



JYOTI NIVAS COLLEGE AUTONOMOUS
DEPARTMENT OF BIOLOGICAL SCIENCES
M.Sc. BIOLOGICAL SCIENCES PROGRAMME

Syllabus and Scheme of Examinations for two-years (Four semesters)

M.Sc. Programme in Biological sciences

For 2025 -2027 Batch

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-years (four semesters) 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 Discipline core courses, elective courses and open elective courses.

M.Sc. BIOLOGICAL SCIENCES PROGRAMME
GRID FOR COURSE CONTENTS

FIRST SEMESTER	COURSE CODE	HOURS/WEEK	CREDITS
DISCIPLINE CORE COURSES			
Cell Biology	BLSH101	4	4
Genetics & Molecular Biology	BLSH102	4	4
Biochemistry	BLSH103	4	4
Microbiology	BLSH104	4	4
DISCIPLINE ELECTIVE COURSES (ANY ONE TO BE OPTED)			
Scientific communication and report writing	BLSS105	3	2
Biological systematics	BLSS106		
PRACTICAL COURSES			
Cell Biology and Genetics & Molecular Biology	BLSP107	8	4
Biochemistry and Microbiology	BLSP108	8	4
SECOND SEMESTER	COURSE CODE	HOURS/WEEK	CREDITS
DISCIPLINE CORE COURSES			
Developmental Biology	BLSH201	4	4
Immunology and Clinical Biology	BLSH202	4	4
Genetic Engineering	BLSH203	4	4
Environmental Biology and Technology	BLSH204	4	4
DISCIPLINE ELECTIVE COURSES (ANY ONE TO BE OPTED)			
Plant Physiology & Metabolism	BLSS205	3	2
Animal Physiology & Metabolism	BLSS206		
PRACTICAL COURSES			
Developmental and Environmental Biology and	BLSP207	8	4

Technology			
Immunology and Clinical Biology and Genetic Engineering	BLSP208	8	4
INTERNSHIP/TRAINING – Between second and third semester (minimum 15 days)			
THIRD SEMESTER	COURSE CODE	HOURS/WEEK	CREDITS
DISCIPLINE CORE COURSES			
Cell culture Technology and Tissue Engineering	BLSH301	4	4
Bioanalytical Techniques	BLSH302	4	4
Research Methodology and Biostatistics	BLSH303	4	4
Life Style disease, awareness and Management (Open Elective course for Non-science students)	BLSE304	4	4
PRACTICAL COURSES			
Cell culture Technology and Tissue Engineering and Research Methodology and Biostatistics	BLSP305	8	4
Bioanalytical techniques	BLSP306	8	4
FOURTH SEMESTER	COURSE CODE	HOURS/WEEK	CREDITS
DISCIPLINE CORE COURSES			
Fermentation and Bioprocess Technology	BLSH401	4	4
Bioinformatics, Genomics and Proteomics	BLSH402	4	4
Cancer Biology and Gene Therapy	BLSH403	4	4
BIOENTREPRENEURSHIP AND INTELLECTUAL PROPERTY RIGHTS	BLSH404	4	4
PRACTICAL COURSES			
Bioprocess Technology & Bioinformatics	BLSP405	8	4
Internship with Report (minimum 60 days)	BLSD406	8	4

Total credits – 100

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

MSC BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE CORE COURSE SYLLABUS
DEVELOPMENTAL BIOLOGY

Course code : BLSH201

Duration : 60

Hours/week : 4 hours

UNIT 1: GAMETOGENESIS AND EARLY DEVELOPMENT IN ANIMALS 12 HRS

Gametogenesis in animals: Spermatogenesis; Oogenesis; Molecular events during fertilization. Morphogenetic determinants in egg cytoplasm; Germ cell determinants and germ cell migration. Developmental commitment, Determinate and Indeterminate development. Mosaic and regulative development.

Genetics of development in *Drosophila* – early development, maternal genes, segmentation genes; homeotic genes.

UNIT 2: VERTEBRATE EMBRYOLOGY 9 HRS

Direct and indirect development. Cleavage: types and patterns. Body plan and symmetries. Germ layer differentiation. Morphogenesis: Epiboly, emboly/ invagination, involution and ingression in frog. Tubulation – neurulation and organogenesis. Developmental stages in frog and chick, Metamorphosis in frog. Developmental mechanisms of evolutionary change (Evo-devo)- Ecological Developmental Biology. Role of organizers in Development, chemistry of organizers.

UNIT 3: PLACENTATION AND HUMAN DEVELOPMENTAL DISORDERS 9 HRS

Role of extra embryonic membranes in development, Placenta: types, structure and functions. Developmental biology in understanding of disorders (Spina bifida, Cleft palate and Anencephaly). Teratogenesis and birth defects, developmental brain disorders.

UNIT 4: GAMETOGENESIS IN PLANTS 12 HRS

Microsporogenesis & male gametophyte: - Anther wall Structure and development- Endothecium, Middle layers, Tapetum, Nuclear behaviour in tapetal cells and Sporogenous tissue; Formation of vegetative and generative cells, Formation of sperms, pollen wall – Structure and development and abnormal pollen grains. Megasporogenesis & female gametophyte: - Structure and development of ovules, Types and parts of ovules. Structure and development of female gametophyte, Types of female gametophytes, Structure of Mature Embryo sac, Embryo sac haustoria.

UNIT 5: FERTILIZATION AND EMBRYOGENY 12 HRS

Structure of style and stigma, Pollen- pistil compatibility, Pollen germination and pollen tube growth. Path of pollen tube, pollen tube discharge, Double fertilization: and syngamy.

Central cell as the second gamete of the flowering plant. Structure and types of endosperms, Relationship between embryo and endosperm. Physiology and cytology of endosperm and functions of endosperm and endosperm haustoria. Classification of Embryogeny, early embryogenesis and mature embryo of Dicotyledons – *Ceratophyllum* and mature embryo of monocotyledons- *Halophyllum* and Grass

UNIT 6: MORPHOGENESIS IN PLANTS

06 HRS

Organization of shoot and root apical meristem; shoot and root development; leaf development; transition to flowering, floral meristems and floral development in *Arabidopsis* and *Antirrhinum*. Aging and Senescence. Theories of morphogenesis.

REFERENCE BOOKS

1. Scott F. Gilbert, Developmental Biology, Sinauer, 2003.
2. Kalthoff, Analysis of Biological Development, McGraw Hill, 1996.
3. Lewin, Genes VIII, Pearson, 2004.
4. Monk, Mammalian Development – A Practical Approach, IRL, 1987.
5. Singh, P. 2001. Essentials of Plant Breeding, Kalyani Publishers, Hyderabad.
6. Allard, R. W. 1999. Principles of Plant Breeding. John Wiley & Sons. New York.
7. Dana, S. 2001. Plant Breeding. Naya Udyog. Calcutta.
8. Singh. B. D. 1995. Plant Breeding – Principles and Methods. Kalyani Publishers, New Delhi.

MSC BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE CORE COURSE SYLLABUS
IMMUNOLOGY AND CLINICAL BIOLOGY

Course code : BLSH202

Duration : 60

Hours/week : 4 hours

UNIT 1: IMMUNE SYSTEM

12 HRS

History and significance of immunology. Concept of Immunity. Innate and Acquired immune response (humoral and cell-mediated), Herd and community immunity, Concept of Endemic, Pandemic and Epidemic. Immune Tolerance: Definition. Factors causing induction. Types of tolerance. Mechanism and recovery from tolerance. Lymphoid organs: Primary (*Thymus and Bone marrow, Bursa of Fabricius*). Secondary (*Lymph node and spleen*). Accessory lymphoid tissues (MALT and GALT). Cells of immune system - Lymphoid and Myeloid lineage, Antigen presentation - APCs and MHC classes (Class I, II and III). Complement proteins – Definition, components, biological importance. Complement activation pathways (*Classical, MB Lectin and alternative*). Messengers of Immune system – Cytokines – classification and general functions, a brief note on Interleukins and Interferon.

UNIT 2: ANTIGEN – ANTIBODY REACTIONS.

08 HRS

Antigen: Definition, Types (*exogenous and endogenous*), Epitopes and Essential factors for antigenicity and immunogenicity, Superantigens, **Antibody:** Basic structure, Immunoglobulin classes (Structure and Biological properties), paratope, antigenic determinates of antibodies (*Isotypes, Idiotypes and Allotypes*), monoclonal and polyclonal antibodies

Concept of specificity, binding forces, affinity, avidity, bonus effect, cross reaction. Types of antigen –antibody reactions: Precipitation and agglutination reaction.

Immunogenetics: VDJ recombination, MHC class genes and its role Antigen presentation.

UNIT 3: TUMOR AND TRANSPLANTATION IMMUNOLOGY

10 HRS

Tumor: Definition, types - Benign and Malignant, Tumor induction, Immune response to evade tumor. Brief note on immunotherapy. **Transplantation:** Definition. Types of Graft. Immunological mechanism for Graft Acceptance and rejection. Prevention of Graft rejection - *HLA typing, immunosuppressive therapy [a brief note on use of corticosteroids and mitotic inhibitors]*. Graft versus host disease (GVHD),

UNIT 4: IMMUNODIAGNOSTIC METHODS

10 HRS

Immune assays and types, immunodiffusion assays – RID, SRID, Immunoelutrophoreiss – Rocket immunoelutrophoresis, Immunofluorescence, competitive immunoassay - Radio immunoassay (RIA) and Flow cytometry, Peptide based immunobinding assays – peptide mapping and epitope mapping. Principles and applications of ELISA, Complement fixation test: Well Felix & Coomb's test. Immunohistochemistry

UNIT 5: CLINICAL IMMUNOLOGY

10 HRS

Hematology – Components of blood, RBCs, WBCs and Platelets, clotting factors, blood grouping, collection, storage and transportation of blood samples and other body fluid samples, **Hypersensitivity reactions**: Definition. Classification of hypersensitivity reactions based on time (*Immediate and Delayed type*) and based on pathogenesis (*Type I, II, III, IV and V*). serum sickness, Arthur's reactions, *Erythroblastosis foetalis*. **Autoimmune diseases**: Definition. Factors causing autoimmune diseases. A brief note on symptoms, immunological mechanisms, Diagnosis and Treatment of Systemic lupus erythematosus (SLE), Rheumatoid Arthritis, Hypo and Hyper Thyroidism. **Immunodeficiency diseases**: Definition, Types, a Brief note on COLD (Common obstructive lung disorders), AIDS and SCID.

UNIT 6: PREVENTIVE BIOLOGY

10 HRS

Immune response to viral, bacterial, and fungal infections. Immunization: Definition, Types: Active, passive and subtypes. Immunization schedule followed in India. **Vaccines**: Definition, Types: Killed and Live attenuated vaccines, Toxoids, Vaccines with specific extracted antigens. Genetically engineered vaccines (*DNA and mRNA vaccines*), polyvalent vaccines, Edible vaccines,

REFERENCES:

1. Ian R Tizard, (1995), Immunology, 4th Edition, Thomson Publications,
2. Ivan M. Roitt, (1994), Essentials of Immunology. Blackwell Scientific Publications, London.
3. Kuby Immunology by Richard A Goldsby, Thomas J. et al., 5th edition, **Publisher**: W. H. Freeman & Co. 2003,
4. Immunology – A Textbook by C.V. Rao, **Publisher**: Narosa Publishing House. 2005,
5. Immunology and Serology- Joshi K.R. and Osama., Student edition, 2004.
6. Textbook of Immunology by B.S. Nagoba and D.V. Vedpathak, **Publisher**: Paras publishing, New Delhi. 2003,
7. Fundamentals of Medical Biotechnology by Aparna Rajagopalan, Ukaaz Publications, 2006,
8. Medical Biotechnology by Prof. Jogdand, **Publisher**: Himalaya Publishing house, 2006.

MSC BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE CORE COURSE SYLLABUS
GENETIC ENGINEERING

Course code : BLSH203

Duration : 60

Hours/week : 4 hours

UNIT 1: INTRODUCTION TO GENETIC ENGINEERING

10 HRS

Overview of recombinant DNA technology, Molecular probes and their applications: radioactive and non-radioactive probes, Northern and Southern blotting, RT-PCR, Molecular beacons, and TaqMan probes

Nucleic acid modifying enzymes:

Types, characteristics, and nomenclature of Restriction endonucleases and Ligases.

Modification of cut ends - Linkers and adaptors

DNA modifying enzymes: Alkaline phosphatase, S1 nuclease, Mung bean nuclease

Genomic and cDNA library

UNIT 2: CLONING VECTORS

15 HRS

Plasmids: Structural features and applications of pUC18, pUC19, pBR322; Ti plasmid (*Agrobacterium*) – structure and components (nopaline-type, octopine-type, *vir* region, T-DNA)

Cosmids: Structure and utility in cloning large DNA fragments

Viral vectors: SV40 vectors – transducing, late replacement, early replacement, and plasmid-based variants, Cauliflower Mosaic Virus (CaMV) and Gemini virus vectors, Retroviral and Adenoviral vectors – design, packaging, transduction efficiency, and applications.

Bacteriophage vectors: Lambda phage – insertion and replacement vectors, M13 phage – single-stranded DNA cloning and phage display systems

Artificial chromosomes: Yeast Artificial Chromosomes (YACs), Bacterial Artificial Chromosomes (BACs) – structure, stability, and use in genome projects

UNIT 3: METHODS OF GENE TRANSFER

08 HRS

Vector-mediated gene transfer: In *E. coli* – plasmid-based systems, transformation efficiency, heat-shock and electroporation techniques, In *Agrobacterium tumefaciens* – Ti plasmid engineering, co-cultivation method, and binary vector systems.

Direct gene transfer techniques: Lipofection – cationic liposome-mediated DNA delivery, Electroporation – optimization and cell type specificity, Particle bombardment (gene gun) – delivery to plant and animal tissues, Microinjection – into oocytes, embryos, or single cells

Protoplast-mediated gene transfer: Isolation, fusion, and DNA uptake techniques in plant systems

Virus mediated gene transfer

UNIT 4: SELECTION OF RECOMBINANTS

08 HRS

Direct and indirect selection methods (antibiotic resistance markers, expression-based screening, blue-white colony screening, colony hybridization, and immunological assays).

UNIT 5: TRANSGENIC PLANTS

09 HRS

Transgenic plants for resistance to herbicides, insecticides, viruses, and fungi (Examples: Bt Cotton, Bt Brinjal, Golden Rice), Terminator gene technology, CRISPR-Cas9 strategies for plant genome editing, Ethical considerations.

UNIT 6: TRANSGENIC ANIMALS

10 HRS

Methods for generating transgenic animals (Fish, Cow, Pig, Sheep, Goat, Applications of transgenic models (Biopharming), Knock-in and Knock-out Mice, Ethical considerations in transgenic research.

REFERENCE BOOKS

1. Recombinant DNA Technology and Genetic Engineering Rajagopal K.
2. Techniques in Genetic Engineering By Isil Aksan Kurnaz
3. An Introduction to Genetic Engineering Desmond S. T. Nicholl
4. Genetic Engineering: Emerging Concepts and Technologies by Patrick Faraday (Editor)
5. Principles of gene manipulation and genomics by S.B Primrose and R M Twyman

BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE CORE COURSE SYLLABUS
ENVIRONMENTAL BIOLOGY AND TECHNIQUES

Course code : BLSH204

Duration : 60

Hours/week : 4 hours

UNIT 1: ENVIRONMENTAL BIOLOGY

10 HRS

Introduction and scope of Environmental biology, Environmental factors: **Climatic factors:** Light, temperature, humidity and precipitation, Atmospheric gases, wind and fire factors. **Edaphic factor:** soil profile, soil microbes, soil pH, soil types. Physical, chemical and biological properties of soil. Soil erosion and its prevention **Biotic factor:** Relationships among organisms; Positive and Negative interactions.

UNIT 2: ECOSYSTEM CONCEPT

10HRS

Ecosystem: Structure and Function; Ecological pyramids; Energy flow in ecosystem-food chain, food web and trophic levels. **Structure and Development of community;** Analytical and Synthetic characters; Nature of ecological succession and climax community.

UNIT 3: POLLUTION AND ITS MANAGEMENT

8 HRS

Sources, Nature, Impact of Air, Water, Soil and Radioactive and Noise Pollution – assessment, control and management. Effects of pollutants on human beings, plants, animals, materials and on climate. Acid Rain, Global warming. Environmental Impact Assessment. **Indicators of Pollution:** Bioindicators. **Climate Change:** International Panel for Climate Change (IPCC), Ozone depleting substances and ozone-friendly technologies – natural refrigerants and HFOs.

UNIT 4: FUNDAMENTALS OF TOXICOLOGY

12 HRS

Principles of Toxicology and types of Toxins, sources, and biological monitoring of Arsenic, Mercury, Cadmium, Chromium, Zinc, Lead and Nickel, Carbon monoxide, O₃ and PAN Pesticides, Insecticides, MIC, carcinogens in the air. Toxicity testing in field and enclosure (aquatic). Toxic dose: Approximate acute IC₅₀, LD₅₀ /LC₅₀ of some representative chemical agents. The use of biomarkers in assessing the impact of environmental contaminants. Bioassay (Ames test). Trophic level transfer of contaminants (Bioaccumulation, biomagnification and biotransformation).

UNIT 5: BIODIVERSITY

8 HRS

Definition, types, Biodiversity hot spots of the world, Conservation strategies, conservation, and management of natural resources; Water, Forest, Mineral and Soil. Methods and application of Remote sensing and GIS in Ecological Science.

UNIT 6: TECHNIQUES IN ENVIRONMENTAL BIOLOGY

12 HRS

Sources, generation, classification & composition of solid wastes. Solid waste management methods - Sanitary land filling, Recycling, Composting, Vermi composting, Incineration, energy recovery from organic waste. Solid Waste Management: Waste minimization technologies, Hazardous Waste Management, Sources & Classification, physicochemical properties, Hazardous Waste Control & Treatment. Biomonitoring, Bioremediation, biofouling /Biofueling, Biofilm and Bio-corrosion.

REFERENCE BOOKS

1. Ambasht, R. S. and Ambasht, A. K. 2002. A textbook of Plant Ecology. C.B.S. Publishers and Distributors.
2. Hill M. K. 1977, Understanding Environmental Pollution. Cambridge University Press.U.K.
3. Koromondy, E. J. 1996. Concepts of Ecology. Prentice Hall, New Delhi.
4. Kumar, H. D. 2000. Modern Concepts of Ecology. Prentice Hall India, New Delhi.
5. Lillesand, T. M. and Kiefer, R. W. 2000. Remote Sensing and Image Interpretation, JohnWiley and Sons, New York.
6. Nobel, B. J. and Wright, R. T 1996. Environmental Science, Prentice Hall, New Delhi.
7. Odum, E. P. 1971, Fundamentals of Ecology. Saunders. Philadelphia.
8. Shukla and Chandel, 2001. Plant Ecology and Soil Science. S. Chand & Co, Ltd., NewDelhi.

PRACTICAL COURSE

DEVELOPMENTAL AND ENVIRONMENTAL BIOLOGY TECHNIQUES

Course Code BLSP 207

Hours/Week – 4

Number of hours -- 30

PRACTICAL SYLLBAUS

1. Micrometry: Measurement of plant and animal cell.
2. Study of microsporangium development, microsporogenesis, male gamete development (slides), pollen germination (hanging drop method), pollen morphology (NPC classification), compound pollen grains.
3. Study of types of megasporangium, Structure of the megasporangium, development of megaspore, types of embryo sacs study of ovary section, types of ovules and types of placentation.
4. Mounting of biological specimens: embryo – *Tridax* sp., chick embryo, endosperm – *Cucumis* sp. shoot apex. Imaginal discs in *Drosophila melanogaster*
5. Study of developmental stages: permanent slides of Angiospermic plants, Frog and chick
6. Developmental stages in *Drosophila* embryo.
7. Study of chick embryo by window pane method.
8. Study of vegetation by quadrat and line transect method.
9. Remote sensing application – vegetation mapping.
10. Ecological instruments. Thermometers (Wet and Dry), Anemometer, Altimeter, Barograph, Thermograph, Hair hygograph, Rain gauge, Noise meter.
11. Determination of Dissolved Oxygen and Biological Oxygen Demand in water by Winkler's method.
12. Analysis of water sample; pH, conductivity, Carbonates and Bicarbonates, Chlorides, Free carbon dioxide, Hardness, Estimation of organic matter.
13. Analysis of soil samples; pH, conductivity, Organic carbon, Moisture equivalent, C/N ratio.
14. Adaptation in Hydrophytes, mesophytes, Xerophytes and Plankton
15. Study of leaf senescence.

PRACTICAL PAPER
IMMUNOLOGY, CLINICAL BIOLOGY AND GENETIC ENGINEERING

Course Code BLSP 208

Hours/Week – 4

Number of hours -- 30

PRACTICAL SYLLBAUS

1. Isolation of Serum of whole blood.
2. Differential staining and counting of WBCs
3. Determination of antigen concentration by RIE
4. Determination of antibody titer value from Double diffusion method.
5. Estimation of blood glucose/sugar by ortho-toluidine method.
6. Liver and kidney function test – SGOT, SGPT, Total creatinine, Urea estimation
7. Determination of percentage of hemoglobin content.
8. Quantification of DNA by DPA method
9. Quantification of RNA by Orcinol method
10. Agarose Gel electrophoresis
11. Plasmid DNA isolation by alkaline lysis method
12. Restriction Digestion of λ - DNA / lambda DNA.
13. Ligation
14. Transformation and screening of cloned colonies

MSC BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE ELECTIVE COURSE SYLLABUS
PLANT PHYSIOLOGY AND METABOLISM

Course code : BLSS205

Duration : 45 Hours

Hours/week : 3 Hrs

UNIT 1: PLANT – WATER RELATIONS

6 HRS

Physical properties of water, Importance of water to plant life. Diffusion, imbibition and osmosis; concept & components of Water potential. Absorption and transport of water and ascent of sap. Transpiration –Definition, types of transpiration, structure and opening and closing mechanism of stomata. Factors affecting transpiration and ascent of sap.

UNIT 2: MINERAL NUTRITION

6 HRS

Mineral Nutrition: Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms. Mineral ion uptake (active and passive transport). Translocation of organic solutes: mechanism of phloem transport, source-sink relationships. Phosphate fixation.

UNIT 3: PHYTOCHEMICALS

6 HRS

Introduction to phytochemicals and their importance, Primary and Secondary metabolites – definition with examples. Commercial importance of secondary metabolites.

Alkaloids: Introduction, Definition. Biological importance, and occurrence of the following: nicotine, atropine, quinine, vinca alkaloids and morphine.

Polyphenols: Introduction, Definition. Biological importance, and occurrence of the following: Quercetin, epicatechin, proanthocyanins. and curcuminoids.

Terpenoids: Introduction, Definition, Isoprene rule. Biological importance, and occurrence of the following: limonene, menthol, santonin, juvenile hormone I, phytol, lycopene, beta carotene and plastoquinone. (structure not required).

UNIT 4: PHOTOSYNTHESIS AND RESPIRATION

10 HRS

Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photophosphorylation, carbon assimilation pathways: C_3 , C_4 , and CAM (brief account) Photorespiration and its significance. Basics of respiration.

UNIT 5: NITROGEN METABOLISM

9 HRS

Nitrogen cycle., Significance of nitrogen. Nitrogen in soil, nitrate reduction in plants, Denitrification, nitrification and ammonification. Nitrogen fixation: Biological nitrogen fixation; diazotrophs (free living bacteria), symbiotic, associative symbiotic. Symbiotic Nitrogen fixation in leguminous plants – formation of root nodules. Factors affecting nodule formation. Biochemistry of nitrogen fixation: requirements, nitrogenase complex. Reactions of symbiotic nitrogen fixation. Symbiotic synthesis of leghemoglobin. Non-biological nitrogen fixation. Sources of nitrogen in insectivorous plants – Pitcher plant, Bladderwort, Sundew, Butterwort and Venus flytrap.

UNIT 6 : GROWTH AND DEVELOPMENT

8 HRS

Growth and development: definition, phases and kinetics of growth. Physiological effects of phytohormones - Auxins, Gibberellins, Cytokinins, ABA, Ethylene and Brassinosteroids. Physiology of flowering -photoperiodism, role of phytochrome in flowering; Vernalization. Physiology of Senescence and Ageing.

REFERENCE BOOKS

- 1.Steward. F.C (1964): Plants at Work (A summary of Plant Physiology) Addison-Wesley Publishing Co., Inc. Reading, Massachusetts, Palo alto, London.
- 2.Devlin, R.M. (1969) : Plant Physiology, Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi .
- 3.Noggle, R.& Fritz (1989): Introductory Plant Physiology Prentice Hall of India.
- 4.Lawlor.D.W. (1989): Photosynthesis, metabolism, Control & Physiology ELBS/Longmans-London.
- 5.Mayer, Anderson & Bonning(1965): Introduction to Plant Physiology D.Van Nostrand . Publishing Co., N.Y.
- 6.Mukherjee, S. A.K. Ghosh(1998) Plant Physiology ,Tata McGraw Hill Publishers(P) Ltd., New Delhi.
- 7.Salisbury, F.B & C.W. Ross (1999): Plant Physiology CBS Publishers and Printers, New Delhi.

M.Sc. BIOLOGICAL SCIENCES
SECOND SEMESTER DISCIPLINE ELECTIVE COURSE SYLLABUS
ANIMAL PHYSIOLOGY AND METABOLISM

Course code: BLSS206

Duration: 45 Hours

Hours/week: 3 Hrs

UNIT 1: HOMEOSTASIS

8 HRS

Homeostasis and regulation: Definition, meaning of internal environment, and the role of feedback mechanisms.

Thermoregulation: Thermoregulation in Endotherms and Ectotherms, Role of Hypothalamus in temperature regulation, Range of temperature tolerance.

Osmoregulation: Osmoregulation in turtle, camel and man

UNIT 2: LIFE PROCESSES- I

8 HRS

Digestion: digestive secretions and its regulations. Role of gut microorganisms in the digestion in humans, Common gastro-intestinal disorders in man: - Hyperacidity GERD, Ulcer, Hepatitis.

Excretion: Ammonotelism, Ureotelism and Uricotelism. Formation of Ammonia, Urea and Uric acid, Disorders & Treatment: Nephritis-Glomeruli, Gout and pyelonephritis. Dialysis-Types and its significance

UNIT 3: LIFE PROCESSES- II

8 HRS

Circulation: Blood pigments and their role. Disorders – Hypo and hyper tension, Cardiovascular diseases, Treatment- Angioplasty, Bypass surgery, ECG.

Respiration: Transport of respiratory gases- Transport of oxygen and the factors influencing it. Carbon dioxide transport-Hamburger's phenomenon, Oxygen dissociation curves and the factors influencing them.

Bronchial disorders: Effects of Tobacco smoking, Carbon mono-oxide poisoning, Bronchitis, Emphysema. COPD.

UNIT 4: CONTROL AND CO-ORDINATION
HRS

6

Muscle contraction: Ultra structure of skeletal muscle – sarcomere and myofibril, Chemical composition, Physico- chemical changes during muscle Contraction-Sliding filament theory

Exercise Physiology: Definition and types of Exercise Physiology. Changes occurring in Body during Exercise

Physiology of nerve conduction: Membrane potential, origin and transmission of action potential – Axonal and synaptic EEG.

UNIT 5: ENDOCRINOLOGY

8 HRS

Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal, gonads; hormones secreted by them and their mechanism of action; Classification of hormones; Regulation of their secretion; Mode of hormone action, Signal transduction pathways for steroidal and non-steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system; Placental hormones

UNIT 6: METABOLISM III

7 HRS

Integration of metabolism: Intermediary metabolism of Carbohydrates, Lipids and Proteins, Inter-conversion between three principal components, Regulation and Control of Reactions.

Metabolism in starvation: Effects on metabolism. Changes in carbohydrate, protein and fat metabolism during fasting and fed conditions. Benefits of fasting and effect on ageing.

REFERENCES

1. Agarwal et.al, 2007. Animal physiology and biochemistry.s chand publ.
2. Arora m p. 2000. Animal physiology, himalaya publishing house.
3. Berry a k. 1995. Human physiology with related biochemistry, emkay publications.
4. Ganong w f. 1997. Review of medical physiology, appleton & lange, 8th edition.
5. Goel, k.a. And satri k.v, 1997. A text book of animal physiology, rastogi publ., meerut.
6. Guyton a.c. Text book of medical physiology, w.b saunder's company, 7th ed.
7. Kavitha juneja. 2002. Animal physiology, anmol publications pvt. Ltd.
8. Schmidt nielson. Animal physiology, cambridge publishers, 4th ed.
9. Vanderet al. 1991.human physiology, mac graw hill publication, 5th Ed.

