DEBRA THANA S.K.S. MAHAVIDYALAYA
(AUTONOMUS)

Chakshyampur, Debra, Paschim Medinipur, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE WITH PHYSIOLOGY

(MULTIDISCIPLINARY STUDIES)

3-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2024-2025)

Based on

Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023 & NEP, 2020

DEBRA THANA S.K.S. MAHAVIDYALAYA
(AUTONOMUS)
BACHELOR OF SCIENCE IN LIFE SCIENCES with PHYSIOLOGY
(*Under CCFUP, 2023*)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. in Life Sc. with Physiology	2nd	III	**SEMESTER-III**							
			Major-A2	PHYPMJ02	**T: Biophysics, Biochemistry and Metabolism; P: Practical** *(To be studied by students taken* **Physiology** *as Discipline- A)*	4	3-0-1	15	60	75
			Major-A3	PHYPMJ03	**T: Endocrinology, Reproductive Physiology; P: Practical** *(To be studied by students taken* **Physiology** *as Discipline- A)*	4	3-0-1	15	60	75
			SEC	SEC03	*To be taken from SEC-03 of Discipline C.*	3	0-0-3	10	40	50
			AEC	AEC03	Communicative English-2 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC03	Multidisciplinary Course-3 (***to be chosen from the list***)	3	3-0-0	10	40	50
			Minor-3 (Disc.-C3)	PHYMIN03	**T: Endocrinology, Reproductive Physiology; P: Practical** *(To be studied by students taken Physiology as Discipline- C)*	4	3-0-1	15	60	75
			Semester-III Total			20				375
		IV	**SEMESTER-IV**							
			Major-B2		*To be decided (Same as MajorA2 for Physiology taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B3		*To be decided (Same as Major–A3 for* **Physiology** *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major (Elective) -1	PHYMJE-01	**T: Neuromuscular Physiology; P: practical** *(To be studied by students taken Physiology as Discipline- A)*	4	3-0-1	15	60	75
			AEC	AEC04	MIL-2 (***common for all programmes***)	2	2-0-0	10	40	50
			Minor -4 (Disc.-C4)	PHYMIN04	**T: Neuromuscular Physiology; P: Practical** *(To be studied by students taken Physiology as Discipline- C)*	4	3-0-1	15	60	75
			Summer Intern.	IA	Internship / Apprenticeship- **activities to be decided by the Colleges following the guidelines to be given later**	4	0-0-4	-	-	50
			Semester-IV Total			22				400
			TOTAL of YEAR-2			42	-	-	-	775

MJP = Major Programme (Multidisciplinary), MI = Minor, A/B = Choice of Major Discipline; C= Choice of Minor Discipline; SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language

Major A2/B2

Credits 04 (FM: 75)

Major A2/B2T: Biophysics, Biochemistry and Metabolism **Credits 03** **[45L]**

Course contents:

❖ **Unit I: Biophysical Principles:**

Physiological importance of the following processes: diffusion, osmosis, dialysis, ultrafiltration, surface tension viscosity, adsorption, absorption. Brief idea about pH, buffer and maintenance of pH in the body. Brief idea about colloids. Enzyme- definition, classification, factors affecting enzyme action. Concept of co-enzyme, isoenzyme. Colloids: properties and significances, Isoelectric pH and isoelectric precipitation. Gibbs-Donnan membrane equilibrium and its biological importance. Acids and bases as proton donors and acceptors.

❖ **Unit II: Chemistry of Biomolecules and metabolism:**

Carbohydrates: Definition and Classification, structure, stereoisomerism, optical isomerism, optical activity, epimerism. Derivatives of monosaccharides: Amino sugars, deoxy sugars, sugar alcohols, sugar acids, sugar esters, their biochemical and physiological importance. Disaccharides - Maltose, Lactose and Sucrose: Occurrence, Structure, bio-chemical properties and Physiological importance. Polysaccharides - Starch, Glycogen, Dextrin, Cellulose, Glycosaminoglycans, Glycoproteins.

Peptides and Proteins: Structure and properties of peptide bonds. Different levels of protein structure - Primary, Secondary (α-helix and β- pleated sheet), Tertiary and Quarternary. Forces stabilizing the structures (Covalent bonds, Ionic and hydrogen bonds, Van-der Waals forces and hydrophobic interactions). Amino acids: Classification, Structure, Nomenclature and Optical properties. Zwitterions and Isoelectric point. Nucleic acids: Nucleosides and Nucleotides - structure. Polynucleotides. DNA double helix structure.

Lipids: Definition and classification. Fatty acids: Classification and structure. Properties of Fat and Fatty acids -Hydrolysis, Saponification, Saponification number, Iodine number.

Glycolysis, TCA cycle. Fatty acid oxidation.

Major A2/ B2P: Practical **Credits 01**

Biochemistry:

➢ **Qualitative analysis of biochemical molecules:**

Carbohydrates- Glucose, fructose, maltose/ lactose, sucrose, starch, dextrin.
Proteins – Albumin, gelatin, peptone.
Others - glycerol, cholesterol, bile salt, acetone, HCI, Lactic acid, Urea.

➢ **Quantitative analysis:**

Preparation of buffer (pH 4 to 10)
Determination of strength of NaOH, HCl, and H_2SO_4 by titration against oxalic acid.

➢ Quantification of glucose, lactose in a specific sample.

Major A3/B3:

Credits 04 (FM: 75)

Major-A3/B3T: Endocrinology, Reproductive Physiology (Theory): Credits 03 [45L]

❖ **Endocrinology:**

Concept & definition of endocrine systems, glands, and hormones. General classification of hormones on a chemical basis. **Hypothalamo-hypophysial axis:** Positive and negative Feedback regulation; **Hypothalamus and Pituitary:** Hypothalamus as a neuroendocrine organ, Releasing Factors, Tropic hormones of hypothalamus. **Hormones:** Chemistry, modes of action, and functions of growth hormone (GH), TSH, ACTH, FSH, LH, Prolactin, MSH, Vasopressin, and Oxytocin. Endocrine gland: Pancreas, Adrenal, Thyroid structure, functions, and deficiencies.

❖ **Reproductive Physiology:**

Primary and secondary sex organs: Physiology and anatomy, secondary sex characters. Puberty and its control. **Testis:** Histological structure of testis, seminiferous tubules, and interstitial cells of Leydig. **Spermatogenesis:** Mechanism of spermatogenesis, Spermiogenesis and hormonal control of testicular function. Prostate and seminal vesicle. **Ovary:** Histological structure of ovary, Graafian follicle, and Corpus luteum, chemical nature and functions of Estrogen and Progesterone. **Menstrual cycles**: Basic concept of menstruation and its hormonal control. **Pregnancy:** Physiology of pregnancy, changes during pregnancy and their hormonal control; Pregnancy tests (Immunological); Ectopic pregnancy. **Placenta:** Formation, structure, functions, and fate of the placenta. Placental hormones. **Lactation and Mammary Gland:** Anatomical and histological structure of mammary gland. Phases of mammary development, lactation, and their hormonal control. **Contraceptive:** Definition, types, and use of contraceptives.

Major-A3/B3P: Practical Credits 01

- **Pregnancy test by strip method.**
- **Histological slide identification:-** Adrenal gland, thyroid gland, pancreas, Testis, ovary, Pituitary and Kidney
- **Preparation and staining of permanent slide (Ovary, Testes).**
- **Oestrus Cycle.**

Major Elective (MJE)-01:

Credits 04 (FM: 75)

MJE-01T: Neuromuscular Physiology (Theory): Credits 03 [45L]

❖ **Nerve-Muscle Physiology:**

Muscle Structure and Functions: Histo-anatomical structures of striated, smooth, and cardiac muscles. **Properties of muscles:** Excitability and contractility, all or none law, summation of stimuli and contractions, genesis of tetanus, the onset of fatigue, refractory period, tonicity, conductivity, extensibility, and elasticity. Muscle proteins and Sarcotubular system of Human Skeletal and Cardiac Muscle. **Mechanism of muscle contraction:** Skeletal muscle contraction and relaxation. The modern concept of muscle contraction. Isometric and isotonic contractions. Red and white muscles. Fast and slow twitch muscle fibers. Muscle length, Tension, and Velocity relationships of skeletal muscle. **Muscle groups:** antagonists and agonists. Motor unit and motor point.

Structure, properties, and Function of Neuromuscular junctions: EM structure of Neuromuscular junctions, Neuro-Muscular transmission of impulse, end-plate potential (EPP), miniature end-plate potential (MEPP). Electromyography. The resting membrane potential and its origin. **The Action Potential:** Action potential components and their ionic basis. Compound action potentials. Concept of Chronaxie and Rheobase. Saltatory conduction. Myelinated and Unmyelinated nerve fibers and process of Myelinogenesis. **Nerve Impulse & its Conduction:** Propagation of nerve impulse in different nerve fibers. Conduction velocity of nerve impulse concerning myelination and diameter of nerve fibers & its significance. **Properties of nerve fibers:** Excitability, Conductivity, All-or-none law, Accommodation, Adaptation, Summation, Refractory period, Indefatigability. **Synapses:** Types, EM Structure and Functions. Mechanism of Synaptic Transmission, Neurotransmission related Synaptic Potentials (EPSP, IPSP). Structure and distribution of acetylcholine and adrenaline receptors**.** Effect of different Neurotrophins on nerve growth.

MJE-01P: Experimental Physiology (Practical): Credits 01

- **Histological slide identification:**- Cerebral cortex, cerebellum, spinal cord,
- Preparation and staining of skeletal muscle by methylene blue.
- Staining of Node of Ranvier.
- **Reflex analysis:** Examination of planter reflex, knee jerk reflex.
- **Calculation and Interpretation of simple muscle twitch and effect of temperature, load and summation on supplied kymographic recording.**

Minor (MI)-03/C3

Credits 04 (FM: 75)

Minor-MI-03/C3T: Endocrinology, Reproductive Physiology (Theory): Credits 03 [45L]

❖ **Endocrinology:**

Concept & definition of endocrine systems, glands, and hormones. General classification of hormones on a chemical basis. **Hypothalamo-hypophysial axis:** Positive and negative Feedback regulation; **Hypothalamus and Pituitary:** Hypothalamus as a neuroendocrine organ, Releasing Factors, Tropic hormones of hypothalamus. **Hormones:** Chemistry, modes of action, and functions of growth hormone (GH), TSH, ACTH, FSH, LH, Prolactin, MSH, Vasopressin, and Oxytocin. Endocrine gland: Pancreas, Adrenal, Thyroid structure, functions, and deficiencies.

❖ **Reproductive Physiology:**

Primary and secondary sex organs: Physiology and anatomy, secondary sex characters. Puberty and its control. **Testis:** Histological structure of testis, seminiferous tubules, and interstitial cells of Leydig. **Spermatogenesis:** Mechanism of spermatogenesis, Spermiogenesis and hormonal control of testicular function. Prostate and seminal vesicle. **Ovary:** Histological structure of ovary, Graafian follicle, and Corpus luteum, chemical nature and functions of Estrogen and Progesterone. **Menstrual cycles**: Basic concept of menstruation and its hormonal control. **Pregnancy:** Physiology of pregnancy, changes during pregnancy and their hormonal control; Pregnancy tests (Immunological); Ectopic pregnancy. **Placenta:** Formation, structure, functions, and fate of the placenta. Placental hormones. **Lactation and Mammary Gland:** Anatomical and histological structure of mammary gland. Phases of mammary development, lactation, and their hormonal control. **Contraceptive:** Definition, types, and use of contraceptives.

Minor (MI)-03/C3P: Practical Credits 01

- **Pregnancy test by strip method.**
- **Histological slide identification:**- Adrenal gland, thyroid gland, pancreas, Testis, ovary, Pituitary and Kidney.
- **Preparation and staining of permanent slide (Ovary, Testes).**
- **Oestrus Cycle.**

Minor (MI)-04/ C4

Credits 04 (FM: 75)

Minor (MI)-04/C4T: Neuromuscular Physiology (Theory): Credits 03 [45L]

❖ **Nerve-Muscle Physiology:**

Muscle Structure and Functions: Histo-anatomical structures of striated, smooth, and cardiac muscles. **Properties of muscles:** Excitability and contractility, all or none law, summation of stimuli and contractions, genesis of tetanus, the onset of fatigue, refractory period, tonicity, conductivity, extensibility, and elasticity. Muscle proteins and Sarcotubular system of Human Skeletal and Cardiac Muscle. **Mechanism of muscle contraction:** Skeletal muscle contraction and relaxation. The modern concept of muscle contraction. Isometric and isotonic contractions. Red and white muscles. Fast and slow twitch muscle fibers. Muscle length, Tension, and Velocity relationships of skeletal muscle. **Muscle groups:** antagonists and agonists. Motor unit and motor point.

Structure, properties, and Function of Neuromuscular junctions: EM structure of Neuromuscular junctions, Neuro-Muscular transmission of impulse, end-plate potential (EPP), miniature end-plate potential (MEPP). Electromyography. The resting membrane potential and its origin. **The Action Potential:** Action potential components and their ionic basis. Compound action potentials. Concept of Chronaxie and Rheobase. Saltatory conduction. Myelinated and Unmyelinated nerve fibers and process of Myelinogenesis. **Nerve Impulse & its Conduction:** Propagation of nerve impulse in different nerve fibers. Conduction velocity of nerve impulse concerning myelination and diameter of nerve fibers & its significance. **Properties of nerve fibers:** Excitability, Conductivity, All-or-none law, Accommodation, Adaptation, Summation, Refractory period, Indefatigability. **Synapses:** Types, EM Structure and Functions. Mechanism of Synaptic Transmission, Neurotransmission related Synaptic Potentials (EPSP, IPSP). Structure and distribution of acetylcholine and adrenaline receptors**.** Effect of different Neurotrophins on nerve growth.

Minor (MI)-04/ C4P: Practical Credits 01

- **Histological slide identification:**- Cerebral cortex, cerebellum, spinal cord,
- **Preparation and staining of skeletal muscle by methylene blue.**
- Staining of Node of Ranvier.
- **Reflex analysis:** Examination of planter reflex, knee jerk reflex.
- **Calculation and Interpretation of simple muscle twitch and effect of temperature, load and summation on supplied kymographic recording.**

Skill Enhancement Course (SEC-3)

Credits 03 (FM: 50) - Practical

❖ Occupational Health:

Occupational health: Basic Concept- The occupational medical history, worker's compensations, disability prevention and management. Occupational health risk. **Occupational Injury:** Musculoskeletal injury, peripheral nervous injury, eye injuries, facial injuries, hearing loss, injury caused by physical hazards, Ergonomics and the prevention of occupational injuries. **Occupational exposures:** Metals, chemicals, solvents, gasses & airborne toxicants, pesticides. **Occupational illness:** Brief idea on: Clinical toxicology & immunology, cardiovascular toxicology, liver, renal & neurotoxicology. Occupational hematology, infection, skin disorders & lung disease. Reproductive toxicology**. Occupational Diseases:** Human diseases associated with occupational exposure. Brief idea on pneumoconiosis, asbestosis, silicosis, farmer's lung and work-related musculoskeletal disorders. **Program management:** Occupational stress, substance abuse & e mp l o ye e assistance programs. Occupational safety, i n d u s t r i a l hygiene, b i o lo g ic a l mo n i t o r i n g . Prevention of accidents. Concept of industrial safety.

Practical:

- Measurement of working heart rate by ten beats methods.
- Measurement of blood pressure before and after different grades of exercise.
- Measurement of some common anthropometric parameters. Calculation of BSA, BMI and BMR from anthropometric data.
- Measurement of noise level by noise level meter.
- Assessment of illumination.
- Determination of strength by hand grip dynamometer.