SUBJECT OUTLINE

1. Programme of study description

1.1.	**THE "CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY**
1.2.	**THE FACULTY OF MEDICINE / THE CLINICAL DEPARTMENT 2**
1.3.	**DISCIPLINE MICROBIOLOGY-VIROLOGY**
1.4.	**DOMAIN OF STUDY: Healthcare – regulated sector within the EU**
1.5.	**CYCLE OF STUDIES: BACHELOR'S DEGREE**
1.6.	**PROGRAMME OF STUDY: MEDICINE**

2. Subject description

2.1.	**Name of the subject/compulsory subject/elective subject within the discipline: Virology**
2.2.	**Location of the discipline: Stefan S Nicolau Institute of Virology, Bucharest**
2.3.	**Course tenured coordinator:**
2.4.	**Practicals/clinical rotations tenured coordinator:**

2.5. Year of study	**III**	**2.6. Semester**	**5 and 6**	**2.7. Type of assessment**	**Exam (theroretical and practical)**	**2.8. Subject classification**	**Mandatory**

3. Total estimated time (hours/semester of didactic activity) – teaching module

Number of hours per week	**4**	**Out of which: course**	**2**	**Clinical rotation**	**2**
Total number of hours from curriculum	**56**	**Out of which: course**	**28**	**Clinical rotation**	**28**
Distribution of allotted time	**14 weeks**		hours		**Hours**
Study from textbooks, courses, bibliography, and student notes					
Additional library study, study on specialized online platforms and field study					
Preparing seminars / laboratories, assignments, reports, portfolios and essays					
Tutoring					
Examinations					
Other activities					
Total hours of individual study					
Number of credit points					**4**

4. Prerequisites (where applicable)

4.1. of curriculum	not applicable
4.2. of competencies	not applicable

5. Requirements (where applicable)

5.1. for delivering the course	Multimedia Projector, videoprojector, laptop
5.2. for delivering the clinical rotation	Light microscope, inverted microscope, cell cultures, ELISA , spectrofotometer, termocycler, elecroforesis system, reagents,adjustable serological pipettes, multimedia projector, videoprojector, laptop

6. Acquired specific competencies

Professional competencies (expressed through knowledge and skills)	-Description of concepts and theories regarding the viral

	replication and structure of the viruses - Understanding the pathogenic mechanisms implied in viral infections -Description of mechanisms of antiviral drugs, indications, contraindications, and adverse effects of the antivirals used in medical practice -Correct assessment of the appropriate active prophylaxis in viral infections (vaccination) / passive prophylaxis in viral infections (immunotherapy) -Evaluation of optimal directions of virological diagnosis, interpretation of results, establishment of an algorithm for monitoring and prediction of natural evolution and treatment of viral diseases
Transversal competencies (of role, of professional and personal development)	- Establishing the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working times, the related deadlines and the related risks in the diagnosis of the main viral syndromes -Identifying the roles and responsibilities in a multidisciplinary team, and applying effective networking techniques within the team -Efficient use of information sources and resources of communication and assisted training (Internet portals, specialized software applications, databases, online courses, etc.), both in Romanian and in a language of international circulation

7. Subject learning objectives (based on the scale of acquired specific competencies)

7.1. General learning objective	- Gaining the ability to understand and apply fundamental notions about viral replication, the pathogeny of viral infections, mechanisms of action of antiviral drugs, methods of correct virological diagnosis in the main viral syndromes - Decide the implications of viral diseases in the community and in the medical system.
7.2. Specific learning objectives	Students will be able to use the optimal virological methods in specific pathologies, interpret biomarkers for monitoring and predict the natural and on treatment evolution of viral diseases. Establishing a good and effective communication relationship between doctor and patient/doctor-family/participants in explaining the results of virological diagnosis and in applying antiviral vaccines as a method of preventing viral syndromes

8. Content

8.1. Course	**Teaching methods**	**Observations**

Course 1. **Viral structure.** Virus replication; Identification of virus families associated with different DNA and RNA virus replication schemes Viral pathogenesis; viral persistence; viral genetics	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 2. **Immunity in viral infections**; humoral and cellular immune response, MHC role in viral infections; viral strategies of eluding the immune response Interferon's: mechanism of action and biological effects	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 3. Viral vaccines: modalities of obtaining the vaccines, viral attenuated vaccines, inactivated vaccines, advantages and disadvantages. Smallpox eradication and emerging Poxviruses (Monkeypox). New technologies for to the development of the vaccines: vaccines using viral vectors and mRNA vaccines	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 4. **Orthomixoviridae:** influenza viruses; pandemic and epidemic strains. Variability of influenza viruses; vaccines. Avian flu.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 5. **Paramixoviridae**: Structure and properties of measles, mumps, parainfluenza and respiratory syncitial viruses.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 6. **Herpesviridae:** The structure of herpes viruses. Herpes simplex types 1 and 2, varicella-zoster virus, Cytomegalovirus, Epstein-Barr virus; Human herpes virus 8 and other herpes types specific antiviral for herpes viruses infections.Rotaviruses and other agents of viral gastroenteritis	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
Course 7. **Neurovirosis.** Main viruses implicated in meningitis and encephalitis	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
8. **HIV/AIDS (I).** Retroviridae family. Structure of HIV. Replicative cycle- receptors and co receptors.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture

Mechanisms of variability.		
9. **HIV/AIDS (II).** Evolution of HIV/AIDS infection in adults and children. Antiretrovirals. Combined therapy. Mechanisms of antiretroviral action. Prevention of HIV transmission.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
10. **Hepatitis viruses (1)**: Hepatitis A, B, C, Delta, and E. Recently identified viral hepatitis.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
11. **Hepatitis viruses (2)**: Chronic hepatitis B and C. Markers for monitoring the evolution and treatment of chronic hepatitis B and C.	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
12. **Human Papilomaviruses umane.** Lithic infection versus persistent infection. High-risk oncogenic genotypes. Human papillomaviruses in cervical carcinoma. HPV vaccination	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
13. **Oncogenic viruses**. Oncogenes, antioncogenes, tumor suppressor genes. Mechanism of viral oncogenesis DNA cancer viruses (polyoma, herpes, papilloma, hepatitis, adenovirus). RNA oncogenic viruses (retroviruses).	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture
14. **Emergent viral infections:** Highly pathogenic coronaviruses: SARS CoV, MERS, SARS CoV-2. Vaccines approved for prevention of SARS CoV-2. Viral hemorrhagic fever: Filoviridae; Swine and Avian influenza. Arboviruses: Flavi- and Bunyaviridae encephalitis	Interactive exposure of the material according to the analytical program, using powerpoint presentations and didactic films.	2 hours/lecture

8.2. Clinical rotation	**Teaching methods**	**Observations**
CR 1. **The algorithm of the operations implied in viral diagnose**. Choosing the samples for viral diagnose. Collecting, labeling and transport of biological samples	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 2. Cell cultures: Classification of cell cultures. Protocol of maintaining a stationary cell culture; Protocol of viral isolation on cell cultures. Types of Cytopathic effects. Examples	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class

CR 3. **Seroneutralisation reaction**. Isolation of viruses on the laboratory animal.	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 4. **Plaques method** and calculation of PFU (plaque forming units)	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 5. Laboratory diagnose in viral influenza infections: Haemagglutination test and haemagglutination inhibition tests. Viral isolation on embrionated egg.	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 6. **Laboratory diagnose in Herpesvirus** infections	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 7. **Diagnose in viral neuroviroses:** viral meningitis and encephalitis	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 8. Diagnose of HIV/AIDS: Serological techniques for screening and confirmation: ELISA, Western Blot (WB). Techniques of viral particle detection and viral parts detection.	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 9. **Diagnose of HIV/AIDS Molecular diagnose.** (PCR, Rt-PCR, real time PCR, nucleotide sequencing)	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 10. Laboratory diagnose in viral hepatitis (I): Diagnose of hepatitis B and D: Methods of HBs Ag detection. Markers of HBV infectivity. Diagnose of hepatitis D.	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class

CR 11. Laboratory diagnose in viral hepatitis (II): Diagnose of hepatitis C: Serological tests: ELISA, RIBA. Clinical cases	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 12. Diagnosticul de laborator în hepatitele virale cu transmitere enterica. Algoritmul diagnosticului hepatitei A si E	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 13. Laboratory molecular diagnose in HPV infection. Algoritmul de screening HPV; Diagnosticul molecular ADN-HPV si determinarea genotipurilor	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students.	2 hours/practical class
CR 14. Algorithm for the diagnostis of an unknown outbreak.	Practical and theoretical applications (power point presentations, biological samples, biochemical techniques, computer simulations, functional tests). Interactive learning. Use of multimedia, didactic films, presentations of bulletins of analysis, discussion with students	2 hours/practical class

Bibliography for course and clinical rotation

"Virusologie Medicala"- C. Cernescu,Ed. Medicala, 2008
"Curs concis de virusologie" C. Cernescu , S.M. Ruta Editura Universitara "Carol Davila", 2003
"SIDA - Tratamentul cu antiretrovirale"- C. Cernescu, S. Ruta Ed. Concept publishing, 1998, capitole- 5, 6, 7.
"Medicamente antivirale-2003, C. Cernescu, S.M. Ruta Editura Universitara "Carol Davila" ,2003.
"Progrese in controlul si prevenirea virozelor cu potential bioterorist", C. Cernescu, S.M. Ruta Editura Universitara "Carol Davila" , 2004.
"Practica diagnosticului virusologic", C. Cernescu, S. Ruta, Ed. Concept publishing, 1997
Fields Virology, Knipe M David (eds)a 5-a editie, editura Walters Kluweer Lippincot Williams, 2007

9. Corroboration of the subject content with the expectations of the representatives of the epistemic community, professional associations, and major employers in the field of the programme of study

Professional training of the third-year student in the Virology Discipline follows three main coordinates: correct virological diagnosis and monitoring of therapeutic schemes, understanding the significance of the results of virological diagnosis, and preparation of the future doctor in order to communicate well /adequately with the future employer (including notions of legislation in the field, professional ethics, methodology of scientific research)

The course and practical classes are consistent to the general training required by a doctor at graduation and are related to the Curriculum of training in residency (medical microbiology, infectious diseases, epidemiology)

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Assessment weighting within the final grade
Course	Attendance at the classes, participation to the activities, clinical cases presentations, partial evaluations	Written Exam	**70%**
		Clinical Cases presentations	**10%**
Clinical rotation	Attendance at the classes, participation to the activities, clinical cases presentations, partial evaluations	Evaluation during the semester and Practical Exam, Clinical Cases presentations	**20%**

Minimum performance standard
Minimum grade is five at Virology exam. Minimum performance standard is **50% for the practical exam and the written examination.** Both, practical and final exam represent elimination tests.

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Signature of the course tenured coordinator
Prof. dr Simona Ruta

Conf. dr Camelia Sultana

Signature of the seminar tenured coordinator
Dr Cornel Popescu

Dr Aura Temereanca

Dr Stefania Marineata

Dr Simona Paraschiv

Dr Simona Mihai

Date of approval in the Council of the Department:

Signature of the Head of the Department
Prof. Dr. Adrian Streinu-Cercel