification of three slide/Electron microphotographs.
5. Practical notebook
6. Viva –voce

BBOT1103T: CELL BIOLOGY AND GENETICS (MIN)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 45 hours
3 hours/week

COURSE OBJECTIVE
1. To study the basics of genetics , chromosomes, genes etc.
2. Students learn about the functional role of cell organelles.

COURSE OUTCOMES- On completion of the course, students are able to:
1. Understand the structures and basic components of prokaryotic and eukaryotic cells,membranes and cell organelles.
2. Acquire knowledge about the structure of chromosomes and role of cellular components

INSTRUCTIONS TO THE PAPER SETTER-
The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short- answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES
Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Structural organisation of cell: Prokaryotic and Eukaryotic cells; Plant and Animal cells. Structure and function of cell organelles: Mitochondria, Plastids, Endoplasmic reticulum, Ribosomes, Golgi Bodies, Lysosomes, Vacuoles and Peroxisomes.
2. Cell envelops: Structure, composition and functions of cell wall in Bacteria, fungi and plants. Plasma membrane: Structure and function; various models proposed, fluid mosaic model; transport across membrane.
3. Structure and function of nucleus; organisation of nuclear membrane, nucleolus and chromosomes.
4. Genetic material: Structure of DNA and RNA, elucidation of DNA and RNA as genetic materials. Organisation of DNA into chromosomes, nucleosome structure. Organisation of genetic material in eukaryotes, prokaryotes and viruses.

SECTION-B

5. Replication of DNA in prokaryotes and eukaryotes, Mitosis and Meiosis.
6. Transcription and Translation in eukaryotes and prokaryotes, genetic code.
7. Mutations – spontaneous and induced; Chromosome alterations – deletions, duplications, translocations, inversions. Variations in chromosome number – aneuploidy, polyploidy.
8. Genetic inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; allelic and non-allelic interactions.

RECOMMENDED READINGS:

1.Cooper, G.M. and Hausman, R.E. 2007. The Cell a Molecular Approach, 4th Edition. SinauerAssociates, MA, USA.
2. De Roberts, E.D.P. and De Robertis, Jr. E.M.F. 2006. Cell and Molecular Biology, Lippincott Williams & Wilkins, USA.
3. Gupta, P.K. 2014. Cytogenetics. Rastogi Publications, Meerut.
4. Singh, B.D. 2006. Genetics. Kalyani Publishers, New Delhi.
5. Singh, R.J. 2017. Plant Cytogenetics, 3rd Edition. CRC Press.

BBOT1104P: CELL BIOLOGY AND GENETICS (MIN LAB)

Max Marks: 50
End Semester Exam: 35
Internal Assessment: 15
Passing Marks: 35%

Credits: 01
Time allowed: 3hrs
2 hours/week

COURSE OUTCOMES

1. Students will be able to critically examine the cell structure ,its components and pigments.
2. Students will gain knowledge on staining and fixation of specimens on slides.
3. Prepare karyotypes and gain knowledge on special chromosomes.
4. Understand the concept of inheritance and linked genes.

SUGGESTED LABORATORY EXCERCISES

Teachers may select plants/material available in their locality/institution.

1. To study cell structure from onion leaf peels.
2. Examination of electron micrographs of eukaryotic cells with special reference to organelle
3. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
4. Preparation of karyotypes from dividing root tip cells of Allium.
5. Study of special types of chromosomes from slides/photographs.
6. Working out the Mendelian laws of inheritance using seed mixture/ data provided

INSTRUCTIONS TO THE PAPER SETTER

1. Preparation of squash mount to show a cell division stage from onion root tip/flower.
2. Experiment on law of inheritance using the seed mixtures.
3. Preparation of temporary slide of onion peel to study cell structure.
4. Identification of three slide/Electron microphotographs.
5. Practical notebook
6. Viva –voce

BBOT1105T: PLANT MORPHOLOGY (IDC/MDC)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 30 hours
3 hours/week

COURSE OBJECTIVES

1. To study and describe the external structure and form of plant organs such as roots, stems, leaves, flowers, fruits, and seeds.
2. To aid in the identification, classification, and taxonomy of plants based on their morphological features.
3. To understand morphological adaptations of plants in different environments and their role in plant development and evolution.

COURSE OUTCOMES -By the end of this course, students will be able to:

1. Understanding Plant Structure: Learners gain detailed knowledge of external plant features (roots, stems, leaves, flowers, fruits, and seeds), which helps in identifying and classifying plants.
2. Improved Plant Identification Skills: Morphological characteristics are critical in recognizing and differentiating plant species, especially in taxonomy and field botany.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have 04 questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short- answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1.Angiosperm diversity based on size, life span, habit, habitat and nutrition.
2.Morphology of Root: characteristics, parts, types, modifications and functions.
3.Morphology of Stem and Leaf. Stem: characteristics, types, modification and functions.
4.Leaf: characteristics, parts, phyllotaxy, venation, modification and functions.

SECTION-B

5.Inflorescence: Racemose, Cymose, Mixed types.
6.Flower: Floral phyllotaxy, Calyx, Corolla, Stamens and Carpel.
7.Fruit: Structure and types. Achenial, Capsular, Schizocarpic, Succulent and Aggregate and Composite. Importance of fruits.
8.Seed: types, structure and functions.

SUGGESTIVE READING:

1. Adrian D. Bell (2008). Plant Form: An Illustrated Guide to Flowering Plant Morphology. Timber Press.
2. Janice Glimn-Lacy and Peter B. Kaufman (2006). Botany Illustrated. Springer-Verlag New York Inc.
3. Arthur J.C. (2018). Handbook of Plant Morphology: Being the Handbook of Plant Dissection.Forgotten Books
4. Chelsea D. Specht and Donald Kaplan (2022). Kaplan's Principles of Plant Morphology. Apple Academic Press Inc.

BBOT1106T: ORGANIC FARMING (SEC)

Max Marks: 50 marks
End Semester Exam: 35 marks
Internal Assessments: 15 marks
Pass Marks: 35%

Credits: 02
Total Lectures: 30 hours
2 hours/week

COURSE OBJECTIVES

1. Objective of the course to acquaint the students about types of farming, principles, process and advantages of organic farming
2. Understand the basic principles and practices of organic farming, including soil health, crop rotation, composting, and biological pest control.
3. Explain the environmental, economic, and social benefits of organic agriculture compared to conventional farming methods.

COURSE OUTCOMES-By the end of this course, students will be able to:

1. Understand the principles and practices of organic farming.
2. Differentiate between conventional and organic agriculture.
3. Learn techniques for soil fertility management, pest control, and organic certification.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have 04 questions each from the respective section of syllabus and will carry 06 marks each. Section C will consist of 11 short- answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 11 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Organic farming – definition, concept, principles, need, scope, characteristics, scenario and components, constraints, relevance to modern agriculture, organic versus natural farming.
2. Different eco friendly farming systems: biological farming, natural farming, regenerative agriculture, permaculture, biodynamic farming, rishi-krishi, panchgavya Krishi, natueco farming, homa farming.
3. Relevance of organic farming to India, and global agriculture, and future prospects. Advantages and barriers.
4. Initiatives taken by the central and state governments, NGOs and other organizations. Strategies for promotion of organic agriculture in India.

SECTION-B

5. Organic nutrient sources and their management: organic manures: Bulk organic manures (FYM, compost, vermicompost, vermiwash), concentrated organic manures (Oil cakes, meat meal, blood meal, fish meal, horn and hoof meal), methods of composting Green manures and biofertilizers: types, methods of application, benefits and limitations.
6. Nutrient use in organic farming-scope and limitations. Nutrient management in organic farming. formulations for soil enrichment.
7. Organic Ecosystem: Concept, Important aspects, eco organic farming during transitional phase. Choice of crops and varieties in organic farming, crop rotations, need and benefits, multiple cropping.
8. Organic certification: purpose, process, of certifications (third party, participatory, alternative and grower group certification), advantages and constraints. Organic certification system in Indian and world, product labeling. National standards for organic production (NSOP).

RECOMMENDED READINGS:

1. Lampin, N. 1990. Organic Farming. Press Books, lpswitch, UK.
2. Maliwal, P.L. 2020. Principles of Organic farming: Textbook, Scientific Publ., Jodhpur
3. Palaniappan, S.P. and Anandurai, K. 2022. Organic Farming – Theory and Practice. 2nd revised edition Scientific Publ., Jodhpur
4. Reddy, M.V. (Ed.). 1995. Soil Organisms and Litter Decomposition in the Tropics. Oxford & IBH.
5. Sharma, A. 2002. Hand Book of Organic Farming.

BBOT1107P: ORGANIC FARMING

Max Marks: 50
End Semester Exam: 35
Internal Assessment: 15
Passing Marks: 35%

Credits: 01
Time allowed: 3hrs
2 hours/week

COURSE OUTCOMES

By the end of this course, students will be able to:

1. Identify and apply basic principles and practices of organic farming.
2. Prepare organic inputs like compost, vermicompost, and biofertilizers.
3. Implement eco-friendly crop management and pest control techniques.
4. Maintain records and understand procedures for organic certification.

LABORATORY EXCERCISES

1. Visit of Organic farms to study the various components and their utilization,
2. Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis,
3. Indigenous technology knowledge (ITK) for nutrient insect, pest disease and weed management.
4. Cost of organic production system;
5. Post-harvest management,
6. Quality aspect, grading packaging and handling.

B. Sc I SEMESTER -II
BBOT1201T: DIVERSITY OF MICROBES (MAJ)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 45 hours
3 hours/week

COURSE OBJECTIVE

1. To acquaint students with basic concepts of diversity of Algae, Fungi, Bacteria, Viruses, lichen etc
2. To study systematic position, structure and function of these microbes.

COURSE OUTCOMES

1. Increase the awareness of human friendly viruses, bacteria, algae and their economic importance.
2. This course makes student aware about the diversity in various life forms of plant kingdom.
3. It enables students to identify algae and fungi.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Viruses: General characters, structure, classification and Lytic and Lysogenic Cycle; importance of viruses, Transmission of viruses. Some common Viruses – Plant viruses, Bacterial viruses. A brief account of Mycoplasma.
2. Bacteria- A general account with particular reference to Morphology, Cell structure, classification, mode of reproduction- Vegetative, Asexual and Recombination. A brief account of Archaebacteria.
3. Nutritional types in bacteria, economic importance and harmful activities of viruses and bacteria
4. General account of Cyanobacteria: thallus organization, cell structure, photosynthetic pigments,reproduction ,economic importance and reserve food material & multiplication with emphasis on Oscillatoria.

SECTION-B

5. Fungi and Fungi like organisms: General characters, reproduction,Classification and economic importance. Important features and life history of members of Kingdom-Chromista: Phytophthora and protozoa stemonitis
6. Important features and life history of members of Kingdom Fungi: Zygomycota-Mucor, Ascomycota-Saccharomyces, Pencillium and Peziza.
7. Important features and life history of Basidiomycota and Mitosporic Fungi: Puccinia, Ustilago, Agaricus, Cercospora, Colletotrichum.
8. Lichens: General accounts, types, morphology, reproduction and economic importance.

RECOMMENDED REDINGS:

1. Dube, H.C.1990. An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Sharma, P.D. 2001. The Fungi. Rastogi Co., Meerut.
3. Singleton, P. 2004. Bacteria in Biology, Biotechnology and Medicine 6th Edition. John Wiley & Sons. Inc. Singapore.
4. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. General Microbiology

BBOT1202P: DIVERSITY OF MICROBES MAJ-LAB

Max Marks: 50
End Semester Exam: 35
Internal Assessment: 15
Passing Marks: 35%

Credits: 01
Time allowed: 3hrs
2 hours/week

COURSE OUTCOMES

1. Students are able to understand the difference between algae, fungi, bacteria, lichen.
2. This course makes the students aware about the diversity in various life forms of plant kingdom.
3. It enables the students to structurally differentiate among different microbes.
4. It enables the students to identify fungi, bacteria, algae.

SUGGESTED LABORATORY EXCERCISES

Teachers may select plants/material available in their locality/institution.

1. Study of the genera included under algae and fungi indicating their systematic position.

2 Observation of disease symptoms in hosts infected by bacteria (Citrus canker), fungi (Late blight of potato, loose smut of wheat, brown rust of wheat, yellow stripe rust of wheat, tikka disease of groundnut, red rot of sugarcane), viruses (Yellow vein mosaic of bhindi) and mycoplasma (little leaf disease of brinjal). Examination of diseased material and identification of pathogens.

3. Gram staining of bacteria.

4 Study of crustose, foliose and fruiticose lichen thalli.

INSTRUCTIONS FOR PAPER SETTER

1. Identification, classification and morphological note on specimens from Algae, Fungi, Lichens.
2. Study of diseased plant material.
3. Practical notebook.
4. Viva-voce.

BBOT1203T: DIVERSITY OF MICROBES (MIN)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 45 hou
3 hours/week

COURSE OBJECTIVE

1. To acquaint students with basic concepts of diversity of Algae, Fungi, Bacteria, Viruses, lichen etc
2. To study systematic position, structure and function of these microbes.

COURSE OUTCOMES

1. Increase the awareness of human friendly viruses, bacteria, algae and their economic importance.
2. This course makes student aware about the diversity in various life forms of plant kingdom.
3. It enables students to identify algae and fungi.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Viruses: General characters, structure, classification and Lytic and Lysogenic Cycle; importance of viruses, Transmission of viruses. Some common Viruses – Plant viruses, Bacterial viruses. A brief account of Mycoplasma.
2. Bacteria- A general account with particular reference to Morphology, Cell structure, classification, mode of reproduction- Vegetative, Asexual and Recombination. A brief account of Archaebacteria.
3. Nutritional types in bacteria, economic importance and harmful activities of viruses and bacteria
4. General account of Cyanobacteria: thallus organization, cell structure, photosynthetic pigments,reproduction ,economic importance and reserve food material & multiplication with emphasis on Oscillatoria.

SECTION-B

5. Fungi and Fungi like organisms: General characters, reproduction,Classification and economic importance. Important features and life history of members of Kingdom-Chromista: Phytophthora and protozoa stemonitis
6. Important features and life history of members of Kingdom Fungi: Zygomycota-Mucor, Ascomycota-Saccharomyces, Pencillium and Peziza.
7. Important features and life history of Basidiomycota and Mitosporic Fungi: Puccinia, Ustilago, Agaricus, Cercospora, Colletotrichum.
8. Lichens: General accounts, types, morphology, reproduction and economic importance.

RECOMMENDED REDINGS:

1. Dube, H.C.1990. An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Sharma, P.D. 2001. The Fungi. Rastogi Co., Meerut.
3. Singleton, P. 2004. Bacteria in Biology, Biotechnology and Medicine 6th Edition. John Wiley & Sons. Inc. Singapore.
4. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. General Microbiology

BBOT1204P: DIVERSITY OF MICROBES MIN-LAB

Max Marks: 50
End Semester Exam: 35
Internal Assessment: 15
Passing Marks: 35%

Credits: 01
Time allowed: 3hrs
2 hours/week

COURSE OUTCOMES

1. Students are able to understand the difference between algae, fungi, bacteria, lichen.
2. This course makes the students aware about the diversity in various life forms of plant kingdom.
3. It enables the students to structurally differentiate among different microbes.
4. It enables the students to identify fungi, bacteria, algae.

SUGGESTED LABORATORY EXCERCISES

Teachers may select plants/material available in their locality/institution.

1. Study of the genera included under algae and fungi indicating their systematic position.

2 Observation of disease symptoms in hosts infected by bacteria (Citrus canker), fungi (Late blight of potato, loose smut of wheat, brown rust of wheat, yellow stripe rust of wheat, tikka disease of groundnut, red rot of sugarcane), viruses (Yellow vein mosaic of bhindi) and mycoplasma (little leaf disease of brinjal). Examination of diseased material and identification of pathogens.

3. Gram staining of bacteria.

4 Study of crustose, foliose and fruiticose lichen thalli.

INSTRUCTIONS FOR PAPER SETTER

1. Identification, classification and morphological note on specimens from Algae, Fungi, Lichens.
2. Study of diseased plant material.
3. Practical notebook.
4. Viva-voce.

BBOT1205T: BIOFERTILIZERS (IDC)

Max Marks: 100 marks
End Semester Exam: 70 marks
Internal Assessments: 30 marks
Pass Marks: 35%

Credits: 03
Total Lectures: 30 hours
3 hours/week

COURSE OBJECTIVE -

1. Objective of the course of the paper is to study the basic principles and application methodologies of different microbial inoculants in order to improve the soil fertility and productivity.
2. Introduce the concept of biofertilizers and their significance in improving soil fertility and crop productivity.

COURSE OUTCOMES –

1. Students will be able to explain the role of biofertilizers in sustainable agriculture and environmental conservation.
2. Students will gain knowledge of nitrogen-fixing, phosphate-solubilizing, and other beneficial microorganisms used as biofertilizers.
3. Students will be able to describe how microorganisms promote plant growth through nutrient mobilization, nitrogen fixation, and phytohormone production.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 12 marks each. Section C will consist of 11 short- answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 22 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION – A

1. Biofertilizers: Definition, types and importance in agriculture and organic farming system. History of biofertilizers production
2. General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier-based inoculants, Actinorrhizal symbiosis.
3. Azospirillum: isolation and mass multiplication – carrier-based inoculant, associative effect of different microorganisms.
4. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.

SECTION – B

5. Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.
6. Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.
7. Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes
8. Biocompost making methods, types and method of vermicomposting – field Application.

RECOMMENDED READINGS:

1. Dubey, R.C. 2005. A Text book of Biotechnology S. Chand& Co, New Delhi.
2. Kumaresan, V. 2005. Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
4. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya publisher

BBOT1206T: MUSHROOM CULTIVATION (SEC)

Max Marks: 50 marks
End Semester Exam: 35 marks
Internal Assessments: 15 marks
Pass Marks: 35%

Credits: 02
Total Lectures: 30 hours
2 hours/week

COURSE OBJECTIVE -

1. Objective of the course to acquaint the students about types of farming, principles, process and advantages of organic farming
2. Introduce students to the biology, classification, and economic importance of edible and medicinal mushrooms.

COURSE OUTCOMES-

1. Identify suitable mushroom species and select appropriate substrates and environmental conditions for their cultivation.
2. Demonstrate skills in spawn preparation, substrate sterilization, and mushroom bed preparation.
3. Apply scientific methods to manage pests, diseases, and physiological disorders in mushroom farms.

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 06 marks each. Section C will consist of 11 short- answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 01 mark in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Introduction, history: Nutritional and medicinal value of edible mushrooms: Poisonous mushrooms. Types of edible mushrooms available in India - Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus.
2. Cultivation Technology: Infrastructure: substrates (locally available) Polythene bag. Vessels, Inoculation hook, inoculation loop, low-cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag.
3. Pure culture: Medium, sterilization, preparation of spawn, multiplication.
4. Mushroom bed preparation-paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation Low-cost technology. Composting technology in mushroom production.

SECTION-B

5. Storage and nutrition: Short-term storage (Refrigeration up to 24 hours) Long term Storage (canning, pickles, papads, etc.), drying, storage in salt solutions.
6. Nutrition-Proteins-amino acids, mineral elements nutrition-Carbohydrates, Crude fiber content - Vitamins.
7. Food Preparation: Types of food prepared from mushroom. Cost benefit ration Marketing in India and abroad. Export Value.
8. Research Centre Role of national level and regional level research centers in mushroom cultivation.

Recommended Readings:

1. Bhal. N. 1984-1988. Hand book of Mushrooms, 2nd Edition, Vol. I & Vol. II
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan, R. 1991. Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agriculture, University, Coimbatore.
3. Swaminathan, M. 1990. Food and Nutrition, The Bangalore Printing and Publishing Co. Ltd. Bangalore.
4. Tewari, P. and Kapoor, S.C. 1988. Mushroom Cultivation, Mittal Publications, Delhi.

BBOT1207P: MUSHROOM CULTIVATION

Max Marks: 50 marks
End Semester Exam: 35 marks
Internal Assessments: 15 marks
Pass Marks: 35%

Credits: 01
Total Lectures: 30 hours
2 hours/week

COURSE OUTCOMES

1. Distinguish major edible and poisonous mushrooms (button, oyster, paddy-straw, milky); correctly describe their morphology, nutritional value, and medicinal uses, and assess environmental suitability for cultivation.
2. Produce pure mycelial culture and prepare mother and bed spawn using standard agar-cleanroom techniques, substrate sterilisation, and quality-control records.

INSTRUCTIONS

1. Acquaintance with the laboratory equipments (Instruments and substrate utilized for mushroom cultivation)
2. Culture media preparation and sterilization techniques
3. Sterilization and sanitation of mushroom house
4. Isolation of pure cultures.
5. Mushroom collection from their natural habitat, isolation and preservation.
6. Spore print development.
7. Identification and preservations of mushroom specimen.
8. Identification of poisonous mushrooms.
9. Inoculation of Mushroom spawn
10. Incubation and spawn production