

**Vidyasagar University**  
**Curriculum for B.Sc (General) in Physiology**  
 [Choice Based Credit System]

**Semester-III**

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
<b>DSC-1C</b>		<b>DSC1CT:</b> Nerve –Muscle Physiology, Nervous system, Skin and Body Temperature Regulation	Core Course	4	0	0	6	75
		- Lab		0	0	4		
<b>DSC-2C</b>	TBD	<b>DSC-2C (other Discipline)</b>	Core Course				6	75
<b>DSC-3C</b>	TBD	<b>DSC-3C (other Discipline)</b>	Core Course				6	75
<b>SEC-1</b>		SEC1T: Public Health and Epidemiology Or Environmental Epidemiology	Skill Enhancement Course-1	1	1	0	2	50
<b>Semester Total</b>							<b>20</b>	<b>275</b>

**L** = Lecture, **T** = Tutorial, **P** = Practical, **CC** = Core Course, **TBD** = To be decided, **SEC** = Skill Enhancement Course.

**DSC-1** = Discipline Specific Core of Subject-1, **DSC-2** = Discipline Specific Core of Subject-2,

**DSC-3** = Discipline Specific Core of Subject-3.

**Semester-III**  
**Core Course (CC)**

**DSC-1C (CC-3): Nerve –Muscle Physiology, Nervous system, Skin and Body Temperature Regulation** **Credits 06**

**DSC1CT: Nerve –Muscle Physiology, Nervous system, Skin and Body Temperature Regulation** **Credits 04**

**Course Contents:**

**Nerve-muscle Physiology**

Different types of muscle and their structures. Sarcotubular system. Red and white muscles. Properties of muscle: all or none law, rheobase, chronaxie, indefatigability, beneficial effect, summation, refractory period, tetanus and fatigue. Smooth Muscle: Morphology, Single-unit and multi-unit smooth muscle. Muscle spindle. Cardiac Muscle: Morphology, Electrical Properties, Mechanical Properties Pacemaker Tissue.

Mechanism of muscular contraction. Structural, chemical and mechanical changes in skeletal muscle during contraction and relaxation. Isotonic and isometric contraction. Molecular basis of smooth muscle and cardiac muscle contraction and relaxation.

Structure and classification of nerves. Nerve cells. Excitation & Conduction. Measurement of electrical events. Degeneration and regeneration of nerve fibre. Myelination. Origin and propagation of nerve impulse. Velocity of impulse in different types of nerve fibres. Properties of nerve fibre: all or none law, rheobase, chronaxie, refractory period, indefatigability. Properties of mixed nerves. Neurotrophin.

Synapse: structure, functional anatomy, classification, mechanism of synaptic transmission. Electrical Events at Synapses, Inhibition & Facilitation at Synapses. Motor unit, motor point. EPSP, IPSP.

Neuromuscular junction: structure, mechanism of impulse transmission, end plate potential. A brief overview on neurotransmitters. Electromyography.

**Nervous System:**

A brief outline of organization and basic functions of the nervous system - central and peripheral nervous system. Structural organization of the different parts of the brain and spinal cord. Hemisection and complete section of spinal cord. Brown-Sequard syndromes. Receptors: Definition, structure, classification, mode of action. Blocker and Stimulator. Reflexes: Introduction, Monosynaptic Reflex, Stretch Reflex, Polysynaptic reflex. Withdrawal Reflex. General Properties of Reflexes. Reflex action - definition, classification, properties, reflex arc.

Ascending and Descending tracts : Origin, course, terminations, and functions. Lower motor neurone and upper motor neurone. Postural reflex, Muscle spindle, Muscle tone and its regulation. Decerebrate and decortico rigidity.

Arousal Mechanisms, Sleep, & the Electrical Activity of the Brain - The Reticular Formation & the Reticular Activating System, The Thalamus & the Cerebral Cortex: structure & functions. The Electroencephalogram, Physiological Basis of the EEG & Sleep, Interpretation of abnormal EEG pattern.

Control of Posture & Movement - Introduction, General Principles, Basal Ganglia & Cerebellum: Structure & functions. Disorders of basal ganglia and cerebellum.

The Autonomic Nervous System - Introduction, Anatomic Organization of Autonomic Outflow, Chemical Transmission at autonomic Junctions.

Central Regulation of Visceral Function - Introduction, Hypothalamus: Anatomic Considerations, Hypothalamic Function, Relation to Autonomic Function, Relation to Sleep, Hunger, Thirst, Control of Posterior Pituitary Secretion, Control of Anterior pituitary Secretion, Temperature Regulation, fever.

Neural Basis of instinctual Behavior & Emotions - Introduction, Limbic system: Anatomic Considerations, Functions - Sexual Behavior, Fear & Rage, Motivation.

CSF: composition, formation, circulation and functions. A brief idea of speech, aphasia, memory conditioning and learning. Sleep and sleep wakefulness cycle.

### **Skin and Body temperature regulation:**

Histological structure of skin. Colour of the skin. Organization of sweat gland. Composition and function of the sweat. Regulation of sweat secretion. Insensible and sensible perspiration. Composition and function of sebum. Triple response.

Normal body temperature. Channels of heat loss and heat gain process. Regulation of body temperature: Higher centre and mechanism of regulation. Hypothermia and Hyperthermia. Physiological basis of fever. Cold stress. Insulating effects. Acclimatization to colds.

**DSC1CP: Practical**

**Credit 02**

### **Practical:**

1. Isolation and Staining of nerve fibers with node(s) of Ranvier (AgNO<sub>3</sub>).
2. Staining of skeletal and cardiac muscles by Methylene Blue stain.
3. Measurement of grip strength.
4. Recording of body temperature.
5. To study the response of the skin to blunt injury (triple response) (**Demonstration**)

### **Neurological experiments:**

1. Experiments on superficial (plantar) and deep (knee jerk) reflex.
2. Reaction time by stick drop test.
3. Short term memory test (shape, picture word).
4. Two point discrimination test.

### **Demonstration:**

1. Study of Kymograph, Induction coil, Key and other instruments used to study mechanical responses of skeletal muscle.
2. Kymographic recording of mechanical responses of gastrocnemius muscle to a single stimulus and two successive stimuli.
3. Kymographic recording of the effects of variations of temperature and load (after-load) on single muscle twitch.
4. Calculation of work done by the muscle.
5. Determination of nerve conduction velocity.

## **Skill Enhancement Course (SEC)**

### **SEC- 1: Public Health and Epidemiology**

**Credits 02**

#### **SEC1T: Public Health and Epidemiology**

#### **Course Contents:**

**Unit I:** Principles of Epidemiology in Public Health: Overview of epidemiology methods used in research studies to address disease patterns in community and clinic-based populations, distribution and determinants of health-related states or events in specific populations, and strategies to control health problems

**Unit II:** Statistical Methods for Health Science Analysis and interpretation of data including data cleaning, data file construction and management; implementation of analytic strategies appropriate for the type of data, study design and research hypothesis; parametric and nonparametric methods, measures of association, Linear and Logistic regression, Generalized Linear Modeling, and Survival analysis

#### **Unit III:**

Environmental Health. Effects of biological, chemical, and physical agents in environment on health (water, air, food and land resources); ecological model of population health; current legal framework, policies, and practices associated with environmental health and intended to improve public health.

**Unit IV:** Psychological, Behavioural, and Social Issues in Public Health. Cultural, social, behavioural, psychological and economic factors that influence health and illness; behavioural science theory and methods for understanding and resolving public health problems; assess knowledge, attitudes, behaviours towards disease and patient compliance to treatment.

**Unit V:** Management of Health Care Program and Service Organizations Techniques and procedures for monitoring achievement of a program's objectives, generating evidence of program effectiveness, assessing impacts in public health settings; evaluation of framework that leads to evidence-based decision-making in public health. Organizational principles and practices including organizational theory, managerial role, managing groups, work design, and organization design at primary, secondary, and tertiary levels of care

**Unit VI:** Epidemiology of disease. Contemporary methods for surveillance, assessment, prevention, and control of infectious and chronic diseases, disabilities, HIV/AIDS; understanding etiology; determining change in trend over time; implementation of control measures

**Suggested Readings:**

1. Gordis Leon. Epidemiology (Fifth edition) , Elsevier Saunders.
2. Dona Schneider and David E. Lilienfeld. Lilienfeld's Foundations of Epidemiology, Fourth Edition, Oxford University Press, USA.
3. Porta Miquel. A Dictionary of Epidemiology, Oxford University Press, USA,
4. Somerville Margaret, et al., Public Health and Epidemiology at a Glance, Second Edition, Wiley-Blackwell,
5. Beaglehole. R. Bonita, et. al Basic Epidemiology, 2nd Edition, WHO Publication, Geneva, .
6. Spasoff R.A. Epidemiologic Methods for Health Policy, Oxford University Press,
7. Barkar, D.J.P., Practical Epidemiology: Churchill pub, Livingstone.
8. Knox E. G. Epidemiology in health care planning: A Guide to the Uses of a Scientific Method, Oxford University Press, USA.

**Or**

**SEC-1: Environmental Epidemiology**

**Credits 02**

**SEC1T: Environmental Epidemiology**

**Course Contents:**

**UNIT-I:**

Introduction, Definitions, man - environment relation, terms, Historical Background- brief history of social reforms. Branches – Descriptive, research, bio- statistical, economic, Methodological and Administrative.

**UNIT-II:**

Principles- an epidemic and ingredients - and types of studies – Descriptive, analytical- cohort, case- control and cross sectional and biological studies.

### **UNIT-III:**

Causes – Koch postulates. Immunological proof- cancers and slow viruses- Hills criteria- emergence of new diseases-and effect modifications. Diseases of plants and animals - extinct and endangered animals - causes and effects - Measurements and statistical associations –prevalence rate – incidence rate - Cumulative incidence rate-Mortality rate- Mean and standard error–risk ratio, attributable ratio - simple problems.

### **UNIT-IV:**

Types of sampling - simple random sampling; stratified sampling; systematic sampling; multi stage sampling; cluster sampling.

Methods in Field study – questionnaire preparation; Data analysis; Report writing.

### **UNIT –VI:**

Environmental hazards and Public health management: Sources of Environmental hazards, hazard identification and accounting, fate of toxic and persistent substances in the environment, dose response, evaluation, exposure assessment. Pollution: Air, water, noise pollution sources and effects. Waste management and hazards: Types and characteristics of wastes, biomedical waste handling and disposal, nuclear waste handling and disposal, Waste from thermal power plants. Case histories on Bhopal gas tragedy, Chernobyl disaster, Seveso disaster and Three Mile Island accident and their aftermath. Diseases: Social and economic factors of disease including role of health services and other organizations: Infectious (Bacterial-Tuberculosis, Typhoid; Viral - AIDS, Poliomyelitis, Hepatitis; Protozoan- Leishmaniasis, Malaria); Lifestyle and Inherited/genetic diseases, Immunological diseases; Cancer; Diseases impacting on Western versus developing societies.

### **Suggested Readings:**

1. Anisa Basheer, Environmental Epidemiology, Pointer Pub .
2. R.Beaglehole, R. Bonita & T. Kjellstrom Epidemiology WHO Publ., Current edition .
3. Epidemiology of Occupational Health, WHO publication.
4. Rose, G. The Strategy of Preventive Medicine, Oxford pres.
5. Gordis Leon. Epidemiology (Fifth edition) , Elsevier Saunders.
6. Porta Miquel. A Dictionary of Epidemiology, Oxford University Press, USA,
7. Somerville Margaret, et al., Public Health and Epidemiology at a Glance, Second Edition, Wiley-Blackwell,
8. Spasoff R.A. Epidemiologic Methods for Health Policy, Oxford University Press,
9. Knox E. G. Epidemiology in health care planning: A Guide to the Uses of a Scientific Method, Oxford University Press, USA.