

**Course Syllabus**  
**MBMB 652 Vaccine Design**  
**Academic Year 2025**

**Course ID and Title:** MBMB 652 Vaccine Design

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**Credits:** 1 (X-X-X)

**Curriculum:** Master of Science Program in Molecular and Integrative Biosciences (Elective course)  
Doctor of Philosophy Program in Molecular and Integrative Biosciences (Elective course)

**Semester:** 2<sup>nd</sup> Semester

**Pre-Requisites:**

None.

**Course Learning Outcomes (CLOs):**

By the end of the course, student should be able to:

1. Describe the different types of vaccine and understand the mechanism of vaccine to stimulate the protective immune response.
2. Apply the knowledge to design the appropriate vaccine antigen to provide a solution for any problem/question.
3. Deliver creative idea(s) to design vaccine with appropriate ICT skills.
4. Demonstrate scientific integrity, responsibility, and safety practices.
5. Demonstrate professional and interpersonal skills.

**Alignment of Teaching and Assessment Methods to Course Learning Outcomes:**

Course Learning Outcomes	Teaching Method	Assessment Method
1. Describe the different types of vaccine and understand the mechanism of vaccine to stimulate the protective immune response	<ol style="list-style-type: none"> <li>1. Lecture</li> <li>2. Discussion</li> <li>3. Hand on practice</li> </ol>	<ol style="list-style-type: none"> <li>1. Pre- and post-test</li> <li>2. Q&amp;A during lecture</li> <li>3. Discussion performance</li> <li>4. Assignment</li> <li>5. Lab performance</li> </ol>
2. Apply the knowledge to design the appropriate vaccine antigen to provide a solution for any problem/question.	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Problem-based learning</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion performance</li> <li>2. Problem-based learning (scientific content and inventive idea)</li> </ol>
3. Deliver creative idea(s) to design vaccine with appropriate ICT skills.	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Writing lab report</li> <li>3. Problem-based learning</li> <li>4. Hand on practice</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion performance</li> <li>2. Lab report writing performance using appropriate ICT tools</li> <li>3. Problem-based learning</li> </ol>
4. Demonstrate scientific integrity, responsibility and safety practice	<ol style="list-style-type: none"> <li>1. Discussion (about scientific integrity, responsibility)</li> <li>2. Assignment</li> <li>3. Writing lab report</li> </ol>	<ol style="list-style-type: none"> <li>1. Attendance (presence, absence, on-time?)</li> <li>2. Task submission (on-time?)</li> <li>3. Lab report writing (plagiarism?)</li> </ol>

Course Learning Outcomes	Teaching Method	Assessment Method
	4. Hands-on lab safety practice	4. Lab performance (follow safety practice?)
5. Demonstrate professional and interpersonal skills.	1. Discussion 2. Writing lab report 3. Individual or group assignment/presentation 4. Problem-based learning	1. Discussion performance (active participation?) 2. Lab report writing performance 3. Performance in the team (teamwork or leadership skills)

**Course Description:**

Introduction of vaccine: type and concept of vaccination, fundamental of vaccine immunology, approaches and techniques for testing the Immunogenicity of vaccine, immunoassay, live attenuated and inactivated vaccine design, viral vector and nucleic acid based vaccine design, structure-based Vaccine design, bioinformatics approaches for vaccine antigen design

(Classroom **XXX** and Lab Classroom **XXX**)

Date	Time	Activities	Description	No. of hr	Lecturer	Class activity/teaching media
Mon, XX XXX 20XX	10:00 – 12:00	Introduction of vaccine: type and concept of vaccination	To understand the concept of vaccination, and type of vaccine; and available vaccines for infectious diseases	2	PM	Lecture/Class discussion
Wed, XX XXX 20XX	10:00 – 12:00	Fundamental of vaccine immunology (I)	To understand how vaccine works to stimulate immune response and prevent subsequent pathogen infection.	2	AK	Lecture/Class discussion

Date	Time	Activities	Description	No. of hr	Lecturer	Class activity/teaching media
Fri, XX XXX 20XX	10:00 – 12:00	Fundamental of vaccine immunology (II)	To understand how vaccine works to stimulate immune response and prevent subsequent pathogen infection.	2	AK	Lecture/Class discussion
Mon, XX XXX 20XX	10:00 – 11:00	Approaches and techniques for testing the Immunogenicity of vaccine	To understand the techniques for testing the Immunogenicity	1	PM	Lecture/Class discussion
Wed, XX XXX 20XX	11:00 - 12:00 – 13:00- 14:00	Immunoassay/ (Neutralization test)	To demonstrate the technique for testing the immunogenicity and discuss about the experimental design for testing the immunogenicity	2	PM, AK	Demonstration/ Hand on Practice
Fri, XX XXX 20XX	10:00 – 11:00	Live attenuated and inactivated vaccine design	To understand the concept and approach to design the live attenuated and inactivated vaccine against the target pathogen	1	PM	Lecture/Class discussion
	11:00- 12:00	Recombinant, Subunit, VLP vaccine design	To understand the concept and approach to design the recombinant vaccine	1	PM	Lecture/Class discussion
Mon, XX XXX 20XX	10:00 – 12:00	Viral vector and nucleic acid based vaccine design	To understand the concept and approach to design the nucleic acid based vaccine against the target pathogen.	2	PM	Lecture/Class discussion

Date	Time	Activities	Description	No. of hr	Lecturer	Class activity/teaching media
Wed, XX XXX 20XX	10:00 – 12:00	Structure-based Vaccine design	To understand the concept and approach to design the surfaces on immunogens against the target pathogen.	1	IM	Lecture/Class discussion
Fri, XX XXX 20XX	10.00 – 12.00	Bioinformatics approaches for vaccine antigen design	To use the bioinformatics tools for visualizing and antigen design and discussion about using the bioinformatics tool for design the vaccine	2	IM, PM	Demonstration/ Hand on Practice
Mon, XX XXX 20XX	9:00- 12:00	Research highlight Student's reflection	To assess student performance and provide feedback on the selected research article. To provide students opportunities to describe their learning experiences received from this course and how it can be applied to their future learning.	3	All staffs	Presentation discussion and assignment

**Assessment Criteria:**

Assessment Criteria	Description (in Details)	Scoring Rubric
1 Class Attendance (5%)	Showing up in the class (5%)	<ul style="list-style-type: none"> <li>• Full attendance (4)</li> <li>• ~ 80% attendance (3)</li> <li>• ~ 60% attendance (2)</li> </ul>

Assessment Criteria	Description (in Details)	Scoring Rubric
		<ul style="list-style-type: none"> <li>• &lt; 50% attendance (1)</li> </ul>
2	<b>Lab Report (25%)</b>	<ul style="list-style-type: none"> <li>• Complete (4)</li> <li>• ~ 80% complete (3)</li> <li>• ~ 60% complete (2)</li> <li>• &lt; 50% complete (1)</li> </ul>
	Data presentation (5%)	<ul style="list-style-type: none"> <li>• Complete (4)</li> <li>• ~ 80% complete (3)</li> <li>• ~ 60% complete (2)</li> <li>• &lt; 50% complete (1)</li> </ul>
	Data analysis and interpretation (5%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
	English and writing skills (5%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
	Report format and typing errors (2%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
	On-time submission (3%)	<ul style="list-style-type: none"> <li>• On-time (4)</li> <li>• Late (2-3)</li> <li>• Very late (1)</li> </ul>
	3	<b>Quiz / Exercise (10%)</b>

Assessment Criteria		Description (in Details)	Scoring Rubric
4	Discussion Performance (20%)	Participation and performance (5%)	<ul style="list-style-type: none"> <li>• Active (4)</li> <li>• Fairly active (2-3)</li> <li>• Inactive (1)</li> </ul>
		Professional and interpersonal skills (responsibility, teamwork, and leadership) (5%)	<ul style="list-style-type: none"> <li>• Active (4)</li> <li>• Fairly active (2-3)</li> <li>• Inactive (1)</li> </ul>
		Creative and high-order thinking skills (10%)	<ul style="list-style-type: none"> <li>• Highly expressed (4)</li> <li>• Fairly expressed (2-3)</li> <li>• Not shown (1)</li> </ul>
5	Reflection (10%)	Knowledge sharing (2.5%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
		Inventive and creative thinking skills (2.5%)	<ul style="list-style-type: none"> <li>• Highly expressed (4)</li> <li>• Fairly expressed (2-3)</li> <li>• Not shown (1)</li> </ul>
		Communication skills (2.5%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
		Professional and interpersonal skills (responsibility, teamwork, and leadership) (2.5%)	<ul style="list-style-type: none"> <li>• Active (4)</li> <li>• Fairly active (2-3)</li> <li>• Inactive (1)</li> </ul>
6	Lab Performance (30%)	Safety practice (5%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> </ul>

Assessment Criteria	Description (in Details)	Scoring Rubric
		<ul style="list-style-type: none"> <li>• Not solid (1)</li> </ul>
	Responsibility (5%)	<ul style="list-style-type: none"> <li>• Highly expressed (4)</li> <li>• Fairly expressed (2-3)</li> <li>• Not shown (1)</li> </ul>
	Lab skills (10%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>
	Decision making and trouble-shooting skills (10%)	<ul style="list-style-type: none"> <li>• Excellent (4)</li> <li>• Good (3)</li> <li>• Fair (2)</li> <li>• Need to be improved (1)</li> </ul>

Student’s achievement will be graded using symbols: A, B+, B, C+, C, D+, D and F, based on the criteria as follows:

Percentage	Grade	Description
80–100	A	Excellent
75–79	B+	Very Good
70–74	B	Good
65–69	C+	Fairly Good
60–64	C	Fair
55–59	D+	Poor
50–54	D	Very Poor
0–49	F	Fail



Date of Revision: 31 Jan 2024