22BI301 IMMUNOLOGY AND IMMUNO INFORMATICS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Cell and Molecular Biology, Biochemistry and Enzymology.

COURSE DESCRIPTION AND OBJECTIVES:

The course on Immunology and immunoinformatics is designed in such a way that the topics related to concepts in immunology, cellular components of immune system, innate and adaptive immune responses and their components are introduced in the first module. This is being followed by the practical exercises. In the second module, the immunoinformatics tools are focused so as to enable students to design vaccine using the online tools.

MODULE-1

UNIT-1   **9L+0T+6P=15 Hours**

FUNDAMENTALS OF IMMUNOLOGY

Types of Immunity: innate and adaptive, humoral and cell mediated, Immune cells and lymphoid organs, Antigens, epitopes, factors influencing antigenicity, Software tools for predicting antigenicity, Antigen processing and presentation, HLA - Role and Types, Cytokines - types and immune response, T cell and B cell activation and differentiation, Applications of Immunoinformatics tools.

UNIT-2   **15L+0T+10P= 25Hours**

CLINICAL IMMUNOLOGY

Inflammation, Hypersensitive reactions, Immune check point inhibitors for cancer therapy, Autoimmunity, Monoclonal antibodies - production and applications, Humanized & Bi-specific antibodies, Structure and types of Immunoglobulins.

PRACTICES:

- Isolation of lymphocytes from the mouse spleen and thymus.
- Identification and enumeration of mouse and human leukocytes.
- Hemagglutination test for blood grouping and evaluation of antigen and antibody behavior in vitro.
- Navigate HLA database to trace HLA haplo types of Indian population. Focus on the population of Andhra Pradesh.
- Prepare a chart showing the Hybridoma Technology.

MODULE-2

UNIT-1   **9L+0T+6P=15 Hours**

ANTIGEN ANTIBODY INTERACTIONS

Antibody affinity and activity, Ouchterlony double immunodiffusion and precipitation, Antibody titer, Agglutination, RIA, ELISA, Western Blotting, Immuno fluorescence, MLR, FACS, Vaccines: various platforms of vaccines, vaccine composition, Disease burden due to the vaccine preventable diseases.

UNIT-2   **15L+0T+10P=25 Hours**

IMMUNOINFORMATICS

Design of multi-subunit and polytope vaccines, Population coverage based on HLA haplotypes, HLA Haplotypes of the population of state of Andhra Pradesh, Prediction of epitopes in vaccine design, Web based tools for vaccine design, IMGT-HLA - KIR databases.

source: https://www.slideshare.net/MekhlaDiwan/immunoinformatics-microarray-and-machine-learning-all-about-immunology-immunological-database

SKILLS:

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

✓ *Work on immunodiffusion techniques.*

✓ *Perform ELISA.*

✓ *Purify IgG.*

PRACTICES:

- Antibody titer.
- Immuno diffusion and precipitation.
- ELISA Test for the estimation of antigen / antibody / protein.
- Mapping of the burden due to vaccine preventable diseases. (e.g. Covid-19, Malaria)
- Prediction of Epitope, Conformational and sequential epitopes.
- Design of multi - subunit polytope vaccine.
- Preparation of antigen and adjuvant emulsion (mineral oil, alum, Freund's adjuvants,etc.).
- Immunization of mouse through intra muscular and intra peritoneal routes.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply cellular machinery of immune system to recognize pathogen and its antigens.	Apply	1,2	1,3,7,9,10
2	Analyze the immune factors involved in the defence mechanisms against viruses, bacteria, fungi and nematode parasites.	Analyze	1	1,2,3,9,10
3	Evaluate immune techniques as life saving devices.	Evaluate	1	3,5,7,8,9,10
4	Design experimental protocols using antigen and antibody immune complexes.	Create	1,2	3,6,7,9,10
5	Design a vaccine using immunoinformatics online tools.	Create	2	1,3,5,9,10

TEXT BOOKS:

1. Thomas J Kindt, Barbara A Osborne, Richard A Golds by and J Kuby, "Immunology", 9th edition, WHFreeman, 2016.
2. Gregory R. BockandJamie A. Goode, "Immunoinformatics: Bioinformatic strategies for better understanding of immune function",1st edition,Wiley, 2003.

REFERENCE BOOKS:

1. Rajat K De and Namrata Tomar, "Immunoinformatics", 2nd edition, Humana, 2014.
2. Kenneth Murphy,"Janeway's Immunobiology", 9th edition, Garland Science, 2016.
3. R.L. Myers, "Immunology: Alaboratory manual", 2nd edition, William C Brown, 2007.
4. Lydyard, P.M., Whelan, A., & Fanger, M.W. "Kingdomtittle of instant notes inimmunology", 3rd edition, Taylor and Francis, 2011.