

Course Objectives:

This 3 credit course, "Molecular Virology" is being designed to introduce students the fundamentals of virology with an emphasis on the molecular aspects of viral replication, pathogenesis, and host interactions. The major objective of the course is to provide students with an integrated and fundamental understanding of how viruses with different genomes replicate. Because of the contents, this course will be very helpful as prerequisites for VIRO-204 (Viral vectors) and subsequent virology courses.

Course outcomes:

At the end of course the student will have a good understanding of the fundamental concepts of the structure and replication of a virus. The course will provide understanding on the effects of viral infection in a Prokaryotic and a Eukaryotic cell. At the end of the course a student should have ample understanding on the taxonomy, morphology, mechanisms of replication, strategies of viral gene expression and diseases caused by them besides knowing the biological control of viruses.

Course Content:

- Introduction to viruses
- Positive-sense RNA viruses
 - RNA-directed RNA replication
 - Positive-sense RNA viruses encoding a single large open reading frame
 - Picornavirus replication
 - The poliovirus protein expression
 - Flavivirus replication
 - Positive-sense RNA viruses encoding more than one translational reading frame
 - Togavirus genome
 - Coronavirus replication
- Replication strategies of RNA Viruses requiring RNA-directed mRNA transcription
 - Rhabdoviruses (Viruses with monopartite genome)
 - Influenza viruses (Viruses with multipartite genome)
 - Ambisense RNA viruses
- Replication strategies of small and medium sized DNA viruses
 - Papovavirus replication

- Replication of SV40 virus – the model polyomavirus
- Adenovirus genome
- Geminiviruses

- Retroviruses-converting RNA to DNA
 - The molecular biology of retrovirus
 - Retrovirus structural proteins
 - The retrovirus genome
 - Replication of retroviruses: an outline of the replication process
 - Initiation of infection
 - Capsid assembly and maturation
 - Action of reverse transcriptase and RNase-H in synthesis of cDNA
 - Virus gene expression, assembly, and maturation
 - Transcription and translation of viral mRNA
 - Capsid assembly and morphogenesis
 - Retrotransposons
 - Lentiviruses- HIV-1

- Replication of nuclear-replicating DNA viruses
 - Herpesvirus replication
 - HSV virion and viral genome
 - Baculoviruses

- Replication of cytoplasmic DNA viruses
 - Poxviruses replication cycle

Recommended Books:

- **Introduction to Modern Virology** by N.J.Dimmock, A.J.Easton, and K.N.Leppard.
- **Basic Virology** by Edward Karl Wagner
- **Fundamental Virology** by David M Knipe and Peter M Howley
- **Principals of virology** by Alan J. Cann.
- **Virology: Principles and Applications** by John Carter and Venetia Saunders
- **Virology** by Carter (2007)
- **Introduction to Modern Virology** by Dimmock, N.J.

Reference Books

1. Fundamentals of Molecular Virology by Nicholas H. Acheson
2. Molecular Virology by Becker Y.
3. Influenza: Molecular Virology by Wang Q and Tao YJ.
4. Retroviruses by Coffin JM, Hughes SH, Varmus HE