BHARATHIAR UNIVERSITY : COIMBATORE- 641 046

M.Phil. / Ph.D. in Physiology

(w.e.f. 2008-2009 and onwards)

PART-I SYLLABUS

PAPER I : Research Methodology in Physiology

PAPER II : Research Trends in Physiology

PAPER III : Special Papers

1. Cold Physiology
2. Ergonomics and Work Physiology
3. Neurophysiology

Paper-I : Research Methodology in Physiology

UNIT1

a). Basic electronics (electrical unit e.g. E.M.F, Charge, Current flow, Resistance, Impedance, Frequency, Conductance etc. ECG, EMG, EEG, GSR (Galvanic Skin Response), EP (Evoked Potential) their principles of measurements, BP measurement.

b) pH measurement, buffers, estimation of macro molecules (protein, carbohyddrate and nucleic acids), enzyme kinetics, Colorimetry- ultraviolet-visible spectrophotometry-principles, instrumentation and application, fluorescence spectrophotometry.

UNIT 2

a. Chromatography techniques and principles and different types (Affinity chromatography, ion exchange chromatography, Gel exclusion chromatography, Gas chromatography, HPLC, TLC, paper chromatography). Isolation of natural products (extraction, purification and separation.

b. Different types of microscopic techniques (light microscope, compound microscope, dark field microscope, phase contrast microscope, Normaski microscope, confocal microscopy, transmission electron microscopy (TEM) and scanning electron microscopy (SEM), Cell sorting-flow cytometry,

UNIT 3

a) Ergometry - its principles and different type of ergometers and their applications. Pulmonary function tests, Spirometry. Respiratory gas analysis (expired air), Blood gas analysis. Physical performance assessment.

b) Routes of immunization, types of adjuvant and their importance, antigen antibody interaction, monoclonal and polyclonal antibodies. ELISA techniques-principle and applications, Immunoradiometric assay- Principles and applications, Hybridoma.

UNIT 4

a) Environmental/Bio-meteorological analysis: Heat indices using Dry bulb &Wet bulb thermometer, Kata thermometer. Anaemometer, measurement of Basal Metabolic Rate, energy expenditure Direct and indirect calorimetry).

b) Isolation of genomic DNA and plasmid DNA, DNA sequencing techniques (PCR, RTPCR, restriction analysis, DNA fragmentation analysis, Hybridization techniques) etc. COMET assay, cell viability assay, karyotyping.

UNIT 5

a) Statistics in biomedical research- Experimental design, Various sampling methods, Probability, frequency distribution average (arithmetic, geometric, means, mode and median) Standard Deviation, Standard Error of Mean, Degree of Freedom, Significance, t-test, Correlation, null hypothesis, distribution.

b) Bioinformatics: use of computers in data analysis, Biological databases- DNA sequence databases and protein sequence databases. BLAST, FASTA, Multiple sequence alignment.

Paper-II : Research Trends in Physiology

UNIT 1

a) Environment factors effective human health and performance (Heat, Cold, High Altitude, Under water and Space).
b) Occupational environment and Pollution (type, effect on human health).

UNIT 2

a. Thermoregulatory mechanisms in human beings and adaptive/acclimatizaton responses.
b. Glycolysis, gluconeogenesis, citric acid cycle, pentose phosphate pathway, β-oxidation of fatty acids, ketone bodies; integration of metabolic pathways, electron transport chain, oxidative phosphorylation. $k_{m,}$ competitive, non-competitive and mixed inhibition, effect of pH; principles of toxicology.

UNIT 3

a) Physical work capacity (Changes in different environmental conditions, High Altitude, Heat and Cold). Anthropometric and body composition changes in different age and sex.
a) Oxidative stress and types of free radicals, their role in cell metabolism and diseases; antioxidant defense system, detoxification mechanism; neurotransmitter and neuromodulater

UNIT 4

a) Biorhythms- Different types mechanisms. Effect of circadian rhythms on human health and efficiency.
b) Development of immune system, regulation of immune response, humoral and cell mediated immunity

UNIT 5

a) Different heat stress indices (Effective Temperature, WBGT) its measurement principles and applications. Wind Chill Index, Measurement, Applications. Clo value, its definition and application.
b) Gene structure and function, DNA replication and repair, cloning and expression of genes. Transcription and translation in prokaryotes and eukaryotes.

Physiology

Special Paper – 1 : Cold Physiology

UNIT 1

a. Temperature regulation-Principle and Heat Balance
b. Regulation of body temperature-Neuropsychological & biochemical basis of temperature regulation

UNIT 2

a. Types of Cold exposure, Newton Law of cooling, Insulation
b. Measurement of body temperature and blood flow (Thermography etc)

UNIT 3

a. Responses to acute cold exposure, shivering, non shivering thermogenes, cold induced vasodilatation
b. Responses to cold adaptation, Eskimos, Australian Aborigine

UNIT 4

a. Hypothermia, Experimental hypothermia
b. Frotst bite mechanism and treatment modality

UNIT 5

a. Oxidative stress, reactive oxygen species, Antioxidant systems, Lipid peroxidation
b. Role of antioxidants, Natural and Synthetic antioxidants

Physiology

Special Paper – 2 : Ergonomics & Work Physiology

UNIT 1

a. Concept of ergonomics, focus of ergonomics, application of ergonomics, understanding man-machine environment system components, macro and micro ergonomics
b. Types of muscles, EM Structure of skeletal muscle, mechanism of muscular contraction, chemical basis of muscular contraction, neuromuscular junction and transmission

UNIT 2

a. Anthropometric priniciples in work place and equipment design, application of anthropometry I design, designing for a population and for everyone, effectiveness and cost effectiveness
b. Designing for standing and seated work

UNIT 3

a. Types of work, O2 and CO2 consumption, aerobic and anaerobic work, O2 debt, maximum aerobic capacity (limit factors affecting standard methods of measurement), lactate threshold
b. Classification of workload, work rest cycle, physical fitness (measurement factors affecting, environmental impact)

UNIT 4

a. Effect of environment on human performance (effect of noise, vibration, heat, cold and illumination), personal protection and protective equipment.
b. Body composition (measurement and analysis), physical activity and obesity, theories of weight control

UNIT 5

a. Ergonomic methods and tools for work analysis (posture analysis-OWAS, RULA, Comfort/discomfort analysis, CG analysis)
b. Occupational ergonomics (ergonomics in military and industrial work environment), musculo-skeletal disorders (development, analysis and prevention).

Physiology

Special Paper – 3 : Neurophysiology

UNIT 1

a. Conduction and transmission of nerve impulse, action potential, processing of information
b. Synapses, synaptic transmission, CNS neurotransmitters

UNIT 2

a. Sleep wakefulness, types of sleep, physiology, mechanism, EEG and neurotransmitters involved in sleep wakefulness
b. Meditation, Physiological effects, applications

UNIT 3

a. Intellectual functions of cerebral cortex, thoughts and consciousness, memory, consolidation
b. Limbic system, hypothalamus, hippocampus, amygadala nad limbicortices, sleep deprivation and cognitive function

UNIT 5

a. EEG, Polysmnography, sleep staging
b. Evoked potentials, event related potentials, fMRI, PET

UNIT 6

a. Effect of low oxygen on the body
b. Sleep at high altitude, cerebral edema, acute mountain sickness.
