19BI211 IMMUNOINFORMATICS
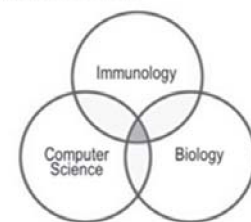
Immunoinformatics

Source: *https:// slideplayer.com/slide/ 7028036/*

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	45	-	10	-	5

COURSE DESCRIPTION AND OBJECTIVES:

The course aims to understand theoretical concepts of Immunology and develop skills in specialized immunological techniques to diagnose and management of health related disorders. The course also provides knowledge and understanding of research methods employing immunological techniques for application in biomedical and clinical research. Acquaint with the latest topic related to the immune checkpoint therapy for advanced cancer treatment.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Familiarize with the basic cellular machinery of immune system.	1
2	Design vaccines by understanding the mechanism of the recognition of pathogen and its antigens.	1,3
3	Evaluate individual differences in disease susceptibility through Immunoinformatics tools.	4,9
4	Analyze and predict the epitopes and antigen-antibody interactions by acquainting the principles of immunology and Immunoinformatics database and tools.	2,4,5,

SKILLS:

✓ *Analyse the data using measures of central tendency.*

✓ *Immunize lab animals for the production of antibodies.*

✓ *Work on immune diffusion techniques.*

✓ *Perform ELISA.*

✓ *Purify IgG.*

UNIT - I   **L-9**

OVERVIEW OF IMMUNE SYSTEM: History and scope of immunology, Types of immunity - innate and adaptive; Cells and organs of the immune system; Antigens - epitopes, antigenicity, factors influencing antigenicity, antigen processing and presentation; Antibodies - structure and function, haptens, adjuvants, mitogens; Major Histocompatability Complex (MHC); Applications of immunoinformatics.

UNIT - II   **L-9**

IMMUNOGLOBULINS: Structure and types of immunoglobulins and biological activities; Monoclonal antibodies; Elements of immune system - hematopoiesis, T-cells, B-cells, myeloid cells, antigen presenting cells, cell mediated subset of T-Cells, helper and suppressor cells, cell medicated and humor immunity; Antibody dependent cell mediated cytotoxicity; Natural killer cells; Auto immune disorders.

UNIT - III   **L-9**

ANTIGEN-ANTIBODY INTERACTIONS: Antibody affinity and activity - precipitation, agglutination; Radio immuno assay (RIA), ELISA, and Western blotting, immunoprecipitation, immune-fluorescence and flow cytometry for separation of immune cells.

UNIT - IV   **L-9**

DESIGN OF VACCINES: Active and passive immunization, DNA vaccines, Multivalent subunit vaccines, Synthetic peptide vaccines, Therapeutic Vaccines.

UNIT - V   **L-9**

IMMUNOINFORMATICS: Introduction; Applications - prediction of epitopes, Web based tools for vaccine design; IMGT - the international immunogenetics database; Web based tools for vaccine design-PREDEPP, Epi predict, Predict, Propred, MHC-1,MHC-2, MHCPred.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS: **TOTAL HOURS: 30**

1. Identification of target.
2. Prediction of MHC-I binding peptides using SYFPEITHI database.
3. Prediction of MHC-I binding peptides using BIMAS database.
4. Proteasomal cleavage prediction using PAProC.
5. Proteasomal cleavage prediction using NetChop.
6. Prediction of MHC-II binding peptides.
7. Prediction of B-Cell sequential epitopes.
8. Prediction of B-Cell conformational epitopes.
9. Antigen- Antibody interaction study.
10. *In silico* vaccine design.

BASIC TEXT BOOK:

1. K. Chakravarthy, "Immunology and Immunotechnology", Oxford University Press, 2006.
2. R. L. Myers, "Immunology: A laboratory manual", Publisher Brown (William C), 2007.
3. D. R. Flower, "Immunoinformatics: Predictive Immunogenicity insilico", Humana Press, 2007.

REFERENCE BOOK:

1. R.A. Goldsby, T. J. Kindt and B. A. Osborne, "Kuby immunology", 4th edition, WH Freeman,New York, 2000.
2. K. Murphy, P. Travers and M. Walport, "Janeway's Immunobiology", 7th edition, Taylor & Francis Publishers, 2008.