



Jamia Millia Islamia
New Delhi

Centre for Distance and Online Education (CDOE)

— Programme Guide —

2026-2027

Bachelor of Science **(Biosciences)** (B. Sc. Biosciences)





Centre for Distance and Online Education (CDOE)

Jamia Millia Islamia, New Delhi

Programme Guide

2025-26

Bachelor of Science (Biosciences)

(B. Sc. Biosciences)

Message from the Director, CDOE

Dear Students,

It gives me great pleasure to welcome you to the **Bachelor of Science (B.Sc.) Biosciences (Open and Distance Learning)** programme at the **Centre for Distance and Online Education (CDOE), Jamia Millia Islamia, New Delhi**.

Education is a powerful instrument for personal growth, scientific advancement, and national development. Through the Open and Distance Learning mode, Jamia Millia Islamia is committed to making quality higher education accessible to learners from diverse backgrounds and to providing the flexibility to pursue academic goals alongside personal and professional responsibilities.

In this context, a B.Sc. programme offered through the ODL mode plays a vital role by expanding access to foundational education in the life sciences, enabling learners to acquire essential scientific knowledge and skills without the constraints of conventional classroom-based study. The B.Sc. Biosciences (ODL) programme is designed to develop a strong foundation in the life sciences, encourage scientific inquiry, and prepare students for higher studies, research, and careers in the biological sciences and allied fields.

I encourage you to make the best use of the academic resources and learning opportunities provided by CDOE. I wish you every success in your academic journey and future endeavours.

With best wishes,

Prof. Aslam Khan
Director

Contents

Message from the Director, CDOE.....	3
Programme Coordinator/In-charge.....	5
About the Programme.....	5
Course structure at a glance.....	6
Detailed Course Structure - Semester I.....	7-12
Detailed Course Structure - Semester II.....	13-18
Detailed Course Structure - Semester III.....	19-24
Detailed Course Structure - Semester IV.....	25-30
Detailed Course Structure - Semester V.....	31-36
Detailed Course Structure - Semester VI.....	37-41
Counselling session	42
Academic calendar	42
Learner support centres.....	43
Evaluation system	43
Semester End Examinations.....	44
Division.....	45
Promotion to the next Semester of the Programme.....	45
Re-evaluation of Answer Scripts.....	45
Improvement of Result.....	46
General regulations.....	46

PROGRAMME COORDINATOR/IN-CHARGE

Dr. Asgar Ali
Assistant Professor (Biosciences)
Centre for Distance and Online Education
Jamia Millia Islamia, New Delhi

Dr. Md. Rizwan Alam
Assistant Professor (Biosciences)
Centre for Distance and Online Education
Jamia Millia Islamia, New Delhi

About the programme

Introduction of the Programme

The Bachelor of Science (B.Sc.) in Biosciences program is designed to provide students with a comprehensive foundation in biological sciences, equipping them with essential knowledge and skills in areas such as genetics, biochemistry, microbiology, and molecular biology. This program aims to prepare students for various roles in research, healthcare, and environmental science, emphasising both theoretical concepts and practical laboratory skills.

Duration of the Programme:

Minimum duration of the Programme: 3 years

Maximum duration of the Programme: 6 years

Medium of Instruction: English

(SLM will be provided in English, with assignments and question papers available only in English.)

Programme Fee

Rs. 20,000 per annum (Two Semesters) to be paid in advance at the beginning of each academic year.

Eligibility:

Senior Secondary School Certificate or an equivalent examination with not less than 50% marks in each science subject, i.e. Physics, Chemistry and Biology.

COURSE STRUCTURE AT A GLANCE

B. Sc. Biosciences, Jamia Millia Islamia, New Delhi-110025

SEMESTER I					SEMESTER II				
N	Papers	Code	Credit	MM	N	Papers	Code	Credit	MM
1	Animal Diversity-I	BBSD- 101	4	100	1	Animal Diversity-II	BBSD- 201	4	100
2	Plant Diversity-1	BBSD- 102	4	100	2	Plant Diversity-1I	BBSD- 202	4	100
3	Cell Structure and Function	BBSD- 103	4	100	3	Chemistry-II	BBSD- 203	4	100
4	Chemistry-I	BBSD- 104	4	100	4	Biomathematics and Biostatic	BBSD- 204	4	100
5	General English I	BBSD- 105	4	100	5	Ecology	BBSD- 205	4	100
6	Lab Course-1	BBSD- 106	4	100	6	Lab Course-II	BBSD- 206	4	100

SEMESTER III					SEMESTER IV				
N	Papers	Code	Credit	MM	N	Papers	Code	Credit	MM
1	Genetics	BBSD- 301	4	100	1	Introduction to Biodiversity	BBSD- 401	4	100
2	Mol. Biology	BBSD- 302	4	100	2	Immunology	BBSD- 402	4	100
3	Applied Microbiology	BBSD- 303	4	100	3	Bioanalytical Tools	BBSD- 403	4	100
4	Biochemistry I	BBSD- 304	4	100	4	Biophysics	BBSD- 404	4	100
5	Lab Course-III	BBSD- 305	4	100	5	Lab Course-IV	BBSD- 405	4	100

SEMESTER V					SEMESTER VI				
N	Papers	Code	Credit	MM	N	Papers	Code	Credit	MM
1	Environmental Science	BBSD- 501	4	100	1	Developmental Biology	BBSD- 601	4	100
2	rDNA Tech. (CBCE)	BBSD- 502	4	100	2	Animal Behaviour	BBSD- 602	4	100
3	Plant Biotech	BBSD- 503	4	100	3	Organic Evolution	BBSD- 603	4	100
4	Biochemistry II	BBSD- 504	4	100	4	Bioinformatics	BBSD- 604	4	100
5	Public Health	BBSD- 505	4	100	5	Animal Physiology	BBSD- 605	4	100
6	Lab Course-V	BBSD- 506	4	100	6	Lab Course-VI	BBSD- 606	4	100

Total Duration of Course	3 Years	Total Credits	134
Total Semesters	06	Total Marks	3400

DETAILED COURSE STRUCTURE SEMESTER I

BBSD-101 ANIMAL DIVERSITY-I

Block 1: Principles of Taxonomy and Protozoan Diversity

Unit 1: Principles of taxonomy and relationship with systematics. General characters and criteria for classification of invertebrates. An outline classification of non-chordates.

Unit 2: Classification of Protozoans. Type study of *Paramecium caudatum* and *Plasmodium vivax*. Locomotion and reproduction in Protozoa.

Unit 3: Leishmaniasis, Trypanosomiasis, Toxoplasmosis, Giardiasis, and Amoebiasis.

Unit 4: General characters and classification of phylum Porifera. Canal system and skeleton in sponges.

Block 2: Metazoan Organisation and Diversity

Unit 5: Organisation of metazoa, including symmetry, metamerism, and body cavity or coelom. Theories of origin of metazoa.

Unit 6: General characters and classification of phylum Coelenterata. Type study of *Aurelia*.

Unit 7: Polymorphism, corals, and coral reefs. General characters and classification of phylum Platyhelminthes.

Unit 8: General characters and classification of nematodes. Type study of *Ascaris lumbricoides*.

Block 3: Nematodes and Arthropod Diversity

Unit 9: Nematodes and human diseases. *Caenorhabditis elegans* and its application in research.

Unit 10: General characteristics and classification of arthropods. Mouthparts of insects.

Unit 11: Vision in arthropods. Metamorphosis in insects. Larval forms of crustaceans.

Unit 12: Social insects and their life cycle. Economic importance of insects, including lac culture, sericulture, apiculture, and prawn culture.

Block 4: Mollusca and Echinodermata Classification

Unit 13: General characters and classification of phylum Mollusca. Type study of *Pila globosa*.

Unit 14: Torsion and detorsion in gastropods.

Unit 15: General characters and classification of phylum Echinodermata. Water vascular system in starfish.

Unit 16: Larval form in echinoderms. Structure and affinities of *Balanoglossus*.

Recommended Books:

1. Ruppert, E. E. and Barnes, R. D., Invertebrate Zoology, Saunders College Publishing.
2. Parker, T. J. and Haswell, W. A., Textbook of Zoology, Vol. 1 (Invertebrates), Low Price Publications.
3. Kotpal, R. L., Modern Textbook of Zoology: Invertebrates, Rastogi Publications.
4. Jordan, E. L. and Verma, P. S., Invertebrate Zoology, S. Chand & Co.
5. Anderson, D. T., Invertebrate Zoology, Oxford University Press, India.

BBSD -102
PLANT DIVERSITY-I

Block 1: Cyanobacteria and Algae

Unit 1: General Features of Cyanobacteria and Algae: Overview of characteristics and classification.

Unit 2: Distribution and Range of Thallus Organisation: Habitats and structural variations in cyanobacteria and algae.

Unit 3: Reproduction and Life Cycle: Mechanisms and stages of reproduction in selected species.

Unit 4: Economic Importance: Importance of Nostoc, Volvox, Oedogonium, Chara, Ectocarpus, and Polysiphonia.

Block 2: Fungi

Unit 5: General Features of Fungi: Overview of characteristics and classification.

Unit 6: Reproduction and Economic Importance: Reproductive strategies and economic roles of fungi.

Unit 7: Special Reference to Selected Fungi: Detailed study of Slime molds, Albugo, Phytophthora, Aspergillus, and Puccinia.

Unit 8: Fungal Diseases: Overview of white rust of crucifers, late blight of potato, and black stem rust of wheat.

Block 3: Lichens and Bryophytes

Unit 9: General Features of Lichens: Thallus organisation and ecological significance.

Unit 10: Reproduction of Lichens: Mechanisms and strategies for reproduction in lichens.

Unit 11: General Features of Bryophytes: Overview of characteristics, habitat, and reproduction.

Unit 12: Type Study of Bryophytes: Detailed study of Marchantia, Anthoceros, and Funaria.

Block 4: Pteridophytes

Unit 13: General Features of Pteridophytes: Overview of characteristics and habitat.

Unit 14: Stele System and Heterospory: Insights into the vascular system and reproductive strategies.

Unit 15: Adaptive Features: Examination of spores, cuticle, stomata, and tracheids in pteridophytes.

Unit 16: Morphology, Anatomy, and Reproduction: Detailed study of Psilotum, Selaginella, and Pteris.

Recommended Books:

1. Hait, Bhattacharya & Ghosh, A Textbook of Botany, Volume I (NCBA).
2. Sporne. Morphology of Bryophytes (Oxford Publishing House).
3. Alexopoulos C.J, Mims C.W. and Blackwell M.I. Introductory Mycology. (John Wiley and Sons Inc).
4. George N. Agrios, Plant Pathology (Elsevier).
5. Tortora, G.J., Funke, B.R., Case, C.L. Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A.
6. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.

BBSD-103
CELL STRUCTURE AND FUNCTION

Block 1: Cell Organelles

Unit 1: Structure and Functions of Endoplasmic Reticulum: Overview of the endoplasmic reticulum, including rough and smooth types, and their roles in protein and lipid synthesis.

Unit 2: SRP-Based Targeting of Proteins to ER: Mechanisms involved in the targeting of proteins to the endoplasmic reticulum, including signal recognition particle (SRP) function.

Unit 3: Mitochondria: Structure, DNA, and Pathways: Exploration of mitochondrial structure, its own DNA, and metabolic pathways including oxidative phosphorylation.

Unit 4: Lysosomes and Golgi Apparatus: Functions of lysosomes in degradation processes and the role of the Golgi apparatus in post-translational modifications of proteins and lipid synthesis.

Block 2: Cytoskeleton Network

Unit 5: Structure and Organization of Actin and Myosin: Detailed study of actin and myosin filaments, their structural organization, and function in muscle contraction.

Unit 6: Intermediate Filaments and Microtubules: Overview of intermediate filaments and microtubules, their structure, organization, and cellular roles.

Unit 7: Cell Shape and Mitotic Spindle: Examination of how the cytoskeleton contributes to cell shape and the formation of the mitotic spindle during cell division.

Unit 8: Filopodia Structure: Analysis of filopodia structure and their significance in cell movement and sensory functions.

Block 3: Nucleus Organization and Cell Cycle

Unit 9: Structure and Function of the Nucleus: Comprehensive look at the nuclear structure and its essential functions in the cell.

Unit 10: Nuclear Membrane and Transport: Examination of the nuclear membrane, nuclear pore complex, and the mechanisms of transport across the nuclear envelope.

Unit 11: Chromosomal Structure and Positioning: Study of chromosome structure, positioning within the nucleus, and their roles in gene expression.

Unit 12: Cell Cycle Controls and Checkpoints: Overview of the cell cycle, including regulatory mechanisms, controls, and checkpoints ensuring proper cell division.

Block 4: Membrane Transport and Cell Signaling

Unit 13: Lipid Bilayer and Membrane Proteins: Analysis of the structure of the lipid bilayer, types of membrane proteins, and their functions.

Unit 14: Ionic Channels and Ion Pumps: Overview of various ionic channels and pumps, their roles in maintaining cellular ion homeostasis.

Unit 15: Membrane Transport Mechanisms: Detailed study of transport mechanisms including simple, facilitated, active, and voltage-gated transport.

Unit 16: Signaling Molecules and Their Receptors: Examination of different signaling molecules (GPCRs, Tyrosine Kinases) and their roles in intracellular signal transduction pathways.

Recommended Books

1. Cell and Molecular Biology by Robertis De, E.D.P. and E.M.F. De Robertis
2. Molecular Biology of the Cell by Bruce Albert, Dannis Bray, Julian Lewis, Martin Raff
3. Molecular Cell Biology by Harvey Lodish
4. Molecular Cell Biology by Darnell, J.E.

BBSD-104
CHEMISTRY-I

Block 1: Fundamentals of Organic Chemistry

Unit 1: Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance, and Hyperconjugation.

Unit 2: Polarity of Bonds and Molecules: Cleavage of Bonds-Homolysis and Heterolysis.

Unit 3: Structure, Shape, and Reactivity of Organic Molecules: Nucleophiles and Electrophiles.

Unit 4: Reactive Intermediates: Carbocations, Carbanions, Free Radicals, and Strength of Organic Acids and Bases: Comparative Study and Factors Affecting pK Values.

Block 2: Stereochemistry

Unit 5: Fischer Projection, Newman and Sawhorse Projection Formulae and Their Interconversions.

Unit 6: Geometrical Isomerism: cis-trans and Syn-anti Isomerism; E/Z Notations.

Unit 7: Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules Up to Two Chiral Centres.

Unit 8: Relative and Absolute Configuration: D/L and R/S Designations.

Block 3: Hydrocarbons

Unit 9: Alkanes: Structure of Methane, Ethane, Propane, and Butane; Nomenclature and Physical Properties.

Unit 10: Reactions of Alkanes: Free Radical Substitution and Halogenation.

Unit 11: Alkenes: Structure of Ethylene, Propylene, and Butylenes; Isomerism, Nomenclature, and Physical Properties.

Unit 12: Reactions of Alkenes: cis- and trans-addition, Addition of HX, Hydration, Ozonolysis, Oxymercuration-Demercuration, Hydroboration-Oxidation.

Block 4: Aromatic Hydrocarbons and Halides

Unit 13: Aromatic Hydrocarbons: Aromaticity, Huckel's Rule, and Character of Arenes.

Unit 14: Electrophilic Aromatic Substitution: Halogenation, Nitration, Sulphonation, and Friedel-Craft's Reactions with Mechanism.

Unit 15: Alkyl and Aryl Halides: Preparation from Alkenes and Alcohols; Structure, Classification, and Nomenclature.

Unit 16: Reactions of Alkyl Halides: Williamson Ether Synthesis, Nucleophilic Substitution Reactions, Elimination Reactions, and Aryl Halides Preparation.

Recommended Books

1. I. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S.
2. R. T. Morrison & R. N. Boyd: Organic Chemistry, Prentice Hall.
3. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand
4. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.

BBSD-105
GENERAL ENGLISH I

Unit I: English grammar: Articles, Prepositions, Tenses, Voice, Direct and Reported Speech

Unit II: Vocabulary: Common Vocabulary, Word Often Confused, Some Common Errors

Unit III: Paragraph Writing: Process Writing, Descriptions Summarizing and Writing in brief of Medical passages, Note- taking Exercise, Formal Correspondence (Letter and application)-Application for job, for higher studies- Letter to The Editor, Ordering Equipments, Requesting for Information

Unit IV: SPOKEN ENGLISH: Communicative Skills, Discussion Sessions, Dialogue Sessions

BBSD-106
LAB COURSE-1

1. To study the principle and working of compound microscope
2. To study the plasmolysis and de-plasmolysis in the given plant part
3. To study the structures of Prokaryotic and Eukaryotic cell.
4. To observe the mammalian cell line and *Leishmania* under the inverted microscope
5. Staining of *Leishmania* infected macrophages through Giemsa stain
6. To Study various stages of mitosis and meiosis in onion root tip.
7. To study the barr-body detection and its significance.

DETAILED COURSE STRUCTURE

SEMESTER II

BBSD-201 ANIMAL DIVERSITY-II

Block 1: Introduction to Chordates

Unit 1: Introduction and Classification of Chordates: General Characters, Origin and Ancestry of Chordates

Unit 2: Brief Classification of Phylum Chordata: Diversity of Chordates and Comparison with Non-Chordates

Unit 3: General Characters and Classification of Subphylum Urochordata: Characteristics and Affinities of Herdmania

Unit 4: General Characters and Classification of Subphylum Cephalochordata: Characters and Structure of Branchiostoma

Block 2: Superclass Pisces

Unit 5: General Characters and Classification of Superclass Pisces

Unit 6: Type Study of Class Cyclostomata: Petromyzon

Unit 7: Scales of Fishes: Air or Swim Bladder and Accessory Respiratory Organs

Unit 8: Migration and Parental Care in Fishes: Pisciculture, Dipnoi, Freshwater and Brackish Water Fisheries in India

Block 3: Class Amphibia and Reptilia

Unit 9: General Characters, Origin and Classification of Amphibians: Parental Care in Class Amphibia

Unit 10: Origin, General Characters and Classification of Reptiles: Identification of Snakes

Unit 11: Poisonous and Non-Poisonous Snakes: Biting Mechanism in Snakes, Venom and Anti-Venom

Unit 12: Extinct Reptiles (Dinosaurs): Evolution and Adaptive Radiation of Reptiles

Block 4: Class Aves and Mammalia

Unit 13: General Characteristics and Classification of Class Aves: Affinities, Origin and Ancestry of Birds

Unit 14: Mechanism and Modes of Flight Adaptations: Types of Beaks in Birds

Unit 15: Flight Adaptation in Birds: Migration in Birds, Economic Importance of Birds

Unit 16: General Characters and Classification of Class Mammalia: Origin and Ancestry of Mammals, Dentition in Mammals, Prototheria and Metatheria

Recommended Books

1. Young J Z (2004) The life of vertebrates III edition, Oxford university press.
2. Kent GC & Karr RK (2000) Comparative anatomy of Vertebrates, 9th Edition, The McGraw-hill companies.
3. Kardong KV (2005) Vertebrates comparative anatomy, function and evolution 4th edition. The McGraw hill higher Education.
4. RL Kotpal (2016) Modern textbook of zoology-vertebrates

BBSD-202
PLANT DIVERSITY -II

Block 1: Introduction to Gymnosperms

Unit I: Introduction to Gymnosperms: Overview, Diversity, Economic Importance, and Classification.

Unit II: Origin and Evolutionary Significance of Gymnosperms.

Unit III: Affinities of Gymnosperms with Angiosperms and Pteridophytes.

Unit IV: Key Characteristics and Role of Gymnosperms in Ecosystems.

Block 2: General Features and Anatomy of Gymnosperms

Unit I: General Features of Gymnosperms: Habitat and Distribution.

Unit II: External Features of Gymnosperms: Morphological Aspects.

Unit III: Anatomy of Vegetative Structures in Gymnosperms.

Unit IV: Anatomy of Reproductive Structures in Gymnosperms.

Block 3: Development and Reproduction of Key Genera

Unit I: Developmental Processes in Cycas: Life Cycle and Reproductive Strategies.

Unit II: Developmental Processes in Pinus: Life Cycle and Reproductive Strategies.

Unit III: Developmental Processes in Gnetum: Life Cycle and Reproductive Strategies.

Unit IV: Comparative Analysis of Development and Reproduction in Cycas, Pinus, and Gnetum.

Block 4: Angiosperm Taxonomy, Floral Structures and Angiosperm Families

Unit I: Inflorescence in Angiosperms: Types and Characteristics. Flowers and Floral Parts of Angiosperms: Structure and Function.

Unit III: Introduction to Angiosperm Taxonomy: Importance and Overview. Systems of Classification of Angiosperms: Bentham and Hooker's, Hutchinson's, and Engler & Prantl's Systems.

Unit III: Systematic Study of Dicot Families: Ranunculaceae, Solanaceae, Moraceae. Systematic Study of Dicot Families: Malvaceae, Fabaceae, Umbelliferae, Asteraceae.

Unit IV: Systematic Study of Monocot Families: Liliaceae and Poaceae. Economic Importance of Dicot and Monocot Families in Various Sectors.

Recommended Books

1. Swingle, D.B. A Text book of Systematic Botany. (Mc Graw Hill)
2. Harrison, H.J., New Concepts of Flowering Plant Taxonomy, (Hieman Educational Books Ltd., London.)
3. Simpson, M.G. Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
4. Hait, Bhattacharya & Ghosh, A Text Book of Botany, Volume II (NCBA)
5. Bhatnagar, S.P. and Moitra, A., Gymnosperms (New Age International).
6. Biswas C and Johari B.M, The Gymnosperms (Narosa Publishing House)
7. Stewart W.N. and Rathwell G.W. Paleobotany and the Evolution of plants (Cambridge University Press).
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. Biology. Tata McGraw Hill, Delhi, India.

BBSD-303
CHEMISTRY-II

Block 1: Carbonyl Compounds and Their Reactions

Unit 1: Carbonyl Compounds: Structure, Nomenclature, and Physical Properties.

Unit 2: Nucleophilic Addition to Carbon-Oxygen Double Bond; Reactions of Aldehydes and Ketones: Oxidation, Baeyer-Villiger Oxidation.

Unit 3: Reduction to Alcohols & Hydrocarbons: Clemmensen & Wolff-Kishner Reduction, Reductive Amination.

Unit 4: Addition Reactions: Water & Alcohols, Derivatives of Ammonia, Hydrogen Cyanide & Sodium Bisulfite, Halides (Wittig Reaction).

Block 2: Carboxylic Acids and Their Derivatives

Unit 5: Carboxylic Acids: Structure, Nomenclature, Physical Properties, and Acidity.

Unit 6: Reactions of Carboxylic Acids: Nucleophilic Substitutions at Acyl Carbon; Conversion into Acyl Chloride and Anhydrides.

Unit 7: Reduction of Carboxylic Acids; Substitution in Alkyl or Aryl Group; Decarboxylation.

Unit 8: Reactions of Acyl Chloride and Acid Anhydrides; Reactions of Esters: Conversion into Acids and Acid Derivatives.

Block 3: Reactions Involving Esters and Acids

Unit 9: Reactions of Esters: Reduction to Alcohols; Reactions with Carbanion.

Unit 10: Aldol Reactions: Enolate Ions and Keto-Enol Tautomerism.

Unit 11: Reactions via Enol and Enolate Ions; Overview of Addition Reactions.

Unit 12: General Reactions of Carbonyl Compounds and Their Applications in Organic Synthesis.

Block 4: Solutions and Colligative Properties

Unit 13: Definition and Types of Solutions; Expressing Concentration of Solutions.

Unit 14: Colligative Properties: Definitions, Raoult's Law, Molecular Weight of Solute.

Unit 15: Elevation of Boiling Point; Depression of Freezing Point; Osmotic Pressure.

Unit 16: Theoretical Explanation of Osmosis; Osmotic Behavior of Living Cells: Tonicity and Turgor Pressure.

Recommended Books

1. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S.
2. R. T. Morrison & R. N. Boyd: Organic Chemistry, Prentice Hall.
3. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand
4. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
5. Atkins, P.W. 2001, Physical Chemistry, W.H. Freeman & Co. 7th Edition.
6. Clydel., R., Metz, 1988, Schaum's Series Outline of Physical Chemistry, McGrawHill.
7. Puri & Sharma, 2002, Physical Chemistry, S. Chand & Sons Co.
8. Bahl & Tuli, 2002, Essential of Physical Chemistry, S. Chand & Sons. Co.
9. Gordon, G., Hammes, 2000, Thermodynamics and Kinetics for the Biological Sciences, John Wiley &

BBSD-204
BIOMATHEMATICS AND BIOSTATISTICS

Block 1: Fundamentals of Differential Equations

Unit 1: Introduction to Differential Equations: Order and Degree of a Differential Equation.

Unit 2: Solutions of First Order and First Degree Differential Equations by Variable Separation Method.

Unit 3: Homogeneous Differential Equations and Their Solutions.

Unit 4: Solution of Linear Differential Equations of the First Order: $dy/dx + P(x)y = Q(x)$.

Block 2: Mathematical Modeling

Unit 5: Mathematical Modeling: Steps in Building Mathematical Models and Their Relation to Data.

Unit 6: Evolution of Mathematical Models: Choosing Mathematics for the Models.

Unit 7: Linear and Non-Linear First Order Discrete Time Models.

Unit 8: Differential Equation Models: Population Dynamics and Discrete Dynamical Models.

Block 3: Statistical Methods

Unit 9: Methods of Sampling: Measures of Central Tendency (Mean, Median, Mode),

Unit 10: Measures of Variation: Mean Deviation and Standard Deviation.

Unit 11: Correlation and Covariance: Karl Pearson's Coefficient of Correlation.

Unit 12: Regression Analysis: Coefficient of Regression and Method of Least Squares.

Block 4: Probability and Distributions

Unit 13: Introduction to Random Experiments and Associated Sample Space.

Unit 14: Events: Definition of Probability and Algebra of Events.

Unit 15: Addition and Multiplication Theorem on Probability (without proof) and Conditional Probability. Unit 16: Distributions: Binomial, Poisson, and Normal Distributions.

Recommended Books

1. Frank Ayres, J.R., 1992, Theory and Problems of Differential Equations. Schaum's Outline Series, McGraw-Hill Book Co
2. Arora, P.N. and P.K. Malhan, 2002, Biostatistics, Himalaya Publishing House.
3. Murray R. Spiegel, 1980, Probability and Statistics, Schaum's Outline Series) McGraw-HillBook Co.

BBSD-602 ECOLOGY

Block 1: General Ecology

Unit 1: General ecology: Atmosphere, Weather, Climate, Weather Assessment, Fine weather; Cloudy weather.

Unit 2: Biosphere, Biomes and Ecosystems: Tundra, Taiga, Grassland, Desert, and Aquatic.

Unit 3: Concept, components, and types of ecosystem: Fresh water, Marine, and Brackish water.

Unit 4: Ecological range (Eury, Steno), Ecological factors (abiotic and biotic), Ecological pyramids.

Block 2: Food Chains and Biogeochemical Cycles

Unit 5: Food chains and food web; Productivity.

Unit 6: Biogeochemical cycles: Gaseous and sedimentary.

Unit 7: Overview of productivity in ecosystems.

Unit 8: Role of ecological pyramids in understanding energy flow.

Block 3: Community Ecology

Unit 9: Community gradients and boundaries: Ecotone and species diversity.

Unit 10: Edge effect and its significance in ecology.

Unit 11: Qualitative characters of community: Floristic composition and stratification of vegetation.

Unit 12: Quantitative characters of community: Population density, Cover, Height, and Weight of plants.

Block 4: Community Dynamics

Unit 13: Community dynamics and processes in succession.

Unit 14: Types of succession: Primary, secondary, Hydrarch, and Xerarch.

Unit 15: Autogenic and Allogenic succession, Autotrophic and Heterotrophic succession.

Unit 16: Models of Succession and trends in succession.

Recommended Books

1. Wilkenson DM. Fundamental Processes in Ecology.
2. Odum EP. 2008. Fundamentals of Ecology.
3. Singh JS, Singh SP and Gupta SR. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
4. LSE-02 Ecology Blocks (1,2,3,4), IGNOU.
5. Pandey SN, Misra SP. 2011. Environment and Ecology, Ane Books Pvt. Ltd.

BBSD-206
LAB COURSE II

1. Identification of algal species by studying their permanent slides.
2. Study of thallus and reproductive structures by slide preparation and staining of the following algal species.

Volvox, Oedogonium, Vaucheria, Ectocarpus, Polysiphonia

3. Identification of different plant diseases by studying the permanent slides.
4. Study of plant diseases by slide preparation and staining for the following diseases. Rust of wheat, Black smut of wheat, citrus canker, late blight of potato, white rust of crucifers, red rot of sugarcane
5. Preparation of solutions and buffers

DETAILED COURSE STRUCTURE

SEMESTER III

BBSD-503 GENETICS

Block 1: Principles of Inheritance and Genetic Interactions

Unit 1: Mendelism and Law of Inheritance: Overview of Mendelism, Law of Segregation, Law of Independent Assortment, Chromosomal Theory of Inheritance.

Unit 2: Linkage and Recombination: Understanding Linkage, Recombination, Linkage Maps, and Crossing Over.

Unit 3: Advanced Recombination Concepts: Double Cross Over, Coincidence & Interference, Sex-Linkage, and X-Linked Inheritance.

Unit 4: Phenotypes and Genotypes: Definition and Importance, Examples of Phenotypes, Genotype Variability, and Genetic Expressions.

Block 2: Complex Genetic Interactions and Bacterial Recombination

Unit 5: Multiple Alleles and Dominance: Definition of Multiple Alleles, Incomplete Dominance, Over-Dominance, and Co-Dominance.

Unit 6: Sex-Linked Traits: Traits Linked to Sex Chromosomes, Inheritance Patterns, Examples, and Implications.

Unit 7: Non-Allelic Gene Interaction: Overview of Non-Allelic Interactions, Modified Dihybrid Ratios (e.g., 9:3:4, 9:7), Examples and Applications.

Unit 8: Bacterial Recombination Mechanisms: Transformation, Transduction, Conjugation, and Their Significance.

Block 3: Population Genetics and Extra-Chromosomal Inheritance

Unit 9: Population Genetics: Definition and Importance of Mendelian Populations, Hardy-Weinberg Equilibrium, and Gene Frequencies.

Unit 10: Factors Affecting Gene Frequencies: Environmental Influences, Natural Selection, Genetic Drift, and Migration.

Unit 11: Pleiotropism and Lethal Genes: Definition of Pleiotropism, Examples of Lethal Genes, Penetrance, and Expressivity.

Unit 12: Extra-Chromosomal Inheritance: Mitochondrial Genome, Cytoplasmic Inheritance, Maternal Effects, and Variegation in Plants.

Block 4: Chromosome Structure and Genetic Aberrations

Unit 13: Structural Organization of Chromosomes: Nucleosome Model, Euchromatin, and Heterochromatin Structure.

Unit 14: Special Chromosomes: Overview of Polytene and Lampbrush Chromosomes, Banding Patterns in Human Chromosomes.

Unit 15: Chromosomal Aberrations: Structural and Numerical Aberrations, Hereditary Defects (e.g., Klinefelter's, Turner Syndrome).

Unit 16: Mutations and Their Implications: Definitions of Mutations, Spontaneous vs. Induced Mutagenesis, and Effects on Genetic Inheritance.

Recommended Books:

1. Principles of Genetics by Gardner, Simmons and Snustad.
2. Genetics: A Conceptual Approach by Benjamin A. Pierce.
3. Genetics by Monroe E. Strickberger.

BBSD-302
MOLECULAR BIOLOGY

Block 1: DNA Replication and RNA Synthesis

Unit I: Replication of DNA: Types of DNA polymerase and enzymes involved; replication origin and replication fork.

Unit II: Semi-conservative replication of double-stranded DNA; mechanism of replication and proofreading.

Unit III: Replication in eukaryotes; RNA synthesis: Types of RNA polymerases.

Unit IV: Mechanism of transcription; RNA processing: capping, polyadenylation, splicing, small interfering RNA, and micro RNA.

Block 2: Protein Synthesis and Gene Regulation

Unit I: Protein synthesis: Genetic code; Wobble hypothesis and tRNA.

Unit II: Ribosome structure and formation of the initiation complex; initiation of translation.

Unit III: Elongation and termination of translation; folding and processing of proteins.

Unit IV: Comparison of prokaryotic and eukaryotic translation; expression and regulation of genes.

Block 3: Molecular Cloning and Enzymatic Techniques

Unit I: Restriction enzymes and their functions; DNA polymerases, ligase, kinase, phosphatase, and nuclease.

Unit II: Molecular cloning techniques; cloning vectors: Lambda phage and plasmids.

Unit III: M13 phage and cosmids; shuttle vectors and yeast vectors.

Unit IV: Viral vectors; construction of genomic and cDNA libraries.

Block 4: DNA Analysis and Biotechnology Applications

Unit I: Nucleotide sequencing methods; amplification of DNA.

Unit II: Types of PCR: RT-PCR, inverse PCR, and asymmetric PCR.

Unit III: DNA fingerprinting; molecular markers: RAPD, RFLP, AFLP, and SNPs.

Unit IV: Analysis of gene expression; microarray technology; production of genetically modified crops and transgenic animals.

Recommended Books

1. Principles of Gene Manipulations & Genomics, S.B. Primrose, M. Twyman, John & Willey Publishers
2. Molecular Biotechnology: Principles and Applications of Recombinant DNA, Bernard R. Glick and Jack J. Pasternack, 2010, Panima Publishing Corporation.
3. Molecular Biology: Genes to Proteins, 2010, Burton E. Tropp, Jones and Bartlett Publishers.
4. Molecular Biology, David Clark, 2010, Publisher A P Cell.

BBSD-303
APPLIED MICROBIOLOGY

Block 1: Foundations of Microbiology and Microscopy

Unit 1: History of Microbiology

Overview of significant milestones: the invention of the microscope, development of the cell theory, theories of spontaneous generation and biogenesis, and Koch's postulates.

Unit 2: Germ Theory and Vaccination

Exploration of germ theory of diseases, methods of fermentation, pasteurization techniques, and the development of vaccination.

Unit 3: Microbial Diversity

Discussion on various microorganisms, including algae, fungi, protozoa, bacteria, viruses, and prions, highlighting their characteristics and importance.

Unit 4: Microscopy Techniques

Detailed examination of different microscopy techniques, including Bright Field, Dark Field, and Phase Contrast Microscopes, as well as Transmission and Scanning Electron Microscopes.

Block 2: Bacterial Morphology and Growth

Unit 5: Bacterial Morphology

Characteristics of bacterial size, shapes, and patterns of arrangement, including Gram-positive and Gram-negative bacteria.

Unit 6: Cell Wall Structure

In-depth analysis of bacterial cell wall structures, including components external and internal to the cell wall, with a focus on Gram staining techniques.

Unit 7: Bacterial Reproduction and Growth

Overview of bacterial cell division modes, generation time, and growth curves.

Unit 8: Bacteriological Media

Types of bacteriological media, including selective, maintenance, and differential media, as well as techniques for isolating and maintaining pure cultures.

Block 3: Control of Microorganisms

Unit 9: Fundamentals of Control

Introduction to the definitions and principles of microbial control, emphasizing the importance of controlling microorganisms.

Unit 10: Physical Agents for Control

Examination of various physical control methods, including high and low temperatures, filtration, desiccation, osmotic pressure, and radiation.

Unit 11: Chemical Agents and Their Action

Discussion on different chemical agents used for microbial control, such as phenol and phenolic compounds, halogens, aldehydes, heavy metals, and antibiotics.

Unit 12: Applications of Control Methods

Practical applications of control methods in clinical and industrial settings, focusing on infection prevention and treatment.

Block 4: Virology and Viral Replication

Unit 13: Architecture of Viruses

Exploration of viral structure, including capsid morphology, nucleic acids, and envelop characteristics.

Unit 14: Virus Transmission

Modes of transmission for various viruses, including plant viruses, animal viruses, and bacteriophages.

Unit 15: Replication of Viruses

overview of viral replication processes, including the specific replication mechanisms for animal viruses and lambda phages.

Unit 16: RNA and DNA Viruses

Detailed examination of the replication cycles of RNA and DNA viruses, highlighting differences and similarities in their mechanisms.

Recommended Books

1. Microbiology by Pelczar M J
2. Principles of Microbiology Ronald M. Atlas
3. Prescott's Microbiology by Christopher J. Woolverton, Joanne Willey, and Linda Sherwood
4. A text book of Microbiology by R. C Dubey

BBSD-304
BIOCHEMISTRY & METABOLISM

Block 1: Enzymology

Unit 1: Enzymes as Biological Catalysts: Characteristics, Nomenclature, and Classification.

Unit 2: Coenzymes: Structure and Function.

Unit 3: Enzyme Kinetics: Michaelis-Menten Equation, Significance of K_m and V_{max} , Analysis of Kinetics Data.

Unit 4: Enzyme Inhibition: Competitive, Uncompetitive, and Mixed Inhibition.

Block 2: Enzyme Catalytic Mechanisms

Unit 5: Enzyme Catalytic Mechanisms: Acid-Base Mechanisms.

Unit 6: Covalent Catalysis and Metal Ion Catalysis.

Unit 7: Proximity and Orientation Effects in Catalysis.

Unit 8: Mechanism of Action of Lysozyme and Chymotrypsin.

Block 3: Carbohydrates

Unit 9: Occurrence, Classification, Characteristics, Structure, and Function of Monosaccharides.

Unit 10: Structure and Function of Disaccharides and Polysaccharides.

Unit 11: Mucopolysaccharides, Glycosaminoglycans, Proteoglycans, and Glycoproteins.

Unit 12: Glycolysis: Reactions and Regulation, Gluconeogenesis, HMP Pathway.

Block 4: Metabolic Pathways and Glycogen

Unit 13: Citric Acid Cycle: Overview and Key Steps.

Unit 14: Glycogen Degradation: Mechanisms and Regulation.

Unit 15: Glycogen Synthesis: Pathways and Enzymes Involved.

Unit 16: Integration of Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, and Citric Acid Cycle.

Recommended Books

1. Principles of Biochemistry by Albert L. Lehninger, David L. Nelson, Michael M. Cox. 2. Biochemistry by Stryer.

BBSD-305
LAB COURSE-1II

1. Qualitative tests for biomolecules (protein, lipids, carbohydrates, nucleic acid)
2. Estimation of protein in given sample by the Lowry method
3. Measuring the enzyme activity under different conditions
4. To study Beer-Lambert law using proteins: Absorbance vs concentration
5. Determination of concentration of protein using Absorption Coefficient
6. Comparative study of phallus and reproductive organs of various algae mentioned in theory.
7. Comparative study of vegetative and reproductive parts of various fungi mentioned in theory.
20. Section cutting and leuco-phenol mount of plant disease materials
8. To study the various types of lichens.
9. Study of external features & anatomy of vegetative and reproductive parts of Marchantia and Funaria.
10. Collection of algae, fungi, plant disease materials and bryophytes available locally.

DETAILED COURSE STRUCTURE SEMESTER IV

BBSD-401 INTRODUCTION TO BIODIVERSITY

UNIT I: Definition of biodiversity, comprehensive understanding: (taxonomic, spatial levels, endemism), levels of biodiversity (microbial, genetic, species, ecosystem, landscape), drivers of biodiversity

UNIT-II: Distribution of biodiversity, evolution of biodiversity, overview of ecological communities, number of species worldwide, Global distribution and change in biodiversity over time in different regions of the world, concept of diversity hot spots; Biodiversity in India (past and present); methodology of analysis of different species groups.

UNIT-III: Biodiversity loss, Consequences and Restoration Monitoring of different species groups; analysis of causes and extinction/changes in biodiversity in India and worldwide, (causes: vulnerability to extinction; changing of the environment; (Habitat fragmentation and destruction) climate change; overexploitation; Consequences: loss of gene pool, loss of ecosystem services, livelihood) Biodiversity restoration strategies: Principles, definitions, degradation, tools and methods, restoration and ecosystem functioning, case studies

BBSD-402 IMMUNOLOGY

Block 1: Overview of Immunity and the Immune System

Unit 1: Historical perspective of the immune system and immunity.

Unit 2: Types of immunity: Humoral and Cell Mediated.

Unit 3: Overview of the cells and organs involved in the immune system.

Unit 4: Innate immunity: Anatomical barriers and cell types; the connection between innate and adaptive immunity.

Block 2: Adaptive Immunity and Antigen Interaction

Unit 5: Adaptive immunity: Overview and mechanisms.

Unit 6: Antigens and haptens; factors that dictate immunogenicity.

Unit 7: Structure and distribution of immunoglobulin classes and substances; Ig fold and effector functions.

Unit 8: Generation of antibody diversity and the complement system; pathways of activation (classical, alternative, lectin).

Block 3: Immunological Methods and Cytokine Function

Unit 9: Immunological methods: Antigen-antibody interactions, including agglutination and hemagglutination.

Unit 10: Precipitin reactions: In solution and in gels; the concept of immunoassays.

Unit 11: Selection and antigen presentation; activation of T and B cells.

Unit 12: The role of cytokines in the immune response.

Block 4: Tolerance, Vaccines, and Immune Response

Unit 13: Immunological tolerance: Primary and secondary responses.

Unit 14: Hypersensitivity and its types; immune response against major classes of pathogens. **Unit 15:**

Overview of vaccines: Live attenuated, inactivated, toxoid, subunit/conjugate vaccines. **Unit 16:**

Monoclonal antibodies: Development and applications.

Recommended Books:

1. Immunology by Kuby.
2. Fundamentals of Immunology by William E. Paul.
3. Text book of Immunology by Seemi Farhat Basir, Abbas, Published PHI 2012.
4. Cellular and molecular Immunology by Abdul Abbas, Andrew H Lichtman & Shiv Pillai

BBSD-403
BIOANALYTICAL TOOLS

Block 1: Spectroscopic Techniques and Principles

Unit 1: Spectroscopic Techniques: Principle and applications of UV-visible spectroscopy.

Unit 2: FTIR and Fluorescence Spectroscopy: Principles and applications in various fields.

Unit 3: Circular Dichroism (CD) Spectroscopy: Principles, applications, and significance.

Unit 4: Colorimetry and Spectrophotometry: Principles, applications, and Beer and Lambert's law.

Block 2: Separation Techniques and Applications

Unit 5: Paper Chromatography: Principle and applications in sample analysis.

Unit 6: Thin Layer Chromatography and Ion Exchange Chromatography: Principles and applications.

Unit 7: Affinity Chromatography and HPLC: Principles, applications, and advantages.

Unit 8: Electrophoresis: Principles and applications of PAGE and agarose gel electrophoresis.

Block 3: Immunological Techniques and Histological Applications

Unit 9: Immunodiffusion Techniques: Single and double immunodiffusion principles and applications.

Unit 10: Immunoelectrophoresis and Immunoblotting: Techniques and applications in detection.

Unit 11: Immunocytochemistry and Immunofluorescence: Techniques, principles, and applications.

Unit 12: ELISA and RIA: Principles, applications, and significance in research and diagnostics.

Block 4: Cytological and Molecular Biology Techniques

Unit 13: Chromosome Preparations: Mitotic and meiotic chromosome preparation techniques.

Unit 14: Chromosome Banding Techniques: G, C, Q, and R banding methods and applications.

Unit 15: Flow Cytometry and Molecular Cytology: Principles and applications of FISH and hybridisation techniques.

Unit 16: Molecular Biology Techniques: Southern and Northern hybridisation, PCR and its types.

Recommended Books

1. Introduction to instrumental analysis-Robert Braun-McGraw Hill.
2. A biologist Guide to Principles and Techniques of Practical Biochemistry- K. Wilsonand K.H. Goulding EIBS Edn.
3. Clark & Swizer. Experimental Biochemistry. Freeman, 2000.
4. Locquin and Langeron. Handbook of Microscopy. Butterwaths, 1983
5. Boyer. Modern Experimental Biochemistry. Benjamin, 1993
6. Freifelder. Physical Biochemistry. Freeman, 1982.
7. Wilson and Walker. Practical Biochemistry. Cambridge, 2000.

BBSD-404 BIOPHYSICS

Block 1: Thermodynamics and Biological Principles

Unit 1: Laws of Thermodynamics: Fundamental principles, Conservation of energy in living systems, Entropy and Life, Gibbs free energy.

Unit 2: Standard free energy: Definitions, Equilibrium constant, Role in biological systems, coupled reactions.

Unit 3: Osmosis and Osmotic pressure: Concepts of osmosis, Osmoregulation in organisms, Biological importance of osmotic pressure, Factors affecting osmosis.

Unit 4: Colloids and Buffers: Colloidal systems in life, Buffer and buffer capacity, Importance of buffers in biological systems, Factors influencing buffer action.

Block 2: Energy Metabolism and Cellular Processes

Unit 5: Energy requirements in cell metabolism: Overview of energy needs, Importance in cellular function, Role of ATP, High-energy phosphate bonds.

Unit 6: Mitochondria: Structure and function, Role in energy metabolism, high-energy phosphate bond dynamics, Biogenesis of mitochondria.

Unit 7: Redox reactions: Oxidation and reduction principles, Redox potential and its calculation, Nernst equation, Examples in biological systems.

Unit 8: Electron transfer phenomena: Mechanisms of electron transfer, Biological significance, Examples in cellular respiration, Role in metabolism.

Block 3: Membrane Dynamics and Transport Mechanisms

Unit 9: Membrane structures: Micelles, reverse micelles, bilayers, and liposomes, Phases of lipid transitions, Characteristics of biological membranes, Role in cellular function.

Unit 10: Transport mechanisms: Active, passive, and facilitated transport of solutes, Laws of diffusion, Fick's Laws, and Nernst-Planck equations.

Unit 11: Donnan effect and permeability: Understanding the Donnan effect, Permeability coefficients, Role of ionophores, Transport equations in biology.

Unit 12: Applications in drug delivery: Mechanisms of drug transport, Role of biological membranes, Strategies for enhancing drug delivery, Examples in therapeutic applications.

Block 4: Spectroscopy and Microscopy Techniques

Unit 13: Electromagnetic radiation principles: Basic concepts, Types of electromagnetic radiation, Importance in biological systems, Energy and wavelength relationships.

Unit 14: Spectroscopic techniques: Overview of absorption laws, Types of spectroscopy, Applications in biology, Analysing biological samples.

Unit 15: Microscopy principles: Basic principles of microscopy, Differences between light and electron microscopy, Applications of microscopy in biological research, Enhancements in imaging techniques.

Unit 16: Uses and applications of microscopy: Applications in cell biology, Importance in research, Techniques for sample preparation, Case studies of microscopy in action.

Recommended Books

1. A text book of Biophysics by Dr. R. N. Roy
2. Biophysics: An introduction by Rodney Cotterill
3. Biophysics by K. Sarn

BBSD-405
LAB COURSE-1V

1. Preparation of stained mounts of anatomy of monocot and dicot roots, stem & leaf.
2. Demonstration of plasmolysis by Tradescantia leaf peel.
3. Demonstration of opening & closing of stomata
4. Demonstration of guttation on leaf tips of grass and garden nasturtium.
5. Separation of photosynthetic pigments by paper chromatography.
6. Demonstration of aerobic respiration.

DETAILED COURSE STRUCTURE

SEMESTER V

BBSD-501 ENVIRONMENTAL SCIENCE

Block 1: Introduction to Environmental Studies

Unit 1: Multidisciplinary Nature of Environmental Studies: Scope and Importance, Sustainable Development, Forest Conservation Act.

Unit 2: International Agreements: Montreal Protocol, Kyoto Protocol, Conservation of Biological Diversity.

Unit 3: Soil Formation: Weathering of Rocks, Mineralisation, Humification.

Unit 4: Soil Nutrients: Soil Cation Exchange Capacity, Nutrient Availability, Soil Moisture, Soil Type, Texture, Aeration, Mixing.

Block 2: Threats to Biodiversity and Wildlife

Unit 5: Threats to Biodiversity: Deforestation, Overgrazing, Agriculture, Shifting Cultivation.

Unit 6: Threats to Wildlife: Hunting and Export, Habitat Loss, Selective Destruction, Domestication.

Unit 7: Extinct and Threatened Species: Red Data Book, Conservation of Biodiversity.

Unit 8: Conservation Strategies: Habitat Conservation, Critical Resources, Captive Breeding, Development of Reserves.

Block 3: Pollution and Environmental Concerns

Unit 9: Pollution: Types, Causes, Effects, and Control (Air, Water, Soil, Noise).

Unit 10: Climate Change: Global Warming, Ozone Depletion, Acid Rain.

Unit 11: Health Effects of Pollution: Minamata Disease, Itai-Itai Disease, Skeletal Fluorosis, Occupational Hazards.

Unit 12: Pollution Monitoring: Physical, Chemical, Biological; Forest Conservation Act, International Agreements.

Block 4: Energy Sources and Water Conflicts

Unit 13: Renewable Energy Sources: Flowing Water, Wind, Tides, Oceanic Waves.

Unit 14: Biofuels: Biodiesel, Biogas, Bioethanol, Hydrogen; Nuclear, Geothermal, Antimatter.

Unit 15: Non-Renewable Energy Sources: Fossil Fuels (Coal, Petroleum, Natural Gas).

Unit 16: Water Management: Rainwater Harvesting, Conflicts over Water (International and Interstate).

Recommended Books

1. Groom Martha J, Gary K Meffe and Carl Ronald Carroll. 2006. Principles of Conservation Biology. Sunderland: Sinauer Associates.
2. Singh JS, Singh SP and Gupta SR. 2014. Ecology, Environmental Science and Conservation. S Chand Publishing, New Delhi.
3. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press.
4. Julian E Andrews, Peter Brimblecombe, Tim D Jickells, Peter S Liss, and Brian J Reid. 2004. An Introduction to Environmental Chemistry. Blackwell Publishing.
7. Pandey SN, Misra SP. 2011. Environment and Ecology, Ane Books Pvt. Ltd.
8. LSE-02 Ecology Blocks (1,2,3,4). IGNOU.

BBSD-502
RECOMBINANT DNA TECHNOLOGY

Unit 1: History of recombinant technology, restriction modification system in bacteria, DNA modifying enzymes and their mechanisms of action, PCR Technology and its applications.

Unit 2: Molecular cloning, purification of DNA from living cells, construction of genomic and cDNA libraries, screening of libraries, substrate hybridisation for tissue-specific DNA libraries

Unit 3: Expression of foreign genes in E. coli, production of recombinant protein by prokaryotic expression vectors, eukaryotic expression vectors, mammalian expression vectors; fusion tags, role in purification of recombinant proteins, detection of expressed proteins. Chemical synthesis of DNA, changing gene: Random and site-directed mutagenesis.

Recommended Books:

1. Singh BD (2010) Biotechnology 4th Edition, Kalyani Publications
2. Nair AJ (2008) Introduction to Genetic Engineering and Biotechnology. Infinity Science Press
3. Brown T (2010) Gene cloning and DNA analysis: an introduction. John Willey & Sons

BBSD-503
PLANT BIOTECH

Block 1: Water Transport and Nitrogen Assimilation

Unit 1: Water Transport: Movement of water in plants concerning water potential, osmotic potential, pressure potential, and metric potential.

Unit 2: Ascent of Sap: Mechanism of water absorption and guttation, physiology of stomatal opening and closing.

Unit 3: Nitrogen Assimilation: Uptake and assimilation of nitrogen by plants, including the role of glutamine synthase and glutamine dehydrogenase.

Unit 4: Nitrogen Fixation: Nonsymbiotic and symbiotic nitrogen fixation, assimilation of ammonia.

Block 2: Photosynthesis and Dormancy

Unit 5: Photosynthesis: Role of photosynthetic pigments in the process of photosynthesis.

Unit 6: Photosystems: PS II and PS I complexes and their inter-relationship, mechanism of photosynthetic electron transport.

Unit 7: Carbon Fixation: Mechanism of carbon dioxide fixation in C₃, C₄, and CAM plants; understanding photorespiration.

Unit 8: Dormancy: Significance of seed dormancy and bud dormancy.

Block 3: Translocation and Plant Growth Regulators

Unit 9: Translocation: Translocation of photo-assimilates in plants, including phloem loading and unloading.

Unit 10: Plant Growth Regulators: Types of regulators such as auxin, ethylene, cytokinins, gibberellins, and abscisic acid.

Unit 11: Mechanism of Action: Distribution and mechanism of action of plant growth regulators, including phototropism and gravitropism.

Unit 12: Vernalization: Understanding the process of vernalization and its significance in plant development.

Block 4: Tissue Culture and Techniques

Unit 13: Introduction to Tissue Culture: Overview of in vitro methods and general techniques used in tissue culture.

Unit 14: Factors in Totipotency: Factors involved in totipotency, embryogenesis, organogenesis, and their applications.

Unit 15: Culture Techniques: Auxiliary bud, shoot tip, and meristem culture, including haploids and somaclonal variations.

Unit 16: Protoplast Isolation: Introduction to protoplast isolation, principles and applications of somatic hybridization.

Recommended Books

1. Taiz, L., Zeiger, E. Plant Physiology. Sinauer Associates Inc., U.S.A.
2. Hopkins, W.G., Huner, N.P. Introduction to Plant Physiology. John Wiley & Sons, U.S.A.
3. Bajracharya, D. Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Plant Biotechnology, 2011, 3rd Ed, BD Singh.

BBSD-504
BIOCHEMISTRY II

Block 1: Lipids

Unit 1: Classification and Types of Lipids: Overview and Functions.

Unit 2: Structure and Function of Phospholipids, Sphingolipids, and Glycolipids.

Unit 3: Lipid-Linked Proteins and Lipoproteins: Types and Functions.

Unit 4: Mobilization of Lipids for Oxidation: Mechanisms and Pathways.

Block 2: Fatty Acid Oxidation

Unit 5: Beta-Oxidation of Saturated and Unsaturated Fatty Acids.

Unit 6: Beta-Oxidation of Odd Chain Fatty Acids.

Unit 7: Synthesis of Palmitic Acid by Fatty Acid Synthase System.

Unit 8: Regulation of Lipid Metabolism: Key Enzymes and Pathways,

Block 3: Amino Acids and Proteins

Unit 9: Structure, Nomenclature, Classification, and Acid-Base Behavior of Amino Acids.

Unit 10: Primary Structure of Proteins and Its Determination.

Unit 11: Secondary Structure of Proteins: Peptide Group, Helical and Beta Structures.

Unit 12: Bonds and Forces Stabilizing Native Protein Structure and Protein Denaturation.

Block 4: Amino Acid Metabolism

Unit 13: Oxidation of Amino Acids: Transamination Reactions and Urea Biosynthesis.

Unit 14: Flow Sheet Diagram of Amino Acid Catabolism and Synthesis (Without Structures). **Unit 15:** Importance of Amino Acid Metabolism in Human Health.

Unit 16: Disorders Related to Amino Acid Metabolism: Overview.

Recommended Books

1. Principles of Biochemistry by Albert L. Lehninger, David L. Nelson, Michael M. Cox. 2. Biochemistry by Stryer.

BBSD-505
PUBLIC HEALTH

Block 1: Introduction to Public Health and Hygiene

Unit 1: Introduction to public health and hygiene: Meaning, significance, and relevance in contemporary society.

Unit 2: Determinants and factors affecting health and hygiene: An overview of social, economic, and cultural influences.

Unit 3: Environment and health-associated hazards: Understanding water and air-borne diseases. **Unit 4:** Prevention of diseases through health education: Strategies for environmental improvements and community engagement.

Block 2: Nutrition and Deficiency Diseases

Unit 5: Balanced diet: The importance of a balanced diet and its components in maintaining health.

Unit 6: Malnutrition: Identifying diseases caused by deficiency of proteins, vitamins, and minerals.

Unit 7: Food adulteration: Understanding the impact of food adulteration on health and safety.

Unit 8: Community nutritional programmes: Exploring nutritional problems in India and initiatives for improvement.

Block 3: Communicable Diseases

Unit 9: Infectious agents: Identifying the agents responsible for diseases in humans.

Unit 10: Overview of communicable diseases: Understanding diseases such as COVID-19, measles, polio, and chikungunya.

Unit 11: Preventive measures: Strategies for preventing communicable diseases like rabies, leprosy, tuberculosis, and AIDS.

Unit 12: Parasitic diseases: Learning about various parasitic diseases and their implications on health.

Block 14: Lifestyle Diseases and Their Management

Unit 13: Non-communicable diseases: Understanding lifestyle diseases and their implications on public health.

Unit 14: Hypertension and heart disease: Exploring the causes and preventive measures for hypertension and coronary heart disease.

Unit 15: Diabetes and obesity: Understanding the prevalence and control measures for diabetes and obesity.

Unit 16: Mental health and cancer: Recognizing the importance of mental well-being and prevention of cancer.

Books Recommended

1. Introduction to Public Health - Mary Jane Schneider
2. A Short Book of Public Health - Muthu, V.K.
3. Oxford Textbook of Public Health (6th Ed.) - Roger Detels
4. Public Health Nutrition - Gibney

BBSD-506
LAB COURSE – V

1. Demonstration of aerobic respiration.
2. Preparation of root nodules from a leguminous plant.
3. Proxy filing of Indian Product patent
4. Proxy filing of Indian Process patent
5. Planning of establishing a hypothetical biotechnology industry in India
6. A case study on clinical trials of drugs in India with emphasis on ethical issues.
7. Case study on women health ethics.

DETAILED COURSE STRUCTURE

SEMESTER VI

BBSD-601

DEVELOPMENTAL BIOLOGY

Block 1: Gametogenesis and Fertilization

Unit 1: Gametogenesis: Spermatogenesis and Oogenesis.

Unit 2: Ovulation and Hormonal Control.

Unit 3: Menstrual Cycle.

Unit 4: Fertilization: Molecular Basis, Block of Polyspermy, Cortical Reaction, and Role of Zona Pellucida.

Block 2: Post-Fertilization and Early Development

Unit 5: Post-Fertilization Events: Zygote Formation and Morula.

Unit 6: Cleavage, Compaction, and Cavitation.

Unit 7: Differentiation: ICM, Trophoblast, and Importance of Blastula.

Unit 8: Implantation and Formation of Gastrula, Germ Layers, and Primitive Streak.

Block 3: Morphogenesis and Neural Development

Unit 9: Types of Morphogenetic Movements: Bilaminar Disk, Epiblast, and Hypoblast.

Unit 10: Neuralation: Neuronal Tube and Neuronal Plate.

Unit 11: Axon Guidance and Somite Development.

Unit 12: Notochord Formation.

Block 4: Developmental Processes and Organogenesis

Unit 13: Fundamental Processes in Development: Gene Activation and Determination.

Unit 14: Induction, Differentiation, and Morphogenesis.

Unit 15: Intracellular Communications, Cell Movements, and Cell Death: Apoptosis and Regulatory Genes.

Unit 16: Organogenesis: Myogenesis, Ossification, Limb Formation, and Development of Heart and Kidney.

Recommended Books

1. Gilbert. S. F. (2006). Developmental Biology, VIII edition, Sinauer Associates Inc, Publishers, Sunderland, Massachusetts, USA
2. Balinsky. B. I. (2008). 'An introduction to Embryology', International Thomson Computer Press.
3. Carison. Bruce M (1996). 'Patten's Foundation of Embryology', McGraw Hill Inc.
4. C.C. Chatterjee's, 'Human Physiology', CBS Publishers and Distributors pvt ltd.

BBSD-602
ANIMAL BEHAVIOUR

Block 1: Animal Behavior Fundamentals

Unit 1: Introduction to animal behaviour: Brief history and scope. Types of stimuli: internal and external cues. Kinds of behaviour: feeding behaviour, territorial behaviour, reproductive behaviour and parental care, defensive behaviour.

Unit 2: Patterns of innate behaviour: kinesis, taxis, simple reflexes, instinct and motivation. Neural control of behaviour. Hormonal control of behaviour: Ring Dove and Red Deer.

Unit 3: Communication in animals: Components and types. Neural and hormonal control of behaviour. Social hierarchy, selection and organization in animals.

Unit 4: Learning process: innate and learnt behaviours, its neural and hormonal control.

Block 2: Learning and Social Behavior

Unit 5: Learning/Learnt Behaviour: habituation, imprinting, conditioned reflex, trial and error learning, latent and insight learning.

Unit 6: Social behaviour: Altruism and reciprocal altruism.

Unit 7: Social organization: Examples from honey bee and naked mole rat.

Unit 8: Innate behaviour: Kinesis, taxis, reflexes, instinct and motivation. Neural control of behaviour.

Block 3: Biological Rhythms and Clocks

Unit 9: Biological clocks: circadian and circannual rhythms, tidal, solar and lunar rhythms.

Unit 10: Migratory behaviour: Examples from fish and birds.

Unit 11: Advantages of biological rhythms and their applications in chronobiology.

Unit 12: Allelomimetic and maladaptive/abnormal behaviour in animals.

Block 4: Communication and Adaptive Behavior

Unit 13: Communication in animals: Various types and components.

Unit 14: Hormonal control of behaviour: Detailed examples of Ring Dove and Red Deer.

Unit 15: Learning processes: Neural and hormonal mechanisms in learnt behaviours.

Unit 16: Social hierarchy and its organization in animal behaviour.

Books recommended/Suggested Readings:

- | | |
|--------------------------------|---|
| 1. Animal Behaviour (Ethology) | : Reena Mathur (Rastogi Publications) |
| 2. Ethology (Animal Behaviour) | : S. Prasad (Ahead Publications) |
| 3. Animal Behaviour (Ethology) | : David McFarland (Longman) |
| 4. Animal Behaviour (Ethology) | : V. K. Agarwal (S. Chand Publications) |
| 5. Animal Behaviour | : Manning & Dawkins (Cambridge) |
| 6. Animal Behaviour | : Graham Scott (Blackwell Publishing) |

BBSD-603
ORGANIC EVOLUTION

Block 1: Origin and Evolution of Life

Unit 1: Origin of Life: Theories of the origin of life, including cosmozoic, chemogeny, and biogeny. Experimental evidence supporting the biochemical origin of life.

Unit 2: Evidence for Evolution: Evidence from embryology, palcontology, and taxonomy, including connecting links between species.

Unit 3: Biological Evidence: Evidence from biology, physiology, and genetics that supports evolutionary theory.

Unit 4: Evolutionary Mechanisms: Overview of the mechanisms driving evolution and their significance in biological sciences.

Block 2: Evolutionary Theories and Patterns

Unit 5: Lamarck and Lamarckism: Overview of Lamarck's theories and their implications for evolutionary biology.

Unit 6: Darwinism and Natural Selection: Explanation of Darwin's theory of natural selection and its foundational role in evolutionary theory.

Unit 7: Modern Evolutionary Synthesis: Overview of Neo-Lamarckism, Neo-Darwinism, and the modern synthetic theory of evolution.

Unit 8: Patterns of Evolution: Examination of evolutionary patterns such as polymorphism, monophyletic, polyphyletic, paraphyletic evolution, divergent evolution, convergent evolution, co-evolution, microevolution, megaevolution, and adaptive radiations.

Block 3: Fossil Record and Geological Time

Unit 9: Fossils: Definition, types, and significance of fossils in understanding evolutionary history.

Unit 10: Geological Time Scale: Explanation of the geological time scale, including eras, periods, epochs, and their features.

Unit 11: Evolution of Specific Species: Origin and evolution of the horse and its significance in the study of evolution.

Unit 12: Phylogeny of Humans: Overview of human phylogeny and its implications for understanding human evolution.

Block 4: Biogeography and Zoogeography

Unit 13: Introduction to Biogeography: Definition and importance of biogeography in understanding species distribution.

Unit 14: Theories of Zoogeography: Overview of various theories explaining zoogeographical patterns.

Unit 15: Regions and Subregions: Discussion of zoogeographical regions and subregions, particularly with reference to the Indian subcontinent.

Unit 16: Spatial Distribution: Analysis of spatial distributions of species within zoogeographical regions and their ecological significance.

Recommended Books

1. Organic evolution by Veer Bala Rastogi, Kedarnaath Ramnaath Publishers, Meerut
2. Organic Evolution, a text book by Lull, Richard Swann, 1867
3. Strickberger's Evolution by Brian K. Hall and Bennedikt Hallgrimsson
4. A text book of Organic Evolution by Mohan P. Arora and Himanshu Arora

BBSD-604 BIOINFORMATICS

Block 1: Computer Fundamentals

Unit 1: Computer and its components: Characteristics of Computer, Types of Digital Computer, Hardware basics (Processors, motherboard, slots/cards, bus, parallel and serial ports).

Unit 2: Various storage devices, Input/Output, Memory unit.

Unit 3: Software basics: Data vs. information, Types of software, Operating systems, Languages, Compilers, Interpreters.

Unit 4: Ideas of portability and platform dependence; Basic word processing in Microsoft Word; PowerPoint and Excel; Preparing and processing text documents.

Block 2: Internet and Its Functionality

Unit 5: Internet: Introduction and background, Functioning, Governing bodies.

Unit 6: Uses of the Internet in daily life, education, and research.

Unit 7: Internet safety and security: Basic concepts and practices.

Unit 8: Future of the Internet: Emerging trends and technologies.

Block 3: Introduction to Bioinformatics

Unit 9: What is Bioinformatics: Definition and importance.

Unit 10: Use of information technology in studying Biosciences.

Unit 11: Emerging areas in Bioinformatics: Applications and innovations.

Unit 12: Future prospects of Bioinformatics: Trends and career opportunities.

Block 4: Key Bioinformatics Concepts

Unit 13: Introduction to Genomics: Basic principles and significance.

Unit 14: Introduction to Proteomics: Scope and applications.

Unit 15: Human Genome Project: Overview and implications.

Unit 16: Biological software and Public databases: GenBank and its resources.

Recommended Books

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell.
3. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

BBSD-605
ANIMAL PHYSIOLOGY

Block 1: Endocrinology

Unit 1: Hormones: Definitions, Functions, and Mechanisms of Action.

Unit 2: Types and Classes of Hormones: Peptides, Steroids, and Amino Acid Derivatives.

Unit 3: Endocrine Glands: Overview of Hypothalamus, Pituitary, Thyroid, Adrenal, Parathyroid, Pancreas, and Gonads.

Unit 4: Neuroendocrine System and Enteric Hormones: Interactions and Functions.

Block 2: Digestion and Respiration

Unit 5: Histology of the Digestive Tract: Structure and Function of Tissues.

Unit 6: Digestive Enzymes: Sources and Roles in Mouth, Stomach, and Intestine.

Unit 7: Absorption of Food: Mechanisms and Importance in Energy Balance.

Unit 8: Pulmonary Ventilation: Respiratory Volumes, Capacities, and Gas Exchange Mechanisms.

Block 3: Excretion and Cardiovascular System

Unit 9: Kidney Structure: Anatomy of the Nephron and Mechanisms of Urine Formation.

Unit 10: Renin-Angiotensin System: Role in Blood Pressure Regulation.

Unit 11: Blood Composition and Hemostasis: Components and Their Functions.

Unit 12: Heart Structure: Cardiac Anatomy and the Origin of the Cardiac Impulse.

Block 4: Nerve and Muscle Systems

Unit 13: Anatomy of the Brain: Overview of the Central and Peripheral Nervous Systems.

Unit 14: Structure of a Neuron: Resting Membrane Potential and Graded Potentials.

Unit 15: Action Potential: Origin, Propagation in Myelinated vs. Non-Myelinated Fibers.

Unit 16: Muscle Fiber Types: Ultrastructure of Cardiac Muscle and Molecular Basis of Contraction.

Recommended Books

1. Tortora, G.J.& Derrickson, B.H. (2009). Principles of Anatomy and Physiology, 12th edn., John Wiley & Sons, Inc.
2. Widmaier, E.P., Raff, H. & Strang, K.T. (2008) Vander's Human Physiology, 11th ed, McGraw Hill.
3. Guyton, A.C. & Hall, J.E. (2011) Textbook of Medical Physiology, 12th ed, HarcourtAsia Pvt. Ltd/ W.B. Saunders Company
4. Human Physiology, CC Chatterjee.

BBSD-606
LAB COURSE-VI

1. Case study on medical errors and negligence.
2. Case study on handling and disposal of radioactive waste
3. Identification and Classification of Any these of the following –
Porifera: Scypha, Leucosolenia, Euspongia, Hylonema, Euplectella
Cnidaria: Medrepora, Millepora, Physalia, Porpita, Valella, Aurelia, Metridium
Platyhelminthes: Taenia, Fasciola
Aschelminthes: Ascaris, Ancylostoma, Enterobius
Annelida: Pheretima, etc.
4. Identification of slides with two points of identification.
Amoeba, Paramecium, Ceratium, Plasmodium, Opalina, L.S. Sponge, Spicules of sponges, L.S.
Hydra, Obelia, Bougainvillia, Larvae of Fasciola, Seta of Earthworm, Radula

Counselling sessions are held at the Learner Support Centre normally on weekends within the general academic schedule of the Programme. However, the Centre has decided to conduct the counselling sessions in blended mode as per UGC-DEB guidelines. It may be noted that the counselling sessions are not conventional classroom teaching. Lectures will be largely based on discussions, which will help to overcome difficulties faced by the candidates while going through the SLMs.

In these sessions, candidates must try to resolve subject-related difficulties if any. Before you proceed to attend the counselling sessions, please go through your Self Learning Materials and identify the points to be discussed. The detailed schedule of the counselling sessions will be available on the University Website:

<https://www.jmi.ac.in/cdoe/cschedule>

Counselling sessions will be organised in all theory / practical courses. There will be **nine** counselling sessions of 2 hours each. Attending the counselling session is not mandatory; nevertheless, it is always in the interest of the learner to attend these sessions.

Mode of instruction

It is based on Self-Learning Study Material prepared and supplied by CDOE, besides counselling sessions and other exercises such as assignments, etc. (The SLM will be provided in English and Assignments and Question Papers will be provided only in English).

Updates regarding academic activities

Students are advised to remain in touch with their respective Learner Support Centre/programme Coordinator and visit the CDOE and COE, JMI websites for updates regarding academic activities about their Programme. Further, they should follow the Academic Calendar provided to them for the current academic year.

Academic calendar

The academic calendar provides important dates and other relevant information corresponding to activities such as Counselling, Assignments, and Examinations etc. Try to keep an eye on the important dates given in your academic calendar for different activities. You can view and download your academic calendar from JMI website <https://www.jmi.ac.in/bulletinboard/academic-calendar/cdol> as well as on the notice board of the Centre for Distance and Online Education / Learner Support Centres.

Learner support centres

The Learner Support Centre to which you have been admitted will remain your Learner Support Centre till you clear all components of the programme during the maximum duration of the programme. No student would be permitted to change his/her Learner Support Centre at any point of time. All the activities related to Counselling, Assignments and Semester End Examinations will be held at the Learner Support Centre only. However, the CDOE, JMI reserves the right to discontinue/change the Examinations/ Learner Support Centre at any point of time as it deems appropriate.

Evaluation system

Assignments

- Assignments are a part of the continuous evaluation system. The submission of assignments is compulsory.
- Assignments of a course carry 25% weightage in terms of marks.
- Assignments are designed in such a way as to help you concentrate mainly on the printed course material (SLM). However, access to other books and sources will be an added advantage in your academic pursuits.
- Assignments should be handwritten. Typed or printed assignments shall not be entertained.
- For your own record, it is advisable to retain a copy of all the assignment responses.
- You have to submit the Assignments to the Learner Support Centre on or before the last date of submission mentioned in the Academic Calendar.
- Write your Name and Roll Number correctly and legibly on the Assignment booklet.
- Getting a pass percentage in assignments is mandatory. If you do not get passing marks in any assignment, you have to submit a fresh assignment in consultation with the Programme Coordinator. However, once you get the passing marks in an assignment, you cannot resubmit it for improvement of marks.

Semester End Examinations

Semester End Examination is the major component of the evaluation system, and it carries 75% weightage in the final result.

You must fill in the Semester End Examination Form online through the Distance Students Exam Portal as per the instructions given in the notification issued on the Controller of Examinations, JMI website <http://jmicoe.in/> . The examination forms should be submitted on or before the last date mentioned in the Academic Calendar/Notice from the Controller of Examinations, JMI.

Semester End Examination Date-sheet

- After the successful submission of the Examination Form, the Admit Card will be generated 15 days before the commencement of the Semester End Examination. In case you fail to download the Admit Card before the commencement of the examination, you may contact your Examinations Centre / Learner Support Centre.
- The Examination Date-sheet will be uploaded on the website much in advance before the commencement of the Examination.
- While submitting your Examination Form for the Semester End Examinations, it is your responsibility to check whether you are registered for the programme and eligible to appear for that examination. If any of the above requirements are found missing, your examination is liable to be cancelled.

Semester end examination result

The evaluation consists of two parts: (i) Assignments, (ii) Semester End Examination. In the final result, all the Assignments of a course will carry 25% weightage, while 75% weightage will be given to the Semester End Examination.

Declaration of Result

To pass a programme under distance mode, a candidate must obtain:

- a) at least 40% marks in each component of theory papers, i.e. in assignments and Semester Examination, separately;
- b) an aggregate of at least 50% marks based on all theory papers and assignments, to obtain the degree;
- c) If a student fails to qualify any component of a paper or a course, he/she can repeat the same during the subsequent Semester, up to the maximum duration provided for the Programme from the date of registration; and

Division

Based on the marks obtained, division will be awarded in the following way:

- i. Distinction to those who obtain 75% marks or more in the aggregate.
- ii. First division to those who obtain 60% marks or more in the aggregate.
- iii. Second division to those who obtain less than 60% marks in the aggregate but not less than 50% marks.
- iv. Third division to those who obtain less than 50% marks in the aggregate but not less than 40% marks.

Grace Marks: A maximum of three (3) grace marks shall be given only to those students who, by obtaining them, can either pass the examination or improve to get a division. Only minimum grace marks as required shall be awarded. The grace marks awarded shall be counted in the grand total.

Promotion to the next Semester of the Programme

- No candidate shall be permitted to move to the third semester if he/she has a backlog of more than 50% of the courses of the first and second semesters combined.
- The students will be declared successful for award of degree only after clearing all theory papers and assignments required within the maximum time period inclusive of the year of admission. A student who does not appear in any component (Semester End Examination and assignments) in the minimum duration provided for the Programme, he/she will have to seek re-registration by submitting the prescribed fee through the online portal/Demand Draft if he/she wishes to continue through the Programme.

Re-evaluation of Answer Scripts

No request for re-evaluation of the result declared in any course shall be entertained. However, the retotaling of marks of an answer book will be permitted on submission of an application along with the prescribed fee by the candidate to the Controller of Examinations.

Improvement of Result

- A student may be allowed to appear in the Semester End Examination for improving his/her result provided that: A student may be allowed to improve his/her grade in any two of the courses in the next semester. However, the improvement of the odd/even semester course will be permitted in the next odd/even Semester End Examination only.
- Improvement examination will be held in Theory courses only.
- The appearance at such an examination in the course will be allowed only once. No further chance will be given under any circumstances.
- For the purpose of determining the final division/ grade, the grades obtained by the candidate in the improvement examination only will be taken into consideration.

General regulations

Programme Fee, Re-Registration, Late fee and other Charges

- **Programme Fee:** The Programme fee is payable in advance each year, irrespective of results, through the CDOE Online Fee Payment Portal on or before the date fixed by CDOE, Jamia Millia Islamia. No refund of fees is allowed in any case.
- **Re-Registration Fee:** A student who does not appear in any component (i.e. theory and assignment) of the Programme during the minimum period and wishes to continue the Programme, then he/she will have to re-register by paying the prescribed re-registration fee, given in the table on the next page.
- **Late Fee:** A student who doesn't submit his/her Assignments and Examination Form on time may submit the same with the prescribed late fee; and
- Candidates are required to intimate the relevant authorities sufficiently in advance if there is any change of address/mobile number, etc.



PROGRAM GUIDE

2026-2027

Session: July-August 2026



JAMIA MILLIA ISLAMIA
NEW DELHI



Centre for Distance and Online Education

Jamia Millia Islamia, New Delhi-25

(A Central University by an Act of Parliament)

Accredited 'A++' Grade by NAAC



Flexible
Learning



Quality
Education



Accessible
Anywhere



Learner
Centric