ABS-836 Microbial Genomics Credit Hrs (3-0)

Educational Objectives

1.   For students with an interest in Microbial Genomics, Proteomics, Bioinformatics, and Computational Biology, it is opportunity to enhance their skills with latest knowledge and skills for their professional development. From bench to beside, the designed course will assist in acquisition of background knowledge in fields such as genomics, proteomics and bioinformatics. To understand the important biological processes (essential) and events, general methods are applied to analyse microbial genomes, annotation and comparing the data, consulting genomic databases. Reading and critical evaluation of most recent published articles and scientific literature.

2.   Research opportunities may be either *in silico* - or laboratory-oriented, the important prediction and findings through computational analysis may be verified through wet lab experimentation, thus will save much time and cost.

3.   **Course outcomes**

   a. The trained students will be able to impart the skills and knowledge into research, thesis and publications.
   b. They will be also able to generate useful genomic data from both dry and wet laboratory experiments.
   c. In the long run, more researchers will be produced in Pakistan having expertise in microbial genomics and experimentation.

4.   **Course Contents**

   a. Introduction to the Microbial Genomics
   b. Advances in sequencing technologies
   c. Genome overview and browsers

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d. Genome structure and organization

e. Genomics in communities: metagenomics

f. Exploring and extracting biological information from sequenced genomes

g. Common and specific databases

h. Web-based tools and analysis

i. File types and handling of sequence data

j. Microbial Phylogeny and Evolution

k. Genomics and evolution

l. Phylogentics trees and interpretation

m. Small subunit ribosomal RNA sequence analysis and beyond

n. Comparative Genomics of Microbial Pathogens

o. Whole genome comparisons

p. Genome rearrangement and plasticity

q. Approaches for genome comparisons and it applications

r. Genome annotation and functional categories

s. Patho-genomics

t. Pathogens behaviors and mechanism of pathogenicity

u. Horizontal gene transfer (gene gain/loss)

v. Virulence factors – toxins and pathways

w. Reverse Vaccinology

x. Vaccine development in the post-genomic era

Recommended books

1. *Computing for Comparative Microbial Genomics* by Ussery, Wassenaar & Borini (Springer) ISBN: 978-1-84800-254-8 (Print) 978-1-84800-255-5 (Online)

2. Microbial Genomes by Fraser, Claire M., Read, Timothy, Nelson, Karen E. (Eds.) Springer Science+ Business Media New York 978-1-58829-189-9