

- a. **Course Code:** HCB-821
- b. **Title:** Viral Oncology
- c. **Credit Hours:** 3+0
- d. **Objectives**

The overall learning objectives for the course are:

- Biology and the replicative cycle of viruses associated with cancers.
- Different mechanisms of carcinogenesis and host immune responses.
- Mechanism of tumorigenesis induced by these viruses.
- Role of the immune system in controlling and modulating these viruses and induced tumors.
- Advances in anti-tumor therapies.

e. **Outcomes**

- After taking the course, the students will be able to have knowledge of contemporary concepts in virology and mutagenesis.
- They will be able to describe the oncoviruses and their nature to manipulate the host mechanisms in order to evade immunity and cause cancer.
- Introduction to modern technologies for diagnosis, treatment, disease prevention, and outcomes will help the students in understanding and plan their ant-tumor or anti-viral strategies.

f. **Contents with suggested contact hours: 3hrs/week**

**1. Introduction to viral oncology**

- Basic concept of oncoviruses
- Viral oncoproteins involvement in the cancer
- Viral tropism
- Virus-based immunotherapies.
- History and mechanism of action of oncolytic viruses
- Antiviral vs oncolytic viruses

**2. Viral-associated inflammation and mutagenesis**

- Viral chronicity and molecular mechanisms involved in inflammation.
- Persistence of viruses leading to the genetic instability
- Perturbation of molecular pathways that leads to mutagenesis.
- Comorbidities leading to oncogenesis

**3. Human papillomavirus and cancer progression**

- Epidemiology
- Oncogenic human papillomavirus and polyomavirus
- Replication and Pathogenesis
- HPV-associated cancer: Cervical cancer

- Treatment or vaccines
- 4. Hepatitis B and C viruses and Hepatocellular carcinoma**
- Epidemiology of HBV/HCV-related HCC
  - Mechanism of HBV/HCV infection establishment
  - Mechanism of HCV/HBV-induced HCC.
  - Coinfection of HIV with HCV/HBV and HCC/CHC
  - Hepatitis B vaccination and HCC elimination
  - Treatment or vaccines
- 5. Human retroviruses and mechanisms of oncogenesis**
- Epidemiology, viral multiplication,
  - viral oncogenesis
  - Endogenous retroviruses
  - T-Cell lymphoma/Leukemia
  - Treatment or vaccines
- 6. Herpes simplex viruses and neurodegeneration**
- Epidemiology
  - Introduction to Oncogenic gamma herpesvirus
  - Mechanism of oncogenesis
  - Kaposi sarcoma
  - Treatment or vaccines
- 7. Epstein–Barr virus**
- Epidemiology
  - EBV-associated cancers
  - Mechanism of oncogenesis of EBV Nuclear Antigen Proteins
  - Burkitt’s lymphoma
  - Hodgkin lymphoma
  - Treatment or vaccines
- 8. Animal viruses**
- Viral diseases in animals that lead to cancer
  - Concept of “One Health”
  - Mechanism involved in the transfer of disease from animals to human
  - Example of animal viruses-mediated cancers
  - Exploring the mechanism involved
  - Therapeutic strategies
- g. Details of lab work, workshops practice (if applicable). NIL**
- h. Recommended Reading (including Textbooks and Reference books).**
- Viruses and Human Cancer: From Basic Science to Clinical Prevention, by John T. Schiller & Douglas R. Lowy (auth.) & Mei Hwei Chang & Kuan-Teh Jeang (eds.)
  - Human Oncogenic Viruses by Jing-hsuin James Ou & T. S. Benedict Yen.

- Cancer-Causing Viruses and Their Inhibitors by Satya Prakash Gupta.
- Viral Oncology: Basic Science and Clinical Applications by Kamel Khalili & Kuan-Teh Jeang.
- Bats and viruses: a new frontier of emerging infectious diseases by Cowled & Christopher & Wang & Lin-fa.

### Academic Plan

Course Title: Viral Oncology (HCB-) (Elective Course- MS Healthcare Biotechnology)

Instructor/Faculty: Dr. Sobia Manzoor

Marks Distribution: Total Marks: 100 (at least 3 Quizzes = 10% + MTE = 30% + Assignments= 10% ETE =50 %)

### Course Learning Outcomes

After Completion of the course, the students will be able to have knowledge of contemporary concepts in virology and mutagenesis.

- They will be able to describe the oncoviruses and their nature to manipulate the host mechanisms in order to evade immunity and cause cancer.
- Introduction to modern technologies for diagnosis, treatment, disease prevention, and outcomes will help the students in understanding and plan their ant-tumor or anti-viral strategies.

Lecture. No	Lecture Topic	Weeks
<b>1<sup>st</sup> Month</b>		
<b>Module 1: Introduction to Viral Oncology</b>		
1	<ul style="list-style-type: none"> <li>• Basic concept of oncoviruses</li> <li>• Viral oncoproteins involvement in the cancer</li> <li>• Viral tropism</li> </ul>	Week 1
2	<ul style="list-style-type: none"> <li>• Virus-based immunotherapies.</li> <li>• History and mechanism of action of oncolytic viruses</li> <li>• Antiviral vs oncolytic viruses</li> </ul>	Week 1
<b>Module 2: Viral-associated inflammation and Mutagenesis</b>		

3-4	<ul style="list-style-type: none"> <li>• Viral chronicity and molecular mechanisms involved in inflammation.</li> <li>• Persistence of viruses leading to the genetic instability</li> <li>• Perturbation of molecular pathways that leads to mutagenesis.</li> <li>• Comorbidities leading to oncogenesis</li> </ul>	Week 2
<b>Module 3: Human Papillomavirus and cancer progression</b>		
5-6	<ul style="list-style-type: none"> <li>• Epidemiology</li> <li>• Oncogenic human papillomavirus and polyomavirus</li> <li>• Replication and Pathogenesis</li> </ul>	Week 3
7-8	<ul style="list-style-type: none"> <li>• HPV-associated cancer: Cervical cancer</li> <li>• Treatment or vaccines</li> <li>• Quiz</li> </ul>	Week 4
<b>2<sup>nd</sup> Month</b>		
<b>Module 4: Hepatitis B and C viruses and Hepatocellular carcinoma</b>		
9-10	<ul style="list-style-type: none"> <li>• Epidemiology of HBV/HCV-related HCC</li> <li>• Mechanism of HBV/HCV infection establishment</li> <li>• Mechanism of HCV/HBV-induced HCC.</li> </ul>	Week 1
11-12	<ul style="list-style-type: none"> <li>• Coinfection of HIV with HCV/HBV and HCC/CHC</li> <li>• Hepatitis B vaccination and HCC elimination</li> <li>• Treatment or vaccines</li> </ul>	Week 2
<b>Module 5: Human Retroviruses and Mechanisms of Oncogenesis</b>		
13-14	<ul style="list-style-type: none"> <li>• Epidemiology, viral multiplication,</li> <li>• viral oncogenesis</li> <li>• Endogenous retroviruses</li> </ul>	Week 3
15-16	<ul style="list-style-type: none"> <li>• T-Cell lymphoma/Leukemia</li> <li>• Treatment or vaccines</li> </ul>	Week 4
<b>3<sup>rd</sup> Month</b>		
<b>Mid-Term Examination (Week 1)</b>		
<b>Module 6: Herpes simplex viruses and neurodegeneration</b>		

17-18	<ul style="list-style-type: none"> <li>• Epidemiology</li> <li>• Introduction to Oncogenic gamma herpesvirus</li> <li>• Mechanism of oncogenesis</li> </ul>	Week 2
19-20	<ul style="list-style-type: none"> <li>• Kaposi sarcoma</li> <li>• Treatment or vaccines</li> </ul>	Week 3
<b>Module 7: Epstein–Barr virus</b>		
21-22	<ul style="list-style-type: none"> <li>• Epidemiology</li> <li>• EBV-associated cancers</li> <li>• Mechanism of oncogenesis of EBV Nuclear Antigen Proteins</li> </ul>	Week 4
<b>4<sup>th</sup> Month</b>		
23-24	<ul style="list-style-type: none"> <li>• Burkitt's lymphoma</li> <li>• Hodgkin lymphoma</li> <li>• Treatment or vaccines</li> </ul>	Week 1
25-26	<ul style="list-style-type: none"> <li>• Presentation</li> </ul>	Week 2
27-28	<ul style="list-style-type: none"> <li>• Final Project</li> </ul>	Week 3