VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE (HONOURS)

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

BACHELOR OF SCIENCE (HONOURS) 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.)	3rd	V	**SEMESTER-V**							
			Major-8	**PHYHMJ08**	**T**: Nervous system with thermoregulation of the body; **P:** Analytical biochemistry (Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major-9	**PHYHMJ09**	**T**: Exercise Physiology with Ergonomics and Sports Training; P: experiments & Anthropometric measurements (Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major-10	**PHYHMJ10**	**T**: Modern concept of Microbiology and Immunity; **P**: Immuno-histochemistry (Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major Elective-01	**PHYHDSE1**	**T**: Nutrition, Fitness, Wellness OR **T**: Maternal-Child Health	**4**	**3-1-0**	**15**	**60**	**75**
			Minor-5 (Disc.-I)	**PHYMIN05**	**T:** Sensory physiology and basic ideas of microbiology**; P:** Experiment on tissue staining, visual sensations and microbiology	**4**	**3-0-1**	**15**	**60**	**75**
					Semester-V Total	**20**				**375**
		VI	**SEMESTER-VI**							
			Major-11	**PHYHMJ11**	**T:** Environmental & Sensory Physiology**; P:** Measurement of environmental parameters **(**Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major-12	**PHYHMJ12**	**T:** Biostatistics and Basics of Computer**; P:** Practical application in pharmacology, biostatistics and computer **(**Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major-13	**PHYHMJ13**	**T:** Basic genetics and molecular biology with Biotechnology, including nanotechnology**; P:** Estimation of genetic materials and nanocrystals synthesis (Practical)	**4**	**3-0-1**	**15**	**60**	**75**
			Major Elective-02	**PHYHDSE2**	**T:** Lifestyle, Health and Diseases OR Psychology and Stress Management	**4**	**3-1-0**	**15**	**60**	**75**
			Minor-6 (Disc.-II)	**PHYMIN06**	**T:** Environmental and developmental physiology with Pharmacology and Biostatistics, along with the basics of computer**; P: Practical** ***(To be taken from other Discipline)***	**4**	**3-0-1**	**15**	**60**	**75**
					Semester-VI Total	**20**				**375**
					YEAR-3	**40**				**750**
			Eligible to be awarded Bachelor of Science in Physiology *on Exit*			**126**	**Marks (Year: I+II+III)**			**2325**

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

SEMESTER-V

MAJOR (MJ)

Major 8: Theory

Major 8T: Nervous system with thermoregulation of the body:

Nervous system- II:

Ascending and descending tract: Origin, courses, termination and functions. Lower motor neuron and upper motor neuron. Structure and function of the vestibular apparatus. Postural reflexes, muscle spindles, muscle tone, and its regulation. Decerebrate and decorticate rigidity. Structure, connections and functions of the cerebellum. Nuclei, connections and functions of the thalamus and hypothalamus. **Basal ganglia and reticular formation:** structure, connections and functions. Emotion. Origin and components of EEG. Physiological Basis of Different Types of Sleep. Sleep-wakefulness cycle. Higher functions of the nervous system: memory, conditioning and learning. Speech and aphasias. Physiology of pain. **CSF:** formation, circulation, and functions. **Autonomic nervous system (ANS) & Peripheral nervous system (PNS):** Organization, outflow, ganglia, centres, and functions. Chemical transmission in the autonomic nervous system: Nicotinic and muscarinic acetylcholine receptors, alpha and beta adreno-receptors, and their agonists and antagonists. Central control of the autonomic nervous system for the regulation of internal body homeostasis. **Spinal Cord:** Structure and functions of the spinal cord with special reference to functional changes after hemi-section and complete section of the spinal cord, Brown-Séquard syndrome.

Skin and body temperature regulation:

Histological structure of skin. Organization of the sweat gland. Composition and functions of sweat. Regulation of sweat secretion. Insensible and sensible perspiration. Composition and functions of sebum. Triple response. Normal body temperature. Channels of heat loss and the heat gain process of heat production and heat loss. Regulation of body temperature: higher centres and mechanisms of regulation. Hypothermia and hyperthermia. Physiological basis of fever.

Major 8: Practical

Major 8P: Analytical biochemistry:

- Estimation of free and total acidity in supplied gastric juice.
- Estimation of lactose and calcium from milk.
- Determination of total carbohydrate by the phenol-sulphuric acid method from cereals.
- Estimation of free amino acids by the ninhydrin method and total protein by the quantitative biuret reagent method from pulses.
- Determination of acid value and iodine number of fat.

Major 9: Theory

Major 9T: Exercise Physiology with Ergonomics and Sports Training:

Work Physiology and Ergonomics:

Physical work: definition and units of measurement. Concepts and classification of physiological work-static, dynamic, positive, negative and isokinetic work. The difference between work and sports. **Energetics of work:** Concept of Aerobic and anaerobic energy production; Energy expenditure in different activities; source of energy- aerobic and anaerobic metabolism; Cardiovascular and respiratory responses during graded work. Aerobic and anaerobic capacity. Maximal aerobic power, factors affecting and methods of measurement. Concept of excess post-exercise oxygen consumption. Concept of fatigue. **Anthropometry:** common instruments for anthropometric measurements. Application of anthropometry in nutrition and ergonomics. **Tests for physical work capacity:** Measurement with bicycle ergometer, treadmill mill and Harvard step test**. Physiology of Strength Performance:** Types of muscle fibres; Muscle hypertrophy and hyperplasia.

Ergonomics: An elementary idea of ergogenic aids. Human factors and fundamentals of ergonomics. Basic concepts of ergonomics and their application in industry to increase individual and group productivity. Ergonomics design methodology and checkpoints for design development. Human body: Structural anatomy and functions; Body posture and supportive devices. Vertical and horizontal work surface. Cognitive aspects and mental workload; Work-rest cycle. Industrial safety; Human error and risk perception.

Sports Physiology: Physical training- General principles and different methods. Nutrition in sports - nutrients and calorie requirements for different kinds of sports. Nutrition in sports - nutrients and calorie requirements for different kinds of sports. Basic concepts of Sports Psychology, Role of sports in emotion, and social factors. **Sports Training:** History, Importance, Aim and objectives of sports training; Characteristics of sports training; biological process in training; Components of physical fitness (motor abilities)– endurance, strength, speed, flexibility, coordination, agility. **Principles of training:** Overload, specificity, progression and reversibility; Meaning and concept of Training load; Adaptation and Recovery. **Sports Application:** Application in competitive sports, recreational sports, and medical rehabilitation; Human energy transfer in rest and exercise

Major 9: Practical

Major 9P: Human experiments & Anthropometric measurements:

Blood Pressure measurement: Measurement of arterial blood pressure at rest, after exercise and at different postural conditions by a Sphygmomanometer. Harvard step test and determination of physical fitness. Measurement of breathing rate before and after exercise. Determination of VO_2 max by Queen's College method. Study of the effect of graded exercise (by Bicycle ergometer/Treadmill) on heart rate. Pneumographic effects of talking, laughing, coughing, exercise, hyperventilation and breath holding. Determination of muscular efficiency by Mosso'sergograph. Spirometric measurement of vital capacity. Determination of hand and foot reaction time.

Anthropometric parameters: Weight, stature, eye height, shoulder height, elbow height, bi-acromian breadth, head breadth, head circumference and neck circumference. Mid upper arm circumference, chest circumference, waist circumference, hip circumference, waist-hip ratio, BMI, and BSA.

Major 10: Theory

Major 10T: Microbiology and Immunology

Microbiology:

Organization of a prokaryotic cell. Classification of bacteria based on morphology, staining characteristics, biochemical tests and 16S rRNA test for identification. Nutritional requirements of bacteria, nutritional types, and culture media. **Sterilization**: Types, principles and importance. Pasteurization and its application. Concept of pure culture and different methods of pure culture technique. **Bacterial growth:** Growth curve and physical conditions for growth, Bacterial metabolism: fermentation (ethanol, lactic acid, acetic acid), glyoxylate cycle, Entner-Doudoroff pathway, phosphoketolase pathway. **Bacterial genetics:** Elementary idea of transformation, conjugation and transduction. **Control of bacterial growth:** concept of antiseptics, disinfectants, antibiotics, probiotics and prebiotics. Elementary idea of bacteriostatic, bactericidal and bacteriolytic agents. **Food microbiology**: Brief ideas about food spoilage (fish, meat, milk, vegetables) and its prevention. Bioremediation, Bio-fertiliser, Metal-leaching. Elementary knowledge of fungi, algae, protozoa, and viruses.

Immunology:

Basic concept of Immunology: Overview of Immune System - properties of the immune system; types of immunity: innate immunity, acquired immunity, active and passive immunity. First and second line defence. **Innate immunity:** Mechanical barrier against pathogens, biochemical organisms, Physiological barrier-antibacterial and antifungal substances in external body secretions, bactericidal action of HCl. Mechanism of chemotaxis, phagocytosis of lysozyme and reactive oxygen species. **Immuno-competent Cells-** Structure and functions of Neutrophil, B-lymphocytes, T-lymphocytes (helper, cytotoxic and suppressor), Natural killer cells, monocytes, and macrophages.

Primary and secondary lymphoid organs**.** Classification, structure and functions of immunoglobulins (IgG, IgM, IgA, IgD, IgE). **Antigen-Antibody:** Properties of immunogen, antigens and haptens. Antigen-antibody interaction, its physiological effects and clinical applications. **Major Histocompatibility Complex (MHC):** Elementary ideas about Human

leucocyte antigens. Self, non-self. Antigen processing and presentation with MHC (Class I and II). **Biology of B-Lymphocyte:** Elementary idea of B-Cell receptors (IgM, Igα/Igβ, CD19, Cr2/CD21) and activation (in brief). **Biology of T-Lymphocyte:** Elementary idea of T-Cell receptors (TCR, CD28/l52, CD40L) and activation of T-cell (in brief): **Humoral immunity:** Primary and secondary immune responses. Mechanisms of humoral immunity- Cooperation of T cells, B cells and macrophages for the production of specific antibody. Role of cytokines in humoral immunity. Antibody diversity (in brief). **Cytokines:** Types and functions. Role of cytokines in inflammatory response. **Complements:** Classification, components, activation of pathways (classical, alternative and lectin) and functions. Cell-mediated immunity: Generation and activation of CTLs, NK cells and their mechanism of killing. Acquired Immunodeficiency: AIDS, The HIV virus & infection; immunological events associated with HIV infection. **Toll-like receptor (TLR):** Role of Toll-like receptor (TLR) in immune functions. Hypersensitivity reactions: Mechanism of different types of hypersensitivity reactions and their physiological effects. Transplantation immunology: **Types of graft;** Immunological basis of graft rejection; Autoimmunity: Immunological features of autoimmune diseases.

Major 10: Practical

Major 10P: Immuno-histochemistry:

- Separation of different types of blood cells by Histopaque (gradients), identification of (a) B-cells by resetting (b) T-cells by resetting (c) Macrophages, polymorphonuclear cells.
- Measurement of the diameter of WBC and megakaryocytes.
- Gram stain, spore stain, fungi stain and Negative staining.
- Qualitative assay of Catalase and amylase in bacterial culture.

MAJOR ELECTIVE (DSE)

Major (Elect.)-1: Theory

(Nutrition, Fitness and Wellness OR Maternal-Child Health)

MJE-01T: Nutrition, Fitness and Wellness:

Definition of Health and Nutrition, Levels of Nutrition, Balanced Diet. Factors affecting food intake and meal planning. **Food groups:** Types of foods, Food exchange system and planning a diet using the food exchange system. **Role of vitamins and minerals in exercise:** Health problems related to physical inactivity. Functions with special reference to the antioxidant function, vitamin requirements for persons engaged in an exercise programme; Effect of exercise on selected minerals in the body-Calcium, Iron and Zinc - Functions with special reference to the antioxidant function. Mineral requirements for persons engaged in an exercise programme. **Growth Nutritional requirements**: Problems related to health and fitness and their management in childhood and adolescence. Nutritional requirements, problems related to health and fitness and their management in adulthood in different levels of activity. **Fitness problems and management:** Nutrition and exercise regimes for pre- and post-natal nutrition and fitness problems and their management. **Obesity:** Prevalence of obesity and its relationship with public health, types of obesity, causes of obesity, causes of weight gain, Health risks associated with obesity, **Components of Fitness:** Health-related physical fitness, Evaluation of health status, measuring cardiorespiratory fitness, muscular strength, and assessment of flexibility. **Different types of physical exercises**: Aerobic, Anaerobic, Cardio etc. Prevention and rehabilitation of exercise-related injuries and diseases. **Exercise-related Muscle injuries**: Adaptation to exercise-causes & concerns -Markers of muscle fitness.

OR

MJE-01T: Maternal and Child Care Health:

Nutritional needs during pregnancy, common disorders of pregnancy (Anaemia, HIV infection, Pregnancy-induced hypertension), and the relationship between maternal diet and birth outcome. **Maternal health and nutritional status**, maternal mortality and issues relating to maternal health. **Nutritional needs** of nursing mothers and infants, determinants of birth weight and consequences of low birth weight. **Mammary Gland:** Anatomy, histology, development, and its hormonal control. **Lactation:** Breastfeeding biology and its hormonal regulation, Breastfeeding support and counselling, nutritional significance of colostrum. Infant and young child feeding and care. Assessment of malnutrition among the children, Micronutrient deficiency in preschool children. **Reproductive and Child Health (RCH):** Antenatal, Intranatal and Postnatal care of mother, Neonatal and infant care, Feeding of infants, Immunization, Pre-school children care**,** Growth and development of children, Adolescent health**,** Indicators of **Reproductive and Child Health (RCH)** Programme and services, Demography and Population Control, National Family Welfare Programme. **Health Programs:** Integrative Child Development Services **(ICDS),** Mid-day-meal **(MDM)** program, Clinical Management- Severe Acute Malnutrition **(CM-SAM),** State-level Nutrition programs, Special Nutrition Programme **(SNP),** Balvadi Nutrition Programme **(BNP).**

MINOR (MI)

Minor 5: Theory

MI-5T: Skin and body temperature, Sensory physiology and basic ideas of microbiology:

Skin and body temperature: Histological structure of skin. Organization of the sweat gland. Composition and functions of sweat. Regulation of sweat secretion. Insensible and sensible perspiration. Composition and functions of sebum. Triple response. Hypothermia and Hyperthermia. Physiological basis of fever. Cold stress. Insulating effects. Acclimatization to colds. Role of the hypothalamus in body temperature regulation.

Sensory Physiology: General and special sensation: Classification of general and special senses and their receptors. Muller's law of specific nerve energies. Weber-Fechner law. Mechanism of transduction of stimuli from sensory receptors. **Olfaction and Gustation:** Structure and functions of the receptor organs, nerve pathways, and centres. Physiology of taste and smell. Olfactometer. **Audition:** Sound waves, decibels, structure and functional significance of the auditory system – external, middle and internal ears. Structure of the organ of Corti. Mechanism of hearing and its modern theories. Role of the auditory pathway and centres in hearing. **Vision:** Anatomy and histological structures of the eye. Role of the visual pathway and centres in vision.

Microbiology: Organization of a prokaryotic cell. Classification of bacteria and viruses based on morphology, staining characteristics, biochemical tests and 16S rRNA test for identification. **Sterilization**: Types, principles, and importance. Pasteurization and its application. **Bacterial growth:** Growth curve and physical conditions for growth, **Bacterial metabolism:** fermentation (ethanol, lactic acid, acetic acid).

Minor 5: Practical

MI-5P: Experiment on tissue staining, visual sensations and microbiology:

1. Isolation and staining of nerve fibers with node(s) of Ranvier (AgNO3).
2. Staining of skeletal and cardiac muscles by Methylene Blue stain.
3. Recording of body temperature.
4. To study the response of the skin to blunt injury (triple response) (Demonstration).
5. Determination of visual acuity by Snellen's chart / Landolt's chart.

6. Determination of colour blindness by the Ishihara chart.
7. Study of disinfection and sterilization techniques.
8. Gram-positive and Gram-negative tests for bacteria.
9. Biochemical characterization of microorganisms (**Demonstration**).

SEMESTER-VI

MAJOR (MJ)

Major 11: Theory

Major 11T: Environmental and Sensory Physiology:

Environmental Physiology:

Environment- Its physiological aspects. Effects of exposure to hot and cold environments. Acclimatization to hot and cold environments. Heat disorders and their preventive measures. Effects of hypobaric and hyperbaric environments. Mountain sickness. Acclimatization to high altitudes. **Preventive measures** against hypobaric and hyperbaric effects. Physiological effects and preventive measures against G force, noise, vibration and radiation. Environmental pollution; global environmental change; biodiversity status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. **Types of pollutants** (primary, secondary and tertiary), sources, mechanisms of action and effects of metabolic pollutants, neurotoxins, mutagens, carcinogens, and teratogens. **Heavy metal toxicity**: Lead (Pb), Mercury (Hg), Cadmium (Cd), and Arsenic (As) toxicity. Air and water pollution - sources, effects and control. Brief idea about biotransformation, bioaccumulation, biomagnification and health hazards of pesticides. An elementary idea about xenobiotics and their effects.

Sensory Physiology:

General and special sensation: Classification of general and special senses and their receptors. Muller's law of specific nerve energies. Weber-Fechner law. Mechanism of transduction of stimuli from sensory receptors. Adaptation of receptors: phasic and tonic adaptations. **General Sense:** Classification, distribution, function and neural pathway of touch, pressure, pain, thermal and kinesthetic sensation. **Olfaction and Gustation:** Structure and functions of the receptor organs, nerve pathways, and centres. Physiology of taste and smell. Olfactometer. **Audition:** Sound waves, decibels, structure and functional significance of auditory apparatus – external, middle, and internal ears. Structure of the organ of Corti. Mechanism of hearing and its modern theories. Discrimination of sound frequency and loudness. Auditory pathway and centres. **Vision:** Anatomy and structures of the eyeball. The structure of the lens. Errors of refraction and their corrections.

Contact Lens. Pupillary reflexes, light reflex, near response. Argyll Robertson pupil. Histological details of the retina. Photopic and Scotopic vision. Chemical and electrical changes in the retina on exposure to light. Visual Pathway and effects of lesion. Colour visions and their modern concept. Colour blindness. Visual field, Perimetry. Visual acuity and its measurement. Factors affecting Visual Acuity. Binocular vision and depth perception.

Major 11: Practical

Major 11P: Measurement of environmental parameters:

- Measurement of environmental temperature - dry bulb and wet bulb, relative humidity, air velocity.
- Determination of O_2, CO_2, BOD and COD. Determination of total alkalinity, Ca, Mg and chlorine in water by the titration method.
- Measurement of noise by a Sound level meter.
- Determination of light intensity (at library, laboratory & classroom) by lux meter.
- Heat stress indices.

Major 12: Theory

Major 12T: Biostatistics and Basics of Computer:

Biostatistics: Definition, classification and application of statistics. Definition of population, parameter and sample. **Sampling:** Simple random and other sampling procedures. Distribution of sample mean and proportion. Frequency distribution & frequency polygon, histogram, bar diagram, pie diagram. Mean, median, mode and the methods of their computation, merits, demerits and applications. Variance, standard deviation, standard error of mean and their computation. **Probability:** Basic concepts; Common probability distributions and probability distributions related to normal distribution. **Students t-distribution**. Skewness, Kurtosis, Null-hypothesis, errors of inference, level of significance, two-tailed and one tail 't' test for significance of difference between sample means. Idea about the **Chi-square test. Linear correlation and regression**: product-moment correlation coefficient, Spearman's p (rho).

Basics of Computer: Introduction to computers, basic units and functions. **Basic concepts of software, hardware** and types of computers, operating systems, word processing, spreadsheets, graphic programs, databases concept, Windows, statistical S/W programs. **Computer packages:** concept of MS Word, Excel, PowerPoint. Concepts of networking and web site, and computer virus.

Major 12: Practical

Major 12P: Practical application in biostatistics and computer:

Biostatistics: Computation of mean, median, mode, standard deviation, standard error of the mean with physiological data like body temperature, height, weight, heart rate, respiratory rate, and blood pressure of human subjects. Student's t' t-test and chi-square test for the significance of the difference between means. Spearman's rank difference correlation coefficient. Chi-square test. Confidence Interval; Errors; Levels of significance, Regression and Correlation analysis.

Computer application: Operation of MS Word and Excel: Preparation of body text and table by using MS Word, Graphical representation of data in pie, bar and line diagrams using Microsoft Excel, Presentation of study material by using Power-Point.

Major 13: Theory

MJ 13T: Basic concept of genetics and molecular biology:

Basic ideas about genetics: Basic concepts of gene, allele, multiple alleles, pseudoallele, and complementation tests. **Extensions of Mendelian principles:** Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters. **Elementary idea about regulation of gene expression**: operon concept, lac operon, lytic and lysogenic cycle of phage. Chromosomal aberrations and gene mutations (agents and types). Idea about the Human Genome Project. Concept of oncogenes, tumour suppressor genes, and properties of cancer cells. **Extra chromosomal inheritance:** Inheritance of Mitochondrial and chloroplast genes, maternal inheritance. **Human genetics:** Linkage and Crossing over: Karyotypes. **Population genetics**: Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; genetic shift.

Molecular biology:

Nucleic acid structure: Nucleotides and nucleic acids, DNA structure, different forms of DNA, unusual DNA structure, different types of RNA, RNA structure. **Nucleic acid chemistry:** Denaturation and renaturation, hybridization, nonenzymatic transformation (Mutation) – spontaneous and induced, point **Chromosome structure:** Concept of nucleosome, molecular organization, chromosomal proteins, and the different levels of chromatin organization. Double helical structure and Watson-Crick model of DNA. **Basic concept of DNA replication:** Meselson and Stahl Experiment, DNA Polymerases, Ligases, and other regulatory proteins. Brief idea of DNA damage and repair. Structure of different RNA molecules and mechanism of transcription of RNA (prokaryotic). **Gene expression:** Knowledge about gene expression at RNA and protein levels, including large-scale expression, such as microarray-based techniques. **Post-translational modification:** Protein folding and protein trafficking.

Major 13: Practical

MJ 13P: Estimation of genetic materials: -

- Isolation and purification of RNA (Orcinol), DNA (DPA), (genomic and plasmid) and estimation of DNA, RNA (Demonstration).
- Analysis of RNA, DNA and proteins by one and two-dimensional gel electrophoresis, and Isoelectric focusing gels (Demonstration).
- Measurement of total protein by suitable methods.
- Chromosome Staining and Karyotyping.

MAJOR ELECTIVE (DSE)

Major (Elect.)-2: Theory

(Lifestyle, Health and Diseases OR Health Psychology and Stress Management)

MJE-02T: Lifestyle, Health and Diseases:

Concept of lifestyle: Definition and components of lifestyle, factors affecting lifestyle, lifestyle and health, lifestyle management. General concept of stress and distress. Concept of risk, risk factors, risk groups; **lifestyle and diseases:** Coronary Heart Disease (CHD), cancer, diabetes mellitus, obesity, hypertension, back pain. Lifestyle modification and management of lifestyle-related diseases. Physical activity and health benefits, physiological effects of exercise. A balanced diet and health promotion. **Concept of health and disease:** Definition of health (WHO), dimensions and determinants of health, physical, mental and psycho-social health. Concept and Principles of public health, Public Health in a global perspective, Public Health problems in India. **Disease:** Definition, Epidemiological triad, Risk factors, Concepts of disease, control, and prevention, and causative factors. **Nutrition-Related Health:** History of the development of the health care delivery system in India. Nutritional Problems: Anaemia, LBW**,** PEM**,** Xerophthalmia, Nutritional anaemia**,** IDD, Endemic fluorosis. **Characteristics and Key Components:** Three-tier health care delivery system- Primary health centre, Subcentre, CHV, Urban health infrastructure, Healthcare professionals, resources and actions. **Functions of a Healthcare System:** Public health, addressing health issues, and vaccination.

OR

MJE-02T: Health Psychology and Stress Management:

Health Psychology: Definition, Mind-Body Relationship. Lifestyles and disease patterns. Behaviour and Health: Characteristics. Health-promoting Behaviour. Exercise and nutrition in health and Well-being. Pain and stress management. Effects of Happiness, Life satisfaction, Optimism and Hope on health.

Stress Physiology and its Management: Meaning and nature of stress: Difference between eustress and distress; Frustration, conflict and pressure; Meaning of stressors; common stressors at work workplace: Stressors unique to age and gender. **Cognitive appraisal of stress:** General adaptation to stress; Consequences of stress; Physiological and psychological changes associated with the stress response. Stress and Memory; **Stress and Other Cognitive Variables;** Stressful environmental conditions on performance. **Behavioural aspects of Stress:** Adaptive and Maladaptive Behaviour; Individual and Cultural Differences: Sources of Stress- Across the Lifespan; College and Occupational Stress. **Stress and Work performance:** Role of communication in managing stress and work performance: Emotional regulation and coping; Emotional intelligence and conflict management: Emotional Basis and Stress; Stress and Conflict in Relationships. **Intervention:** Performance and Stress Intervention- The relationship between stress and performance; **Stress intervention:** interpersonal, Management Standards and Management Competencies. **Strategies of Stress Management:** Prevention of stress, Challenging Stressful Thinking; Problem Solving, **Emotional and cognitive coping styles:** Strategies of Synthesis and Prevention: Resilience and Stress; Optimal functioning; Making changes last; Small changes and large rewards.

MINOR (MI)

Minor 6: Theory

MI 6T: Environmental with Pharmacology and Biostatistics, along with the basics of statistics and computer

Environmental Physiology- Definition and types of environments. Effects of exposure to hot and cold environments. Acclimatization to hot and cold environments. Effects of hypobaric and hyperbaric environments. Acclimatization to high altitudes. **Preventive measures** against hypobaric and hyperbaric effects. Physiological effects and preventive measures against G force, noise, vibration and radiation. Environmental pollution; global environmental change; **Types of pollutants** (primary, secondary, and tertiary), sources, mechanisms of action, and effects of metabolic pollutants, neurotoxins, mutagens, carcinogens, and teratogens. **Heavy metal toxicity**: Lead (Pb), Mercury (Hg), Cadmium (Cd), and Arsenic (As) toxicity. Air and water pollution - sources, effects and control.

Pharmacology and toxicology: The importance of pharmacology in the study of physiological processes. Drugs, Agonist, Antagonist. Pharmacokinetics- absorption, distribution, excretion and bioavailability of drugs. **Pharmacodynamics**-Drug biotransformation and mechanism of drug action (elementary idea). The dose-effect relationship and the characteristics of the dose-response curve. **Assessment of drug toxicity** – LD-50 and ED-50. Drugs affecting synaptic and neuro-effector functional sites – Chemistry, systemic effects.

Biostatistics and Basics of Computer: Definition and classification of statistics. Definition of population, parameter and sample. **Sampling:** Simple random and other sampling procedures. Distribution of sample mean and proportion. Frequency distribution & frequency polygon, histogram, bar diagram, pie diagram. Mean, median, mode and the methods of their computation, merits, demerits and applications. Variance, standard deviation, standard error of mean and their computation. **Basics of Computer:** Introduction to computers, basic units and functions. **Basic concepts of software, hardware** and types of computers, operating systems, word processing, spreadsheets, graphic programs, database concepts, Windows, statistical S/W programs.

MI 6P: Basic practical on environment, animal handling and statistics with a computer application.

- Measurement of environmental temperature - dry bulb and wet bulb, relative humidity, air velocity.
- Determination of O_2, CO_2, BOD and COD. Determination of total alkalinity, Ca, Mg and chlorine in water by the titration method.
- Animal handling, animal health checkup, route of administration of drugs, dose response relationship, analgesic activity of a compound.
- Computation of mean, median, mode, standard deviation, standard error of the mean with physiological data like body temperature, height, weight, heart rate, respiratory rate, and blood pressure of human subjects