Centre for Biochemistry and Microbial Sciences

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

Ph.D. Program in Microbial Sciences

2017-18

Semester-I

Ph.D. Program in Microbial Sciences

Sr. No	Course Code	Course Title	L	P	Cr
1	LBM.701	Research Methodology and Computer Applications	4	-	4
2	LMS.703	Advanced Microbiology	4	-	4
		Total Sem-1			**8**

L: Lectures; P: Practical; Cr: Credits

In addition to the course work, 80 research credits are required for the award of PhD degree.

Semester-I

LBM.701: Research Methodology and Computer Applications

Part	Syllabus	Lectures
1.	**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.	18
2.	**Introduction and Principles of Good Lab Practices:** Good laboratory practices, Biosafety for human health and environment. Biosafety issues for using cloned genes in medicine, agriculture, industry, and eco-protection, Biological containment and physical containment, CDC Biosafety levels, Biosafety in Clinical laboratories and biohazard management, Physical, Chemical & Biological hazards. **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, Plagiarism	18
3.	**Computer Application Software:** Spreadsheet applications, Word-processing applications, Presentation applications, Internet browsers, Reference Management, and Image processing applications. World wide web: Origin and concepts, Overview of internet and its application for quality literature collection and secondary data related to research work. Exploring various websites and search engines. Computer application to some statistical packages (Graphpad prism, SPSS etc). *In silico* approaches for drug designing.	18
4.	**Bioinformatics:** Organization, management and analysis of biological data, use of computers in data analysis, biological databases - DNA sequence databases and protein sequence databases, BLAST, FASTA, multiple sequence alignment, primers in biology (design and types of primers) genome projects (human, *Arabidopsis* and other genome projects), NCBI, UCSC and other database searches.	18

Suggested Reading:
1. Gupta, S. (2008). *Research Methodology and statistical techniques*. Deep & Deep Publications (P) Limited, New Delhi.
2. Kothari, C. R. (2014). *Research methodology (s)*. New Age International (p) Limited. New Delhi.
3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in life sciences*. Anmol Publications. New Delhi.
4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students*. Samfunds literature Publications.
5. Dharmapalan B. (2012). *Scientific Research Methodology*. Narosa Publishing
6. Norman, G. and Streiner, D. (2008). *Biostatistics:* The Bare Essentials.3/e (with SPSS). Decker Inc. USA.
7. Rao, P. P., S. Sundar and Richard, J. (2009). *Introduction to Biostatistics and Research Methods*. PHI learning.
8. Christensen, L. (2007). *Experimental Methodology*. Boston: Allyn & Bacon.

9. Fleming, D. O. and Hunt, D.L. (2006). *Biological Safety: Principles and Practices*. American Society for Microbiology, USA.
10. Rockman, H. B. (2004). *Intellectual Property Law for Engineers and Scientists*. Wiley-IEEE Press, USA.
11. Shannon, T. A. (2009). *An Introduction to Bioethics*. Paulist Press, USA.
12. Vaughn, L. (2009). *Bioethics: Principles, Issues, and Cases.* Oxford University Press, UK.

LMS.703: Advanced Microbiology

Part	Syllabus	Lectures
1.	**Advanced Techniques to Study Microbial Pathogenesis:** Host defense mechanisms such as phagocytosis, osponization and complement, Nonspecific, innate and adaptive host defenses. Genetic, bioinformatic, proteomic and systems biology approaches to study host pathogen interactions.	18
2.	**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.	18
3.	**Pathogenesis of Selected Organisms:** Spirochetes such as *Treponema pallidum*, *Borrelia burgdorferi* and *Borrelia hermsii*. Intracellular pathogens/ Gram-negative bacteria: *Salmonella* and *Helicobacter pylori*. Gram-positive bacteria: *Staphylococcus aureus*, *Listeria monocyctis*. Myxobacteria: *Mycobacterium tuberculosis*.	18
4.	**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.	18
Suggested Reading:		
Research papers and reviews published in peer-reviewed international journals in the above areas.		