JYOTI NIVAS COLLEGE AUTONOMOUS

DEPARTMENT OF LIFESCIENCES

M.Sc. BIOLOGICAL SCIENCES PROGRAM

Syllabus and Scheme of Examinations for two-year (four semester) M.Sc. Degree Program in Biological sciences under NEP 2020

Preamble:

As per guidelines of the Bangalore City University, UGC and HEI, Government of Karnataka, the Board of Studies in biological science, Jyoti Nivas College Autonomous, has framed a new syllabus according to the regulations governing the Choice-based Credit System for the two-year (four semester) M.Sc. Degree Programme. The proposed M.Sc. programme in Biological Sciences under NEP and CBCS scheme has a total of 100 credits consisting of hard core courses, soft core courses and open elective courses.

M.Sc. BIOLOGICAL SCIENCES PROGRAM
GRID FOR COURSE CONTENTS

FIRST SEMESTER	COURSE CODE	HOURS/WEEK	CREDITS
DISCIPLINE CORE COURSE			
Cell Biology	BLSH101	4	4
Molecular Biology & Genetics	BLSH102	4	4
Biochemistry	BLSH103	4	4
Microbiology	BLSH104	4	4
SOFT CORE COURSE (ANY ONE TO BE OPTED)			
Scientific communication and report writing	BLSS105	3	2
Biological systematics	BLSS106		
PRACTICAL COURSE			
Cell Biology and Molecular Biology and Genetics	BLSP107	4	4
Biochemistry and Microbiology	BLSP108	4	4
SECOND SEMESTER	**COURSE CODE**	**HOURS/WEEK**	**CREDITS**
DISCIPLINE CORE COURSE			
Developmental Biology	BLSH201	4	4
Immunology and Clinical Biology	BLSH202	4	4
Genetic Engineering	BLSH203	4	4
Environmental Biology and Technology	BLSH204	4	4
SOFT CORE COURSE (ANY ONE TO BE OPTED)			
Plant Physiology & Metabolism	BLSS205	3	2
Animal Physiology & Metabolism	BLSS206		
PRACTICAL COURSE			
Developmental and Environmental biology	BLSP207	4	4
Immunology and Clinical Biology and Genetic Engineering	BLSP208	4	4
THIRD SEMESTER	**COURSE CODE**	**HOURS/WEEK**	**CREDITS**
DISCIPLINE CORE COURSE			
Plant and Animal cell Technology	BLSH301	4	4
Bioinformatics, Genomics and Proteomics	BLSH302	4	4
Bioanalytical Techniques	BLSH303	4	4
Research Methodology and Biostatistics	BLSH304	4	4
SOFT CORE COURSE (ANY ONE TO BE OPTED)			
Gene therapy and Genetic Counseling	BLSS305	**3**	**2**
Intellectual Property and Bioentrepreneurship	BLSS306		

DISCIPLINE OPEN ELECTIVE			
Biology for Criminal investigation	BLSE307	**3**	**2**
Nutrigenomics	BLSE308		
Ethnomedico Botany	BLSE309		
Entrepreneurial Zoology	BLSE309		
PRACTICAL COURSE			
Plant and Animal cell technology	BLSP310	**4**	**4**
Bioanalytical techniques and Bioinformatics	BLSP311	**4**	**4**
FOURTH SEMESTER	**COURSE CODE**	**HOURS/WEEK**	**CREDITS**
DISCIPLINE CORE COURSE			
Fermentation and Bioprocess Technology	BLSH401	4	4
SOFT CORE COURSE (ANY ONE TO BE OPTED)			
Cancer Biology	BLSS402	**3**	**2**
Behavioral Science and Life Style disorders	BLSS403		
PRACTICAL COURSE			
Bioprocess Technology	BLSP404	**4**	**4**
Project work with Report (Can include a long internship – 2 to 3 months)	BLSD405		**5**
INTERNSHIP/TRAINING – between semesters, minimum 15 days			**2-5**

Total credits –

Abbreviations

BLS – Biological Sciences; BLSH – Biological science hard core paper BLSS – Biological Science Soft core paper; BLSP – Practical paper; BLSE – open elective paper BLSD – project and dissertation

JYOTI NIVAS COLLEGE AUTONOMOUS

I SEMESTER M.Sc., BIOLOGICAL SCIENCES

DISCIPLINE CORE COURSE SYLLABUS

CELL BIOLOGY

Course code : BLSH101

Duration : 60

Hours/week : 4 hours

UNIT 1: HISTORICAL PERSEPECTIVES 5 HRS

Cells as basic functional unit of living body, cellular classification (3 domains, i.e. eubacteria, archaebacteria, eukaryotes). Evolution of the cell, from molecules to first cell, from Prokaryotes to Eukaryotes, from single cells to multicellular organisms, discovery of cell, cell theory, prokaryotes and eukaryotes, evolution of eukaryotic cell.

UNIT 2: CELLULAR ORGANIZATION AND MOVEMENT 8 HRS

Organization of Eukaryotic cells: Cell Wall: Ultra structure, chemical composition, and function; plasmodesmata and gap junctions. Plasma membrane organization, structure and function. Fluid mosaic model - Lipid bilayer, Membrane Proteins. Principles of membrane transport –carrier proteins, active transport and ion channels.

UNIT 3: CYTOSKELETON AND CELL ORGANELLES 12HRS

Cytoskeleton: microtubules, cilia, flagella. Tubulin, Actin and Myosin filaments. Microtubule structure and dynamics. Centrioles, Intermediate filaments.
Extracellular matrix: components and functions
Ultrastructure: Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Lysosomes and Peroxisomes. Vesicular traffic, Exocytosis and Endocytosis.

UNIT 4: NUCLEUS AND CHROMOSOMES 10HRS

Nucleus: nuclear envelope, nuclear pore, organization and functions of nucleolus. Structure and function of chromatin, organization of nucleosomes, euchromatin, heterochromatin. Mechanism of chromosome condensation. Ultrastructure of Eukaryotic Chromosome.

UNIT 5: CELL CYCLE AND CELL DIVISION 12HRS

Cell cycle and cell division and significance: Mitosis and Meiosis, - Karyokinesis and Cytokinesis importance of M phase, mechanism of cell division. Amitosis, Endomitosis and their significance; Checkpoints in cell cycle regulation. Molecular mechanism of Synaptonemal complex, Mitotic apparatus, Mitogens and Mitotic inhibitors.

UNIT 6: CELL SIGNALING AND APOPTOSIS 13 HRS

Cell Signaling and Apoptosis: General principles of cell signaling (autocrine, paracrine, synaptic, endocrine), classes of cell-surface receptor proteins (ion-channel linked, G protein-coupled, enzyme-linked) signaling via GPCRs & enzyme-linked cell-surface receptors, Characteristics and Mechanism of Programmed cell death: intrinsic and extrinsic pathway, regulation of apoptosis by Bcl-2 family of proteins. Cancer: Types, Tumour suppressor genes (with examples), proto-oncogenes, viral oncogenes. Mechanism of carcinogenesis.

REFERENCE BOOKS

1.Cell and Molecular Biology. De Roberts and De Roberts., Saunders College, USA 6th edition.

2 .Molecular Cell Biology. Lodish, Berk, Zipursky, Matsudaira, Baltimore & Darnell. Freeman Press, 6th edition.

3.Cell Biology. Karp G., McGraw Hill book comp. New York. 2010 6th edition.

4. The Cell : A molecular approach. Cooper, G.M. ASM Press, USA 2009, 5th edition.

5.Chromatin structure and function. Wolfe, A., Academic press, New York 1995.

6.Cell Biology. Pollard. J.P. and Earnshow, W.C. Saunders, 2002.

7.The Cell –A molecular approach. Cooper, G.M. Princeton Publishers, NY, 2000.

8.Molecular Cell Biology. Lodin, H., Berk, A., Zipursky, S.L., Matsudain, P., Baltimore, D. and Darneil, T. Will Freeman company, NY, 6th edition.

9.Molecular biology of the cell. Albert, B., Johnson, A., Raff, M., Robert, K., Walter, P. Garland Sciences, NY, 5th edition.

JYOTI NIVAS COLLEGE AUTONOMOUS

I SEMESTER M.Sc., BIOLOGICAL SCIENCES

DISCIPLINE CORE COURSE SYLLABUS

MOLECULAR BIOLOGY AND GENETICS

Course code : BLSH102

Duration : 60

Hours/week : 4 hours

SYLLABUS

UNIT 1: CHROMOSOME AND KARYOTYPE 9 HRS

Human and Onion karyotypes; Banding techniques – G, C, Q, R, Ag-NOR (Nucleolar organizing region), FISH, GISH. Digital and Spectral karyotyping. Paris nomenclature. Types of sex determination, Dosage compensation in *Drosophila* and humans. Special types of chromosomes – Polytene and Lampbrush chromosomes (structure and significance).

UNIT 2: MUTATIONS AND CHROMOSOMAL ABERRATIONS 12 HRS

General characteristics of mutations, Morphological, Biochemical and Genetic manifestations of mutations; Types of mutations: Germinal and Somatic; Spontaneous and Induced. Isolation and detection of mutants in bacteria (replica plating, Ames tests); *Drosophila* (ClB, Muller stock). Chromosomal aberrations - Structural and numerical aberrations (1 example each)

UNIT 3: TRANSPOSONS: 6 HRS

Contributions of Barbara McClintock, IS elements and composite transposons in prokaryotes. Ac and Ds elements in Maize, Retrotransposons and P elements in *Drosophila*, Humans transposons, Genetic and evolutionary significance of transposons

UNIT 4: DNA REPLICATION AND REPAIR 8 HRS

Replication in Prokaryotes (rolling circle model) and Eukaryotes, telomere replication, DNA Repair: Photoreactivation, Excision repair, recombination repair.

UNIT 5: FROM GENES TO PROTEINS: REGULATION OF GENE EXPRESSION 15 HRS

Central Dogma, Transcription in Prokaryotes and Eukaryotes: initiation, elongation and termination, mRNA processing in eukaryotes-formation of 5'cap, addition of poly-A tail and RNA splicing. Differences in transcription between prokaryotes and eukaryotes. Genetic code: Triplet codon, Wobble hypothesis, universality, degeneracy and non-overlapping; initiation and termination codons, Translation in prokaryotes-initiation (including amino-acylation), elongation and termination. Translation in eukaryotes- initiation (including formation of ternary complex, pre-initiation complex and formation of complete initiation complex), elongation and termination. Differences in translation between prokaryotes and eukaryotes.

Regulation of gene expression: Lac Operon, Tryptophan and Britten and Davidson model.

UNIT 6: MENDELISM **10 HRS**

Biography of Mendel and his experiments: Law of Segregation: Monohybrid cross, Law of Independent Assortment: Dihybrid cross

Mendelian human traits: Straight/Curly hair, Dimple cheeks, Mid digital hair, Hitchhiker's thumb, Attached ear lobes, Tasters and Non-tasters

Deviations from Mendelism: Incomplete, Complementary, Supplementary (self-learning - CIA)

REFERENCE BOOKS

1.Cell and Molecular Biology. De Roberts and De Roberts., Saunders College, USA 6th edition.

2 .Molecular Cell Biology. Lodish, Berk, Zipursky, Matsudaira, Baltimore & Darnell. Freeman Press, 6th edition.

3. The Cell : A molecular approach. Cooper, G.M. ASM Press, USA 2009, 5th edition.

4.Chromatin structure and function. Wolfe, A., Academic press, New York 1995.

5.Molecular Cell Biology. Lodin, H., Berk, A., Zipursky, S.L., Matsudain, P., Baltimore, D. and Darneil, T. Will Freeman company, NY, 6th edition.

6.Molecular biology of the cell. Albert, B., Johnson, A., Raff, M., Robert, K., Walter, P. Garland Sciences, NY, 5th edition.

7. From Genes to Genomes 7th Edition is written by Leland Hartwell and published by McGraw-Hill Higher Education.

8. Principles of Genetics. Peter J, Snustad, M.J. Simmons, Wiley; 7th edition.

9. Molbiol4masters.com more web references

JYOTI NIVAS COLLEGE AUTONOMOUS

I SEMESTER M.Sc., BIOLOGICAL SCIENCES

DISCIPLINE CORE COURSE SYLLABUS

BIOCHEMISTRY

Course code : BLSH103

Duration : 60

Hours/week : 4 hours

SYLLABUS

UNIT 1: CHEMISTRY OF BIOMOLECULES I 10 HRS

Carbohydrates: Biological importance and classification. Monosaccharides (glucose, fructose, galactose, mannose and ribose.), Oligosaccharides: disaccharides (Sucrose, lactose, maltose) and trisaccharides (Raffinose), Polysaccharides (homo and heteropolysaccharides). Classification and biological function.

Lipids: classification of lipids (simple, compound and derived lipids). Saturated and unsaturated fatty acids (C12 to C20), Phosphoglycerides; structures and biological roles, plasmologens, Sphingolipids, phosphosphingolipids-sphingomyelins; Glycosphingolipids - cerebrosides. and gangliosides. Prostaglandins; An overview of biological roles. Lipoproteins: types and functions.

UNIT 2: CHEMISTRY OF BIOMOLECULES II 10 HRS

Amino acids and proteins

Structure and classification of α-amino acids, 3 and 1 letter designations for amino acids, Proteins: Classification based on composition, shape, function; Structural organization: primary (insulin), secondary- α helix, β-pleated sheet, β turns (triple helix-collagen), tertiary (myoglobin) and quaternary structure (haemoglobin). Protein folding - Assisting proteins: chaperonins, Improper protein folding, Peptides: the peptide bond, characteristics of peptide bond, Ramachandran plot.

Nucleic acids

Types: Components of nucleic acids, bases, nucleosides and nucleotides. Polynucleotides. DNA as genetic material; Structure of DNA (Watson – Crick model), supercoiling of DNA; types and forms of DNA (A,B,Z). RNA: RNA as genetic material; Types of RNA, structure and functions (mRNA, tRNA, rRNA, guide RNA, snRNA, siRNA others).

UNIT 3: ENZYMES 8 HRS

Introduction, Classification of enzymes, IUB classification (EC number not required); Characteristic features: Properties – specificity, activation energy active site, binding site, catalytic site, enzyme activators and inhibitors, cofactors, coenzyme, metalloenzyme. Fischer and Koshland models (lock and key model & Induced fit hypothesis). Effects of substrate, temperature, pH and inhibitors on enzyme activity and stability. Michaelis - Menten equation and its significance, Enzyme inhibition: definition, types: reversible (competitive, non-competitive and uncompetitive) and irreversible enzyme inhibition, Allosteric regulation of enzymes and feedback regulation. Applications of industrial

enzymes

UNIT 4: BIOENERGETICS AND BIOLOGICAL OXIDATION 7 HRS

Bioenergetics: Introduction, metabolic energy capture, energy transformations in living systems, free energy concept, exergonic and endergonic reactions. High energy compounds, energy coupling. Mitochondrial electron transport chain, ATP synthesis: ATP Synthase –F_0F_1, proton motive force, oxidative phosphorylation – chemiosmotic theory.

UNIT 5: METABOLISM I 13 HRS

Introduction to metabolism

Anabolism, catabolism, and amphibolic pathways, compartmentalization of metabolic pathways in cells. Major metabolic features of the principal organs – liver, muscle and adipose tissue. **Carbohydrate Metabolism -** Glycolysis, The citric acid cycle, Glycogen metabolism (Outline), Gluconeogenesis (Outline)

Lipid Metabolism - Biosynthesis of fatty acid (palmitic acid) and its regulation, Cholesterol biosynthesis (outline), regulation of cholesterol. Beta oxidation of fatty acid (Palmitic acid). Ketogenesis

UNIT 6: METABOLISM II 12 HRS

Amino acid Metabolism- Overview of amino acid metabolism, general reactions of amino acid metabolism: transamination. Metabolism of ammonia. Urea cycle- regulation and its significance. Integration of urea cycle with transamination and Krebs cycle. Physiologically active amines: synthesis, functions and clinical significance GABA, histamine, serotonin, epinephrine, norepinephrine, and dopamine.

Nucleic acid Metabolism - Purine and pyrimidine biosynthesis. Salvage reactions. Major pathway of purine and pyrimidine catabolism.

REFERENCES:

1. David Nelson and Michael.M Cox, Lehninger Principles of Biochemistry, 7th Edition, 2017, W.H.Freeman and company Ltd. ISBN-10 : 9781319108243, ISBN-13 : 978-1319108243
2. Lubert Stryer, Jeremy Berg, John Tymoczko and Gregory Gatto, Biochemistry, 9th Edition, 2019, W.H.Freeman Publishers, ISBN : 9781319114671.
3. Donald Voet and Judith G.Voet – Biochemistry, 3rd Edition, 2010, John Wiley and Sons, INC. ISBN: 978-0-470-57095-1
4. Mitchell Fry, Essential Biochemistry for Medicine, 1st Edition, 2010, John Wiley and Sons, Ltd, ISBN-10 : 0470743271, ISBN-13 : 978-0470743270.
5. Eric E Conn, Paul K Stumpf, Geaorge Bruening, Roy H Doi, Outlines Of Biochemistry, 5th Edition, 2016, Wiley India Pvt Ltd, ISBN-10 : 8126509309, ISBN-13 : 978-8126509300.
6. Denise R Ferrier, Lippincott's Illustrated Reviews Biochemistry, 7th Edition, 2017, Wolters Kluwer India Pvt. Ltd. ISBN-10 : 9351297942, ISBN-13 : 978-9351297949
7. David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil, Harper's Illustrated Biochemistry, 31st Edition, 2018, McGraw Hill Publishers,India, ISBN-10 : 1259837939, ISBN-13 : 978-1259837937

JYOTI NIVAS COLLEGE AUTONOMOUS

I SEMESTER M.Sc., BIOLOGICAL SCIENCES

DISCIPLINE CORE COURSE SYLLABUS

MICROBIOLOGY

Course code : BLSH104

Duration : 60

Hours/week : 4 hours

SYLLABUS

UNIT 1: SCOPE AND APPLICATIONS OF MICROBIOLOGY 8 HRS

Milestones in the development of microbiology, Spontaneous evolution of microorganisms, scope and applications of microbiology, Koch's postulates, concept of microbial and numerical taxonomy. Bergy's manual for bacterial systematics. Recent trends in microbial taxonomy. Role of microorganisms in human welfare.

UNIT 2 MICROBIAL DIVERSITY 12 HRS

Bacteria – structural organization of the cell, classification of bacteria based on morphology, nutrition, environment and staining. Biofilm and its importance.

Fungi – General structure and classification, modes of reproduction in fungi. *Saccharomyces cerevisiae* - Structure and reproduction. Beneficial and harmful fungal species. Economic importance.

Viruses - Diversity, classification, characteristics and applications, General account on bacterial, plant, animal, algal, fungal and protozoan viruses.

Overview of Cyanobacteria, *Mycoplasma,* Pleomorphic bacteria, Extremophiles, prions, viroids.

UNIT 3: MICROBIOLOGICAL TECHNIQUES 10 HRS

Bacterial growth pattern. Bacterial growth curve, Nutritional requirements of microorganisms, modes of uptake of nutrients in microorganisms, Culture media and its types, isolation procedure for bacteria, fungi and viruses. Culturing techniques, sterilization and disinfection techniques, observation of microbes – Microscopy and staining methods. Biochemical characterization of bacteria.

UNIT 4: MICROBIAL DISEASES AND ANTIMICROBIAL THERAPY 8 HRS

Antimicrobial compounds (synthetics and natural sources), concept of antibiotics, classification of antimicrobial compounds, mode of action and resistance mechanisms for antimicrobial agents. Examples of antibacterial, antifungal, antiviral and anti-parasitic agents. Concept of Antibiotic sensitivity test, viral neutralization test, and plaque assay method, brief account on MDR, XDR and its challenges.

UNIT 5: CLINICAL, INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY 12 HRS

Clinical Microbiology: Overview of microbial diseases, survey of disease-causing microbes, Mechanisms of pathogenesis, Host-pathogen relationship, mechanisms of virulence, quorum sensing, pathogenesis in plants and animals. Immune response elicited

by microorganisms. Clinically significant microbes. Concept of nosocomial and opportunistic infections.

Industrial Microbiology: Industrially important microorganisms, strain improvement, Commercial products from microbes: Antibiotics, biopolymers and biofuels. Microbes as Biosensors.

Environmental Microbiology: Nature of anthropogenic wastes, Municipal wastes and xenobiotic, Enrichment cultures, Xenobiotic degrading consortia, Bioremediation. Role of microorganisms for biomonitoring of various quality-parameters related to water and wastewater - Indicator organisms, single species laboratory bioassays and biosensors.

UNIT 6: FOOD AND AGRICULTURAL MICROBIOLOGY 10 HRS

Microbes in Agriculture: Symbiotic Nitrogen fixation, Rhizobium, Cyanobacteria (*Anabaena*, *Azolla*, etc.), *Mycorrihiza*, Nitrogen metabolism; Nitrogen fixation, Assimilatory nitrate reduction, Ammonia assimilation and synthesis of amino acids, Regulation of 'nif' and 'nod' genes. **Chemical transformation by microbes**: Organic matter decomposition, nutrient mineralization and immobilization; transformation of carbon and carbon compounds; availability of phosphorus, sulfur, iron and trace elements to plants. Biocontrol agent *Trichoderma*. Biopesticides – bacterial, fungal and viral pesticides.

Food microbiology: Beneficial and harmful microbes, Microbial spoilage of food products, food borne infections. Concept of food poisoning. Preservation of food. Food preservatives and their uses. Microbial quality indicators for food industries. Fermented food products. Concept of probiotics and prebiotics. Single cell proteins and Mushroom cultivation technology.

REFERENCE BOOKS

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.
2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology.
5. 5th edition Tata McGraw Hill.
6. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
7. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
9. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
10. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.

PRACTICAL PAPERS

CELL BIOLOGY, MOLECULAR BIOLOGY AND GENETICS

Code BLSP107

Hours/Week – 4

Number of hours -- 56

PRACTICAL SYLLABUS

1. Isolation and separation of sub cellular organelles (Chloroplast).
2. Vital staining of mitochondria in Yeast/cheek cells.
3. Squash and smear preparation of mitotic chromosomes – *Allium cepa*.
4. Determination of chromosome number from mitotic and meiotic preparations.
5. Squash preparation of salivary glands and observation of Polytene chromosome- *D. melanogaster /Chironomus.*
6. Preparation of inversions- *D. nasuta*
7. Cytological technique, preparation of semi-permanent and permanent slides.
8. Counting of cells using Haemocytometer.
9. Karyotype analysis after mitotic arrest using colchicine – *Allium cepa*
10. Buccal smear: Barr body, Neutrophils: drumstick body
11. Squash and smear preparation of meiotic chromosomes
12. Translocation in *Rheo*
13. Induction of Polyploidy with colchicine – *Allium cepa*
14. Isolation of Genomic DNA
15. Chromosomal Aberrations – Structural and Numerical (Abnormal karyotypes – Down's syndrome, Turner's syndrome and Klinefelter's syndrome Cri-du-chat syndrome).

BIOCHEMISTRY AND MICROBIOLOGY

Code BLSP108
Hours/Week – 4
Number of hours - 56

PRACTICAL SYLLABUS:

1. Preparation of buffers in the laboratory over a pH range (2 to 11); Use of pH meters. Handling of buffers and storage concerns
2. Qualitative analysis of carbohydrates, lipids, amino acids
3. Quantitative analysis of glucose by DNS method
4. Quantitative analysis of protein by Lowry's method
5. Extraction of liver lipids and Quantitative analysis of cholesterol by Zak's method
6. Isolation of polysaccharide (starch or glycogen) from the biological material.
7. Estimation of pyruvate by DNPH method
8. Study of instruments – Microscope, LAF, hot air Oven, Autoclave, Incubator, pH meter, Colony counter.
9. Preparation of Culture media – solid and broth medium (Bacteria, fungal and cyanobacteria)
10. Isolation and culturing of bacteria, cyanobacteria and fungus from different environment (Air, Water and soil) – serial dilution, pour and spread plate techniques, streak plate methods.
11. Staining techniques – Gram's Staining, Endospore staining.
12. Biochemical characterization of bacteria – IMViC test, Citrate utilization test, Triple sugar iron utilization test, carbohydrate utilization test, starch and gelatin hydrolysis test, Hydrogen sulphide test, antibiotic sensitivity test (Phytocompounds and synthetic).
13. MPN test for water quality analysis.
14. Microbial degradation of cellulose or plastics.

I SEMESTER MSC BIOLOGICAL SCINENCES

SOFT CORE COURSE SYLLABUS

SCIENTIFIC COMMUNICATION AND REPORT WRITING

Course code : BLSS 105

Duration : 45

Hours/week : 3 hours

UNIT 1: SCIENTIFIC COMMUNICATION AT MODERN WORLD 8 HRS

Science and Technology: History (from Indus valley civilization and traditional wisdom of the world), Definition, Professional scientific communication, Emergence of modern science, Eminent scientists and their achievements, Nobel laureates in science (from 2000), Science journalism in India and abroad, Contributions of women in science. Role of science communication in agriculture, health, nutrient science, Environmental hazards, Weather forecast and Climate change.

UNIT 2: SCIENCE AND TECHNOLOGY COMMUNICATION AND POLICY SETUP 7 HRS

Need for scientific communication and reporting, Public Understanding of Science (PUS), science popularization (Programmes, organizations, individual), Sources of scientific information (Books, scientific reports, scientific journals, magazines, feature syndicates, leaflets, wall magazines, speeches, seminars, press releases, databases, encyclopedias on science), Comparative study of science sections, S & T policy statements – technology statements, policy resolutions, science and technology setup in India, IPR, Science communication organizations – NCSTC, NCSM,NISCAIR, Vignan Prasar, CSIR

UNIT 3: SCIENTIFIC QUALITY, REPUTATION AND IMPACT FACTOR 10 HRS

Open access publishing articles, predatory publications, discovering open access publications, Journal impact factor, fitness factor: journal scope and aim, Journal's publishing trend and priorities, Time, publishing and distribution factors, difficulty of acceptance, abstract and indexing services. Language factors. Communication with the editorial office, acceptable formats for manuscripts, handling a negative editorial decision.

UNIT 4: ACADEMIC PUBLISHING 10 HRS

Introduction to academic publishing, manuscript submission. Peer review process, manuscript revision and resubmission. Copy editing, typesetting, page proofs and proof reading. Final publications. Types of scientific articles – primary or original research articles, secondary or review articles, special articles, tertiary literature, gray literature. Authorship – collaborative research, credit to collaborators, assigning authorship, corresponding author, ethical responsibility. Guidelines on authorship.

UNIT 5: RESEARCH GRANTS AND PROPOSALS 10 HRS

Introduction, Grant life cycle, Types of Funding organizations (Federal funders, stage, National and International agencies, Foundation, Business and industry), Types of Grant Applications and agreements. Funding cycle. Research plan – specific aims and hypothesis, background and significance, Preliminary studies, research design and methods, Budget and Budget justification, Grant documents and formatting.

Skill development activities proposed

- Writing a review paper
- Editing a research article
- Drafting proposal for grants
- Oral/poster presentations
- Role of women in science
- Poster designing
- Documentary videos

REFERENCE BOOKS

1. Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded Illustrated Edition by Joshua Schimel Oxford University Press; Illustrated edition (November 29, 2011)
2. The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career by Stephen B. Heard Princeton University Press (April 12, 2016)
3. How to Write a Scientific Paper: An Academic Self-Help Guide for PhD Students Paperback – November 3, 2018 by Jari Saramäki Independently published (November 3, 2018)

FIRST SEMESTER MSC BIOLOGICAL SCINENCES

SOFT CORE COURSE SYLLABUS

BIOLOGICAL SYSTEMATICS

Course code : BLSS 106

Duration : 45

Hours/week : 3 hours

SYLLABUS

UNIT 1: 10 HRS

Definition and basic concepts of biosystematics taxonomy and classification. History and theories of biological Classification. Trends in biosystematics: Chemotaxonomy, cytotaxonomy, numerical taxonomy and molecular taxonomy. Dimensions of speciation. Species concepts: Typological, Nominalistic and Biological species concepts. Subspecies and other infra-specific categories.

UNIT 2: 10 HRS

Plant Systematics: Taxonomy Vs Systematics, Principles and Methods of Taxonomy. Concept of species and hierarchical taxa. Biological nomenclature (International Code of Botanical Nomenclature), Classical and quantitative methods of taxonomy.

UNIT 3 8 HRS

Taxonomic Characters and different kinds: Origin of reproductive isolation, biological mechanism of genetic incompatibility. Taxonomic procedures: Taxonomic collections, preservation, curetting, process of identification.

UNIT4: 9 HRS

International Code of Zoological Nomenclature (ICZN): Operative principles, interpretation and application of important rules: Formation of Scientific names of various Taxa. Synonyms, homonyms and tautonym. Taxonomic keys, types, merits and demerits.

UNIT 5: 8 HRS

Evaluation of biodiversity indices, Shannon Weiner Index. Dominance Index. Similarity and Dissimilarity Index.

REFERENCE BOOKS

1. M. Kato. The Biology of Biodiversity, Springer.
2. J.C. Avise. Molecular Markers, Natural History and Evolution, Chapman & Hall, New York.
3. E.O. Wilson. Biodiversity, Academic Press, Washington. 4. G.G. Simpson. Principle of animal taxonomy, Oxford IBH Publishing Company.
4. E. Mayer. Elements of Taxonomy.
5. E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northem & Co.
6. B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta.