

Centre for Biochemistry and Microbial Sciences

School of Basic and Applied Sciences
Central University of Punjab, Bathinda

Ph.D. Program in Biochemistry and Microbial Sciences

Semester – I						
Sr. No	Course Code	Course Title	L	T	P	Cr
All are compulsory						
1	LBC.701	Research Methodology and Biostatistics	3	1	-	4
2	LBC.702	Good Laboratory Practices	3	-	-	3
3	LBC.799	Credit Seminar	1	-	-	1
Semester – II						
Specialized Courses (Opt any four)						
1	LBC.703	Advanced Biochemistry	3		-	3
2	LBC.704	Advanced Microbiology	3		-	3
3	xxx	Opt any two courses (3-credit) from other Centers under Life Sciences	6	-	-	6
Total Sem-1			12	-	0	12

L: Lectures; T: Tutorial; P: Practical; Cr: Credits

Semester I

LBC.701: Research Methodology and Biostatistics

Part	Syllabus	Lectures
A.	General principles of research: Meaning and importance of research, Critical thinking, Formulating hypothesis and development of research plan, Review of literature, Interpretation of results and discussion. Technical writing: Scientific writing, Writing synopsis, Research paper, Poster preparation, oral presentations and Dissertations.	16
B.	General Statistics: Difference between parametric and non-parametric statistics, Univariate and multivariate analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing. Measures of central	20

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	tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and skewness.	
C.	Comparative Statistics: Comparing means of two or more groups: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Fisher's LSD (Least significant difference), Kruskal-Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks and Chi-square test.	18
D.	Regression and correlation: Standard errors of regression coefficients, Comparing two regression lines, Pearson Product - Moment Correlation Coefficient, Spearman Rank correlation coefficient, Power and sampling size in correlation and regression.	18

LBC.702: Good laboratory practices

Part	Syllabus	Lectures
A.	Introduction and Principals of Good Lab Practice: Good laboratory practices, Biosafety for human health and environment. Biosafety issues for using cloned genes in medicine, agriculture, industry, and ecoprotection. Biological warfare, Biological containment and physical containment, CDC Biosafety levels, Biosafety in Clinical laboratories and biohazard management, Physical, Chemical & Biological hazards.	14
B.	Bioethics and Biosafety in Molecular Biology: Gene pollution, Biological invasion, Risk and safety assessment from genetically engineered organisms, special procedures for r-DNA based products.	12
C.	Research ethics: Ethical theories, Ethical considerations during research, data manipulations, subject consent, Animal testing. Animal rights, Perspectives and methodology & Ethical issues of the human genome project	10
D.	Medical ethics: Code of Ethics in medical/clinical laboratories, healthcare rationing, ethical issues of xenotransplantation, ethics involved in embryonic and adult stem cell research, Ethics in Assisted Reproductive Technologies: animal and human cloning and <i>In-vitro</i> fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia.	14

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Semester II

LBC.703: Advanced Biochemistry

Part	Syllabus	Lectures
A.	Metabolism: Recent advances in amino acid, carbohydrate, lipid and nucleotide metabolism; Electron transport and oxidative phosphorylation	14
B.	Enzymes: Nucleases, Proteases, Lipases, and other enzymes; Role in human and plant diseases.	10
C.	Xenobiotic Metabolism: Chemical nature of xenobiotic; Transport of xenobiotic within the body; Fate of metabolism; Biotransformation; Detoxification; Examples of xenobiotic metabolism.	10
D.	Stress Biology: The stress response; Biomarkers of chronic stress and their role in diagnosis and therapy; Metabolic and neuroendocrine biomarkers; Exocytosis and ER Stress: Role of disruptive function of glycosylation/inter- and intra-molecular disulfide bond formation.	14

LBC.704: Advanced Microbiology

Part	Syllabus	Lectures
A.	Advanced Techniques to study microbial pathogenesis: Host defense mechanisms such as phagocytosis, opsonization and complement, Non specific, innate and adaptive host defenses. Genetic, bioinformatic, proteomic and systems biology approaches to study host pathogen interactions.	10
B.	Mechanism of microbial pathogenesis: Microbial colonization and adherence strategies, Microbial invasion strategies, Bacterial secretion systems, Bacterial surface structures, Antigenic variation, Biofilms and quorum sensing, modulation of apoptotic processes and microbial toxins.	14
B.	Pathogenesis of selected organisms: Spirochetes such as <i>Treponema pallidum</i> , <i>Borrelia burgdorferi</i> and <i>Borrelia hermsii</i> . Intracellular pathogens/Gram-negative bacteria: <i>Salmonella</i> and <i>Helicobacter pylori</i> . Gram-positive bacteria: <i>Staphylococcus aureus</i> , <i>Listeria monocytis</i> . Myxobacteria: <i>Mycobacterium tuberculosis</i> .	14
D.	Mechanisms of interference with pathogenesis: Mechanisms of action of antimicrobial agents and resistance; Recent advances in development antibiotics and vaccine. Human Microbiome and their role in therapeutics	10