VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM&SYLLABUS (DRAFT) OF

B. Sc. (HONOURS/ HONOURS WITH RESEARCH)

MAJOR IN PHYSIOLOGY

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023& NEP, 2020

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

VIDYASAGAR UNIVERSITY
BACHELOR OF SCIENCE (HONOURS/ HONOURS WITH RESEARCH) MAJOR IN PHYSIOLOGY
(under CCFUP, 2023)

Level	YR.	SEM	Course Type	Course Code	Course Title		Credit	L-T-P	Marks		
									CA	ESE	TOTAL
B.Sc. (Hons./ Hons. with Research)	4th	VII	SEMESTER-VII								
			Major-14	PHYHMJ14	T: Biotechnology with Nanotechnology and Bioinformatics; P: Practical		4	3-0-1	15	60	75
			Major-15	PHYHMJ15	T: Bioinstrumentation; P: Practical		4	3-0-1	15	60	75
			CRM	PHYHCRM	T: Research Methodology and Ethics; P: Practical		4	3-0-1	15	60	75
			Major Elective-03	PHYHDSE 03	Concept of Yoga with Mental Health OR Naturopathy and its Physiological importance		4	3-1-0	15	60	75
			Minor-07 (Disc.-I)	PHYMIN07	T: Biotechnology, Bioinformatics and Bio-instrumentation; P: Practical *(To be taken by the other Discipline)*		4	3-0-1	15	60	75
			Semester-VII Total				20				375
		VIII	SEMESTER-VIII								
			Major-16	PHYHMJ16	T: Pharmacology with drug development; P: Practical		4	3-0-1	15	60	75
			Major Elective-04	PHYHDSE04	Environmental Studies OR Pathophysiology		4	3-1-0	15	60	75
			Major Elective-05	PHYHDSE05	Clinical Biochemistry OR Cytogenetics and Tissue Culture	FOR HONOURS STUDENTS	4	3-1-0	15	60	75
			Major Elective-06	PHYHDSE06	Molecular Endocrinology OR Food Microbiology with Food Science		4	3-1-0	15	60	75
			Research	PHYHRD	DISSERTATION:	*FOR HONOURS WITH RESEARCH STUDENTS*	*8*	*0-0-8*	*-*	*150*	*150*
			Minor-8 (Disc.-II)	PHYMIN08	T: Advanced nervous system; P: Practical *(To be taken by the other Discipline)*		4	3-0-1	15	60	75
			Semester-VIII Total				20				375
			YEAR-4				40				750
		To be awarded *B.Sc. (Honours / Honours with Research) Major in* Physiology					166	Marks (Year: I+II+III+IV)			3075

MJ = Major, MI = Minor Course, DSE = Discipline Specific Elective Course, CRM= Compulsory Research Methodology, CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

SEMESTER-VII

MAJOR (MJ)

MJ-14: Biotechnology, Nanotechnology and Bioinformatics **Credits 04 (FM:75)**

MJ-14T: Biotechnology, Nanotechnology and Bioinformatics (Theory) *Credits 03 (45 hrs.)*

Course Content:

Elementary idea of biotechnology: Elementary idea of biotechnology. **Cloning:** Idea about molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Expression of recombinant proteins using bacterial, animal and plant vectors. Isolation of the specific nucleic acid sequences. **Plasmid:** Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors. **Concept of protein sequencing** and detection of post-translational modification of proteins. Strategies for genome sequencing.
Fermentation technology, Fermentation: types (submerged and solid state), bioreactors and its operation, types of microbes, raw materials, and downstream processing. **Production of human insulin**, interferons, and vaccines (hepatitis). Production, application and utility of monoclonal antibodies. Concept of single cell proteins, biofuels, bioremediation, biofilters, biopesticides (BT cotton, Alkaloids of Azadirachta indica (neem), Pheromone, Baculovirus), bioplastic, biosensors, and biochips. **Genetically modified food:** Golden rice. Safety aspects of genetically modified food. Ethical and Regulatory Issues. **Concept of genetically modified organisms**, transgenic goats, cattle, and chickens. Bio-safety and Intellectual Property Rights**.**

Nanotechnology: Types of Nanomaterials: Nanoclusters, Solid solutions, thin film, Nanocomposites (Metal Oxide and Polymer based), Core Shell Nanostructure, Buckyballs, Carbon nano tubes and, Zeolite minerals, Dendrimers, Micelles, Liposomes, Block Copolymers, Porous Materials, Metal Nanocrystals, Semiconductor nanomaterials. Applications of nanotechnology in drug delivery. Quantum confinement of nano-structure.

Bioinformatics: Introduction to bioinformatics - Definition, important contributions, tasks, applications, challenges and opportunities. An elementary idea about bioinformatics, genomics, and proteomics. Computer Fundamentals – Programming languages in bioinformatics, Role of supercomputer in biology. Historical background. Scope of bioinformatics – Genomics, Proteomics and Computer-aided Drug Design (Structure-based and ligand-based approaches). Biological databases and data retrieval: Information Network. Database, Tools and uses. Introduction to biological databases – primary, secondary and composite databases, NCBI, nucleic acid databases (GenBank, EMBL, DDBJ, NDB), Protein databases (PIR, Swiss-Prot, TrEMBL, PDB). Nutrient databases. Bioinformatic tools- FASTA, BLAST. DNA sequence analysis. Sequence Alignment. Predictive method using DNA and Protein sequences. Introduction to computational biology- prediction of 3-D protein structure. Identification of an unknown protein.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

Phylogenetic Analysis. Drug Design, Discovery and Pharmacoinformatics. Bioinformatics and Health Informatics: Concepts and application in health and medicine.

MJ-14P: Practical application of Biotechnology and Bioinformatics (Practical) *Credits 01 (30 hrs)*

Course Outline:

- **Biotechnology:** Isolation of DNA (from blood and microbial culture) and RNA (, Isolation of protein, Gel electrophoresis of DNA and protein, Quantification of DNA (DPA) and RNA (Orcinol) and protein (Lowry and Bradford methods
- **Chemical Methods for nanomaterials:** Metal nanocrystals by reduction, Sol-gel, Solvothermal synthesis, Photochemical synthesis, Electrochemical synthesis, Nanocrystals of semiconductors and other materials by arrested precipitation, Thermolysis routes, Liquid-liquid interface (Demonstration).
- **Bioinformatics:** Nucleic acid and protein sequence databases; data mining methods for sequence analysis. Web-based tools for sequence searches, motif analysis and presentation (Demonstration).

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MJ-15: Bioinstrumentation **Credits 04 (Full Marks:75)**

MJ-15T: Bioinstrumentation (Theory) *Credits 03 (45 hrs.)*

Course Content:

Instrumentation in biology:

Microscope: Basic components, principles and use of light for simple, compound, phase contrast, and electron microscopy (EM). Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, and microscopy of living cells. Scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, and image processing methods in microscopy. **Principles and uses of biomedical instruments:** ECG, USG, Endoscopy, X-ray, MRI, CT-scan, UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods. Artificial pacemaker. **Spectrophotometer:** Biomedical application of the spectrophotometer and its principles. **Chromatography:** Principles and uses of Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography. **Electrophoresis:** Principle, methods and uses of application of Agarose Gel Electrophoresis (AGE), PAGE, SDS-PAGE. **Centrifugation:** Differential and density gradient centrifugation, sucrose density gradient, CsCl2 gradient, analytical centrifugation, ultracentrifugation- principles, moving boundary and density gradient ultracentrifugation technique. **Radioactivity**: Use of radio isotopes in physiological studies. Concept of radiolabelling of biomolecules and their detection by autoradiography. Principles of radioimmunoassay (RIA), ELISA, and immunoblotting.

MJ-15P: Application of instrumentation & research methodology in biology (Practical)

Credits 01(30 hrs)

- **Technical Methods in Biology:** Visualization of cells and subcellular components by light and compound microscopy. Centrifugation: Cell fractionation, Homogenization of tissue.
- Protein separation by electrophoresis: SDS-PAGE (Demonstration).

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

COMPULSORY RESEARCH METHODOLOGY (CRM)

[for both Hons. and Hons. with Research students]

CRM: Research Methodology and Ethics

CRM (T): *Research Methodology and Ethics (Theory)* *Credits 03 (45 hrs.)*

Course Content:

Foundation of Research: Introduction and definition of meaning, objectives, and motivation of research. Research Methods vs. Methodology. **Types of Research:** Analytical vs. Descriptive, Quantitative vs. Qualitative, Basic vs. Applied. **Research problems:** Problem identification, Experimentation, and determining experimental and sample design**. Planning of research design and experiment**: Need and importance of research design. Features of good design, important concepts related to good design- Observation and Facts, Prediction and Explanation. **Development of research models:** Developing a research plan. **Research report:** Criteria and importance of research proposal; mechanics and precautions of writing a research report. **Review of literature (RL)**: Organisation, reasons, importance and errors of RL; General guidelines and techniques for writing a literature review. **Research hypothesis**: Characteristics, development process, strategies and importance of research hypothesis. **Methods of data collection:** Significance and collection of primary data by observation, questionnaire, interview and schedule methods. **Reference or bibliography:** General concept, rules, types and style of citation writing.

Ethics in research: Code of ethics and research, Ethics and research process, Importance of ethics in research, and bio-safety. **Intellectual Property Rights (IPR):** General criteria and research importance. Commercialization, Copyright, Royalty. **Patent:** Basic idea about patent, Patent law, significance in research. **Plagiarism:** Introduction and definition of plagiarism, its importance in thesis writing. **Citation**: Definition, types, methods and significance of it.

CRM (P): *Research Methodology and Ethics (Practical)* *Credits 01(30 hrs.)*

- **Submission of research proposal:** A Research project work on physiology/ or related health topics to be submitted based on any of the above tools and techniques.

Or

- **Submission of review report:** Based on physiology/ related health topics

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MAJOR ELECTIVE (DSE)

Major Elective – 03:

(Concept of Yoga with Mental Health / Naturopathy)

MJDSE-03: Concept of Yoga with Mental Health **Credits 04 (Full Marks:75)**

MJDSE-03T: Concept of Yoga with Mental Health (Theory) *Credits 04 (60 hrs)*

Course Content:

Yoga and Mental Health: General introduction to yoga. Brief about the origin of Yoga: Psychological aspects and Mythological concepts; History and Development of Yoga: before the Vedic period, Vedic period, Medieval period, modern era; Etymology and Definitions of Yoga. **Aim and Objectives of Yoga**, Misconceptions of Yoga; Brief about Streams of Yoga; Principles of Yoga, Importance of Yoga. **Yogic perspective:** Smritis, Puranas with emphasis to Bhagavat Purana; Yogic perspective to Shad-darshanas; Emphasis to Vedantic approach of Shankara, Ramanuja, Madhva and Vallabha; Brief: Agamas, Tantras, Shaiva Siddhanta. **Breathing practices:** Hands in and out, Hands stretch, Ankle stretch, Rabbit, Dog, Tiger, Straight leg raising breathing; Breath Awareness: Shwas-prashwas samyama; Abdomen, Thoracic & Clavicular Breathing, Abdomen plus Thoracic Breathing, Abdomen + Thoracic + Clavicular Breathing; **Yogic Breathing:** Pause Breathing (Viloma Pranayama), Spinal Passage Breathing (Sushumna Breathing); Practice of Puraka, Rechaka & Kumbhaka (Antar & Bahya Kumbhaka).

Mental health: Definition & Importance of mental health according to WHO; Dimensions of mental health. **Mental processes, motivation, emotions and intelligence**: Sensation, Perception, Attention, Memory, Learning, Feeling, etc.; Their definitions and types, Intelligence and its' measurements; Emotional Intelligence and Social Intelligence. **Mental and emotional ill health**: Styana, Samshaya, Pramada, Avirati, Duhkha, Daurmanasya, Bhranti-darsana, Alabdha-bhumikatva and Anavasthitatva; **Psychological and yogic method**: Tackling ill effects of conflict and Frustration; Yogic methods. **Yoga Psychology for Adjustment**: Psychological, philosophical and yogic counselling; the remedial measures.

OR

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MJDSE-03: Naturopathy and its Physiological importance **Credits 04 (FM: 75)**

MJDSE-03T: Naturopathy and its Physiological importance (Theory) *Credits 04 (60 hrs)*

Course Content:

Introduction to Naturopathy: General introduction to Naturopathy; Naturopathy – its definition, meaning, scope and limitations; History of Naturopathy – Indian and Western; Comparative study of Naturopathy with other systems of Medicine; Catechism of Nature cure. **Principles and concepts of naturopathy:** Composition of the human body according to Naturopathy, Laws of Nature: Pancha-Mahabhootas, Shareera Dharmas: Ahara, Nidra, Bhaya, Maithuna; Fundamental principles of Naturopathy; Natural rejuvenation and vitality, how to acquire natural immunity; importance of Physical & Mental Hygiene and prevention of diseases. **Hydrotherapy:** Introduction, definition, scope, history, principles; role of hydrotherapy in prevention of diseases; **Upavasa (Fasting):** Introduction, definition, scope, history, principles and types; its role in disease prevention, health promotion; concept of de-toxification; **Diet:** Introduction, definition, scope, types and its principles; role of Naturopathy diet in disease prevention and, health promotion; **Massage:** Introduction, definition, scope, history, its principles and manipulative techniques; Different types of Massages and their role in in disease prevention, and health promotion.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MINOR (MI)

Minor (MI)-07: Biotechnology, Bioinformatics and Bio-instrumentation

Credits 04 (Full Marks:75)

MI-07T: Biotechnology, Bioinformatics and Bio-instrumentation (Theory) *Credits 03 (45 hrs)*

Course Contents-

Basic concept of biotechnology and bioinformatics: Fermentation technology. Fermentation: types (submerged and solid state), bioreactors and their operation, types of microbes, raw materials, and downstream processing. **Pasteurization, sterilization**, Canning, thermal processing of food with numerical values, Irradiation, Dehydration, low-temperature processing, and the use of preservatives. **Genetically modified food:** Golden rice. Safety aspects of genetically modified food: Ethical and Regulatory Issues. Bioplastic, biosensors, and biochips. **Biotechnology concerning food products:** Antioxidants and nutraceuticals.

Bioinformatics: Introduction to bioinformatics - Definition, important contributions, tasks, applications, challenges and opportunities. An elementary idea about bioinformatics, genomics, and proteomics. Computer Fundamentals – Programming languages in bioinformatics, Role of supercomputer in biology. Historical background. Scope of bioinformatics – Genomics, Proteomics and Computer-aided Drug Design (Structure-based and ligand-based approaches).

Bioinstrumentation: Microscope- Basic components, principles and use of light for simple, compound, phase contrast, and electron microscopy. **Principles and uses of biomedical instruments:** ECG, USG, Endoscopy, X-ray, MRI, CT-Scan. **Chromatography:** Principles and uses of Paper chromatography; Column chromatography, TLC, GLC, HPLC.

MI-07P: Basic application instrumentation, biotechnology and bioinformatics in biology (Practical)
Credits 01 (30 hrs)

- Visualization of cells and subcellular components by light and compound microscopy. Centrifugation: Cell fractionation, Homogenization of tissue.
- Quantification of DNA (DPA) and protein (Lowry and Bradford methods).
- TLC and Paper chromatography

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

SEMESTER-VIII

MAJOR (MJ)

MJ-16: Pharmacology with drug development **Credits 04 (FM:75)**

MJ-16T: Pharmacology with drug development (Theory) *Credits 03 (45 hrs.)*

Course Contents:

Pharmacology and drug development: Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, agonists, antagonists (competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. **Pharmacokinetics:** Membrane transport, absorption, distribution, metabolism and excretion of drugs. **Pharmacodynamics:** Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptor interactions, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. **Drugs and its action:** Pharmacology of drugs acting on the peripheral nervous system (PNS), central nervous system (CNS). **Drug discovery and clinical evaluation of new drugs:** Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials, and pharmacovigilance. **Adverse drug reactions:** Drug addiction, drug abuse, tolerance and dependence

MJ-16P: Practical application of drugs in animal models (Practical) *Credits 01 (30 hrs.)*

Course Outline:

1. Introduction to experimental pharmacology. Commonly used instruments in experimental pharmacology.
2. Maintenance of laboratory animals as per the Committee for Control and Supervision of Experiments on Animals (CCSEA) guidelines.
3. Study of different routes of drug administration in mice/rats.
4. Bioassay of drugs on intestinal movement of rat by Dales' apparatus.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MAJOR ELECTIVE (DSE)

Major Elective – 04:

(Environmental Studies OR Pathophysiology)

MJDSE-04: Environmental Studies **Credits 04 (Full Marks:75)**

MJDSE-04T: Environmental Studies (Theory) *Credits 04 (60 hrs)*

Course Content:

Environmental Studies: Introduction; Definition of Environment; Link between source/environment/receptor; Exposure; Health effects; Toxicology; Defining the need for fate and transport, advantages, disadvantages, Current and future status of environmental surveillance and monitoring. **Environmental pollution: Definition. Causes and effects on human health. Water, air and soil pollution. Chemicals of concern:** Relevant properties for environmental fate and transport**. Monitoring of environmental parameters**: Screening parameters – BOD, COD, TOC, TDS. **Environmental sampling**: Definition and synthesis of a monitoring/sampling/analysis method. **Introduction to environmental transport**: BOX Models and the application to multimedia transport of pollutants. **Fundamentals of mass transport**: Definition of interphase and inter-phase chemical flux; interphase mass transport, diffusion coefficient and convection mass transfer coefficients. **Quality Assurance and quality control (QA/QC).** Methods for sampling/processing/analysis of organic and inorganic constituents in air/water/soil/sediment.

OR

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MJDSE-04: *Pathophysiology* **Credits 04 (Full Marks: 75)**

MJDSE-04T: Pathophysiology (Theory) *Credits 04 (60 hrs)*

Course Content:

Basic principles of cell injury and adaptation: Introduction, definitions, knowledge of the causes, mechanisms, types and effects of cell injury and their clinical significance. Describe the etiology of cell injury. Distinguish between reversible and irreversible injury: Mechanisms; Morphology of cell injury: Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia). Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, nuclear damage), Cell swelling, intracellular accumulation, Calcification, Enzyme leakage and Cell Death: types, mechanisms, necrosis, apoptosis (basic as contrasted with necrosis), autolysis. **Basic mechanism involved in the process of inflammation and repair:** Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis. **Systemic pathophysiology:** Cardiovascular System: Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis). Respiratory system: Asthma, Chronic obstructive airways diseases. Renal system: Acute and chronic renal failure. **Inflammatory bowel diseases, jaundice, hepatitis** (A, B, C, D, E, F), alcoholic liver disease. **Diseases of bones and joints:** Rheumatoid arthritis, osteoporosis and gout. **Principles of cancer:** classification, etiology and pathogenesis of cancer. **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, gout. **Metabolic and Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract Infections. **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MAJOR ELECTIVE- 05

[to be studied by Honours students only]

(Clinical Biochemistry / Cytogenetics and Tissue Culture)

MJDSE-05: Clinical Biochemistry **Credits 04 (Full Marks: 75)**

MJDSE-05T: Clinical Biochemistry (Theory) *Credits 04 (60 hrs)*

Course Content:

Clinical Biochemistry: Metabolic Disorders: Disorders of carbohydrate metabolism. Disorders of plasma lipids and lipoproteins. Diabetic panel test. Glucose tolerance test (GTT), its importance and principles and techniques of GTT. Insulin tolerance test. Gastric juice analysis. Bile pigment metabolism and pathophysiology of jaundice. **Water and Electrolyte balance and imbalance:** sodium, potassium, chloride, CO_2 (HCO_3 -), total and ionized Calcium, phosphorus (Inorganic), magnesium. **Protein disorders:** Clinical features and laboratory findings in disorders/abnormalities of the plasma proteins, acute phase proteins, serum proteins and albumin, serum and urine protein electrophoresis, hypo and hyper-albuminemia; hypo- and hyperglobulinemias, Alpha-1-antitrypsin deficiency, Homozygotes vs. heterozygotes, e.g. phenylketonuria, tyrosinemia, cystic fibrosis and sweat tests, amino-acidurias, organic acidurias. Protein folding disorders (Alzheimer's, prions and amyloid). Plasma creatinine, urea (blood urea nitrogen). **Enzymes and Iso-enzymes of factors affecting enzyme levels in blood and their clinical importance:** Principle, assay, and clinical significance of transaminases, creatine kinase, lactate dehydrogenase, alkaline phosphatases, acid phosphatases, SGOT, SGPT, CPK and LDH, isocitrate dehydrogenase, amylase, lipase, trypsin, chymotrypsin, choline esterase, glutamate dehydrogenase, glucose-6-phosphate dehydrogenase and ceruloplasmin. **Physical and chemical analysis of urine**: pH, specific gravity, reducing substances, protein, ketone bodies, blood, bile salts, bile pigments, Urine urea, creatine, creatinine, uric acid, calcium, phosphorus, Urine anion gap. **Clearance test for urine function:** Creatinine clearance, Urea clearance, Differential protein clearance, inulin clearance, Normal and abnormal urine composition, including abnormal pigments. measurement of glomerular filtration rate; creatinine clearance; cystatin measurement, phosphate clearance (TmP/GFR). Urinalysis (including microscopy). Protein estimation in urine (Proteinuria) and microproteinuria. Urinalysis, stick tests, and microscopic analysis.

OR

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MJDSE-05: Cytogenetics and Tissue Culture **Credits 04 (Full Marks: 75)**

MJDSE-05T Cytogenetics and Tissue Culture (Theory) *Credits 04 (60 hrs)*

Course Content:

Cytogenetics: History and development of Human Cytogenetics, Centromere and kinetochore, telomere and its maintenance. **Cell Division:** Mitosis, meiosis, synaptonemal complex, crossing over, and chiasma formation. **Chromosome Organization:** Structure, euchromatin, heterochromatin, nucleosomes, and special chromosomes (polytene and lampbrush). Chromosome banding techniques, sister chromatid exchanges, FISH. Idiogram, Karyotyping, Numerical and structural aberrations, Cytogenetic nomenclature, Chromosomal disorders. **Structural & Numerical Variations:** Deletions, duplications, inversions, translocations, aneuploidy, and polyploidy. Common syndromes due to numerical changes and structural disorders. Genetics of fetal wastage.

Tissue culture: Introduction and basics of tissue culture, culture environment, factors affecting tissue culture, contamination and its remedies, cryopreservation, PBLC. **Culture Media:** Composition of MS media, macro/micronutrients, vitamins, and plant growth regulators (auxins, cytokinins). Culture initiation, maintenance, suspension and monolayer cultures, primary and secondary cultures, cell lines, and organ culture. **Structural Hybridization & Mapping**: Linkage, recombination, and genetic mapping. Animal Cell Culture: Primary culture, cell lines, and maintenance requirements. In Vitro Techniques: Callus culture, micropropagation, organogenesis, soma clonal variation, and haploid production.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MAJOR ELECTIVE- 06

[to be studied by Honours students only]

(Molecular Endocrinology / Food Microbiology with Food Science)

MJDSE-06: Molecular Endocrinology **Credits 04 (Full Marks: 75)**

MJDSE-06T: Molecular Endocrinology (Theory) *Credits 04 (60 hrs)*

Course Content:

Molecular Endocrinology: Overview and principles of molecular endocrinology. Genetic, biochemical and molecular analysis of structural and functional domains within steroid receptors. DNA binding properties of steroid receptors, analysis of receptor mutations. Sequence-specific high-affinity DNA binding sites; functional and mutagenic analysis of receptor DNA binding sites, receptor specificity of DNA binding sites, role of spacing and orientation. Molecular genetic analysis of co-regulator interactions with steroid receptors. Androgen insensitivity syndrome and receptor structure/function. Identification of primary steroid receptor target genes, steroid-regulated expression of individual genes and populations of endogenous genes in steroid-responsive cells. GREs in primary response genes; steroid receptor-transcription factor interactions. Transcriptional co-regulators and role in steroid receptor function. Role of chromatin structure in steroid receptor-mediated gene expression. Formation of protein complexes and protein-protein interactions involving nuclear receptors. Overview of cell surface receptor structures, receptor dimerization, clustering and interactions with membrane components. Mechanism of tyrosine kinase receptor action: Insulin receptor signalling and EGF receptor signalling; molecular genetic analysis of the receptor structural domains, receptor binding proteins, SH2/SH3 domains and protein-protein interactions. Down-stream tyrosine kinase receptor signalling events-serine/threonine protein kinase cascades, Ras-activation of MAPK, alterations in cancer cell receptor signalling n. Transcriptional regulation by protein hormone receptor signalling. TGF-beta receptor signalling through SMAD proteins; Interleukin. Cross-talk between steroid and protein hormone pathways. Bone is an endocrine tissue.

OR

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MJDSE-06: Food Microbiology and Food Science **Credits 04 (Full Marks: 75)**

MJDSE-06T: Food Microbiology and Food Science (Theory) *Credits 04 (60 hrs)*

Course Content:

Food Microbiology: Introduction to food Microbiology: Growth and survival of microorganisms in foods (Yeast, Mould, Bacteria); Factors affecting growth of microorganism: Intrinsic, Extrinsic; Physical and chemical methods to control microorganisms, General principles of spoilage, Biochemical changes caused by microorganisms; microbes in food fermentation, putrefaction, lipolysis; Antagonism and synergism in microorganism; General concept of Prebiotics, probiotics and symbiotic; Principle of food preservation by controlling growth of microorganism (asepsis, high temp., low temp.,). Contamination, Preservation and Spoilage of different kinds of foods: cereal, Pulses, Fruit and Vegetable, Meat, fish, egg, poultry and their processed products, Milk and milk Products, Canned foods and Beverages. Food toxicology & food-borne illness: Food hazards, microbiological, nutritional, environmental, natural toxicants, pesticides, food additives, preservatives, food-borne illness: (Clostridium, botulinum, Escherichia coli, Brucella, Bacillus, Salmonella, Staphylococcus) Non-bacterial agents & food-borne illness, (Helminths & Nematodes, protozoa, toxic algae, fungi & food-borne viruses. Microbial Food Hygiene and Sanitation: Method for microbial examination of food: indicator organisms, direct examination, cultural techniques, Rapid methods in detection of microorganisms. Contamination during handling, processing and its control. Industrial Microbiology: Elementary knowledge for the production of fermented products like alcohol, glutamic acid, penicillin and milk products (cheese, dahi).

Food Ingredients, Additives & Nutraceuticals: Properties of solid and liquid foods: Physical properties (solutions, vapor pressure, boiling point, freezing point, osmotic pressure, viscosity, surface and interfacial tensions, specific gravity). **Food pigments and colors:** Some common pigments used in the food industry (chlorophylls, myoglobin, anthocyanin, betalain, carotenoids, synthetic colors & lake /dye colors and other colourants); Flavors: types of flavor, flavor compounds, and extraction principles of flavor. **Nutraceuticals and phytochemicals:** definition, Classification. Dietary supplements, Functional foods- their legislation and health claims, Natural occurrence of certain photo-chemicals. **Antioxidants and flavonoids:** omega-3 fatty acids, carotenoids, dietary fiber, phytoestrogens; Neutraceuticals for effective control of disease or health benefit with adequate safety. Role of neutraceuticals against- skin health/ageing, bone health, eye health, mental health, cardiovascular health, cancer prevention, etc. Safety, adverse effects and interactions of neutraceuticals.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

PROJECT / DISSERTATION (RD)

[to be undertaken by students opting for and eligible for Hons. with Research]

DISSERTATION:
Credit: 8; Full Marks: 150

Structure of the dissertation

Preliminary Pages

- Title Page: Includes name of the student, university, degree, and submission date.
- Certificate/Declaration: Signed statement of originality and supervisor's approval
- Abstract: A 250-350 word summary covering research problem, methodology, and core findings.
- Acknowledgements: To supervisors and others, if any.
- Table of Contents: Clear hierarchical mapping of chapters with page number
- List of Abbreviations: Specialized terms, if any

Introduction

- Background & Context: Situates the topic in historical or theoretical context.
- Research Problem & Objectives: The specific question or gap the research is addressing.
- Thesis Statement/Hypothesis: The core argument the dissertation intends to prove.
- Scope and Significance: Why the study matters.
- Literature Review & Theoretical Framework

Literature Review: Analyzes existing scholarly works to show the gap the study fills.

- Theoretical Framework: Identifies the philosophers, critics, or schools of thought shaping the analysis in the dissertation.

Methodology

- Describes *how* the research was conducted - Anyone or a combination of textual analysis/ archival research/ conducting interviews/ ethnographic/semi-ethno-graphic research involving both textual analysis and field visit etc.
- Thematic or Analytical Chapters

The Core Body: Usually 3 to 4 chapters focusing on the core concerns of the study.

- Structure: Each chapter introduces its specific theme, analyzes primary and secondary sources, and contributes to the overarching thesis.

Conclusion

- Summary & Synthesis: Recaps your main points without simply repeating them.

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

Final Verdict: Answers the research questions posed in the introduction.

Future Scope: Suggests how future scholars can build upon your work.

- Works Cited/ Reference, and/or Bibliography: A comprehensive list of all primary and secondary sources cited as per the latest MLA style.

Appendices: Transcripts, interview logs, or raw archival data, if any.

Marks distribution-

Sl. No	Particulars	Marks
1	Research Project / Dissertation Report	70
	▪ Proposal and Abstract (along with some keywords)	10
	▪ Literature Review &Theoretical Framework	10
	▪ Methodology and Research design	10
	▪ Thematic Analysis (Chapter-wise)	20
	▪ Report Quality	20
2	Seminar Presentation	30
3	Viva-Voce	50
Total		**150**

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714

MINOR (MI)

Minor (MI)-08: Advanced nervous system **Credits 04 (Full Marks: 75)**

MI-08T: Advanced nervous system (Theory) *Credits 03 (45 hrs)*

Course Contents-

Higher centres of brain: Cerebrum: Structure, functions and connections of cerebrum. Origin, courses, termination and functions. **Cerebellum:** Structure, connections and functions of cerebellum. Decerebrate and decorticate rigidity. **Spinal cord and nuclei:** Anatomy and histology, connections and functions of the spinal cord. Lower motor neuron and upper motor neuron. Postural reflexes, Muscle spindle, muscle tone and its regulation. **Thalamus and hypothalamus:** Structure and functions, thalamic nuclei. Structure and function of vestibular apparatus. **Basal ganglia:** structure, connections and functions. Cerebral cortex: histological structure, connections and functions. **Limbic system:** Organization of the limbic system and its functions. Emotion. **EEG:** Origin and components of EEG. Physiological basis of different types of sleep. Sleep-wakefulness cycle. **Higher functions of nervous system:** memory, conditioning and learning. Speech and aphasias. Physiology of pain. CSF: formation, circulation and functions. **Autonomic nervous system:** Organization, outflow, ganglia, centres and functions. Chemical transmission in autonomic nervous system; Nicotinic and muscarinic acetylcholine receptors, alpha and beta adreno-receptors and their agonists and antagonists. Central control of autonomic nervous system for regulation of internal body homeostasis.

MI-08P: Basic practical on the central nervous system (Practical) *Credits 01 (30 hrs)*

Practical:

- **Reflex testing:** Elicit superficial reflexes (abdominal/plantar) and deep tendon reflexes (biceps, triceps, knee, ankle jerks).
- **Sensory system evaluation:** Examine tactile touch, pain/temperature discrimination, vibration sense, and joint position (proprioception).
- **Histological Study:** Microscopic structures of the cerebrum, cerebellum (Purkinje cells), and spinal cord.
- **EEG Recording and Sleep Studies**: Monitoring brain activity during different sleep stages (demonstration).

******

Downloaded from Vidyasagar University by 14.139.211.194 on 19 Nov 2026 07:51:27 AM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=714