VIDYASAGAR UNIVERSITY

Curriculum for 3-year B.Sc. (General)

Physiology

Revised Syllabus under CBCS
(w. e. f. 2022-2023)

Vidyasagar University
Midnapore 721102
West Bengal

Vidyasagar University

Curriculum for B.Sc. (General) in Physiology

[Revised Syllabus w.e.f. 2022-23]

SEMESTER-I

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC1 [DSC-1A]		**DSC-1AT**: Cellular Physiology, Biophysical Principles, Biochemistry, Digestive system & Metabolism	Core Course-1	4	0	4	6	75
		DSC-1AP: Fresh tissue experiments & Identification of permanent slides						
CC2 [DSC-2A]		**DSC-2A: TBD** (***from other Discipline***)	Core Course-2				6	75
CC3 [DSC-3A]		**DSC-3A: TBD** (***from other Discipline***)	Core Course-3				6	
AECC (Elective)		**English**	AECC (Elective)	1	1	0	2	50
Semester Total							**20**	**275**

L=Lecture, **T=**Tutorial, **P=**Practical, **CC =** Core Course, **TBD =** To be decided, **AECC (Elective) =** Ability Enhancement Compulsory Course (Elective)

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- I

DSC-1A (CC-1): Cellular Physiology, Biophysical Principles, Biochemistry, Digestive system & Metabolism **Credits 06**

DSC1AT: Cellular Physiology, Biophysical Principles, Biochemistry, Digestive system & Metabolism **Credits 04**

Course Contents:

• Cellular Physiology and Biophysical Principles

Membrane physiology: structure and functions of cell- Endoplasmic reticulum, Golgi complex, Peroxisome, Mitochondria, Ribosome.
Tissue- Structure, classification, distribution and function of different human tissues. Physicochemical principles and Physiological importance of: Diffusion, Osmosis, Adsorption, Absorption, pH and buffers, Colloids.
Enzymes - classification, coenzymes, factors affecting enzyme action, Isozymes.

• Biochemistry and Metabolism:

Carbohydrates : classification , structure and properties

Proteins : Classification , order of structure (elementary idea), Amino acids: classification and properties **Lipids :** classification. Fatty acids – Classification, and properties, lipoprotein – Classification and structure **Nucleic acid** – structure of DNA and RNA
Vitamins – classification and functions. Minerals – functions of Sodium, Potassium, Calcium, Phosphorus, Iron, Zinc, Iodine and Fluoride.

Metabolism – Glycolysis, TCA cycle, Beta oxidation of saturated fatty acid, Ketone bodies – formation and significance. Deamination, Transamination. Amino acid pool, Urea cycle.

• Digestive System:

Alimentary cana1 and digestive glands – Structure in relation to functions. Composition, functions and regulation of secretion of digestive juices including bile. Digestion and absorption of carbohydrate, protein and lipid. Movements of the stomach and small intestine.

DSC1AP: Fresh tissue experiments & Identification of permanent slides (Practical)
Credits 02

Contents:

1. **Fresh tissue experiments:**
   a) Study of compound microscope
   b) Examination & staining of fresh tissue: squamous, ciliated & columnar epithelium, skeletal muscle fibre (Rat/ Goat) by Methylene blue stain.
   c) Transitional epithelium, mesentery (Rat/ Goat) (counter stain by Methylene blue)
2. **Identification of permanent slides:**
   a) Lung, spleen, liver, salivary glands, pancreas, oesophagus, stomach, small intestine, large intestine, ovary, adrenal, testis, thyroid, spinal cord, cerebellum, cerebral cortex, kidney, skin, tongue

Suggested Readings:

1. Text book of Medical Physiology, by A.C. Guyton, John E. Hall, Eleventh edition. Elsevier Saunders.
2. Vander et al's Human Physiology: The Mechanisms of Body Function; 9th Edition Eric P. Widmaier, Hershel Raff, Kevin T. Strang The Mc Graw-Hill Companies.
3. Human Physiology, From Cells to Systems Lauralee Sherwood, Brooks/Cole.
4. Best & Taylor's Physiological Basis of Medical Practice, edited by B.R Brobeck. The William and Wilkins Co.
5. Ganong's Review of Medical Physiology, by Kim E. Barrett et al., Lange Medical Book.
6. Harper's Review of Biochemistry by R K. Murry and others. Lange Medical Book, Prentice-Hall International.
7. Lehninger Principles of Biochemistry, by, D. L. Nelson and M. M. Cox, CBS Publishers Inc.
8. Text book of Biochemistry, by E.S. West, W.R. Todd, H.S. Mason, J.T. Van Bruggen, The Macmillan Company.
9. Biochemistry, by D. Das: Academic Publishers.
10. Biophysics and Biophysical Chemistry, by D .Das, Academic Publishers.
11. Samson Wright's Applied Physiology, edited by C.A. Keele. E. Neil & N. Toets. Oxford University Press.
12. Physiology, by R.M. Berne & M.N. Levy, B.M. Koeppen, B. A. Stanton, Mosby Co.
13. Basic Histology, by L.C. Jungquire, J. Carneiro& J.A Long; Appleton & Lange.
14. Neuroscience Third Edition Edited By D. Purves, G. J. Augustine, D. Fitzpatrick, W. C. Hall, A S.I. Lamantia, J.O. Mcnamara, S. M Williams, Publishers Sinauer Associates, Inc.
15. Histology - A Text and Atlas, by M.H.Ross&E.J.Reith, The Williams and Wilkins Company.
16. Bailey's Text Book of Histology, revised by W.M. Copenhaver; The Williams and Wilkins Company.
17. Human Physiology, by R.F. Schmidt & G. Thews, Springer-Verlag.

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SEMESTER-II

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC4 [DSC-1B]		**DSC-1BT**: Blood, body fluid and immune System, Cardiovascular System and Respiratory System.	Core Course-4	4	0	4	6	75
		DSC-1BP: Practical						
CC5 [DSC-2B]		**DSC-2B: TBD** ***(from other Discipline***)	Core Course-5				6	75
CC6 [DSC-3B]		**DSC-3B: TBD** ***(from other Discipline***)	Core Course-6				6	75
AECC (Elective)		**ENVS**	AECC-2 (Elective)				4	100
Semester Total							**22**	**375**

L=Lecture, **T=**Tutorial, **P=**Practical, **CC =** Core Course, **TBD =** To be decided, **AECC (Elective) =** Ability Enhancement Compulsory Course (Elective); **ENVS -** Environmental Studies

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- II

DSC-1B (CC-4): Blood, body fluid and immune System, Cardiovascular System and Respiratory System **Credits 06**

DSC1BT: Blood, body fluid and immune System, Cardiovascular System and Respiratory System **Credits 04**

Course Contents:

Blood and Body fluids:

Blood : Properties of blood, Composition, character, properties and function of blood. Plasma proteins: origin, separation and functions. Plasmapheresis. Erythrocytes : Morphology, fate and functions. Erythropoiesis: Definition, steps of erythropoesis, role of different factors on erythropoesis. Haemoglobin: functions, derivatives. Abnormal haemoglobin. Anaemia: different types, Clinical significances. Leucopoiesis. Leucocytes : morphology, and functions. Phagocytosis, Inflammation. Leukaemia. Platelets: Structure, functions. Significance of platelets counts. Coagulation of blood: Mechanism of blood coagulation, factors affecting blood coagulations, Anticoagulants. Bleeding disorders, tests for bleeding disorders. Coagulation time, bleeding time, prothrombin time.

Blood groups - The ABO systems, The Rh systems, Importance of blood groups, Immunological basis of identification of ABO and Rh blood groups. Cross matching, Donor and Recipient. Blood transfusion- Precaution and hazards of blood transfusions. The RH system and pregnancy, Erythroblastosisfoetalis. Blood volume: Normal value. Determination of blood volume. factors influencing blood volume, regulation of blood volume.

Body fluids: Intracellular and extra cellular compartment of body fluids. Lymph and tissue fluids: Composition, function and fate of lymph and tissue fluids.

Immune System

Immune system: Overview, properties of immune system, types of immunity : innate immunity, acquired immunity, active and passive immunity. First and second line defence. Humoral and Cell mediated immunity. Complement system. Immune Competent cells : structure and functions of neutrophil, B lymphocytes, T- lymphocytes (helper, cytotoxic and suppressor), Natural killer cells, monocytes – macrophages. Primary and Secondary lymphoid organs.

Antigen and Antibody : Properties of immunogen, antigens and haptens. Classification, structure and functions of immunoglobulins. Antigen- antibody reaction, physiological effects and clinical significances. Vaccination: Immunization- Passive and active immunization. Vaccine.

Cardiovascular system:

Cardiovascular system - Anatomy and histology of the heart. Properties of cardiac muscle. Origin and propagation of cardiac impulse. Electrophysiology of cardiac tissue. Heart rate and its regulations. Frank – Starlings law's of heart. Electrocardiography

Cardiac cycle: Events. Different phases and factors affecting. Heart sounds. Cardiac output: definition, factors affecting.

Pulse - arterial and venous. Blood pressure and its regulation and factors controlling. Baro and Chemoreceptor.

Respiratory System:

Anatomy and histology of the respiratory passage and organs. Role of respiratory muscles in breathing. Lung Compliance & surfactant, Significance of physiological and anatomical dead space. Lung volumes and capacities. Exchange of respiratory gases between lung and blood and between blood and tissues. Transport of oxygen and carbon dioxide in blood. Hypoxia, asphyxia, dyspnea, asthma, cyanosis, dysbarism.

DSC1BP: Practical **Credits 02**

Contents:

Haematology:

1. Preparation of blood film of your own blood. Staining of the blood film with Leishman's stain. Identification of different types of blood corpuscles.
2. Determination of TC of RBC and WBC by haemocytometer.
3. Differential count of WBC.
4. Determination of ESR of human blood.
5. Estimation of haemoglobin by haemoglobinometer.
6. Preparation of haemin crystals.
7. Determination of Blood groups.
8. Determination of clotting time, bleeding time, prothrombin time.

Human Experiment:

1. Measurement of arterial blood pressure by Sphygmomanometer at rest and after exercise, Calculate the mean arterial blood pressure (MABP)
2. Measurement of heart rate and pulse rate (30 beats methods) during rest and exercise and graphical plotting.
3. Modified Harvard step test and determination of physical fitness.
4. Demonstration: Measurement of oxygen saturation by pulse oxymeter before and after exercise. Measurement of Peak Expiratory Flow Rate.

Suggested Readings:

1. Text book of Medical Physiology, by A.C. Guyton, John E. Hall, Eleventh edition. Elsevier Saunders.
2. Vander et al's Human Physiology: The Mechanisms of Body Function; 9th Edition Eric P. Widmaier, Hershel Raff, Kevin T. Strang The Mc Graw-Hill Companies.
3. Human Physiology, From Cells to Systems Lauralee Sherwood, Brooks/Cole.
4. Best & Taylor's Physiological Basis of Medical Practice, edited by B.R Brobeck. The William and Wilkins Co.

5. Ganong's Review of Medical Physiology, by Kim E. Barrett et al., Lange Medical Book.
6. Harper's Review of Biochemistry by R K. Murry and others. Lange Medical Book, Prentice-Hall International.
7. Lehninger Principles of Biochemistry, by, D. L. Nelson and M. M. Cox, CBS Publishers Inc.
8. Text book of Biochemistry, by E.S. West, W.R. Todd, H.S. Mason, J.T. Van Bruggen, The Macmillan Company.
9. Biochemistry, by D. Das: Academic Publishers.
10. Biophysics and Biophysical Chemistry, by D .Das, Academic Publishers.
11. Samson Wright's Applied Physiology, edited by C.A. Keele. E. Neil & N. Toets. Oxford University Press.
12. Physiology, by R.M. Berne & M.N. Levy, B.M. Koeppen, B. A. Stanton, Mosby Co.
13. Basic Histology, by L.C. Jungquire, J. Carneiro& J.A Long; Appleton & Lange.
14. Neuroscience Third Edition Edited By D. Purves, G. J. Augustine, D. Fitzpatrick, W. C. Hall, A S.I. Lamantia, J.O. Mcnamara, S. M Williams, Publishers Sinauer Associates, Inc.
15. Histology - A Text and Atlas, by M.H.Ross&E.J.Reith, The Williams and Wilkins Company.
16. Bailey's Text Book of Histology, revised by W.M. Copenhaver; The Williams and Wilkins Company.
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SEMESTER-III

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC7 [DSC-1C]		**DSC-1CT**: Nerve –Muscle Physiology, Nervous system, Skin and Body Temperature Regulation. **DSC-1CP**: Practical	Core Course-7	4	0	4	6	75
CC8 [DSC-2C]		**DSC-2C: TBD** ***(from other Discipline***)	Core Course-8				6	75
CC9 [DSC-3C]		**DSC-3C: TBD** ***(from other Discipline***)	Core Course-9				6	75
SEC-1		**SEC1:** Public Health and Epidemiology **OR** Environmental Epidemiology	Skill Enhancement Course-1				2	50
Semester Total							**20**	**275**

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SEMESTER- III

Course Structure

DSC-1C (CC-7): 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. Red and white muscles. Properties of muscle: all or none law, rheobase, chronaxie, summation, refractory period, tetanus and fatigue. Smooth Muscle: Morphology, Single-unit and multi-unit smooth muscle.

Mechanism of skeletal muscle contraction. Isotonic and isometric contraction..

Structure and classification of nerves. Nerve cells. Excitation & Conduction. 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.

Synapse: structure , functional anatomy, mechanism of synaptic transmission. Electrical Events 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. Receptors : Definition, structure, classification, mode of action. Blockers and stimulators. Reflexes: Introduction, Monosynaptic Reflexe, Stretch Reflex, General Properties of Reflexes. Reflex action - definition, classification, properties, reflex arc.

Ascending and Descending tracts : Origin, course, terminations, and functions of pyramidal and pain pathway.

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

CSF: composition, formation, circulation and functions.

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. Hypothermia and Hyperthermia. Physiological basis of fever. Cold stress. Insulating effects. Acclimatization to colds.

DSC-1CP: Practical **Credits 02**

Contents:

Practical:

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. 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. 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

Skill Enhancement Course (SEC)

SEC- 1: Public Health and Epidemiology **Credits 02**

SEC1T: Public Health and Epidemiology **Credits 02**

Course Contents:

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

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

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.

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.

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

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. Spassoff 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 **Credits 02**

Course Contents:

Introduction, Definitions, man - environment relation.

Principles- an epidemic and ingredients - and types of studies – Descriptive, analytical- cohort.

Environmental hazards and Public health management: Sources of Environmental hazards. Dose response relationship. 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, and Three Mile Island accident and their aftermath. Diseases: Socioeconomic factors and health impacts of different diseases: Infectious (Bacterial-Tuberculosis, Typhoid; Viral - AIDS, Poliomyelitis, Hepatitis; Protozoan- Malaria); Lifestyle and Inherited/genetic diseases.

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. Spassoff 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.

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SEMESTER-IV

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC10 [DSC-1D]		**DSC-1DT**: : Sensory Physiology, Endocrine and Reproductive System, Renal Physiology	Core Course-10	4	0	4	6	75
		DSC-1DP: Practical						
CC11 [DSC-2D]		**DSC-2D: TBD** ***(from other Discipline***)	Core Course-11				6	75
CC12 [DSC-3D]		**DSC-3D: TBD** ***(from other Discipline***)	Core Course-12				6	75
SEC-2		**SEC2:** : Lifestyle, Health and Diseases **OR** Biochemical Techniques	Skill Enhancement Course-2				2	50
Semester Total							**20**	**275**

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SEMESTER- IV

Course Structure

DSC-1D (CC-10): Sensory Physiology, Endocrinology and Reproductive Physiology, Renal Physiology Credits 06

DSC1DT: Sensory Physiology, Endocrinology and Reproductive Physiology, Renal Physiology Credits 04

Course Contents:

Sensory Physiology:

Classification of general and special senses and their receptors. Weber – Fechner LawReceptors as biological transducer. Neural pathway of touch, pressure.

Olfaction and Gustation: Structure of sensory organ, neural pathway of olfactory and gustatory sensation. Physiology of olfactory and gustatory sensation. After-taste.

Hearing: Auditory apparatus- external, middle and internal ears. Organ of Corti. Mechanism of hearing. Auditory pathways.

Vision: Histology of retina. Photopic and Scotopic vision. Chemical changes in retina on exposure to light. Visual pathway. Accommodation and Visual acuity. Positive and negative after-image. Light and dark adaptation. Colour vision and colour blindness.

Endocrinology: Anatomy of endocrine system. Hormones - classification. Experimental and clinical methods of study of endocrine glands. Basic concept of regulation of hormone actions. Positive and negative feedback mechanism.

Hypothalamo - Hypophysial axis: Basic concept of neurohormone. Hypothalamo-hypophyseal tract and portal system. Releasing factors, Tropic hormones, vascular and neural connectionsbetween the hypothalamus and pituitary.

Pituitary gland: Hormones, functions of anterior, middle and posterior lobes of pituitary. Hypo and hyperactive states of pituitary gland.

Thyroid gland: Thyroid hormone: Functions of thyroid hormones (T4 T3) Thyrocalcitonin. Hypo and hyper-active states of thyroid..

Adrenal Cortex: Functions of different hormones. Hypo and hyper-active states of adrenal cortex.

Adrenal Medulla: Functions of adrenal medulla. Pheochromocytoma.

Pancreas: function of pancreatic hormones. Diabetes mellitus

Reproductive Physiology: Primary and secondary sex organs: Anatomy and Physiology, secondary sex characters. Puberty, Precocious & Delayed Puberty.

Testis: histology, spermatogenesis, spermiogenesis, testicular hormones and their functions,

Ovary: histology, oogenesis, ovarian hormones and their functions. Control of ovarian functions. Physiological mechanism of ovulation. Ovarian cysts.

Menstrual cycles and their hormonal control. Fertilization, Pregnancy: Physiological changes during pregnancy. ectopic pregnancy. Lactation - Role of hormones, Menopause.

Renal Physiology:

Structure and functions of kidney. Juxtaglomerular apparatous. Mechanism of formation of urine. Function of Malpighian corpuscles and renal tubule. Normal and abnormal constituents of urine and their clinical significances. Renal threshold. Micturation. Non excretory function of kidney. Dialysis

DSC1DP: Practical **Credits 02**

1. Staining and identification of kidney.
2. Silver nitrate preparation of corneal cell space.
3. Study of estrous cycle.
4. Identification of normal and abnormal constituents of urine.
5. Detection of specific gravity of urine.
6. Determination of visual acuity by Snellen's chart / Landolt's chart.
7. Determination of colour blindness by Ishihara chart.
8. Exploration of conductive and perceptive deafness by tuning fork method.
9. Sperm count.

Demonstration:

1. Study of the effects of adrenaline on intestinal / uterine movements.
2. Pregnancy test from human urine by kit method.
3. Quantitative estimation of Urea in Urine

Skill Enhancement Course (SEC)

SEC- 2: Lifestyle, Health and Diseases **Credits 02**

SEC2T: Lifestyle, Health and Diseases **Credits 02**

Course Contents:

Concept of health and disease: Definition of health (WHO), dimension and determinants of health, physical, mental and psycho-social health. Disease - Definition, causal factors. Concept of lifestyle: Definition and components of lifestyle, factors affecting lifestyle, lifestyle and health, lifestyle management

Lifestyle and diseases: 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 life-style related diseases. Physical activity and health benefits, physiological effects of exercise. Balanced diet and health promotion

OR

SEC- 2: Biochemical Techniques **Credits 02**

SEC2T: Biochemical Techniques **Credits 02**

Spectroscopic Techniques

Principle of UV- Visible absorption spectrophotometry, instrumentation and applications. Flourimetry: Phenomena of fluorescence, intrinsic and extrinsic fluorescence, instrumentation and applications

Chromatography

Basic principles of chromatography: Partition coefficient, concept of theoretical plates, various modes of chromatography (paper, thin layer, column), preparative and analytical applications, LPLC and HPLC.
Principle and applications of: Paper Chromatography, Thin Layer Chromatography. Molecular Sieve Chromatography, Ion Exchange Chromatography, Affinity Chromatography

Electrophoresis

Basic principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, discontinuous gel electrophoresis, PAGE, SDS-PAGE, Native and denaturing gels. Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, protein and nucleic acid blotting, detection and identification. Molecular weight determination, Isoelectric Focusing of proteins,

Centrifugation

Principle of centrifugation, basic rules of sedimentation, sedimentation coefficient, various types of centrifuges, different types of rotors, differential centrifugation, density gradient centrifugation (Rate zonal and Isopycnic)

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SEMESTER-V

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
DSE-1A		**DSE-1A**: Sports Physiology, Work Physiology & Ergonomics **OR** Nutrition and Fitness	Discipline Specific Elective-1	4	0	4	6	75
DSE-2A		**DSE-2A: TBD** ***(from other Discipline***)	Discipline Specific Elective-2	5-1-0/4-0-4			6	75
DSE-3A		**DSE-3A: TBD** ***(from other Discipline***)	Discipline Specific Elective-3	5-1-0/4-0-4			6	75
SEC-3		**SEC3:** Community and Public Health **OR** Maternal and Child Care	Skill Enhancement Course-3	1	1		2	50
Semester Total							**20**	**275**

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SEMESTER- V

Course Structure

DSE-1A Sports Physiology, Work Physiology and Ergonomics **Credits 06**

DSE1AT: Sports Physiology, Work Physiology and Ergonomics **Credits 04**

Course Contents:

Sports & work Physiology: Concepts of Physical work and Physiological work. Classification of workloads. Energetic of muscular works. Cardiovascular and respiratory changes during graded exercise. Aerobic and anaerobic capacity. Maximum aerobic power.

Exercise Physiology. Exercise & Performance. Exercise Physiology & Gender. Environmental Exercise Physiology. Maximal oxygen consumption and post exercise oxygen consumption – definition, factors affecting, Work rest cycle and importance of rest pause.

Physical Training: General Principles and different methods. Nutrition in sports. Ergogenic aids.

Ergonomic – Basic concepts and its application in industry to improve efficiency. occupational health and well beings. Occupation diseases – Silicosis, Asbestosis, Farmer's Lung. Industrial safety

DSE1AP: Sports Physiology, Work Physiology and Ergonomics (Practical) **Credits 02**

1. Measurements of resting and working heart rate using thirty beats and ten beats methods respectively.
2. Measurement of blood pressure before and after different graded exercise.
3. Determination of Physical Fitness Index (PFI) of an individual and recording of recovery heart rate after standard exercise.
4. Determination of $VO_{2\ max}$ by Queen College step test.
5. Determination of endurance time by hand grip dyanometer.
6. Six minutes walk tests.
7. Measurement of some common anthropometric parameters – stature, weight, eye height (standing), shoulder height, sitting height, knee height (sitting), , mid – arm circumference, waist circumference, hip circumference, neck circumference, head circumference, chest circumference.
8. Determination of body surface area (using a nomogram) and Body Mass Index (BMI) for an anthropometric measurement.
9. Measurement of body fat percentage.

OR

DSE-1A Nutrition and Fitness **Credits 06**

DSE1AT: Nutrition and Fitness **Credits 04**

Course Contents:

Understanding Fitness: Definition of fitness and health and related terms, Assessment of fitness, Approaches for keeping fit

Importance of nutrition: Role of nutrition in fitness, Nutritional guidelines for health and fitness,

Nutritional supplements

Importance of Physical activity: Importance and benefits of physical activity , Physical Activity – frequency, intensity, time and type with examples ,Physical Activity Guidelines and physical activity pyramid

Weight Management: Assessment, etiology, health complications of overweight and obesity, Diet and exercise for weight management, Fad diets, Principles of planning weight reducing diets

DSE1AP: Nutrition and Fitness (Practical) **Credits 02**

1. Quantitative estimation of glucose by Benedict's method.
2. Estimation of amino nitrogen through formol titration methods.
3. Qualitative analysis of pulse, rice, milk to test the presence of carbohydrates, protein, fat.
4. Qualitative identification of lipids and cholesterol.
5. Assessment of noise by sound level meter.
6. Diet survey report of a family, (repot should be hand written).

Skill Enhancement Course (SEC)

SEC- 3: Community and Public Health **Credits 02**

SEC3T: Community and Public Health **Credits 02**

Course Contents:

Nutrition - introduction. Food as source of nutrients, functions of food, definition of nutrition, Nutrients & energy. Malnutrition and under nutrition, Over nutrition. Food guide - Basic food groups. ACU-concept. Diet Survey, Dietary fibres - role of fibers in human nutrition. Principles of formulation of balanced diets for growing child, pregnant and lactating woman. Diet management of obese, diabetic, hypertensive person and athlete. Basic idea on PCM, marasmus, kwashiorkor and their prevention. Iron and Iodine deficiency. Micronutrient disorders : Xerophthalmia, . Brief idea on food toxicity.

Epidemiology : Etiology, epidemiology and prevention of malaria, dengue, filarial, hepatitis, AIDS, nutritional anemia. Cause and management of gout, obesity, endemic goiter, dental carries. Principles of family planning. Sound pollution as a community health issue.

OR

SEC- 3: Maternal and Child Care **Credits 02**

SEC3T: Maternal and Child Care **Credits 02**

Course Contents:

Nutritional needs during pregnancy, common disorders of pregnancy (Anaemia, HIV infection, Pregnancy induced hypertension), 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, Breastfeeding biology, Breastfeeding support and counselling. Infant and young child feeding and care. Assessment of malnutrition among the children, Micronutrient deficiency in preschool children.

Vidyasagar University

Curriculum for B.Sc. (General) in Physiology

[Revised Syllabus w.e.f. 2022-23]

SEMESTER-VI

Course Structure

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
DSE-1B		**DSE-1B**: Microbiology, Immunity and Biotechnology **OR** Clinical Hematology	Discipline Specific Elective-4	4	0	4	6	75
DSE-2B		**DSE-2: TBD** ***(from other Discipline***)	Discipline Specific Elective-5	5-1-0/4-0-4			6	75
DSE-3B		**DSE-3B: TBD** ***(from other Discipline***)	Discipline Specific Elective-6	5-1-0/4-0-4			6	75
SEC-4		**SEC4:** Environmental Surveillance **OR** Health Psychology and Stress Management	Skill Enhancement Course-4	1	1		2	50
Semester Total							**20**	**275**

L=Lecture, **T=**Tutorial, **P=**Practical, **TBD =** To be decided, **SEC =** Skill Enhancement Course; **DSE-1** = Discipline Specific Core of Subject-1, **DSE -2** = Discipline Specific Core of Subject-2, **DSE -3** = Discipline Specific Core of Subject-3

SEMESTER- VI

Course Structure

DSE-1B Microbiology, Immunity and Biotechnology **Credits 06**

DSE1BT: Microbiology, Immunity and Biotechnology **Credits 04**

Course Contents:

Bacteria: structure, classification. Principle ofGram stain, Acid – fast stain. Pathogenic and non - pathogenic bacteria. Nutritional requirements of bacteria, nutritional types culture media. Bacterial Growth curve and factors required for growth. Sterilization, disinfection and pasteurization. Concept of antibiotics. Importance of probiotics and prebiotics. Basic idea about microbial fermentation. Fundamental idea on fungus, algae, protozoa, viruses.

Immunity and Vaccination: Elementary knowledge of innate and acquired immunity. Humoral and Cell mediated immunity. Toxin and toxoids. Vaccination: Principles and importance. Passive and active immunisation

Biotechnology: Recombinant DNA technology: concepts, techniques and application. Cloning – concept and significances. Cloning vectors. c DNA libraries. Basic idea on Polymerase Chain Reaction (PCR). Use of Monoclonal antibody. Concept of gene therapy. Fermentation technology: Fermentation, types, and concept of Upstream and downstream processing. Importance of Bio-safety

DSE1BP: Microbiology, Immunity and Biotechnology (Practical) **Credits 02**

1. Study disinfection and sterilization techniques.
2. Gram staining techniques of bacteria.
3. Biochemical characterization of microorganisms (**Demonstration**).
4. DNA and Protein quantification (**Demonstration**)

OR

DSE-1B Clinical Hematology **Credits 06**

DSE1BT: Clinical Hematology **Credits 04**

Course Contents:

Anemia and its classification. Iron deficiency anemia, megaloblastic anemia, pernicious anemia-pathogenesis and laboratory investigation. Reticulocytes. Management of anemia. Hemoglobin - abnormal hemoglobin. Hemolyticanemia and its laboratory investigation. Haemoglobinopathies. Causes and significances of leucocytosis, leucopenia, neutrophilia, eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia. Hemostasis and Coagulation: Platelet development. Qualitative and quantitative disorders of platelets. Secondary hemostasis. Hemophilia. Fibrinolysis. Bleeding and coagulation disorders. Blood groups: ABO and RH blood groups. Biochemical basis of ABO system. Definition and significance of TC, DC, ESR, Arnth count, PCV, MCV, MHC, MCHC. bleeding time, clotting time, prothrombin time.

DSE1BP: Clinical Hematology (Practical) **Credits 02**

1. Differential Leucocyte Count.
2. Determination of haemoglobin.
3. Determination of total RBC count and WBC count.
4. Determination of PCV
5. Determination of red cell indices
6. Determination of ESR.
7. Determination of blood groups.
8. Perform sickling test (**Demonstration**)
9. Perform Heinz bodies(**Demonstration**)
10. Demonstration of leukemic slides (**Demonstration**).
11. Determine fibrinogen conc.(**Demonstration**)

Skill Enhancement Course (SEC)

SEC- 4: Environmental Surveillance **Credits 02**

SEC4T: Environmental Surveillance **Credits 02**

Course Contents:

Environmental Surveillance Monitoring – definition, advantages, disadvantages, Current and future status of environmental surveillance and monitoring. Types of Environmental surveillance. Water quality surveillance, water and health. Household water and the concept of safe drinking water. Biological surveillance programme for the monitoring of crop pests. Vectors surveillance. Biomarkers in environmental surveillance. Disease surveillance (pathogenic) Dengue hemorrhagic fever, Hepatitis, Influenza, severe Acute Respiratory Syndrome, Smallpox

OR

SEC- 4: Health Psychology and Stress Management **Credits 02**

SEC4T: Health Psychology and Stress Management **Credits 02**

Course Contents:

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 Management: Various sources of stress: environmental, social, physiological and psychological. Stress and health effects. Managing stress: - yoga, meditation.

END