

### Syllabus template

<b>Semester:</b>	5			
<b>Course :</b>	Major			
<b>Paper Title:</b>	Immunology, Industrial and Molecular Microbiology			
<b>Paper code:</b>	C3MB230541P			<b>Credits: 4</b>
<b>Hours/week :</b>	4			
<b>Category: Core/MDC/SEC/VAC :</b>	Core			
<b>Theory / Practical / Composite :</b>	Practical (non composite)			
<b>No of Modules :</b>	No			
<b>Course Overview:</b> This practical paper aims to provide basic informations on antigens and antibodies through precipitation, agglutination reactions initially. Then moves to advanced antigen-antibody reactions like ELISA, Western blot, IgG separation etc. Students gain an overall experience in immunotechniques at the end of the course.				
<b>Course Outcome:</b>				
1. Understanding- To be acquainted with the methods of transformation, conjugation, mutation and immunological techniques				
2. Remembering- To study about a typical fermenter; To produce (lab scale) some fermented products.				
3. Analyzing-To perform simple experiments on transformation, conjugation, mutations on bacteria and study its effects. Analysis of results obtained in ELISA and other immunological experiments				
4. Application: Educational industry visit.				
<b>Prerequisites: <i>Basic knowledge about any prior course</i></b>				
<b>SYLLABUS</b>				
<b>UNIT/ Module</b>	<b>CONTENT</b>	<b>HOURS or NUMBER OF CLASSES</b>	<b>CO Ma ppi ng</b>	<b>COGNIT IVE LEVEL</b>
I.	Plaque Assay	4	CO1 , CO3	K1, K3
II.	Bacterial Transformation	4	CO1 , CO3	K1, K3
III.	Bacterial Conjugation	4	CO1 , CO3	K1, K3
IV.	Study of bacterial growth after ultraviolet ray treatment as physical mutagen.	4	CO1 , CO3	K1, K3
V.	Study of different parts of fermenter.	4	CO1 , CO2	K1, K2
VI.	Microbial fermentations for the production and estimation of: (a)	12	CO1 ,	K1, K2, K3

	Enzymes: Amylase and Protease (b) Organic acid: Citric acid (c) Alcohol: Ethanol/Wine		CO2 CO3	
VII.	Immobilization using Sodium alginate.	4	CO1 , CO3	K1, K3
VIII.	A visit to any educational institute/industry to see an industrial fermenter, and other downstream processing operations.	8	CO4	K4
IX.	immunodiffusion by Ouchterlony Double diffusion method.	4	CO1 , CO3	K1, K3
X.	Recognition of immunodiffusion patterns.	4	CO1 , CO3	K1, K3
XI.	Identification of human blood groups.	4	CO1 , CO3	K1, K3
XII.	Perform immunoelectrophoresis	4	CO1 , CO3	K1, K3
XIII.	Perform sandwich ELISA.	8	CO1 , CO3	K1, K3
XIV.	Separation of IgG by column chromatography	4	CO1 , CO3	K1, K3
XV.	Detection of viral fever by slide agglutination tests	4	CO1 , CO3	K1, K3
<b>Text Books</b>				
1. Practical manual of Modern Microbiology; Mitra A K & Sarkar K. Himalaya Publishing house Pvt. Ltd				
2.				
3.				
<b>Suggested readings</b>				
1. Manuals provided in kit				
2. Write ups supplied in lab				
3.				
<b>Web Resources</b>				
1. <a href="#">SWAYAM course on Industrial Microbiology and Immunology   SWAYAM</a>				
<b>Evaluation Practical (if applicable) CA: 80; Semester Exam: 15+ 5 (attendance)</b>				
<b>Paper Structure for Theory Semester Exam Module :</b>				

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

<b>COs</b>	<b>CO Description</b>	<b>Cognitive levels</b>
<b>CO1</b>	Understanding- To be acquainted with the methods of transformation, conjugation, mutation and immunological techniques	K1
<b>CO2</b>	Remembering- To study about a typical fermenter; To produce (lab scale) some fermented products.	K2
<b>CO3</b>	Analyzing-To perform simple experiments on transformation, conjugation, mutations on bacteria and study its effects. Analysis of results obtained in ELISA and other immunological experiments	K3
<b>CO4</b>	Application: Educational industry visit.	K4