

**Course Syllabus**

# Virology

## 2022-2023

<b>College</b>	<b>Health&amp; Medical Technical College- Erbil</b>	
<b>Department</b>	<b>Medical Laboratory Techniques</b>	
<b>Module Name</b>	<b>Virology</b>	
<b>Module Code</b>	<b>VIR702</b>	
<b>Semester</b>	<b>7</b>	
<b>Credit</b>	<b>6</b>	
<b>Module type</b>	<b>Basic</b>	
<b>Weekly hours</b>		
<b>Weekly hours (Theory)</b>	<b>( 2 )hr Class</b>	<b>( 4 )hr Workload</b>
<b>Weekly hours (Practical)</b>	<b>( 2 )hr Class</b>	<b>( 4 )hr Workload</b>
<b>Lecturer (Theory)</b>	<b>Sheylan Salah Abdullah</b>	
<b>E-Mail</b>	<b>sheylan.salah@epu.edu.iq</b>	
<b>Lecturer (Practical)</b>	<b>Sheylan Salah Abdullah</b>	
<b>Email</b>	<b>sheylan.salah@epu.edu.iq</b>	

**Course Book**

Practical Topics	Weeks	Learning Outcome
<ul style="list-style-type: none"> <li>➤ <b>Lab1#:1</b> Laboratory Organization-Guidelines on Establishment of Virology Laboratory key elements of a virology laboratory- Room (space), Electricity, Water supply etc.</li> <li>➤ Biosafety, containment and biosecurity for viruses (including standard precautions, use for personal protective equipment, hospital infection control and biomedical waste management)</li> </ul>	1	<ul style="list-style-type: none"> <li>- Discussion and understand principles of the Biosafety, personal protective instruments used in virology lab.</li> </ul>
<ul style="list-style-type: none"> <li>➤ <b>Lab2 #:</b> Laboratory detection of virus (Collection and transport of samples) Specimen management- Selection of specimen, specimen collection, optimal times for collection of specimens, specimen transport and storage</li> </ul>	2	<ul style="list-style-type: none"> <li>- Discussion of the principles in virology to include specimens-disease relationship, specimen collection, stored and transported using a suitable transport medium and suitable host systems for isolation.</li> </ul>
<p><b>Lab3#: Methods of work at the laboratory of virology:</b></p> <p><b>1. Virus isolation</b></p> <ul style="list-style-type: none"> <li>➤ Knowledge in the field of tissue culture and sterile work</li> <li>➤ Principles of growing viruses in culture c) The process of isolation and adjustment of culture to the virus</li> <li>➤ Basic cell culture techniques and virus cultivation in cell culture</li> <li>➤ Virus isolation from diagnostic samples (inoculation of embryonated eggs)</li> <li>➤ Animal inoculation</li> </ul>	3	<ul style="list-style-type: none"> <li>- Understand basic methods and techniques used in virology</li> <li>- Principles and preparing media</li> <li>- Demonstration of media and solution preparation utilizing both autoclave and filtering as a means for sterilization.</li> <li>- preparation of primary cell cultures.</li> <li>- Discussion and demonstration of passing techniques employed in maintaining continuous cell cultures. This will include the preparation of equipment and supplies methods of cell cultivation, detection of contaminants, and preservation of cells by freezing.</li> <li>- Discussion of techniques employing embryonated hen's eggs and specific reference will be made to routes of information versus specific viruses.</li> <li>- Discussion and demonstration of hemagglutination and hemagglutination-inhibition assays.</li> </ul>

<p><b>Lab4#:</b></p> <ul style="list-style-type: none"> <li>➤ Identification of viral growth in culture (CPE, HA and other)</li> <li>➤ Virus-induced cytopathic effects</li> <li>➤ Staining and microscopy for viral inclusion bodies</li> <li>➤ Electron microscopy</li> </ul>	4	<ul style="list-style-type: none"> <li>- Demonstration and discussion of cell culture inoculation and viral cytopathic effects and the use of cytopathic effects for preliminary viral identification.</li> <li>- Demonstration and participation of inoculation of known viruses and studying their progressive cytopathic effect by microscopy examination of cell cultures</li> </ul>
<p><b>Lab5#:</b></p> <p><b>2. Serological methods</b></p> <p>(1) Types of antibodies examined and for what purposes</p> <p>(2) Methods of serological tests: IFA, ELISA, WB, other (NT)</p> <p>(3) Use of serological methods – when and how to use</p> <ul style="list-style-type: none"> <li>➤ Titration of viruses: Determination of viral titer</li> <li>➤ Preparation of viral stock</li> </ul>	5	<ul style="list-style-type: none"> <li>- Demonstration and discussion measuring the immune response to virus infection</li> <li>- Discussion of viral titration and identification procedures. Utilization of hemadsorption, hemadsorption–inhibition, neutralization, complement fixation, and hemagglutinationinhibition is incorporated into the discussion.</li> </ul>
<p><b>Lab6#:</b></p> <p><b>3. Molecular methods</b></p> <p>Principles of work:</p> <ul style="list-style-type: none"> <li>➤ prevention of molecular contamination</li> <li>➤ Methods of nucleic acid extraction</li> <li>➤ Methods of nucleic acid identification: PCR, RT/PCR, Real time PCR.</li> <li>➤ Quantitative PCR – viral load</li> <li>➤ Molecular characterization by restriction enzyme digest.</li> <li>➤ Molecular characterization by determination of specific sequences</li> </ul>	6	<ul style="list-style-type: none"> <li>- Test of viral components (Antigen detection)</li> </ul>

<p><b>Lab7#: Differential diagnosis of different respiratory diseases.</b></p> <ul style="list-style-type: none"> <li>➤ Sample collection</li> <li>➤ Sample processing for virus isolation</li> <li>➤ Real Time PCR for Influenza virus</li> <li>➤ Virus isolation</li> <li>➤ Haemagglutination assay (HA)</li> <li>➤ Haemagglutination inhibition assay</li> </ul>	7	<ul style="list-style-type: none"> <li>- Discussion and demonstration diagnosis of viral infections of the upper respiratory tract and d to obtain specimens for the diagnosis of viral infection of the lower respiratory tract</li> <li>- Processing of clinical specimens for virus isolation</li> <li>- Virus isolation in cell culture</li> <li>- Serological diagnosis of influenza</li> </ul>
<p><b>Lab8#: Laboratory diagnosis of Viral Exanthematous Diseases</b></p> <ol style="list-style-type: none"> <li>1. Rubella (IgG, IgM) diagnosis</li> <li>2. Measles (IgG, IgM) diagnosis</li> <li>3. Measles PCR</li> </ol>	8	<ul style="list-style-type: none"> <li>- Discussion and demonstration of direct and indirect immunofluorescence. Specific reference will be made to viral diagnosis using monoclonal Ab.</li> <li>- Residents will examine slides from direct IF for Ag detection: for example, measles, RSV parainfluenza, and an indirect immunofluorescence assay for Ab detection.</li> <li>- Diagnosis of congenital infection by Rubella, Cytomegalovirus, and Herpes simplex (TORCH).</li> </ul>
<p><b>Practical Midterm Exam</b></p>		
<p><b>Lab9#: Diagnostic methods of Viral Encephalitis (Rabies):</b></p> <ul style="list-style-type: none"> <li>➤ Virus neutralization assay for differential diagnosis of encephalitic viruses.</li> <li>➤ Genome detection-based diagnosis of encephalitic viruses.</li> <li>➤ Diagnosis of human viral encephalitis in specimens collected during acute phase of illness through detection of IgM antibodies.</li> <li>➤ Detection of viral antigen in clinical specimen using virus specific antibodies.</li> </ul>	9	<ul style="list-style-type: none"> <li>- Discussion and demonstration Laboratory diagnosis of viral encephalitic agents, basic principles, preferred methods and problems</li> </ul>

<p><b>Lab10#: Viral Hepatitis</b></p> <ul style="list-style-type: none"> <li>➤ HBV-DNA PCR</li> <li>➤ Preparation of stool suspension and HAV/HEV-RNA PCR</li> <li>➤ Real Time PCR quantitation for HBV DNA HBV/ HCV genotype analysis</li> <li>➤ HBsAg, Anti-HBsAg, HEV and HAV IgM ELISA</li> </ul>	<p>10</p>	<ul style="list-style-type: none"> <li>- Discussion and demonstration of the enzyme-linked immunosorbent assay (ELISA). Application of the assay in the detection of Anti-HCV etc...</li> </ul>
<p><b>Lab11#:</b> <b>Diagnosis and monitoring of HIV infection: Serologic and virologic tests.</b></p> <ol style="list-style-type: none"> <li>1. HIV Diagnosis</li> <li>2. HIV subtyping</li> <li>3. CD4, CD8 counts</li> </ol>	<p>11</p>	<ul style="list-style-type: none"> <li>- Discussion and demonstration laboratory diagnosis of HIV infection, HIV isolation, characterization and viral estimation.</li> <li>- Diagnosis by ELISA: Discussion and demonstration of the enzyme-linked immunosorbent assay (ELISA). Anti-HIV – 1, anti-HIV – 2.</li> </ul>
<p><b>Lab12#:</b> <b>laboratory diagnosis of rotavirus infections</b></p> <ul style="list-style-type: none"> <li>➤ Hospital visit- enrollment of acute gastroenteritis patients, recording of clinical information, collection of stool samples, determination of severity of Acute Diarrheal Disease.</li> <li>➤ Sample preparation and ELISA for detection of Group A Rotaviruses</li> <li>➤ RNA extraction by Trizol method</li> <li>➤ Nested RT-PCR for detection of Enteroviruses from clinical samples/ isolates.</li> </ul>	<p>12</p>	<ul style="list-style-type: none"> <li>- Discussion and demonstration clinical samples required, choice of laboratory diagnostic tests and their interpretation for differential diagnosis.</li> <li>- Diagnosis by ELISA: Discussion and demonstration of the enzyme-linked immunosorbent assay (ELISA) Rotavirus</li> </ul>

**Lab13, 14& 15 #**

- Viral case study
- e.g.:
  
- Monoclonal antibodies against complement receptor CD21 on the surface of B-lymphocytes could prevent infection with which of the following viruses?
  - A. Parvovirus B19
  - B. Human immunodeficiency virus
  - C. Epstein-Barr virus
  - D. Cytomegalovirus
  - E. Adenovirus

**Explanation:**

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- A 23-year-old pregnant woman is found to have chronic viral hepatitis B on liver biopsy. The presence of which of the following serologic markers is most likely to increase the risk of vertical transmission of the virus?
  - A. HBcAg
  - B. HBsAg
  - C. HBeAg
  - D. Anti- HBcAg IgG
  - E. Anti- HBeAg IgM
  - F. Anti-HBsAg IgG

**Explanation:**

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13,14  
& 15

Case Studies For the case study assignments, students will work in groups, and each group is assigned the same case study. Everyone in the group needs to participate and students that do not contribute to their group will not receive credit for that assignment. The same guidelines for discussion also apply to participation with the case studies

**Assessment scheme:**

Assessment task (e.g., essay, test, group project, examination, etc.) Your grade will be based on the following:

<b>Year Works</b>	<b>Details</b>	<b>Work load</b>	<b>Degree</b>	<b>Total</b>
<b>Midterm Examinations</b>	Theoretical	1	10	<b>60%</b>
	Practical	1	15	
<b>Activities</b>	Homework	2	5	
	Seminar	1	10	
	Report	1	10	
	Essay	1	10	
	Quiz	2	8	
	Class Activity (Attendance)	1	2	
	Lab Report	1	10	
<b>Final Examinations</b>	Theoretical		20	
	Practical		20	
<b>Total</b>			<b>100</b>	

**Course Reading List and References:**

- Collier, L., Kellam, P., and Oxford J. (2011). Human Virology. Fourth Edition. Oxford University Press, U.K.
- Principles of Virology” Flint S.J., Enquist L.W., Racaniello V.R., Skalka A.M. 2008, 3rd edition, ASM Press.
- “Basic Virology” Edward K. Wagner, Martínez J. Hewlett, David C. Bloom, David Camerini. 2007, 3rd edition, Wiley-Blackwell. “Introduction to Modern Virology” N.J. Dimmock, A.J. Easton, K.N. Leppard. 2007, 6th edition, Wiley-Blackwell.
- “Janeway’s Immunobiology” K. Murphy, P. Travers, M. Walport. 2011, 8th edition, Garland Science.
- “Understanding viruses” Teri Shors. 2nd ed. Burlington: Jones & Bartlett Learning, cop. 2013.