DEPARTMENT OF BIOCHEMISTRY
MAHARSHI DAYANAND UNIVERSITY, ROHTAK

Program Specific Outcomes:

PSO1 Students would be acquainted with research methodology and experiential knowledge

PSO2 Students would be able to design, conduct and report research outcome

PSO3 Students would be well versed with the advance techniques and instrumentation could be used in research

PSO4 Students will develop skills of academic writing and data presentation

The entire course have four course papers . Examination scheme is Ph. D program is as follows:

Paper No	Nomenclature	Theory	Internal assessment	Seminar (if any)	Max Marks
17BCHPC1	Research Methodology	80	20*	--	100
17BCHPC2	Biostatistics & Computers	80	20*	--	100
17BCHPC3	Advanced Techniques in Biochemistry	80	20*	--	100
17BCHPC4	Review writing and presentation/Seminar	50	--	50	100
Grand Total					**400**

Paper: 17BCHPC1   **Research Methodology**

Course Outcome

Course Outcomes:

By the end of the course the students will be able to:

CO1 Learn the concept of research, research process, types of research, research models and basic formats of report writing.

CO2 Identify the differences between measurement and scaling and how sample is selected and determined using various approaches.

CO3 To understand sources of data collection and how data is collected from different sources.

M.Mark : 100

Internal Assessment: 20

Examination: 80; Time: 3 hrs.

Unit-I:

Research Methodology:- Meaning, types and objective of research, Selection of Research, Research methodology- philosophical, descriptive, experimental and genetical methods. Motivation in Research, Developing the hypothesis.

Types of information and sources: primary and secondary sources, overview of research process- phases and steps. Research process planning and conducting.

Unit-II:

Review of Literature: Meaning. Procedure and steps for preparing review;

Data collection:- Types of data, Sources, Methods of data collection, Constructing questionnaire, Establishing reliability and validity, Data processing:- Coding, Editing, displaying of data by tables and graphs.

Thesis layout:- Preliminaries, Text of the thesis-Format and conventions, charts and diagrams, Norms for using Index and Bibliography.

Unit-III:

Scientific Writing: Scientific Document; Organization and writing of research paper, Types of Scientific Communication, short communications, monographs, technical and survey reports, Importance of publishing research paper. Writing review articles, Patent drafting and submission, Preparing documents for Technology Transfers, MoUs,

Unit-IV:

Presenting and Publishing paper: Format, choosing Journal, Title, Running Title, Writing Abstract, Keywords, Introduction section, Materials and Methods selection, Result section, Figures, tables, graphs, Discussion Section, References, Preparing posters for scientific presentation, Preparing and delivering of oral presentation, Research Grant Funding Agencies,

References:

1. Research Methodology: Methods And Techniques By Dr C R Kothari.

2. Research Methodology: An Introduction By Wayne Goddard and Stuart Melville

3. Research methodology: techniques and trends By Y.K. Singh

4. Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.

5. Fundamentals of Research Methodology for Health-care Professionals By Hilla Brink, Christa Van der Walt

<div align="center">**Paper: 17BCHPC2**   **Biostatistics and Computers**</div>

Course Outcomes:

By the end of the course the students will be able to:

CO1. Learn the use of statistical analytic techniques for data analysis and testing of hypothesis.
CO2. To understand the concept of interpretation and role of computer in mathematical and statistical analysis
CO3 understand basics of operating systems and C programming language

<div align="right">**M.Mark : 100**</div>

<div align="right">**Internal Assessment: 20**</div>

<div align="right">**Examination: 80; Time: 3 hrs.**</div>

Unit-I:

Tests of significance – concepts of null and alternative hypothesis, level of significance, type-I and type-II errors – power of the test. Measures of central tendency and dispersion

Non-parametric tests: Wilcoxon signed rank test, Wilcoxon rank sum test (Mann-Whitney U test), Sign test, Runs test, Kruskal-Wallis H Test, Spearman's rank correlation and Tukey-Duckworth test

Unit-II:

Parametric Tests of large samples by Z test. Small sample tests- t-test, F, chi-square test. Coefficient of correlation & regression. ANOVA- one way and two way techniques.

Unit-III:

Basics of Computers- classification, computer system components (CPU, Input/output devices, internal memory i.e. RAM, ROM & Cache and external memory i.e. secondary storage devices). Computers networks and introduction of internet. MS-Office 2003/2007. Number systems.

Unit-IV:

Overview of Windows Xp. Flow charts in computing language. DOS internal and external commands, Batch files, generations of programming languages, system and application software, Introduction of programming in BASIC and C.

References:

1. Biostatistics By PN Arora and PK Malhan, Himalaya Publishing House.
2. Biostatistics: a guide to design, analysis and discovery By Ronald Forthofer, Eun Sul Lee and Michael Hernandez.
3. Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.
4. Fundamentals of Research Methodology for Health-care Professionals By Hilla Brink, Christa Van der Walt
5. Computer Fundamentals: Concepts, Systems and Applications By PK Sinha. BPB Publications.
6. Computer Fundamentals and Programming in C By JB Dixit. University Science Press.
7. Computer fundamentals and programming in C By Amiya Kumar Rath, Alok Kumar Jagadev and Santosh Kumar Swain. Scitech Publications.
8. Computer Fundamentals (Paperback) by Ashok Arora, Shefali Bansai and Shefali Bansal. Publisher: Excel Books.
9. Discovering Computers: Fundamentals (Paperback) by Gary B. Shelly. Publisher: Course Technology.
10. Discovering Computers: Fundamentals, Fourth Edition (Shelly Cashman) (Paperback) by Gary B. Shelly Thomas J. Cashman and Misty E. Vermaat. Publishers: Course Technology
11. Computer Fundamentals: Architecture and Organization (Paperback) by B. Ram. Publisher: New Age Publications (Academic)

Paper: 17BCHPC3   **Advanced Techniques in Biochemistry**
                              Course Outcome

Course Outcomes:

CO1. Researchers will be familiarized with recent biochemical techniques

CO2. Researcher will develop a better understating of Genomics concept and could plan genome based discoveries

CO3. Students would gain knowledge about drug discovery and drug launch.

CO4. It would connects the bench work to bed- side discovery and thus emphasize on the demands of industry from students.

CO5. Researcher will understand the concept of biosensor and their potential applications in clinical diagnostics

                                          M.Mark : 100
                                          Internal Assessment: 20
                                          Examination: 80; Time: 3 hrs.

Unit-I: Molecular biology & Bioinformatics

Gene Cloning, Screening and selection of recombinants clones, RFLP, RAPD, tRFLP analysis, Polymerase chain reactions, Site directed mutagenesis, De Novo Genome sequencing of Prokaryotes and Sequence analysis, protein-protein interactions, yeast two hybrid systems, pull down assay, reporter assays, searching in BLAST & FASTA, Multiple sequence alignment, phylogeny analysis, Structure database- Secondary structure prediction, Predicting 3D structure of proteins

Unit-II: Enzyme Technology

Immobilization of enzymes/proteins on organic and inorganic supports including artificial and natural membranes, Study of kinetic properties of immobilized enzymes, Co-immobilization of enzymes and their analytic applications, Construction of enzyme electrodes, Optimization and applications of enzymes electrodes.

Unit-III: Toxicology

Analytical and preparative methodology, Drug susceptibility testing: Minimum inhibitory conc., Disc diffusion, Spot assay, Time kill kinetics, Combinatorial drug testing, Hodge test, Drug-drug interactions, CYP interaction, inhibition and induction.

Toxicokinetics and toxicodynamics, Transport and accumulation of xenobiotics, bioactivation of xenobiotics, xenobiotic-induced oxidative stress. Introduction to GLP/GMP and CRO.

Unit –IV: Biochemical Techniques

Centrifugation and its applications, purification of proteins using ion-exchange, gel-filtration and affinity chromatography, SDS-PAGE, western blotting, 2-D PAGE, isoelectric focusing, Mass spectrometry, HPLC. Preparation and processing of sample for electron microscopy, Fluorescence microscopy and immuno-histochemistry

References:

1. Bioinformatics: Methods & Protocols *By* Stephen Misener and Stephen Krawetz
2. Essential Bioinformatics *By* Jin Xiong
3. Gene cloning *By* TA Brown
4. Principles of Gene Manipulation and Genomics, *By* S.B. Primrose & Richard M. Twyman, Blackwell Publishing.
5. Molecular Biology of the Gene VI *By* Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.
6. Handbook of Enzyme Biotechnology *By* Alan Wiseman
7. Nature of enzymology *By* RL Foster
8. Disinfection, sterilization, and preservation *By* Seymour Stanton Block
9. Pharmacodynamics and drug development: perspectives in clinical pharmacology *By* Neal R. Cutler, John J. Sramek, Prem K. Narang
10. Mechanistic toxicology: the molecular basis of how chemicals disrupt biological targets *By* Urs A. Boelsterli
11. Modern Experimental Biochemistry *By* Rodney Boyer
12. Principles & Techniques of Biochemistry and Molecular Biology *By* Keith Wilson and John Walker.
13. Immunohistochemistry: Basics and Methods *By* Igor B. Buchwalow, Werner Böcker

Paper: 17BCHPC4   **Review writing and Presentation/Seminar**

Course Outcome

Course Outcomes:

CO1 Researchers will feel confident in academic writing

CO2 Researcher will have a better understating of plagiarism and copyright related issues

CO3 Students would gain knowledge of research subject

CO4 It will enrich the presentation skills of young researchers.

M.Mark : 100: Seminar: 50 + Review Writing : 50