

## 3 MONTHS THERAPEUTIC PEPTIDE RESEARCH AND DEVELOPMENT PROGRAM

**TITLE:** The Use of Modern Bioinformatics Strategies for the Research and Development of Therapeutic Peptides, Targeting Emerging and Infectious Diseases.

DAYS	TOPICS
1	<ul style="list-style-type: none"> <li>• Introduction, aims, and objectives of the training and research project on therapeutic peptide design and development integrated with the practical applications of drug design and discovery in the process</li> <li>• Understanding the concept of therapeutic peptide design and development in health and the industrial sectors</li> <li>• Main research approaches involved in therapeutic peptide development</li> </ul>
2	<ul style="list-style-type: none"> <li>• Classification of therapeutic peptides (Sources, Activity-based functionality and therapeutic target, Structure, and Amino acid richness)</li> <li>• The use and application of genomics techniques in the discovery of novel peptides for therapeutic research and development</li> </ul> <p><b>Search for subject-related research articles, study them, and pick a research area of interest for your project</b></p>
3	<p style="text-align: center;"><b>PRACTICAL CLASSES PHASE</b></p> <p><b>1:</b></p> <ul style="list-style-type: none"> <li>• The use of critical thinking to identify biological research problems relating to your research interest for the project</li> <li>• The designing of therapeutic research project workflow and execution according to your area of research interest</li> </ul>
4	<ul style="list-style-type: none"> <li>• Peptide Sources: Microbial and Plants</li> <li>• Practical genomics techniques in the discovery of novel peptides <ul style="list-style-type: none"> <li>○ Accessing and raw sample data</li> <li>○ Raw reads processing and genome assembly</li> <li>○ Genome annotation and drug target identification</li> </ul> </li> </ul> <p><b>Creating a table for the collected samples used and Writing Introduction</b></p>
5	<p><b>PHASE 2:</b></p> <ul style="list-style-type: none"> <li>• Introduction to peptide databases, their pipeline tools, and specialization</li> <li>• Sequence-based peptide design tools and other useful resources to utilize</li> </ul>
6	<ul style="list-style-type: none"> <li>• Prediction and extraction of the peptide/protein from databanks or sequence samples using the peptide tools/pipelines <ul style="list-style-type: none"> <li>✦ The use of the Macrel pipeline tool from microbial sources</li> </ul> </li> </ul> <p><b>Creating a table for the predicted therapeutic proteins and their sources</b></p>
8	<ul style="list-style-type: none"> <li>✦ The use of web servers and machine learning models</li> </ul>
9	<p>The design and construction of classified novel therapeutic peptides for targeted therapeutic approaches</p> <ul style="list-style-type: none"> <li>• Anti-bacteria</li> <li>• Anti-Viral</li> <li>• Anti-cancer</li> </ul>

10	<ul style="list-style-type: none"> <li>• Anti Fungi</li> <li>• Anti-parasite</li> <li>• Plant-based</li> <li>• Functional target-based peptides and others</li> </ul> <p><b>Table of all predicted therapeutic peptides discovered and writing of research methodology</b></p>
11	<ul style="list-style-type: none"> <li>• <b>Phytochemical properties of designed therapeutic Peptides</b></li> </ul> <p><b>Selecting the most potential peptides based on the results and creating table for it</b></p>
12	<p><b>PHASE 3 (In silico prediction of structure &amp; function of the peptide:</b></p> <ul style="list-style-type: none"> <li>• Molecular formula</li> <li>• Experimental Verification of peptide using BLAST</li> <li>• Predicting the half-life of the peptides</li> <li>• Predicted peptide toxicity</li> <li>• Cell penetration and others</li> </ul> <p><b>Results per potential peptides selected</b></p>
13	<ul style="list-style-type: none"> <li>• Peptide structure (Secondary Structure, 3D)</li> <li>• Function prediction</li> </ul>
14	<p>Introduction to Drug Design and Discovery The Application of drug design and discovering therapeutic peptide    Molecular Docking</p> <p><b>Results writing for research paper</b></p>
15	<p>Introduction to the needed tools Drug target identification and retrieval Ligand selection of leads hits, and retrieval</p> <p><b>Table for Selected Drug Targets to be used in the research</b></p>
16	<p>Pharmacokinetics analysis and Lipinski rule of 5 Exploring software used for docking, their peculiarities, similarities, and differences</p>
17	<p>Protein preparation and ligand preparation process Exploring docking types based on protein structure: rigid-rigid, rigid-flexible, protein-ligand, protein-protein, protein-DNA</p>
18	<p>Docking analysis using different software like Pymol, Ds visualizer etc. Evaluation of Results</p> <p><b>Results from Molecular Docking</b></p>
19	<p>Evaluation and Research paper writing</p>
20	<p>Research paper writing and conclusion.</p>
	<ul style="list-style-type: none"> <li>• <b>1 MORE MONTHS TO FINISH PAPER, CORRECTION AND READY FOR PUBLICATION</b></li> </ul>