

## SUBJECT OUTLINE DETAILS

### 1. Subject: General Virology (Virus học đại cương)

- Code: MM413C
- Credits: 02
- Hours: 22 theory hours, 08 report, 10 self study.

### 2. Management Unit:

- Department: Molecular Biotechnology
- Institute: Biotechnology Research and Development Institute

**3. Prerequisites:** CS302 Basic Biotechnology, CS102 Molecular biology, CS112 Introductory microbiology.

### 4. Subject objectives:

#### 4.1 Knowledge:

4.1.1 Mastering knowledge of the structure, classification of viruses and methods used in virology.

4.1.2 Understanding the molecular biology mechanisms of the infection, growth and transmission modes of different virus groups in order to know the general principle for virus control.

#### 4.2 Skills:

- 4.2.1 Training voluntarily and self-study ability.
- 4.2.2 Improving the skills of teamwork, searching document.
- 4.2.3 Training presentation skills.

#### 4.3 Attitude:

- 4.3.1 Participate fully in the class, on time provisions.
- 4.3.2 Having self-discipline in learning.
- 4.3.3 Active in discussions, comments.
- 4.3.4 Honesty in examination.

### 5. Brief description of subject content:

An overview of the virus, the historical development, structure and classification of viruses. Integration modes of each virus group with particular hosts. The transmission path of different virus group into their host. Mechanism of replication, transcription, translation of the virus groups. Mechanism of virion maturing and exit from host cell of different virus groups.

## 6. Subject content structure:

	<b>Content</b>	<b>Hours</b>	<b>Objectives</b>
<b>Chapter 1</b>	<b>Viruses and their importance</b>	<b>02</b>	
1.1	Viruses are ubiquitous on Earth		Discussion of viruse present in nature environment
1.2	Reasons for studying viruses		Discuss reasons for studying viruses.
1.3	The nature of viruses		Identify how viruses different from other organisms.
<b>Chapter 2</b>	<b>Methods used in virology</b>	<b>04</b>	
2.1	Cultivation of viruses		Outline methods for cultivation of viruses
2.2	Isolation of viruses		Outline methods for purification of viruses.
2.3	Centrifugation		The method supporting for purification and detection of viruses.
2.4	Structural investigations of cells and virions		Outline methods for detection of viruses and their components.
2.5	Electrophoretic techniques; Detection of viruses and virus components; Infectivity assays		Outline methods for Virus investigation; assay of virus infectivity; detection of viruses and their components.
2.6	Virus genetic		Outline methods for investigation of virus genome function. Assess the value of virus genome sequencing.
<b>Chapter 3</b>	<b>Virus structure</b>	<b>02</b>	
3.1	Introduction to virus structure		Describe the components of virions.
3.2	Virus genomes		Illustrate the variety of virus genome.
3.3	Virus proteins		Outline the function of virus structural and non-structural proteins.
3.4	Capsids		Define the terms “helical symmetry” and “icosahedral symmetry”.
3.5	Virion membranes		Describe the virions of a selection of naked and enveloped viruses.
3.6	Occlusion bodies		Occlusion bodies definition, structure and function.
3.7	Other virion components		Describe the other components within Virus virion.

<b>Chapter 4</b>	<b>Virus transmission</b>	<b>02</b>	
4.1	Introduction		Discuss the general principle of Virus transmission.
4.2	Transmission of plant viruses		Describe the transmission modes of plant viruses.
4.3	Transmission of vertebrate viruses		Describe the transmission modes of vertebrate viruses.
4.4	Transmission of invertebrate viruses		Describe the transmission modes of invertebrate viruses.
4.5	Permissive cells		Describe the required characteristics of a virus host cell.
<b>Chapter 5</b>	<b>Attachment and entry of viruses into cells</b>	<b>02</b>	
5.1	Overview of virus replication		Outline of generalized scheme of virus growth (seven steps).
5.2	Attachment and entry of animal viruses		Describe how animal viruses attach to and enter their host cells. Differentiate between the entry mechanisms of naked and enveloped animal viruses
5.3	Attachment and entry of bacteriophages		Outline the infection mechanisms of bacterial viruses (phages)

<b>Chapter 6.</b>	<b>Transcription, translation and transport</b>	<b>04</b>	
6.1	Introduction		Definition the keywords related to transcription, translation and transport mechanism of virus within the host cells.
6.2	Transcription of virus genomes		Analysis of the general transcription mechanism of different virus groups.
6.3	Transcription in eukaryotes		Detailed analysis the transcription mechanism of vius genes in eukaryotic hosts.
6.4	Translation in eukaryotes		Detailed analysis the translation mechanism of vius genes in eukaryotic hosts.
6.5	Transcription and translation in bacteria		Detailed analysis the transcription and translation mechanisms of vius genes in bacteria.
<b>Chapter 7.</b>	<b>Virus Genome Replication</b>	<b>03</b>	
7.1	Overview of virus genome replication		General principle of virus genome replication.
7.2	Location of virus genome replication in eukaryote cells		Describe how virus genome replicated in eukaryotic host cells.
7.3	Initiation of virus genome replication		The roles of virus and host protein in virus genome replication.
7.4	Polymerase		Structure and role of the enzyme polmerase.
7.5	DNA genome replication		Outline the replication mechanisms of virus DNAs.
7.6	RNA genome replication		Outline the replication mechanisms of virus RNAs.
7.7	Reverse transcription		Explain the mechanism and the term “ reverse transcription”.
<b>Chapter 8.</b>	<b>Assembly and exit of virions from cells</b>	<b>02</b>	
8.1	Introduction		Describe the assembly mechanism for nucleocapsids having (a) helical symmetry (b) icosahedral symmetry.
8.2	Nucleocapsid assembly		Explain the roles played by

			membrane/matrix proteins in the Nucleocapsid assembly.
8.3	Formation of virion membranes		Discuss the origins of internal virion membranes and virion envelopes
8.4	Virion exit from the infected cell		Describe mechanisms used by viruses to exit from cells
<b>Chapter 9</b>	<b>Classification and nomenclature of viruses</b>	<b>01</b>	
9.1	History of virus classification and nomenclature		Evaluate the traditional criteria used to classify viruses
9.2	Modern virus classification and nomenclature		Write family and genus names in the correct format. Explain how genome sequence data are used to classify viruses; Evaluate phylogenetic trees.
9.3	Baltimore classification of viruses		Explain the basic of the Baltimore classification of viruses.

### 7. Teaching Method:

- Communication through the lecture files, supplemented with many images, video, ..to help students absorb the lecture more effectively.
- Rising questions related to student discussion
- Consolidating knowledge for students after the end of the lecture, explained soon questions in class.
- Distribution of study groups, assignments, thematic reports, promote teamwork, improve information search skills, more information beyond lectures.
- Test and examination as prescribed.

### 8. Duties of student:

Students have to do the following duties:

- Attend at least 80% of theoretical classes on time provisions.
- Perform a full range of group exercise, the thematic reports are delivered.
- Participate group assignment.
- Attend final exam.
- Proactively implementing self-study.
- Seriously and honestly in the learning process, testing and implementation

### 9. Assessment of student learning outcomes:

#### 9.1. Assessment

Students are assessed as follows:

	Point components	Rules and Requirement	Weights	Objectives
1	Overall attendance	Details of attendance number / total	10%	4.3

		number of classes		
2	Group assignments	- Report / overs / ... - Grouped confirmed participation	30%	4.24, 4.2.5, 4.2.6
3	End module scores	- Quizzes (60 minutes) - Participate fully 80% more theoretical - Required contest	60%	4.1, 4.3

## 9.2. Grading

- Grading components and final test scores will be marked on a scale of 10 (0 to 10), rounded to one decimal place.
- Subject score is the sum of all the components of the evaluation multiplied by the corresponding weight. The subject score is marked on a scale of 10 and rounded to one decimal place, then is converted to A-B-C-D score and score on a scale of 4 under the academic provisions of the University.

## 10. Materials:

Material information	Code number
[1] John B. Carter and Venetia A. Saunders, 2007 Virology principles and applications. School of Biomolecular Sciences, Liverpool John Moores University, UK	Sending PDF file to students by lecturer
[2] Pham Van Ty, Nguyen Lan Dung, 2006 Viruses Syllabus.	

## 11. Self-study Guide:

Week	Content	Theory (hours)	Practice (hours)	Students' duties
1	<b>Chapter 1: The Virus and the importance</b> 1.1. Viruses anywhere on Earth 1.2. Reasons for research 1.3. The nature of the virus	2	0	- Prepare: + Document [1]: item content from 1.1 to 1.3, Chapter 1
2	<b>Chapter 2: Methods used in virology</b> 2.1. Cultivation of viruses 2.2. Isolation of viruses 2.3. Centrifugation	2	0	Prepare : + Document [1]: the content from section 2.1 to 2.3, Chapter 2. + Review the learned content. + Look up content on virus isolation method

3	<p><b>Chapter 2: Methods used in virology</b></p> <p>2.4. Structural investigations of cells and virions</p> <p>2.5. Electrophoretic techniques; Detection of viruses and virus components; Infectivity assays</p> <p>2.6. Virus genetic</p>	2	0	<p>Prepare :</p> <p>+ Document [1]: the content from section 2.4 to 2.6, Chapter 2.</p> <p>+ Review the learned content.</p> <p>+ Look up technical content of Electrophoretic techniques</p>
4	<p><b>Chapter 3: Virus Structure</b></p> <p>3.1. Introduction of virus structure</p> <p>3.2. genome</p> <p>3.3. protein</p> <p>3.4. Capsids</p> <p>3.5. membranes</p> <p>3.6. Occlusion bodies</p> <p>3.7. Other virion components</p>	2	0	<p>- Prepare:</p> <p>+ Document [1]: the content from section 3.1 to 3.7, Chapter 3</p> <p>+ Review the learned content.</p> <p>+ Look up virus structural content.</p> <p>Working-group (according to the menu sub-headings): report of the group</p> <p>- Teamwork: discussion questions.</p>
5	<p><b>Chapter 4: Virus Transmission</b></p> <p>4.1. Introduction to virus transmission</p> <p>4.2. Transmission of plant viruses</p> <p>4.3. Transmission of vertebrate viruses</p> <p>4.4. Transmission of invertebrates viruses</p>	2	0	<p>-Prepare:</p> <p>+ Document [1]: item content from 4.1 to 4.4, Chapter 4</p> <p>+ Review the learned content.</p> <p>+ Look up content of plant viruses</p> <p>+ Look up content of animal viruses</p> <p>The documents [2]: learning viral plant and animal viruses.</p>
6	<p><b>Chapter 5: Attachment and entry of virus into the cells</b></p> <p>5.1. Overview of virus replication</p> <p>5.2. Animal Virus</p> <p>5.3. Bacteriophages</p>	2	0	<p>- Preparation:</p> <p>+ Document [1]: 5.1 to 5.3 content, Chapter 5</p> <p>+ Review the learned content.</p> <p>The documents [2]: find out information in the virus infection,</p>

<b>7</b>	<b>Chapter 6: Transcription, translation and intracellular transport</b> 6.1. Introduction 6.2. Transcription of the viral genome 6.3. Transcription in eukaryotes	2	0	- Prepare + Document [1]: content from 6.1 to 6.3, Chapter 6 + Review the learned content. + Look up the content of viral transcription.
<b>8</b>	<b>Chapter 6: Transcription, translation and transportation</b> 6.4. Translation in eukaryotes 6.5. Transcription and translation in bacteria	2	0	- Prepare + Document [1]: content 6.4 and 6.5, Chapter 6 + Review the learned content. + Look up the content of viral translation.
<b>9</b>	<b>Chapter 7: Virus Genome Replication</b> 7.1. Overview of virus genome replication 7.2. Location of virus genome replication in eukaryote cells 7.3. Initiation of genome replication	1	0	- Preparation: + Document [1]: item content from 7.1 to 7.3, Chapter 7 + Review the learned content. + Look up the contents of the elements involved in the process of viral genome replication.
<b>10</b>	<b>Chapter 7: Virus Genome Replication</b> 7.4 Polymerase 7.5. DNA replication 7.6. Double-stranded RNA replication Single-stranded RNA replication 7.7. Reverse transcription	2	0	Preparation: + Document [1]: 7.4 to 7.7 content categories, Chapter 7 + Review the learned content. + Look up content on replication principle of the virus genome.
<b>11</b>	<b>Chapter 8: Assembly and exit of virions from cells</b> 8.1. Introduction 8.2. Nucleocapsid assembly 8.3. The formation of the virion membrane 8.4. Virion release from infected cells	2	0	Preparation: + Document [1]: content 8.1 to 8.3, Chapter 8 + Review the learned content. The documents [2]: find out information in the process of reverse transcription and viral replication in host cells. + Find out information in the process of virus assembly and releasing
<b>12</b>	<b>Chapter 9: Classification and nomenclature of viruses</b> 9.1. History of classification and nomenclature of viruses	1	0	Preparation: Document [1]: 9.1 to 9.3 content categories, Chapter 9

	9.2. Modern virus classification and nomenclature 9.3. Baltimore classification system			+ Review the learned content. The documents [2]: find out information in the virus classification and nomenclature principle.
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Can Tho, 20<sup>th</sup> February 2014

**ON BEHALF OF RECTOR  
DEAN/ DIRECTOR**

**HEAD OF DEPARTMENT**