

# **SRI VENKATESWARA INSTITUTE OF MEDICAL SCIENCES**

**TIRUPATI – 517 507**

*(A University established by an act of Andhra Pradesh State Legislature)*



PG Programme in Allied Health Sciences

## **M. Sc Clinical Virology**

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**TIRUMALA TIRUPATIDEVASTHANAMS**

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## General Regulations

1. Title of the Course  
Master of Science degree in clinical virology
2. Duration of the Course  
The duration of the course shall be 2- years on full time basis
3. Eligibility for Admission-BSC – Microbiology/Biotechnology/Zoology/Botany
4. Selection Criteria
  - a) All the PG (M.Sc) will have a common entrance exam
  - b) The selection is based on the combined merit in the qualifying examination (degree) and marks secured in the entrance test conducted by the university (SVIMSPGCET) in the ratio of 80:20.
  - c) The entrance test will be conducted on the subjects and weightage as mentioned below-  
English -30%, logical reasoning 30%, biology 20%, physical sciences 20% (+ 2 level) (intermediate).
  - d) There are no qualifying marks in the entrance test. All the candidates appearing for the entrance test will be awarded ranks based on the marks secured.
5. Admission schedule:
  - a) Commencement of Course: August every year
  - b) The admissions are closed by 30<sup>th</sup> September or 60 days from the date of commencement of the programme.
6. Medium of instruction.  
English shall be the medium of instruction for the subjects of study as well as for the Examination.
7. Course of study
  - The course shall be pursued on full time basis. In the end of first year there shall be an examination. Students shall be posted to SVIMS and SPMC hospitals during the practical hours.
  - Subjects for study and teaching hours for first year and second year of the PG courses are shown below.
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### Distribution of Teaching Hours

#### First Year

S. No	Main subject	Theory No. of Hours	Practical No. of Hours	Total
1.	<b>Basic- Microbiology and Virology</b>	100	30	130
2.	<b>Immunology and Medical Entomology</b>	60	30	90
3.	<b>Basic and Applied Viral Genetics</b>	80	30	110

4.	<b>Epidemiology and biostatics</b>	<b>50</b>	<b>-</b>	<b>50</b>
5.	<b>Dissertation</b>			<b>70</b>
	<b>Total:</b>	<b>290</b>	<b>90</b>	<b>450</b>

## Second year

S. No.	Main subject	Theory No. of Hours	Practical No. of Hours	Total
6.	<b>Diagnostic Virology</b>	<b>110</b>	<b>30</b>	<b>140</b>
7.	<b>Applied Epidemiology, Applied Biostatistics &amp; Applied Entomology</b>	<b>35</b>	<b>75</b>	<b>110</b>
8.	<b>Recent Advances in molecular virology</b>	<b>30</b>	<b>30</b>	<b>60</b>
9.	<b>Dissertation</b>			<b>140</b>
	<b>Total:</b>	<b>465</b>	<b>225</b>	<b>900</b>

### 8 a) Attendance:

A candidate is required to put in minimum 80% of attendance both in theory and practical separately of each paper before admission to the university examination. Participation in NCC, NSS, sports and games, educational tours, professional meetings and conference or other co-curricular activities representing the institution/university will not count as absence.

### b) Condonation for lack of attendance:

The condonation of attendance on medical grounds or on absence under extraordinary circumstances to those who are having the attendance between 70% and 79% in each paper will be granted in genuine cases. The students who have shortage of attendance in the particular papers have to apply to the controller of examinations, indicating the reasons for shortage of attendance. The representation to be forwarded by the HOD & Prof. i/c AHS. If the reason is on the medical grounds, the relevant medical certificate has to be enclosed to the representation. If any student falls below the 70% of attendance, he/she will not be allowed to write the university examinations.

### 9. Scheme of examination

- The examination for the degree shall consist of written papers, practical and oral.
- There shall be two examinations viz. Preliminary and final. The preliminary

- c) examination shall be taken at the end of the first year. The final examination shall be taken at the end of 2<sup>nd</sup> year.
- d) The examination shall be conducted ordinarily twice a year, viz. July/August and January/February.

### Preliminary Examination

This consists of theory, practical and oral. There will be separate papers for each specialization.

**10. Examination fee structure:** The examination fee shall be applicable as existing to the Other M.Sc. Courses (AHS).

**11. University Examination and Distribution of marks.**

#### **First year**

S. No	Subjects	Paper	Theory		Practical (Marks)		Viva	Grand Total
			IA	UE	IA	UE		
1.	Basic- Microbiology and Virology	I	20	80	15	60	25	200
2.	Immunology and medical entomology	11	20	80	15	60	25	200
3.	Basic and Applied Viral Genetics	III	20	80	15	60	25	200
4.	Epidemiology and Biostatistics	IV	20	80	-	-	-	100
Total			80	320	45	180	75	700

#### **Second year**

S. No	Subjects	Paper	Theory		Practical (Marks)		Viva	Grand Total
			IA	UE	IA	UE		
5.	Diagnostic Virology	V	20	80	15	60	25	200
6.	Applied Epidemiology, Applied Biostatistics & Applied Entomology	VI	20	80	15	60	25	200
7.	Recent Advances in molecular virology	VII	20	80	15	60	25	200
8.	Dissertation		100(evaluation)				50	150
Total								750

## **Dissertation**

The student should submit dissertation one month before the final examination. Those students who have not submitted the dissertation shall not be allowed to appear for the final examination. The dissertation shall be confidentially assessed by an internal faculty other than the guide. At the time of practical university exam soft copy of the dissertation should be sent to the external examiner for proper evaluation and viva on the dissertation should be taken during orals at the time of practical examinations by all the examiners. The dissertation shall be written under the following headings:

Introduction; Aims or objectives of study; Review of literature; Materials and methods  
Results; Discussion; Conclusion; Summary; References; Tables; Annexure

The written text of dissertation shall not be less than 50 pages and shall not exceed 100 pages excluding references, tables, questionnaires and other annexure. It should be neatly typed in double line spacing on one side of paper (A4 size, 8.27" x 11.69") and bound properly. Spiral binding should not be done. A declaration by the candidate that the work was done by him/her shall be included. The guide and head of the department shall certify the Bonafide of the dissertation.

Three copies of dissertation shall be submitted to the university through proper channel along with a soft copy (CD), one month before the final examinations.

Internal assessment (IA):

- a) A student must secure at least 35% marks of the maximum marks fixed for internal assessment in a particular subject to be eligible to appear for the university examination of that subject.
- b) There shall be three internal assessment tests and the average of these tests shall be considered for awarding final marks.
- c) If the candidate is absent for any of the exams, the marks in that exam shall be taken as zero.
- d) The computed internal assessment marks as per the regulation shall be sent to the controller of exams 15 days before the commencement of the University exam.
- e) The internal assessment marks should be signed by the concerned teaching faculty or HOD and counter signed by the HOD before being forwarded to the Controller of Examinations.
- f) For those who failed in internal assessment test/s, have to reappear as per the regulation 9 a) & b) before he/she appears for the university examination.
- g) For those who want to improve their marks in internal assessment tests, they can

appear again as per the regulation 9 a) & b). For such students, the internal assessment marks of the student at the time of first appearance will be compared with the marks obtained at the present appearance and the higher of the two will be taken as his/her internal assessment marks.

## 12. Minimum for a pass

- a) 35% in internal assessment of each theory paper and practical's / viva voce
- b) 40% in each theory paper of university examination.
- c) 50% on the total marks of theory university examination and internal assessment clubbed together, applicable to each paper.
- d) Where, viva voce involved which is part of theory examination, 50% on the total marks of theory university examination, internal assessment and viva voce clubbed together, applicable to each paper.
- e) Where there is no internal assessment marks, 50% on the total theory marks, 50% in practical's/viva voce applicable to each subject.

Note: For 2-year PG course, where any paper contains both theory and practical's/viva voce, the student has to pass both theory and practical's/viva voce, if any student pass in theory examination and fail in practical's/viva voce examination or vice versa, the student concerned has to appear again for both theory and practical's/viva voce examination.

## 13. Classification of successful candidates

### Percentage of Marks for declaring Class:

Distinction	- 75% and above of the total marks.
First Class	- 65 - 74% of the total marks.
Second Class	- 50- 64% of the total marks.
Pass Class	- If the student does not pass all the subjects with in the duration of the course, the class will not be awarded, and the final results will be declared as "Pass". Those who have break in the middle of the course due to attendance shortage, it will be taken into consideration as not completed within the duration of the course and the final results will be declared as "Pass".

## 14. Reappearance

The student has to pass both theory and practical's/viva voce, if any student pass in theory examination and fail in practical's/viva voce examination or vice versa, the concerned student has to appear again for both theory and practical's/viva voce examination. Supplementary examination shall be conducted after 6 months of declaration of results.

**15. Carry-over Provision**

The students are permitted to complete the course period irrespective of their success in the preliminary part. However, the final results will be kept under “withheld” until he/she passes all the previous papers”.

**16. Maximum duration for completion of course**

A candidate shall complete the course within four years from date of admission.  
Failing which, the candidate will be discharged.

**17. Eligibility for award of degree**

A candidate shall have passed in all the subjects of first and second year to be eligible for award of degree.

**18. Panel of examiners:**

- a) There shall be a panel of four external examiners as advised by the Head of the department.
- b) Theory paper setting to be done by the examiners locally, within the state or outside the state.  
For practical and viva-voce
- c) No. of Examiners Required - Two  
No. of Internal Examiner - One  
No. of External Examiner – One

**Eligibility for the examiner ship:**

- a) The examiner shall be a full-time teacher in the college or institution he or she is working.
- b) Academic qualification and teaching/professional experience for examiners:  
External / Internal Examiner: MD microbiology shall have not less than 5 years of teaching experience in the specialty concerned and working as Asst Prof. or above in a teaching hospital



## First year

### Course content (syllabus) Theory

#### Paper I: Basic- Microbiology and Virology

Unit no.	Unit title	Content	Hours	Method of evaluation
1.	Basic virology	1.History and principles of virology, virus taxonomy, introduction to replication strategies.	3	Sessional examination
		2. Virus structure and morphology.	2	
		3. Viruses of veterinary importance.		
		4. Principles of bio-safety, containment facilities, maintenance and handling of laboratory animals and requirements of virological laboratory.	2	
		5.Bacteriophages.	2	
2.	Tissue culture	1.Introduction to tissue culture Principles of tissue culture, applications, maintenance of sterility, use of antibiotics, mycoplasma and other contaminations	2	Sessional examination
		2. Cell environment.	2	
		3. In vitro cultures	2	
		4. Cell characterization	2	
		5. Large scale production	2	
		6. Quality assurance in animal tissue culture.	2	
3.	Cell biology	1.Microscopy	1	Sessional examination
		2. Cell ultra-structure and electron microscopy	3	

		3. Structure and function of cellular organelles	2	
		4. Cell division and cell cycle	2	
		5. Cell signalling	2	
		6. Cell growth and differentiation	2	
		7. Stem cells -adult and embryonic	2	
		8. Cell dynamics, cell death	2	
4.	Concepts of biosafety and biosecurity	1. Infectivity/Pathogenicity/Virulence, Routes of entry/exit, Modes of transmission, Secondary spread, Immune status of staff and immunization issues	2	Sessional examination
		2. Biosafety Levels and Risk group, Classification, Containment, Good microbiological practices, Disinfection, Decontamination and Sterilization	2	
		3. Primary Barriers and Secondary Barriers, different zoning and BSC]	2	
		4. Risk & Hazard Assessment	1	
		5. Safe laboratory Practices: Good microbiological practices, Good clinical practices (GCP), Good clinical and laboratory practices (GCLP), Good Laboratory practices (GLP)]	2	
		6. Decontamination procedures: Disinfection, Methods of sterilization, Decontamination Waste categories & Color coding of Bio-Medical Waste Containers/Bags, various types of Standards International norms & local government regulations	2	
		7. Regulatory Framework: [Code of conduct for scientists, Statuary roles of Department of Biotechnology (DBT), Indian Council of Medical Research (ICMR), Various types of committees for biosafety International Issues for Biosafety & Biosecurity, Laboratory certification, accreditation and standards, Commissioning, Certification & Validation, Accreditation, ISO, NABL,	3	

		8. Public health structure / system: [Disease surveillance and reporting, Disease control program	1	
5.	Bioethics	1.Ethics in Biomedical Research. 2. Ethical and regulatory issue in animal experiment. 3. Ethical issues in biotechnology. 4. Basics of Intellectual Property Rights. 5. Indian patenting system. 6. Issues related to Good Manufacturing Practices (GMP). 7. Issues related to Good Clinical Practices (GCP). 8. Issues related to Good Clinical Laboratory Practices (GCLP). 9. Development of consent document for clinical trials.	1 1 1 1 1 1 1 1 1	Sessional examination
6.	Virological Methods	1.In vivo, in vitro and in ovo systems for virus growth 2. Introduction to PCR 3. Fluorescence, confocal and electron microscopic techniques – principles and applications.	5 2 3	Sessional examination
7.	Analytical techniques	1.Characterization of biomolecules 2. Concentration of biomolecules 3. Electrophoresis of molecules from paper/gels. 4. Cell sorting and Flow cytometry: Principles and Applications. 5. Radioisotope techniques 6. Spectroscopy, Spectrophotometry, ORD and CD; Xray diffraction and Xray crystallography, surface plasmon resonance. 7. Micro array-based techniques 8. Introduction to Histological techniques 9. Detection of molecules in living	2 2 2 2 2 5 2 2 2	Sessional examination

		cells, in situ localization by techniques such as FISH and GISH		
8.	General Microbiology	1. Origin and evolution of microorganisms. 2. Cultivation of microorganisms hrs. 3. Isolation from different natural samples 4. Enumeration / measurement and preservation of growth of microorganism 5. Medical Microbiology: <i>Vibrio cholera</i> , <i>Salmonella typhi</i> , <i>S. pneumoniae</i> .	1 1 1 1 5	Sessional examination

## Paper II: Immunology and medical entomology

Unit no.	Unit title	Content	Hours	Method of evaluation
1.	Immunology	1. Introduction and history; Primary and secondary organs of the immune system, Cells of the immune system. 2. Innate immune response & inflammation, complement system. 3. Hapten/antigen; antibody, structure & Function, Immunoglobulin classes. Antigen & antibody interaction, Antibody diversity. 4. Major histocompatibility complex, Polymorphism, Human leukocyte Antigen association with disease, Ontogeny, Positive and negative selection. 5. Antigen processing and presentation, Co-stimulation, T and B cell stimulation, Cytokines & Chemokines. 6. Cells and organs of the mucosal immune system. Mucosal effector	5 5 6 8 6 4	

		mechanisms. 7. Phagocytosis. Cytotoxic and T helper response. Natural killer and gamma delta cells. 8. Antigen-antibody, cytokine-mediated immune regulation. Complement mediated regulation. Hypersensitivity. Autoimmunity; immunodeficiency. Transplantation immunology.	4 7	
2.	<b>Vector Biology</b>	1.General entomology, insect morphology and classification of Insects and other arthropods of medical importance and their structures and functions. 2. Biology and life history of <i>Aedes</i> , <i>Culex</i> and <i>Anopheles</i> mosquitoes, their behaviour 3. Biology, morphology and disease relationship of sandflies, fleas, lice, ticks and mites in relation to viral infections prevalent in India 4. Vector virus relationship Xenodiagnosis- methods and application. 5. Vector Control, insecticide resistance mechanism and control dynamics	2 2 3 3 5	

**Paper III- Basic and Applied Viral Genetics**

Unit no.	Unit title	Content	Hours	Method of evaluation
1.	Molecular biology	1.Genomes: types, diversity in size, structure and organization in viruses, prokaryotes (nucleoid) and eukaryotes. Genome complexity and sequence components. Central dogma theory and flow of genetic information. 2. Genes: gene	4 1	Sessional examination

		structure and architecture, types of genes.		
		3. Plasmids	1	
		4. Mobile genetic elements	1	
		5. Gene transfer mechanisms and gene mapping in bacteria	1	
		6. Genetic recombination	2	
		7. Replication / perpetuation of nucleic acids: Concepts, definitions, and strategies / models for replication.	3	
		8. DNA damage and repair	1	
		9. Mutations: Types, causes and consequences of mutations	2	
		10. Transcription (RNA biosynthesis): Types of RNA and their role. Types of RNA polymerases. DNA foot printing. Promoters, enhancers, silencers, insulators. Events of transcription. Maturation and processing of different RNA transcripts capping, methylation, polyadenylation, splicing, RNA editing and modification of nucleosides in tRNAs.	4	
		11. Translation, post-translational modification of	4	

		proteins and their sorting and targeting. regulation of translation 12. Regulation of gene expression 13. Gene silencing mechanisms	5  1	
2.	Recombinant DNA Technology	1.Scope and importance of recombinant DNA technology. 2. Tools for Recombinant DNA Technology 3. Cutting and joining of DNA molecules 4. Techniques for gene manipulation 5. Molecular diagnostics: Nucleic acid blotting and hybridization PCR, DNA profiling and DNA finger printing and their applications. 6. Site directed mutagenesis and protein engineering 7. Gene cloning strategies 8. Gene cloning & Expression in bacteria, yeast, plant and animal cells Insect cell system Construction of vectors 9. Phage display libraries, reverse genetics, viral replicons 10. Functional genomics – transcriptome and gene expression profiling	1  4  2  3  6  2  2  8  3  2  1	Sessional examination

		11. Proteomics- proteome and analysis of protein expression.		
3.	Virus cell interactions	1. Definition, structure and methods of discovery of viral receptors (polio, herpes, VSV, HIV). Cellular interactions 2. Replication sites and their characterization, IRES, replicons, transport of viral proteins. 3. Host cell 'shut off', apoptosis, necrosis, stress response, alteration of signalling pathways, cellular basis of transformation, types of cytopathic effects, ultrastructural cytopathology. 4. Cellular injury associated markers, mechanism of viral persistence and latency—	5  3  3  5	Sessional examination

#### Paper IV- Epidemiology and Biostatistics

Unit no.	Unit title	Content	Hours	Method of evaluation
1.	Basic epidemiology and biostatistics	1. History, evolution, definitions and concepts in Epidemiology. 2. Descriptive and analytical epidemiology 3. Sample size estimation and introduction to study designs	5  8  5	Sessional examination



		4. Introduction, types of data, tabular and graphical presentation of data.	5	
		5. Measures of central tendency.	5	
		6. Concept of probability. Concept of significance tests	5	
		7. Introduction to Sampling Methods	2	
		8.Types and methods of public health and infectious disease surveillance, establishing surveillance system.	5	
		9. Case control and cohort studies.	4	
		10. Needs and steps to be taken for outbreak investigations, collaboration with State and National health authorities.	4	
		11. Veterinary Epidemiology [2 hrs]	2	

### Paper V- Diagnostic Virology

Unit no.	Unit title	Content	Hours	Method of evaluation
1.	Viral Enteric Diseases and Oncogenic viruses	1. Epidemiological scenario with respect to Viral Enteric Diseases at National And International level	1	Sessional examination
		2. Enteric viral infections: Clinical course, disease burden, risk factors, prevention, and treatment.	2	

		<p>3. Rotavirus diversity, emerging strains, immunopathogenesis and vaccines under development.</p> <p>4. Other viruses associated with diarrhoea and gastroenteritis:</p> <p>5. Polio &amp; Non-polio Enteroviruses</p> <p>6. Viral oncogenesis, oncogenic viruses HPV, HTLV, Epstein Barr virus</p>	<p>2</p> <p>6</p> <p>3</p> <p>2</p>	
2.	Viral hepatitis	<p>1. Physiology of Jaundice, clinical features and differential diagnosis, presentations of hepatitis caused by different hepatitis viruses.</p> <p>2. Structure &amp; genomic organization, replication, genotypes, serotypes of HAV, HBV, HCV &amp; HEV. Mutations in hepatitis viruses.</p> <p>3. Serological and molecular diagnosis of different hepatitis viruses. [3 hrs].</p> <p>4. Immunopathogenesis of different hepatitis viruses. Animal models and their uses.</p> <p>5. types of hepatitis vaccines, vaccines presently used &amp; vaccines of the future.</p>	<p>3</p> <p>4</p> <p>3</p> <p>2</p> <p>3</p>	Sessional examination
3.	Viral respiratory diseases	<p>1. Epidemiology of respiratory diseases</p> <p>2. History, clinical features, epidemiology, of</p>	<p>1</p> <p>5</p>	Sessional examination

		<p>influenza, RSV and other respiratory diseases.</p> <p>3. Biology and pathogenesis of SARS, Metapneumovirus, human rhino virus and Corona virus etc.</p> <p>4. Differential diagnosis of different respiratory diseases.</p> <p>5. Vaccines against different viral respiratory diseases.</p>	<p>3</p> <p>3</p> <p>4</p>	
4.	Skin diseases	<p>1. Epidemiology of Exanthematous diseases.</p> <p>2. Viruses associated with Exanthematous Diseases</p> <p>3. Measles, mumps, rubella, Parvovirus B-19, Chicken pox and other viral pox diseases.</p> <p>4. Common features of viral pox diseases and case definitions. Para specific immunity due to pox vaccination, eradication and control programs.</p>	<p>1</p> <p>5</p> <p>7</p> <p>3</p>	Sessional examination
5.	Viral haemorrhagic fevers	<p>1. Epidemiology of Viral Haemorrhagic Fevers</p> <p>2. Common clinical features of Viral Haemorrhagic Fevers, History and Disease burden, Risk factors and geographical distribution of viruses associated with haemorrhagic fevers and their impact on global health. Clinical samples required,</p>	<p>1</p> <p>3</p>	Sessional examination

		<p>choice of laboratory diagnostic tests and their interpretation for differential diagnosis.</p> <p>3. Virus replication strategy, Pathogenesis, Prevention and treatment of Dengue.</p> <p>6</p> <p>4. Virus replication strategy, Pathogenesis, Prevention and treatment of Yellow Fever, Kyasanur forest disease, Chikungunya, Rift Valley Fever, Crimean Congo haemorrhagic fever, Hanta, Marburg and Ebola, and Rickettsial fevers.</p> <p>6</p>		
6.	Viral encephalitis	<p>1. Epidemiology of Viral Encephalitis</p> <p>2. Viral Encephalitis, encephalopathy and meningitis, clinical symptoms and causative agents, treatment modalities, transmission, spread of an outbreak in relation to causative agent. Laboratory diagnosis of viral encephalitic agents, basic principles, preferred methods and problems.</p> <p>3. Japanese encephalitis and West Nile viral infection</p> <p>3</p> <p>4. Chandipura encephalitis, other rhabdoviral neurotropic agents.</p> <p>2</p> <p>5. Encephalitis caused by measles, mumps</p> <p>4</p>	1 3 3 2 4	Sessional examination

		, alpha viruses, Nipah and Hendra virus, Herpes 6. Routes and modalities of infections of the nervous tissue, blood brain barrier, factors affecting the neurovirulence	3	
7.	HIV/ AIDS	1.Epidemiology of HIV/ AIDS, Introduction to retroviruses 2. Sexually transmitted diseases and their relation with HIV, opportunistic infections in HIV infected individuals. Social and behavioural aspects of prevention and control. Natural history. 3. Structure and replication of HIV, immunopathogenesis of infection, laboratory diagnosis of HIV infection. HIV isolation, characterization and viral load estimation. 4. Antiviral therapy and drug resistance, HIV vaccines. 5. Origin of HIV-1, HIV -2, SIV.	1  4  5  2  3	Sessional examination

**Paper VI: Applied Epidemiology, Applied Biostatistics & Applied Entomology**

Unit no.	Unit title	Content	Hours		
1.	<b>Applied epidemiology</b>	1.Types and methods of public health and infectious disease surveillance, establishing	5		

		surveillance system. 2. Case control and cohort studies. 3. Needs and steps to be taken for outbreak investigations, collaboration with State and National health authorities. [4 hrs.] 4. Veterinary Epidemiology 5. Medical surveillance: Medical first aid, Vaccination requirements, Accident reporting and investigation, post-exposure assessments & management, Hospital infection control 6. Preparedness and Response for emerging infections and outbreaks  7. Engineering and laboratory maintenance: general maintenance program of facility, environment controls, Laboratory AHUs, filters etc and other decontamination procedures, Various Alarms, Biosafety Cabinets, Autoclaves, keeping, Freezers, Incubators, Centrifuges etc.	4 4 2 1 2 2		
<b>2.</b>	<b>Bioinformatics</b>	1. search engines, sequence data	3		

		formats and submission tools, scoring matrices for sequence alignments, algorithms, database similarity searches—BLAST, FASTA.			
		2. Methods for sequence analysis: Multiple sequence alignment, phylogenetic analysis and tree building methods, data mining tools and applications	7		
		3. Structure based Approaches, homology based methods for protein tertiary structure prediction, visualization tools, structure evaluation and validation	3		
		4. Primer designing for PCR.	2		

### Paper VII: Recent Advances in Molecular Virology

Unit no.	Unit title	Content	Hours	Method of evaluation
	Antivirals and Viral Vaccines	1. Conventional vaccines, immunomodulators (cytokines), vaccine delivery & adjuvants, large scale manufacturing- QA/QC issues.	8	Sessional examination
		2. Animal models and vaccine potency testing.	2	
		3. Vaccine induced	2	

		immune response and immune markers of protection		
		4. Interferons, designing and screening for antivirals, mechanisms of action, antiviral libraries, antiretrovirals- mechanism of action & drug resistance.	10	
		5. Anti-sense RNA, siRNA, miRNA, ribozymes, <i>in silico</i> approaches for drug designing.	8	

## PRACTICALS

### Paper 1: Basic- Microbiology, Virology -30 hours

Analytical methods (30 hours)

1. Preparation of reagents and buffers
2. Protein estimation by Lowry method
3. DNA estimation (spectrophotometric)
4. Polyacrylamide gel electrophoresis
5. Gel Filtration chromatography (Demonstration)

Tissue culture techniques (30 hours)

1. Glassware decontamination, washing, sterilization, packing and sterile handling.
2. Media and reagents preparation, sterility checks
3. Maintenance of cell cultures
4. Growth studies. cell count, mitotic index.
5. Preparation of primary cell culture (CEC)

Virus / Antigen detection (30 hours)

1. ELISA
2. Immunofluorescence assay
3. Heamagglutination
4. Agar gel diffusion
5. Polymerase chain reaction
6. Electron microscopy (Demonstration)



Propagation of viruses (15 hours)

1. Estimation of virus yields-- plaque assay & TCID<sub>50</sub>
2. Preparation virus stocks and determination of mouse LD<sub>50</sub>
3. Routes of inoculations in embryonated eggs
4. Handling of animals: Rules & Regulation

### **Paper II-Immunology and Entomology -30 hours**

Entomological methods (15 hours)

1. Mosquito collection & taxonomy
2. Taxonomy of ticks and sandflies
3. Processing of arthropods
4. Mosquito inoculation & immunofluorescence
5. Insecticide testing
6. Water Sample Analysis (As Breeding Sources of Vector Mosquitoes)
7. Feeding Patterns of Mosquitoes & Houseflies & Mouthparts Dissection
8. Agar Gel Diffusion
9. Lymphocyte Separation
10. ELISA
11. IFA
12. Serodiagnosis of HCV, Serodiagnosis of HBV, Serodiagnosis of HIV
13. Water Sample Analysis (As Breeding Sources of Vector Mosquitoes)

### **Paper III- Basic and Applied Viral Genetics -30 hours**

1. Nucleic Acid Extraction
2. Detection of DNA & RNA
3. Estimation of DNA & RNA
4. PCR
5. RT-PCR
6. Real Time PCR
7. Agarose Gel Electrophoresis
8. PAGE
9. Identification of PCR Amplified Products of Viral Antigens
10. Rt-PCR-Arbovirus
11. RT-PCR-Influenza

### **Paper IV- NO PRACTICALS**

### **Paper V- Diagnostic Virology -30 hours**

1. Sample collection
2. Sample processing for virus isolation and IFA
3. IFA
4. Virus isolation
5. HA test
6. HI test

### Viral Exanthematous Diseases (15 hours)

1. Rubella (IgG, IgM) diagnosis
2. Measles (IgG, IgM) diagnosis
3. Measles PCR

### Viral Hemorrhagic Fevers (Special reference to Dengue) (30 hours )

1. MAC-ELISA, Multiplex RT-PCR for serotyping
2. RNA extraction by Trizol method, Reverse transcription- PCR, agarose gel electrophoresis, interpretation
3. Hemagglutination inhibition assay

### Viral Encephalitis ((15 hours)

1. Flavivirus neutralization tests for differential diagnosis
2. RT PCR of JE

### HIV / AIDS ((15 hours)

1. HIV Diagnosis
2. HIV subtyping
3. CD4, CD8 counts

## **Paper VI: Applied Epidemiology, Applied Biostatistics & Applied Entomology-30 hours**

### Statistical software (EPI-Info)-

- 1: Introduction to the software  
Design data entry form  
Importing MS Excel data in Epi-Info
- 2: Basic commands in Epi-Info  
Recoding/transforming a variable  
Preparing frequency distributions/cross tables  
Computing descriptive statistics and interpretation
- 3: Graphical presentation of data:  
Bar diagram, Line diagram, Pie chart, Histogram, EpiCurve  
Interpretations
- 4: Computing correlation coefficient  
Comparing proportions using chi-square test  
Comparing means using t test  
Computing risk using univariate logistic regression  
Interpretations

1. Biological data banks.
2. Pairwise sequence alignments.
3. Phylogeny & tree building 1.
4. Phylogeny & tree building 2.
5. Secondary structure prediction.
6. Secondary databases – Motif, family searches, Epitope prediction(B-cell).
7. Epitope predictions (T-cell).
8. Biomolecular Structure visualization 1.
9. Biomolecular Structure visualization 2.
10. Primer designing.

#### Applied epidemiology

1. Laboratory emergency response issues: [Spills: laboratory simulation on Splashes/spills CIP protocol, Needle stick injury, Cuts, & Medical emergencies etc. Air & surfaces decontaminations of the facility based on incidents/accidents, Safeguarding against accidents in the facility, Ventilation failure and emergency protocols, Fire and other emergencies, Simulation fire alarm system, immediate remedial measures, emergency exit protocol, Safety measures & preparedness for Natural disasters & Terrorist threats].

2. Engineering requirements for Containment laboratory (BSL- II, III): Construction (Civil, Plumbing, drain line), HVAC & BMS, Electrical system (UPS, DG set), Access control system, Furniture, Communication, Fire alarm system, Definition of HEPA/ ULPA filter, Percentage (%) of penetration, In place testing, HEPA filters, Autoclave, BSC working & testing, Equipment's use in waste management: Incinerator & Shredder]

#### **Paper VII: Recent Advances in Molecular Virology-30 hours**

1. Biological Data Banks & Bioinformatics
2. NCBI, IVR, SWISSPROT & GISAID
3. Sequence Alignment Tools
4. Multiple Alignment
5. BLAST
6. Nucleic Acid to Translation
7. Sequence Assembly
8. Phylogeny Analysis
9. Software's : Mega & Bio Edit

### **Interdepartmental postings- 4 weeks**

Students will be posted in the microbiology, biotechnology, bioinformatics for the observation and to develop expertise in various the diagnostic/ research methods.

### **Clinical Department Postings -4 weeks**

Students will be posted on rotation basis to various clinical departments such as medicine, pediatrics, neurology and skin & VD.

### **Peripheral postings –2 weeks**

Students will be posted in the microbiology department of veterinary college and virology department of SV university to gain experience in plant and animal diagnostic and research methods.

## **MONITORING LEARNING PROGRESS**

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured, and assessment be done using checklists that assess various aspects. Model Checklists are given in this Chapter, which may be copied and used. The learning out comes to be assessed should include:

i) *Acquisition of Knowledge*: The methods used comprise of 'Log Book' which records participation in various teaching / learning activities by the students. The number of activities attended and the number in which presentations are made are to be recorded. The logbook should periodically be validated by the supervisors. Some of the activities are listed. The list is not complete. Institutions may include additional activities, if so, desired.

*Journal Review Meeting (Journal Club)*: The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist – I, Section IV)

*Seminars / Symposia*: The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (See Model Checklist-II, Section IV)

ii) *Teaching skills*: Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist III, Section IV)

ii) Dissertation: Please see checklist IV and V in Section IV.

iii) Work diary / Log Book- Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal, reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of experiments or laboratory procedures, if any conducted by the candidate.

iv) *Records*: Records, log books and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University.

Log book:

The logbook is a record of the important activities of the candidates during his training; Internal assessment should be based on the evaluation of the logbook. Collectively, logbooks are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate.

Format for the logbook for the different activities is given in Tables 1 and 2 of Section IV. Copies may be made and used by the institutions.

Procedure for defaulters: Every department should have a committee to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default, the departmental committee may recommend that defaulting candidate be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set himself or herself right. Format of Model Checklists

## Checklist - I

### Model Checklist for Evaluation of Journal Review Presentations

Name of the student: \_\_\_\_\_ Date: \_\_\_\_\_

Name of the faculty/Observer: \_\_\_\_\_

Sl. No.	Items for observation during presentation	Poor	Below average	Average	Good	Very Good
		0	1	2	3	4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross- references have been consulted					
4	Whether other relevant references have been consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

## Checklist - II

### Model Check List for the Evaluation of the Seminar Presentations

Name of the student: \_\_\_\_\_ Date: \_\_\_\_\_

Name of the faculty/Observer: \_\_\_\_\_

Sl. No.	Items for observation during presentation	Poor	Below average	Average	Good	Very Good
		0	1	2	3	4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross- references have been consulted					
4	Whether other relevant references have been consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

Checklist – III

Model Check list for Evaluation of Teaching Skill

Name of the student: \_\_\_\_\_ Date: \_\_\_\_\_

Name of the faculty/Observer: \_\_\_\_\_

SL.No.		Strong Point	Weak point
1	Communication of the purpose of the talk		
2	Evokes audience interest in the subject		
3	The introduction		
4	The sequence of ideas		
5	The use of practical examples and /or illustrations		
6	Speaking style (enjoyable, monotonous, etc., specify)		
7	Summary of the main points at the end		
8	Ask questions		
9	Answer questions asked by the audience		
10	Rapport of speaker with his audience		
11	Effectiveness of the talk		
12	Uses of AV aids appropriately		



### Checklist - IV

#### Model Check list for Dissertation / Project Work Presentations

Name of the student: \_\_\_\_\_ Date: \_\_\_\_\_

Name of the faculty/Observer: \_\_\_\_\_

Sl. No.	Points to be considered	Poor	Below average	Average	Good	Very Good
		0	1	2	3	4
1	Interest shown in selecting topic					
2	Appropriate review					
3	Discussion with guide and other faculty					
4	Quality of protocol					
5	Preparation of proforma					
	Total score					

### Checklist – V

#### Continuous Evaluation of dissertation / project work Guide/ Co-Guide

Name of the student: \_\_\_\_\_ Date: \_\_\_\_\_

Name of the faculty/Observer: \_\_\_\_\_

Sl. No.	Items for observation during presentation	Poor	Below average	Average	Good	Very Good
		0	1	2	3	4
1	Periodic consultation with guide/ co-guide					
2	Depth of Analysis/ Discussion					
3	Department presentation of findings					
4	Quality of final output					
5	Others					
	Total score					

### Overall Assessment Sheet

Date:

Check list No.	Name of the students			
	A	B	C	D
1				
2				
3				

Signature of the HOD

Signature of the Prof. i/c AHS

The above overall assessment sheet used along with logbook should form the basis for certifying satisfactory completion of course of study, in addition to the attendance requirement.  
**KEY**

Mean score: Is the sum all the scores of checklists 1 to 5

A, B, C: Name of the students

### LOG BOOK

Table 1: Academic activities attended

Name: Admission

Year:

Date	Type of activity, Specific Seminar, Journal club, presentation, UG teaching	Particulars

Table-2: Academic presentations made by the student

Name:

Admission Year:

Date	Topic	Type of activity, Specific Seminar, Journal club, presentation and UG teaching

Management Information System Report

1. Name of the college imparting MSc clinical virology
2. Details of M.Sc.

Sl. No	Name of the Branch & Teaching faculty	Sanctioned Strength	Admitted	Name of the subjects to be studied at 1 <sup>st</sup> Year M.Sc.	
1					
2					

3. No. of experiments/assignments conducted for 1<sup>st</sup> year M.Sc. clinical virology

Sl.No	Branch	Subject		Assigned by SVIMS University	Conducted	%	Remarks
1.		No	Name				
2							

4. No. of theory classes conducted for 1<sup>st</sup> year M.Sc. clinical virology

Sl.No	Branch	Subject		SVIMS University Norms (25)	Conducted	%	Remarks
1.		No	Name				
2.							

5. Number of theory and practical classes taken by 2<sup>nd</sup> year M.Sc. clinical virology students for undergraduate program (Optional).

6. No. of Journal club's department wise for 1<sup>st</sup> year and 2<sup>nd</sup> year M.Sc. Clinical virology students

Total No. of students Dept. Wise	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1 <sup>st</sup> year M.Sc. Cardiac catheterization and Interventional Technology No.=	10 per candidate per year			
2 <sup>nd</sup> year M.Sc. Cardiac catheterization and Interventional Technology No.=	10 per candidate per year			

7. Number of seminars for 1<sup>st</sup> year and 2<sup>nd</sup> year M.Sc. Clinical virology students

Total No. of students: 10	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1 <sup>st</sup> year M.Sc. Cardiac catheterization and Interventional Technology No.=10	10 per candidate			
2 <sup>nd</sup> year M.Sc. Cardiac catheterization and Interventional Technology No.= 08	10 per candidate			

8. Number of inter departmental meetings

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
6			

Overall Assessment of the student by the clinical/Lab work:

Sl. No	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4	Excel lent 5
1	Attendance						
2	Punctuality						
3	Interaction with colleagues and support staff						
4	Performance in the lab						
5	Topic Presentation						
7	Time sense						
8	Knowledge						
9.	Clinical orientation						
10	Overall quality of work						
	Total Score	--	--	--			

## MODEL QUESTION PAPER

### THEORY

Each theory paper will have

- |  |               |
|--|---------------|
| 1) Essay questions – 03 nos. carrying 10markseach        | - 03 x 10 =30 |
| 2) Short answer questions – 10 nos. carrying 05markseach | - 10 x 05 =50 |

	Total	=80
Internal assessment		=20

### PRACTICAL

(a) Preliminary:

Internal assessment	:	15
University examination	:	60

Total	=75
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(b) Viva	=25
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