

**MMB Sem 2**

<b>Semester: 2</b>				
<b>Course : Molecular Medical Microbiology</b>				
<b>Paper Title:</b> Bioinformatics and Automation in a Molecular Microbiology lab				
<b>Paper code:</b> DMMB5202				<b>Credits:</b>
<b>Hours/week : 4</b>				
<b>Category: Core/MDC/SEC/VAC : Core</b>				
<b>Theory / Practical / Composite : Theory</b>				
<b>No of Modules : 2</b>				
<p><b>Course Overview:</b> The present course deals with the application of molecular tools in the diagnosis of different pathogens present in patient samples. It deals with the automation tools helping in the elucidation of different pathological samples as bacteria, virus, etc. The use of modern tools as bioinformatics help in the further analysis of human biological sample and in the development of vaccines against the various human pathogens.</p>				
<b>Course Outcome:</b>				
1. <b>Remember:</b> To learn and remember the basic fundamentals of bioinformatics tools and different molecular tools used in medical microbiology. To understand principles and application of informatics in Medical Microbiology				
2. <b>Understand:</b> To understand principles and application of informatics in Medical Microbiology.				
3. <b>Apply:</b> The bioinformatics tools used for identification, characterization and analysis of human pathogens.				
4. <b>Analyze:</b> to study, analyze and provide the different molecular and bioinformatics tools used for analysis of human pathogens, drug designing and for characterization of pathogens.				
5. <b>Evaluate:</b> Evaluate the field of informatics and bioinformatics field with a multidisciplinary approach.				
6. <b>Create:</b> Apply the bioinformatics and informatics method to produce a translational approach to the field.				
<b>Prerequisites: Basic knowledge about any prior course</b>				
<b>SYLLABUS</b>				
<b>UNIT/Module</b>	<b>CONTENT</b>	<b>HOURS or NUMBER OF CLASSES</b>	<b>CO Mapping</b>	<b>COGNITIVE LEVEL</b>
I.	<p><b>Basics of Bioinformatics</b></p> <ul style="list-style-type: none"> <li>○ Application of bio-informatics in whole genome sequencing</li> </ul>	20	CO1, CO3, CO4, CO5	K1, K3, K4, K5

	<ul style="list-style-type: none"> <li>○ Application of bio-informatics in microbiome analysis</li> </ul>			
II.	<p><b>Informatics and Automation in a Molecular Microbiology lab</b></p> <p>Informatics and Automation in a molecular Microbiology lab</p> <ul style="list-style-type: none"> <li>○ LIS: Laboratory Information System</li> <li>○ HIS: Hospital information System</li> <li>○ Laboratory Informatics</li> <li>○ Data protection, Data security, data storage,</li> </ul> <p>Classification of data</p> <p>Automations in bacteriology, Serology, Virology</p>	20	CO1, CO2, CO3, CO4, CO6	K1, K2, K3, K4, K6
III.				
IV.				
V.				
VI.				
VII.				
VIII.				
<b>Text Books</b>				
<ol style="list-style-type: none"> <li>1. Bioinformatics-a Practical Guide to the analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellette, B.F., Wiley India Pvt Ltd 2009</li> <li>2. Essential Bioinformatics by Jin xiong., Cambridge University press, New York 2006</li> <li>3. Bioinformatics: Sequence and Genome analysis by Mount D; Cold Spring Harbor Lb. Press New York 2004</li> <li>4. Introduction to Bioinformatics by Teresa K Attwood, David J Parry Smith Pearson Education 1999</li> </ol>				
<b>Suggested readings</b>				

5. Bansal AK. Bioinformatics in microbial biotechnology--a mini review. Microb Cell Fact. 2005 Jun 28;4:19. doi: 10.1186/1475-2859-4-19. PMID: 15985162; PMCID: PMC1182391.

6. Rhoads DD, Sintchenko V, Rauch CA, Pantanowitz L. Clinical microbiology informatics. Clin Microbiol Rev. 2014 Oct;27(4):1025-47. doi: 10.1128/CMR.00049-14. PMID: 25278581; PMCID: PMC4187636.

7. Greub G, et al A; ESGMD Study Group. Clinical bioinformatics for microbial genomics and metagenomics: an ESCMID Postgraduate Technical Workshop. Microbes Infect. 2020 Nov-Dec;22(10):626-634. doi: 10.1016/j.micinf.2020.07.008. Epub 2020 Aug 22. PMID: 32841729.

**Web Resources**

- 1.
- 2.
- 3.
- 4.

**Evaluation Theory CA:** CIA: 20 Marks: (Each module: 10 marks) End semester Exam: 80 Marks (Each module: 40 marks)

**Paper Structure for Theory Semester Exam Module :** End semester Exam: 80 Marks Two Modules: 40 marks each

Question Pattern:Each Module: MCQ-20 marks (2 marksX10 questions to be attempted out of 12 questions given)(5 marks X 4 Questions to be attempted out of 6 questions given)

### Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	<b>Remember:</b> To learn and remember the basic fundamentals of bioinformatics tools and different molecular tools used in medical microbiology. To understand principles and application of informatics in Medical Microbiology	K1
CO2	<b>Understand:</b> To understand principles and application of informatics in Medical Microbiology.	K2
CO3	<b>Apply:</b> The bioinformatics tools used for identification, characterization and analysis of human pathogens.	K3
CO4	<b>Analyze:</b> to study, analyze and provide the different molecular and bioinformatics tools used for analysis of	K4

	human pathogens, drug designing and for characterization of pathogens.	
<b>CO5</b>	<b>Evaluate:</b> Evaluate the field of informatics and bioinformatics field with a multidisciplinary approach.	K5
<b>CO6</b>	<b>Create:</b> Apply the bioinformatics and informatics method to produce a translational approach to the field.	K6