Semester VII

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Molecular Basis of Infectious Diseases (BCH-DSE-9)	**4**	**2L**		**2P**	**Class XII with Science and Biology**	**-**

Learning Objectives

The course aims to provide knowledge about various microbial infectious agents that cause diseases in humans, the concepts of treatment and the biochemical basis of mechanism of action and drug resistance for various antimicrobial agents. The course will also provide an outline of the various strategies that are employed for preventing infectious diseases and the role of vaccination in eradication of diseases. It will cover the concept of emergence and re-emergence of diseases and its impact worldwide. The course will also summarize the significance of hygiene, sanitation, drugs and vaccination in prevention and eradication of infectious diseases.

Learning Outcomes

1. Upon completion of this course, a student will:
2. Understand various classes of pathogens and their mode of action and transmission.
3. Be exposed to the molecular basis of treatment, diagnosis and vaccine design strategies for all the diseases listed.
4. Gain insight into host immune responses that ensue subsequent to infection.
5. Learn the details of diseases such as tuberculosis, AIDS and malaria which are highly prevalent in the Indian subcontinent.

SYLLABUS OF DSE-9

BCH-DSE-9: MOLECULR BASIS OF INFECTIOUS DISEASES

Semester – VII

Theory

Credits: 2 **Total Hours: 30**

Unit I: Introduction to Infectious diseases **No. of Hours: 4**

Basic understanding of infection cycle, nosocomial infections, emerging and re-emerging infections, pathogenic agents of biological warfare, Source, reservoir and transmission of pathogens, reproduction number, LD50, Sanitation and Biosafety levels.

Unit II: Diseases caused by Bacteria **No. of. Hours: 10**

Classification of bacterial pathogens based on structure and nutritional requirements. Study of tuberculosis: History, causative agent, infection and pathogenicity, diagnostics, prevention/precautions, therapeutics and vaccines, drug resistance. Other diseases – Typhoid, Diphtheria, Tetanus, Cholera, Plague.

Unit III: Diseases caused by Virus **No. of. Hours: 10**

Unit Overview of structure, viral virulence factors and host pathogen interactions; detailed study of AIDS (including opportunistic infections) and Influenza: history, causative agent, pathogenesis, diagnostics, drugs, prevention/precautions; overview of other viral diseases including Hepatitis A/B/E, Dengue, Polio, Rabies, SARS.

Unit IV: Fungal and Parasitic Infections **No. of. Hours: 6**

Detailed study of Malaria: history, causative agents, vectors, life cycle, Host parasite interactions, diagnostics, drugs, vaccine development, prevention/precautions. Other diseases including Kala Azar, Amoebiasis, Giardiasis. Fungal diseases such as Candidiasis: general disease characteristics, medical importance, pathogenesis, diagnosis and treatment, antifungal drugs, prevention/precautions.

2.3 Practical:

Credit: 2 **Total Hours: 60**

1. Permanent slides of pathogens: *Mycobacterium tuberculosis*, *Leishmania*, *Plasmodium falciparum*
2. Gram staining
3. Acid fast staining of non-pathogenic *Mycobacterium smegmatis*

4. WIDAL test as a diagnostic test for Typhoid
5. MIC determination using Kirby Bauer / Alamar Blue assay
6. PCR as a diagnostic tool/dry lab.
7. Case studies on SARS, Rabies, Dengue, Polio and Plague
8. Case studies on Malaria, Amoebiasis and Giardiasis
9. Research presentation on current trends in infectious diseases

Essential readings:

1. Jawetz, Melnick & Adelbergs (27th ed.), *Medical Microbiology.* McGraw Hill Education. ISBN-10: 0071790314; ISBN-13: 978-007179031.
2. Kenneth J. Ryan, C., George Ray (2010), *Sherris Medical Microbiology: An introduction to infectious diseases*. McGraw-Hill. ISBN-13: 978-0071604024 ISBN-10: 0071604022
3. Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. Klien's (2008). Microbiology (7th ed.). Mc Graw Hill International Edition (New York) ISBN: 978-007-126727
4. Pier, Lyczak and Wetzler, *Immunology, infection and immunity. ASM Press.* Print ISBN:9781119739555 |Online ISBN:9781683672111 |DOI:10.1128/9781555816148

3. Teaching Learning Process and Assessment Methods

Facilitating the Achievement of Course Learning Outcomes**

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Students will develop an understanding of important terminologies used in infectious diseases, transmission of pathogens and will gain insight into host immune responses that ensue following infection. They will understand the importance of biosafety equipment for people who work on infectious disease-causing pathogens.	Traditional chalk and board teaching aided with Power Point presentations. Videos for Biosafety levels will be shared.	Regular question answer sessions, MCQs and unit-test for internal assessment.
II	Students will learn classification of bacteria and study various bacterial virulence factors. They will learn the pathophysiology of Mycobacterium tuberculosis	Traditional chalk and board teaching aided with Power Point presentations. Animations and video tutorials will be used to	Group discussion, Quiz will be conducted, and students will be asked to deliver Power Point

	and study ways to prevent and treat Tuberculosis. They will also learn about various bacterial diseases (Typhoid, Diphtheria, Tetanus Cholera, Plague) their molecular mechanisms and intervention strategies	teach pathogen-host interactions.	presentations on the assigned topics
III	Students will learn about virus structure and viral virulence factors. They will understand the pathophysiology of the HIV, Influenza and study ways to diagnose and prevent disease. The students will also learn about secondary infections that can happen with AIDS. Students will learn about other various viral diseases (Hepatitis, Rabies, Dengue, Polio and SARS) their molecular mechanisms, diagnosis and intervention strategies. An introduction to Coronavirus will also be done.	Classroom teaching from research papers, chalk and board method of teaching and use of powerpoint presentation. Audio visual to demonstrate the viral infection, transmission and pathogenesis.	Group discussion, Quiz will be conducted, and students will be asked to deliver Power Point presentations on the assigned topics

IV	Students will learn about various parasitic diseases, host parasite interaction, their molecular mechanisms of infection, diagnosis and intervention strategies. Students will also learn about fungal diseases (Candidiasis), molecular mechanisms, diagnosis and intervention strategies	Classroom teaching from research papers, chalk and board method of teaching and use of powerpoint presentation.	Group discussion, Quiz will be conducted, and students will be asked to deliver Power Point presentations on the assigned topics

(Assessment tasks enlisted here are indicative in nature)**

Keywords

Infection, Pathogen, Immune response, Diagnosis, Vaccines, Diseases