



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Science

Level: Under Graduate

Branch Name: Honors/ Honors With Research (Biotechnology)

Course / Subject Code: BS04001051

Course / Subject Name: Virology

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|-------------------------|------------------------|
| W.e.f. Academic Year: | 2025-26 |
| Semester: | 4 |
| Category of the Course: | Minor Elective Subject |

Prerequisite: Students must have studied the basic microbiology in previous classes. They have basic knowledge about the Cell Biology, Biochemistry and Genetics & Molecular Biology.

Rationale: This course provides students with a comprehensive understanding of viruses, their classification, replication, transmission, and impact on plants, animals, and humans.

Course Scheme:

| Teaching Scheme | | | Total Credits | Assessment Pattern and Marks | | | | Total Marks |
|-----------------|---|----|---------------|------------------------------|-------|-----------|--------|-------------|
| L | T | PR | C | Theory | | Practical | | |
| | | | | ESE (E) | PA(M) | ESE (V) | PA (I) | |
| 3 | 0 | 2 | 4 | 70 | 70 | 30 | 30 | 200 |

Course Content:

| Sr. No. | Course Content | No. of Hours | % of Weightage |
|---------|---|--------------|----------------|
| 1 | <p>History: History, origin and evolution of viruses, pioneers of Virology.</p> <p>Introduction to Virology: Origin and evolution of viruses.</p> <p>Morphology and properties of viruses: Physical- morphology and structure, Biochemical composition, nucleic acids, proteins, enzymes, lipids, carbohydrates, polyamines, cations.</p> <p>Nomenclature and classification of viruses: Criteria used for naming and classification, Current ICTV classification of viruses of bacteria, plants and animals and humans.</p> | 8 | 20 |
| 2 | <p>Isolation, cultivation, and maintenance of viruses: Cultivation of plant and animal viruses (experimental plants and tissue culture, experimental animals, embryonated eggs, organ cultures, primary and secondary cell cultures, suspension and monolayer cell cultures, cell strains, cell lines). Assay of viruses-Infectivity assay methods (plaque, pock, end point, local / systemic assay of plant viruses), physical (EM), serological (HA, HI, immunofluorescence, ELISA) and chemical (viral protein and nucleic acid based) approaches.</p> <p>Purification of viruses: Extraction of viruses from tissues, clarification, concentration of viruses in clarified extracts by physical and chemical methods, further purification of viruses by rate zonal / equilibrium</p> | 15 | 30 |



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| | density gradient centrifugation, Criteria of virus purity, Quantitation and preservation of purified virus preparations. Cultivation of viruses: Experimental plants and experimental animals, embryonated eggs and cell cultures. | | |
| 3 | Transmission of Viruses: Non-vector and Vector mode of transmission of viruses. Virus detection methods: Biological, physical, serological and molecular methods. | 8 | 20 |
| 4 | Biology of sub-viral agents: Satellite viruses, sat-RNAs, viroids, virusoids and prions. Bacteriophages: Biology of major RNA (MS2, Q β) and DNA (T4, lambda, Φ x174, M13) bacteriophages. | 8 | 20 |
| 5 | Management of plant viruses: Cultural practices, control of vectors, production of virus free plants, plant quarantine, production of transgenic plants. Management of animal viruses: Sanitation, vector control, vaccines, antiviral drugs, and chemotherapy. | 6 | 10 |

Reference Books:

1. Epidemiology, diagnosis, and Management of Zoonoses. (2004). K.G. Narayana Sri Kuldeep Sharma Pub.
2. Clinical Virology. D.D. Richman et al., 2 nd Edition. (2002). ASM Press.
3. Veterinary Virology. F.A. Murphy et al. (1999). 3rd Edition. Academic Press.
4. Principles of Virology- Molecular biology, pathogenesis and control. (2004). S.J. Flint, L.W. Enquist, R.M. Krug, V.R. Racaniello and A.M. Skalka. ASM press.
5. Medical Virology. (2001). 5th edition. D.O. White, F.J. Fenner. Academic Press.
6. Introduction to Modern Virology. (2001). 5th edition. Dimmock et al. Blackwell Sci.
7. Matthews' Plant Virology. (2001). 4th edition. R. Hull. Academic Press.
8. Fundamental Virology. (2001). 4th Edition. Editors-in-Chief David M. Knipe, Peter.M. Howley. Lippincott.
9. Basic Virology. (1999). E.K. Wagner and M.J. Hewlett. Blackwell Science, INC.,
10. Principles of Molecular Virology. (1997). Second edition. A.J. Cann. Acad. Press.
11. Encyclopedia of Virology. (1994). R.G. Webster and A. Granoff (9ed.). Vol. I, II and III.
12. Recent Advances in Animal Virology (2019) 1st Edition, Kindle Edition, by Yashpal Singh Malik, Raj Kumar Singh, Mahendra Pal Yadav, 471 pages, Publisher: Springer
13. Virology (2017) RenWarom, Titan Books.
14. A Planet of Viruses: (2015) 2nd ed, by Carl Zimmer (2015) University of Chicago Press.
15. Plant Virology. (2001). 4th edi. By R. Hull. Academic Press.

Course Outcome:

After Completion of the Course, Student will able to:



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| Sr. No | Course Outcomes | RBT Level |
|--------|--|-----------|
| 1 | Describe the origin, evolution, morphology, classification and nomenclatures, properties of viruses, cultivation, and transmission of viruses | UN,RM,AP |
| 2 | Define the methods used for isolation, cultivation and purification of viruses | UN,RM,AP |
| 3 | Define the biology of bacteriophages and subviral agents. | UN,RM,AP |
| 4 | Acquire knowledge about biological, physical, serological, and molecular methods used for detection of viruses and describe strategies followed for management of plant and animal viruses | UN,RM,AP |

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

List of Experiments:

1. Bacteriophage isolation.
2. Diagnosis of HIV using kit.
3. Diagnosis of HBV using kit.
4. Diagnosis of HCV using kit.
5. Diagnosis of PRSV using ELISA.
6. Diagnosis Dengue using kit.
7. Diagnosis of SARS-CoV-2 using kit
