Syllabus for Ph. D. course work

HUMAN PHYSIOLOGY WITH COMMUNITY HEALTH

VIDYASAGER UNIVERSITY

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

COURSE	TOPICS		MARKS	CREDIT
COURSE I	General research methodology, Biostatistics and Computer application	1. Research methodology 2. Application of computer in research 3. Statistical analysis of biological data	50	16
COURSE II	Research methods and techniques used in biology	1. Analytical Techniques 2. Techniques in microbiology 3. Techniques in Biophysics and Electrophysiology 4. Nanobiotechnology 5. Advances in Molecular Biology and Genetic Engineering	50	16
COURSE III	Advanced topics in Human Physiology	1. Cardiovascular Physiology 2. Neurophysiology 3. Environmental Physiology 4. Genetics, Molecular biology and Biotechnology 5. Microbiology and Immunology 6. Sports Physiology and Ergonomics 7. Endocrinology and Reproductive 8. Physiology 9. Community Health and Epidemiology 10. Stem cell Biology	50	16
COURSE IV	Review of Literature	1. Collection of available literature 2. Evaluation	50	16
SUGGESTED BOOKS				

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

Vidyasagar University

Subject: Human Physiology with Community Health

Syllabus for Ph. D. course work

Paper 1: General Research methodology, Biostatistics and Computer Application

1. Research methodology

a) Meaning of research, types of research, significance of research, Process of research – formulating research problem, development of hypothesis, research design, collection of data, data analysis.

b) Literature survey and bibliography, art of thesis writing

c) Writing a research project – preparation of project (statement of problem, goal of the project, methodology, significance, budget planning, selection of funding agency, execution of project, report writing.

d) Research ethics - Ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law, Reproduction of published material – Plagiarism - Citation and acknowledgement, Reproducibility and accountability.

2. Application of Computer in Research

a) MS office and its application in Research – MS Word, MS Power point and MS Excel

b) Operating system- function, types, Windows, Unix, Linux

c) Use of Internet in Research – Websites, searches Engines, E-journal and E-Library – INFLIBNET.

d) Data base – definition , structure, biological database

e) Bioinformatics – computer languages for bioinformatics, Application of Bioinformatics, Bioinformatics Resources: NCBI, EBI, ExPASy, RCSB, DDBJ: The knowledge of databases and bioinformatics tools available at these resources, Open access bibliographic resources and literature databases: PubMed, BioMeb Central, Public

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

Library of Sciences (PIoS), CiteXplore., software tools for structure analysis of biomolecules, structure prediction, Sequence Analysis: Basic concepts of sequence similarity, identity and homology, genome analysis, Phylogenetic tree, motif analysis

3. Statistical analysis of biological data
   a) Sampling – different types, methods for sampling, scaling techniques
   b) Correlation – Multiple, regression- multiple, stepwise regression
   c) Experimental design
   d) Avova, Anocova , multivariate analysis technique, factor analysis
   e) Nonparametric statistics- Chi square test for normality of distribution, non parametric test for correlation studies

Paper 2: Research methods and techniques used in biology

1. Analytical Techniques

Preparation of solutions, Expression of concentrations, Buffers and preparation, Cell disruption and fractionation, Protein purification techniques, DNA and Protein Microarray

2. Techniques in Microbiology

Molecular Techniques in Clinical Microbiology, molecular approaches to diagnostic microbiology

Preparation and sterilization of solid and liquid culture media, techniques of tissue and cell culture, sources of type strains of microorganisms, preservation and maintenance of cultures

3. Techniques in Biophysics and Electrophysiology

a) Separation technique - HPLC: mobile phase systems, modes of operations application, Hydrodynamics method: fundamental principles, Centrifugation, Ultracentrifugation and their applications in molecular weight, size determination.
b) Fluorescence anisotropy and polarization measurement, Protein tryptophan fluorescent measurement, Study of membrane fluidity.
c) Study of phase transition of membrane phospholipids, study of membrane potential using fluorescence spectroscopy
d) Techniques in electrophysiology – Modern techniques in voltage clamp, current clamp, and patch clamp. Computational electrophysiology, Bioelectric recognition Assay (BERA)

4. Nanobiotechnology

Types of nanomaterials and their classifications (1D, 2D and 3D etc. Nanocrystal, Nanoparticle, Quantum dot, Quantum Wire and Quantum Well etc)), Physical and Chemical Fundamentals of Nanomaterials , Applications of Nano-Materials in Biosystems , Protein Targeting - Small Molecule/ nanomaterial - Protein Interactions , Nanomaterial-

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

Cell interactions-Manifestations of Surface Modification, Nanomaterials and Diagnostics/Drug Delivery and Therapeutics , Nanomaterials and Toxicity

5. Advances in Molecular Biology and Genetic Engineering

Gene therapy: Introduction, vectors in gene therapy, advances in gene therapy, safety assurances, DNA analysis and diagnostics: Methods of DNA analysis, Diagnosing, Medical forensics: DNA fingerprinting, - genetic identification, Pharmaceutical products of DNA technology: Human protein replacements, Human therapies, Vaccines- traditional vaccines and DNA vaccines

Genome mapping- Genetic mapping, Physical mapping, Resolution of
Mapping, Strategies for Sequencing whole genome and sequence data analysis,
Comparative Genomics,
Importance of Proteomics, Strategies in proteomics: 2D PAGE and Mass spectrometry
Mapping of protein interactions: two hybrid, phage display, Applications of proteomics: Understanding mechanism of pathogenesis, Drug discovery, Disease diagnosis, identification and characterization of novel proteins

Paper 3: Advanced topics in Human Physiology

1. ***Cardiovascular Physiology:*** Ischemia and reperfusion injury, Arrhythmia, Integrative cardiovascular control, Echocardiography, Angiogenesis technology.
2. ***Neurophysiology:*** Molecular basis of Schizophrenia, Alzheimer's disease, Mood disorder, Neurobehavioral studies, Neurological assessment techniques: EEG, Patch-clamp techniques.
3. ***Environmental Physiology:*** Assessment of thermal environment- hot and cold environment, thermal discomfort assessment, auditory environment and noise assessment-subjective and empirical measure, noise mapping, measuring hearing threshold.
4. ***Genetics, Molecular Biology and Biotechnology***: Linkage, Crossing over and RFLP in linkage analysis, Mapping in eukaryotes, Chromosome Mutation, Gene therapy, Genetics and Cancer, 2-D Gel Electrophoresis, MALDI, Southern, Northern and Western Blotting, RT-PCR, Micro assay, Stem cell Biology, Site – direction mutagenesis, DNA fingerprinting and foot printing, transgenesis, Recombinant DNA Technology application studies in Biotechnology.
5. ***Microbiology and Immunology***: Host microbe Interaction, Infectious diseases, epidemiological studies, Bioremediation. Immunology- a) T-cell regulation, b) B-cell regulation, c) Cytokines, Apoptosis, e) Flow cytometry, Confocal microscopy, Cell links, Knockout mice.

   Viable But Non Culturable (VBNC) State in Bacteria, Factors inducing VBNC state, VBNC state in pathogenic bacteria, Virulence and Gene Expression of VBNC cells, The

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

concept of Microbiome, Study of Micropbiome, The Microbiome Project: Human and Earth.

6. ***Sports Physiology and Ergonomics***: Kin anthropometry, Biomechanical analysis of posture, Shoulder moment, back force-2D & 3D model. Computer aided work space design-Ergo man, Ergo space, Workspace modeling. Physiological and Psychological methods of work stress.
7. ***Endocrinology and Reproductive Physiology***: Molecular endocrinopathy at the level of receptors, molecular basis of endocrine tumors, in vitro fertilization, cytokines as hormones.
8. ***Community Health and Epidemiology***: Setting a Community Health Program, Concept of Epidemiology, Principle of Epidemiological research.
9. **Stem Cell Biology :** Introduction to Stem Cells , Reprogramming of Somatic Cells to induced pluripotent Stem cells, Application of iPS technology to Regenerative Medicine, Developmental hematopoiesis, Epigenetic regulation of stem cell fate, Niche Biology: regulation of hematopoiesis by the nice-mediated signaling mechanisms. Cryopreservation of cells (general), Cord blood banking and long-term, storage of stem cells, FACS and its application in stem cell research, neural stem cells and differentiation.

Paper IV: Review of literature

Students shall collect the available literature in the chosen field of research, preparation chronological order about the development of various subtopics in the chosen field, identification of gaps in the knowledge and preparation of objectives to the bridge of those gaps. Students should perform the review work under the guidance of a teacher (preferably supervisor of the Ph. D. Work). They should keep in regular contact to complete the work. The report should not be less than 30 pages (Times New Roman , 12 pts, 1.5 line space) and it should be prepared in a standard format (Introduction, objective, review / discussion, conclusion , reference).

Evaluation: students shall submit a printed report through the guide to the Head of the Department. The review will be evaluated on the basis of the report submitted and viva-voce examination conducted by the department.

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135

Suggested books

1. Kothari, C.R.(2008). Research Methodology: Methods and Techniques. Second Edition. New Age International Publishers, New Delhi.
2. Garg.B.L., Karadia, R., Agarwal,F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
3. Day RA (1992) How to write and publish a scientific paper. Cambridge University press. London
4. Anderson, Durston and Poole : Thesis and Assignment writing
5. R. Kumar : Research methodology – a Step-by Step Guide for beginners
6. Dawson C. : Practical Research methods :
7. Das D. and Das A.: Statistics in Physiology and Psychology. Academic publisher. Kolkata
8. Gupta S.P. (2008). Statistical Methods. 37th ed. (Rev) Sultan Chand and Sons. New Delhi. 1470 p.
9. Downine N.M : Basic Statistical Methods. New York:¨Harper and Health Row Publishers.
10. Frank, Harry. Statistics. Concepts and Applications. Cambridge. Althoen, Steven Cambridge University.
11. Dhara P C : Computer in Biological Sciences. Academic Publisher, Kolkata
12. Leon & Leon (2202). Internet for everyone, Vikas Publishing House.
13. SPSS – Operating Manual and handbook – Latest version
14. Sinha p.K.(1992). Computer Fundamentals, BPB Publications, New Delhi.
15. De Robertis and De Robertis: Cell and Molecular Biology
16. Gupta P. K. : Cell and Molecular Biology

Downloaded from Vidyasagar University by 14.139.211.194 on 09 Nov 2026 21:39:59 PM; Copyright (c) : Vidyasagar University
http://download.vidyasagar.ac.in/OpenLink.aspx?LINKID=135