

# SYLLABUS

## MASTER OF SCIENCE PHYSIOLOGY

Credit Based System  
(2017-19)



## **Program Specific Outcome**

Department of Physiology offers M.Sc. in Physiology to students with Physiology B.Sc. (Hons) degree. The curriculum deals with human Physiology from both the classical as well as reductionist approach considering organismic scale as well as molecular approach. Ergonomics, occupational, sports and environmental physiology are as much in balance with physiological therapeutics as with human cell biology, its different kinetics and modelling. The techniques and methodologies of Physiology have wide applications in the biological, medical and related sciences. Candidates with Masters in Physiology have special job opportunities in the universities, colleges, schools, research & development centers in industries, medical centers/colleges, research institutes, other government and non-government organizations, especially pathophysiological institutes.

The course outcome (CO) has been appended at the end of each unit.

### **General Instructions:**

The post graduate course in physiology is comprised of four semesters each of 250 marks and 20 credits.

Each theory paper will be evaluated by internal assessment (10 marks) and semester examination (40 marks). Each practical paper shall be internally evaluated on 80% marks and the rest shall be assessed by the external examiner. No credit can be allotted on failure to attend the examination by the external examiner and the candidate shall be declared as absent. For each paper there are multiple internal assessments, which may be evaluated by written test or oral test or seminar presentation and class attendance. The average marks of the assessments shall be credited to the students.

Each student will have to participate in a field study as a part of practical training program.

WBSU M.Sc. Physiology Syllabus (2017-19)

Semester I	Topics	Credits	Marks
PHYG-228101	1. Homeostasis & Environment	4	50
PHYG-228102	2. Physiological system-I (Nervous system, Special Sense, Cardiovascular system, Respiratory system)	4	50
PHYG-228103	3. Nutrition & Community Health	4	50
PHYG-228104	4. Computational Biology & Biostatistics	4	50
PHYG-228105	5. Practical- I (Anatomy, Statistics, Bioinformatics)	4	50
		<b>=20</b>	<b>=250</b>
<b>Semester-II</b>			
PHYG-228201	1. Physiological System II (Endocrinology, Reproduction, Gastro-intestinal System, Renal Physiology)	4 (1x4)	50
PHYG-228202	2. Molecular Biology & Biotechnology	4	50
PHYG-228203	3. Biochemistry		
PHYG-228204	4. Social Medicine	4	50
PHYG-228205	5. Practical – II (Review/ Study tour, Functional Physiology, Molecular Methods, Biochemistry)	4	50
		<b>=20</b>	<b>=250</b>
<b>Semester –III</b>			
PHYG-228301	1. Microbiology, Haematology & Immunology	4 (1+1+2)	50
PHYG-228302	2. Epidemiology	4	50
PHYG-228302	3. Cell Biology	4	50
PHYG-228304	4. Ergonomics & Occupational Physiology	4	50
PHYG-228305	5. Practical-III (Immunology, Pathophysiology /Pharmacology, Ergonomics, Microbiology)	4	50
		<b>=20</b>	<b>=250</b>
<b>Semester- IV</b>			
PHYG-228401	1. Biophysics & Biomedical Instrumentation	4	50
PHYG-228402	2. Pathophysiology	4	50
PHYG-228403	3. Pharmacology	4	50
PHYG-228404	4. Project, Seminar & Grand Viva Voce (60+20+20)	4	100
		<b>=20</b>	<b>=250</b>
	<b>Total</b>	<b>=80</b>	<b>=1000</b>

## Semester-I

### PHYG-228101 (2+2 credits)

#### Homeostasis & Environment

**Homeostasis:** Control system: physical and physiological control system, Components, Regulatory mechanisms, Different feedbacks mechanisms in physiological system. Integrated regulation of ions, electrolytes and osmotic balance of the body fluids. Transport and exchange of gases and nutrients. Sensory system - from receptor to perception. Neuroendocrine regulation of metabolism including energy balance, Autonomic control of the functions of the visceral organs. Stress and adaptation: Neuroendocrine control of body homeostasis and stress, Oxidative stress. Cellular response to stress.

**Environment:** Human health and environment - environmental factors and general health, effects on growth and development. Acclimatization: Physiological response to heat stress, cold stress, noise, vibration, ultra-violet radiation, hypobaric and hyperbaric environment, altered G-force on human body, artificial gravity, zero gravity. Physiological effects of metal pollution on health and their control measures; noise pollution and control; environment and allergy. Environmental sanitation, medical measures, ergonomic measures, legislation.

CO: Deviation in the homeostasis causes disease manifestation hence its understanding would help in the management of disease processes. Homeostasis, the key principle of physiology helps in understanding interconnection between different components within a particular system or across systems.

Environmental aspect is a major knowledge point that would help know the effects that the ever-changing climatic conditions would have on human. Equipped with the knowledge of environmental toxicants that are harmful for human health, helps in increasing awareness about pollutants and importance of conservation of nature. This would also assist in gaining access to jobs in authorities concerned with environmental issues.

### PHYG-228102 (1+1+1+1 credits)

**Physiological system-I** (Nervous system, Special Sense, Cardiovascular system, Respiratory system)

**Nervous System:** Brain anatomy, neurogenesis & gliogenesis. Neuronal basis of behavior. Neuroimmunology. Regulatory function of cerebellum with special reference to autonomic function, thalamocortical projections and its influence on evoked cortical activity, Anaesthesia, startle reflex. EEG and Brain waves. Neural stem cell and Neural Plasticity. Higher functions of brain and cognition.

**Sensory Organ:** Chemical senses- Taste, Olfaction; Visual sense; Auditory and Cutaneous sense.

**Cardiovascular System:** Evolution of heart on comparative basis, Rhythmicity of heart, Junctional tissue, Role of autonomic nervous system on heart, Cardiovascular reflexes, Cardiac metabolism and the role of hormones, ECG – its principle and significance, ECG in cardiac abnormalities: Analysis of Electrocardiography, Angiogenesis and Angiography.

**Respiratory System:** Anatomy of respiratory system, Lung Mechanics, Neural and chemical regulation of respiration, Non-respiratory functions of lungs.

CO: Physiological systems-based knowledge helps in systems-based design of therapy. Basic understanding of the physiological processes about Nervous system, Special Senses, Cardiovascular system, Respiratory system is learnt here.

**PHYG-228103** (4 credits)

**Nutrition & Community Health:**

**Nutrition:** Etiology of Protein energy malnutrition, anaemia, vitamin A deficiency, rickets, osteomalacia, osteoporosis, beriberi, pellagra, scurvy, goitre, fluorosis. Hypervitaminosis and excess intake of minerals. Nutritional regulation of gene expression. Role of specific nutrients in controlling gene expression. Dietary fibre: Definition, fibre components – cellulose, hemicellulose, pectin substances, lignin, gums, mucilage and algal polysaccharides, response of upper and lower G.I. tracts to dietary fibres, recommended intake; implications in disease prevention. Flavonoids: Chemistry, source and nutritional importance of flavonoids.

**Community Health:** Definitions and Concepts of Community Health, Evolution of Public Health, Important Public Health Acts, Health problems of developed and developing countries, Health problems in India, Problems of Population growth, Birthrates, death rates, fertility rates, age-specific mortality rates, MMR, CPR, etc., Communicable and Non-communicable diseases, Reproductive and Child health, Family Welfare and Planning, Approaches and methods of contraception MTP. Major nutritional problems, etiology, manifestations and prevention, Components of RCH care, Need and package of services under RCH Programme.

Health planning in India including various committees and National Health Policy and Health Goals set from time to time, Organised sector with reference to Centre, State, District and Block level structures and local bodies and Panchayati Raj, Organisation and functions of community health centres and primary health centres, Health Manpower, Primary Health care and concept. Link of University with Community Health

CO: Knowledge of Nutrition fortifies one with the knowledge of everyday food intake and nutritional management of common diseases. Diet planning for disease conditions is a practical approach for training as a nutritionist or dietician.

Community nutrition is to share knowledge of physiology among the community, so that right steps maybe taken towards disease prevention and necessary actions adopted to reach to clinical professionals in time. Commonly seen diseases that are seen in community is addressed in this unit so that right judgements can be taken towards that disease.

**PHYG-228104** (4 credits)

**Computational Biology & Biostatistics**

**Computational Biology:** Basic concepts of computer hardware, software, Operating System and use of open source software and internet, Basics of programming. Word processor- basic operation and its application in biological sciences; MS excel – basic operation and its application in biological sciences; MS PowerPoint – steps of PowerPoint presentation, slide preparation for biological items.

Concept of Bioinformatics- field of application, common bioinformatics sites in www.Biological databases, data acquisition, retrieval of biological data – Entrez , DBGET, LinkDB, Database searches- FASTA, BLAST. Sequence analysis tools.

Major Bioinformatics Resources: NCBI, EBI, ExPASy, RCSB, knowledge of various databases and bioinformatics tools available at these resources, organization of databases: data contents and formats, purpose and utility in Life Sciences, Open access bibliographic resources and literature databases: Open access bibliographic resources related to Life Sciences viz., PubMed, BioMed Central, Public Library of Sciences (PloS), Principles of BLAST, sequence analysis and alignment, primer designing, vector design.

**Statistics:** Biostatistics as applied to public health problems principles, use of classical statistical approaches to describe the health of populations. Basic concepts in statistics, approaches and methods, Mean, Median, Mode, t-test (one tail, two tail), Chi square test, ANOVA (one way & two way), parametric and nonparametric statistics, correlation and regression analysis, trend analysis, operational research, mathematical models, Research related to health economics, medical geography, Sources of biological information and database,

CO: Course contents helps in understanding of genome, morphological and physiological functional data; its manipulation and analysis. This prepares the background for Medical Analytics that are presently important to Pharma-IT industry.

**PHYG-228105** (4 credits)

**Practical-I**

Experiments with tissues and organs, ECG, Spirometry, Tools and open source software for analysis of Anatomy, Biostatistics and Bioinformatics

CO: This would provide hands-on experience with computer softwares, biostatistical applications in mundane issues. It will also help in the global understanding of anatomy, at *in silico* level.

## Semester-II

**PHYG-228201** (1+1+1+1 credits)

**Physiological System II** (Endocrine System, Reproduction, Gastro-intestinal System, Renal Physiology)

### **Endocrine System:**

Endocrine functions of the hypothalamus; Pituitary hormones and their molecular action; Regulations different Adrenals hormones, Molecular actions and regulation of Pancreatic hormones; Adipose tissue hormones; Regulation and action of Parathyroid and calcitonin, calcium and phosphate regulation. Non-conventional endocrine molecules in health & disease.

### **Reproduction:**

Testosterone & male sex hormones –Molecular mechanism, spermatogenesis, prostate function; Male infertility and its treatment; Female sex hormones –cellular and molecular mechanisms of action, Gametogenesis, folliculogenesis, embryonic development of gonads and the genital ducts, sex determination; Reproductive hormones and their role in fertilization, Implantation, Hormonal regulation of pregnancy, parturition and lactation; Umbilical cord blood and stem cells in health & disease; Placenta and placental hormones; menopause and andropause; Infertility and its treatment, assisted reproduction (IVF, ET), extra-uterine pregnancy, Hyper & hypogonadism; Puberty.

### **Gastrointestinal System:**

Histomorphology of Gastrointestinal tract, Gastrointestinal hormones, Role of hepato-biliary systems in gastrointestinal functions, Hepatic circulation, Endoscopy.

### **Renal System:**

Electron microscopic and molecular structure of filtering membrane. Peculiarities of glomerular circulation. Transport mechanism of ions and molecules in kidney during physiological and pathological condition. Tubulo-glomerular feedback. Renal blood flow. Counter-current-exchanger and multiplier system, Assessment of renal functions. Kidney perfusion techniques, Peritoneal dialysis, Artificial kidney, Non-excretory renal functions of kidney. Urine formation, Waste elimination. Respiration and excretion on comparison

**CO: Physiological systems-based knowledge helps in therapy based on system organizations. Basic understanding of physiological processes of Endocrine System, Reproduction, Gastro-intestinal System and Renal Physiology.**

**PHYG-228202** (4 credits)

**Molecular Biology & Biotechnology:**

Structure of Chromosome, Nucleic acid Structure and Metabolism,

DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.

RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.

Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post- translational modification of proteins.

Control of gene expression at transcription and translation level: Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing.

**Recombinant DNA technology:** Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; expression of recombinant proteins using bacterial, animal and plant vectors; isolation of specific nucleic acid sequences; generation of genomic and cDNA libraries, plasmid, phage, cosmid, BAC and YAC vectors; isolation, separation and analysis of carbohydrate and lipid molecules.

CO: This prepares for an advanced research field with modern technology. This would help pursue cutting edge research or join R&D of biotechnology industry

**PHYG-228203** (2+2 credits)

### **Biochemistry:**

Properties of Enzyme, Michaelis-Menten Kinetics, Allosteric modulation, Mechanisms of Enzyme actions. Structure of atoms, molecules and chemical bonds. Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.)

Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds). Conformation of nucleic acids (A-, B-, Z-, DNA, t-RNA, micro-RNA).

Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).

Metabolism of carbohydrates, lipids, amino acids, nucleotides, Integration of carbohydrate, fat and amino acids metabolism. Regulation and integration of metabolic pathways. Role of vitamins and minerals in metabolism of carbohydrate, protein, fat and nucleic acid metabolism. Bioenergetics in metabolism.

CO: It helps in understanding of the biochemical basis of health, physiology and different human diseases. This also creates the foundation of employing physiological parameters to therapeutic nutrition.



**PHYG-228204** (4 credits)

**Social Medicine:**

Definition and scope of social and behavioural sciences in Health Concept and significance of social structure and social organization, Culture and Behaviour related to Health and Disease Political and Economical aspects of Health, Concepts and techniques of Information, Education and Communication including Counselling methodology.

Epidemiology, Etiology, Pathogenesis, Prevention and Control of Communicable Diseases, like Malaria, Cholera, Tuberculosis, Leprosy, Diarrhoea, ARI, Poliomyelitis, Viral Hepatitis, Measles, Dengue, Rabies, AIDS, Plague, etc.

Non-communicable diseases, like coronary heart disease, hypertension, diabetes mellitus, cancers, etc.

Occupational disorders like, pneumoconiosis, hearing loss, accidents, dermatosis, etc., Alternative systems of medicine, like Ayurveda, Homeopathy, etc. Holistic Approach, Non-Governmental Organisations (NGOs) and Private Voluntary Organisations (PVOs), Unorganised Sector.

CO: This section shall prepare students for national level research and faculty examination NET introduces social aspects and applications of medicine.

**PHYG-228205** (2+2 credits)

**Practical-II**

Review of scientific literature (25 marks)

Experiments on Functional Physiology: ECG, Spirometry, DNA blotting, Western blotting (25 marks)

CO: This includes practical activities beyond laboratory work. This unit helps students to be at par with the latest research, comprehend and present it. Scientific writing skill is also developed. Group activities also develop interpersonal relations necessary for adjustment at multiple levels.

## Semester-III

**PHYG-228301** (2+2 credits)

### **Microbiology, Haematology & Immunology:**

#### **Microbiology**

Taxonomic classification and nomenclature of bacteria, archaebacteria, Structure and characteristics of Bacterial cell wall, Gram positive and gram negative bacteria, Bacterial chromosomes and Plasmids, Flagella and Ion pump. Microbial Culture, Microbial Growth, Yield and Characteristics. Strategies of Cell Division, Stress Response, Structure of spores, Microbial Genetics (Transformation, Conjugation, Transduction, recombination and transposition), Microbial Fermentation, Industrial production of alcohol, lactic acid, drug. Microbe-Human Interaction: Beneficial and Harmful, Biosensors, Antibiotics. Mycobacterium. Prebiotics and probiotics.

Virus – structure, classification and replication of Phage virus, Adenovirus, Herpes virus, Retrovirus. Virion. Prion.

Fungus – structure and reproduction of Yeast, Aspergillus, Penicillium, Candida.

Identification of microbial species.

Protozoa – Identification and life cycle of malaria, leishmania, filaria.

#### **Haematology & Immunology:**

Erythrocytes development, haemoglobin, iron-ferritin-transferrin system. Erythropoietin. Blood transfusion.

Leukocytes development, Homeostatic regulation of blood cells development. Role of transcription factors in blood cell development, cross-talks between immunocytes. Innate and adaptive immunity, Cell-mediated immunity. Humoral immunity. Antibody types and structure, Vaccination, Lymphatic system.

Major Histocompatibility Complex- Types and detection techniques, Regulation of its expression, Immunogenetics and its applications. Role of Complement in immunological defense, Evolution of immune system. Haematological & Immunological techniques. Cell and Tissue Culture, Role of Cytokines on immunocytes.

Infectious immunity, Cancer immunity, Reproductive Immunity, Brain immunity. Basic mechanism of Autoimmune disorder

**CO: Microbiological knowledge and its manipulation at the molecular level is the seed for public health, pharmaceutical and biotechnological industry. This course will provide basic principles of microbiology, parasitology and the molecular principles of life process.**

**Combined knowledge of hematology and immunology is the foundation of different diseases – from infectious diseases to cancer and autoimmunity. Most of the pathological investigations are blood based. This course is the foundation of diagnostic and disease preventive area.**

**PHYG-228302** (4 credits)

**Epidemiology**

Definition and Concepts of Epidemiology, Concepts of Health and Disease, Role of Genetics in Health and Disease, Levels of Prevention, Types of Epidemiology, Uses of Epidemiology, methods of epidemiologic investigation, appropriate summaries and display of data, dynamic behavior of disease; usage of rates, ratios and proportions; methods of direct and indirect adjustment, and clinical life table which measures and describes the extent of disease problems. Epidemiologic study designs for investigating associations between risk factors and disease culminating with criteria for causal inferences. Techniques of social sciences research relevant to health fields,

Basic methods for infectious disease epidemiology and case studies of important disease syndromes and entities, Methods, definitions and nomenclature, outbreak investigations, disease surveillance, case-control studies, cohort studies, laboratory diagnosis, molecular epidemiology, dynamics of transmission, and assessment of vaccine field effectiveness. Case-studies focus on acute respiratory infections, diarrheal diseases, hepatitis, HIV, tuberculosis, sexually transmitted diseases, malaria, and other vector-borne diseases.

Application of these disciplines in the areas of health services, screening, genetics, and environment policy. The influence of epidemiology and biostatistics on legal and ethical issues.

Objectives and organisation of important agencies, like WHO, UNICEF, FAO, ILO, Indian Red Cross Society, UNFPA, World Bank, Asia Development Bank, Ford Foundation, CARE, Rockefeller Foundation, etc. and their role in Health care activities in India

**CO:** This unit deals with health problems of various etiology at the community level. Equipped with the merits and demerits of community lifestyle, strategies maybe created to prevent the diseases at the societal level. This would increase self-awareness as well as help disseminate the critical information.

**PHYG-228303** (4credits)

**Cell Biology:**

Classification of Cell, cell variability (size, shape, complexity, functions). Structural organization of prokaryotic and eukaryotic cells. The ultrastructure of cell membrane, nucleus, mitochondria, endoplasmic reticulum (rough and smooth), Golgi apparatus, lysosomes & peroxisomes and their functions. The cytoskeleton – microtubules and microfilaments. Cell movement and chemotaxis. Nuclear envelope, nuclear matrix, DNA and other components of chromatin, nucleolus, nuclear changes indicating cell death. Cell cycle, cell renewal. Cellular differentiation and proliferation. Electron microscopic details and structural basis of function, regeneration and degeneration. Protein sorting, transport and secretion, Cell to cell communication, Molecular process of specific receptor mediated signal transduction; Transport across membranes; Endocytosis and Protein trafficking, growth factors, transformation, Cell fusion, cellular dynamics, Movements of macromolecules, organelles and whole cells.

Stem Cell Biology: Introduction to concepts in stem cell biology (renewal, potency, differentiation, plasticity etc.), Embryonic and adult stem cells, Germline stem cells and germline-derived pluripotent cells, Induced pluripotent stem cell (iPS), Cloning, therapeutic cloning and nuclear cloning, Tissue regeneration and regenerative medicine, Tissue specific stem cells, Chromatin and stem cells, Telomeres and stem cells, Planaria stem cells, Regeneration in vertebrates, Mesenchymal stem cells, Hematopoietic stem cells, Stem cells and diabetes, Stem cells and cancer, Cancer Stem Cell.

CO: Knowledge of cell biology is necessary for understanding of molecular physiology. This prepares for an advanced research field with modern technology. This would help pursue cutting edge research or join R&D of biotechnology industry

**PHYG-228304** (2+2 credits)

### **Ergonomics & Occupational Physiology:**

#### **Ergonomics:**

Concept of system design; Effect of man, machine and environment; Failure of system- accident; Management of systems; Work, time and motion study; Ergonomics & safety: Application of ergonomics for the development of safety; Analysis of accident; Unsafe conditions; Personal protective device; Occupation health and safety norms; Anthropometry: Definition of anthropometry; Static, dynamic & Newtonian anthropometry; Application of anthropometry in design; Nutrition in sports and exercise; Cardio-respiratory changes in sedentary and trained persons during exercise; Concept of physical fitness; Physiological effects of doping/drug abuse.

Prevention and health measures of occupational hazards – nutrition, disease control,

#### **Occupational Physiology:**

Occupational Health –factors affecting it. Occupational health hazards.

Occupational hazards in work place – mechanical, chemical, biological, fire, toxic substances, and Explosive materials

Occupational safety and health – concept of health and safety; Accidents – theories of accident, effect on industry; method of assessment of accidents, promotion of safety, health and safety training, personal protective devices

Occupational diseases – Pneumoconiosis, silicosis, asbestosis, bagasosis, byssinosis, anthrocosis.

Occupational cancer – skin, lungs, urinary bladder, blood, Occupational health problem of agricultural workers.

Occupational stress – causes, evaluation and management of stress.

Chronobiology: Photoperiodism, Cellular mechanism of clock, zeitgebers, Synchronizer, Jet lag, shift-work, seasonal affective disorder; Human circadian rhythm and its mechanism of control - cellular and molecular mechanism.

CO: With change in civilization followed by urbanization, different occupational diseases occur. So to combat the occupation related disease, the subject ergonomics have evolved. This subject deals with association between man and environment. To ensure safety of the employees innumerable industries now employ ergonomists.

**PHYG-228305** (2+2 credits)

**Practical-III:**

Experiments with Microbial cells, Biochemical assays, Experiments with blood and cells (2 credits)

Ergonomical measurements and designing (2 credits)

CO: This unit deals with microbial, biochemical techniques and ergonomical designs. Besides research work, these would provide opportunity to work in R&D of industries or other industries based on ergonomic designing or undertake research work

## Semester-IV

**PHYG-228401** (4 credits)

### **Biophysics & Biomedical Instrumentation**

Colligative properties, Filtration, Centrifugation, pH and Buffer, Thermodynamics – adiabatic, isothermal, quasibatic changes, Entropy & Enthalpy, Information Entropy. Bioenergetics and energy transduction.

Tracer techniques in biological experimentation and medical applications.

Recording instruments – Galvanometers.

Microscopy – Light, Phase contrast, fluorescence and confocal; Electron microscopy; Staining Techniques;

Spectroscopic principles – UV/light, fluorescence, ORD/CD, Magnetic resonance imaging; IVP, PET and CT scanning. Image analysis.

Use of sound in diagnosis: Echocardiography, ultrasound.

Chromatography and Electrophoresis – application in separation and characterization of biomolecules.

Biophysical principles and applications of Blotting techniques.

Amino acids, Protein and Nucleic acid sequencing. Genomics.

Gene amplification – PCR. Gene Knockout and In vitro mutagenesis Technique. Endonuclease, Plasmid map.

Gene Expression Analysis, Post-translational modification – application of Proteomics.

**CO: This unit deals with the biophysical principles for understanding of physiological parameters and measurement technology. This prepares for an advanced research and professional field.**

**PHYG-228402** (4 credits)

### **Pathophysiology:**

Pathophysiology of different communicable and noncommunicable diseases associated with different system; differences between symptoms, syndrome and disease. Thalassemia; Pathogenesis of thrombosis and purpura. Immunecomplex, Inflammation, Allergy, Tissue Transplantation. Immunological defence against infectious diseases, Cancer, Autoimmunity, Leukemia; Lymphoma; Eosinophilia; Immunodeficiency diseases (HIV etc).

Iatrogenic diseases: Pulmonary diseases like ventilation failure, asthma and COPD, alveolar fibrosis, pulmonary hypertension, Artificial ventilation and lung transplantation. Renal Diseases like Nephritis, Kidney stone, Renal failure.

Disorders of pituitary and adrenal functions, Thyroid secretions and their clinical manifestations; Autoimmune and genetic disorders of endocrine glands. Disorders of Menstrual cycle; Infertility and its treatment, assisted reproduction (IVF,ET), extra-uterine pregnancy. Lifestyle diseases: Stroke and Neurological disorders of brain - mechanism of development of Alzheimer's,

Parkinson's disease and Epilepsy. Neuropsychiatric diseases – Depression, bipolar disorder, Schizophrenia & psychosis.

Cardiovascular diseases like Atherosclerosis, Ischemic heart disease, Myocardial infarction, Cardiac hypertrophy, Cardiac valve disorder. GI tract related diseases like Ulcer, Varices, Irritable Bowel Syndrome, Pancreatitis.

CO: This unit disseminates knowledge on molecular basis of pathological manifestation. Understanding pathophysiological shift in disease opens up avenues to pharmaceutical industries.

**PHYG-228403** (4 credits)

**Pharmacology:**

Application of pharmacological principles in the management of diseases. The reactive groups, dose, mode of action and side effects (if any) of the following clinically important group of drugs: Analgesic, Anti-inflammatory, Anti-haemorrhagic, Iron chelators, Mucolytic, Bronchodilator, Anti-allergic, Sedatives, Anti-hypertensive, Anti-congestive, Diuretic, Anti-diuretic, Purgative, Hypolipidemic, Antibiotic, Antifungal, Antiprotozoal, Antihelminthic and Antiviral drugs. Management of hormonal diseases. Angiogenic and antiangiogenic drug.

Metabolism of xenobiotics: Drug detoxifying enzymes; Bioavailability of drugs; LD<sub>50</sub>, ED<sub>50</sub>, Drug clearance, Isolation, purification, and identification methods of drugs from natural sources; Bioassay of drugs; Use of microbes for synthesis of drugs.

Drug design, Drug delivery, Drug stability, Drug metabolism, Pharmacokinetics and pharmacodynamics, Drug resistance, Pharmacogenetics. Stages of drug development – up to clinical trials, Principles of toxicology, Mechanism of toxicity, Biotransformation of chemicals, Toxicity testing and toxicological risk assessment – Mutagenicity, Carcinogenicity, Teratogenicity, Functional assays, Exposure and disease, DNA adducts, Microarray techniques for toxicological prediction, Immunosuppressive agents, Immunotoxicology, Chronopharmacology.

CO: This unit imparts knowledge on the pharmacological principles of disease management. Understanding this in the management of different diseases opens up avenues to pharmaceutical industries.

**PHYG-228405** (4+4 credits)

**Project, Seminar & Grand Viva Voce:**

A project shall be carried out under the guidance of a teacher for a period of maximum four months. Students will have to prepare the project report in a standard format and submit the same in duplicate well before the examination. The report should not be less than 30 A4 size typed pages.

Project presentation: The project work will be evaluated on the basis of the internal assessment,

seminar delivered by the student as well as viva-voce on the project report, before the external examiners.

There shall be a separate grand viva-voce encompassing the knowledge of Physiology in a greater sense.

CO: Objective of the course is to prepare students for research. This will provide practical training on data collection and analysis for further research work or survey compilation. This would help students realize the vitality of proper presentation of a work. Besides recollecting all the study materials, this would help prepare students for interview.

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