GUJARAT TECHNOLOGICAL UNIVERSITY

School of Applied Sciences and Technology
Integrated M.Sc. Biotechnology

IMMUNOTECHNOLOGY

Prerequisite

Students are expected to have knowledge about cell biology and basic human physiology in the preceding classes or courses

Rationale:

The objectives of this course are to learn about structural features of components of immune system as well as their function. The major emphasis of this course will be on development of immune system and mechanisms by which our body elicit the immune response. This will be imperative for students as it will help them to think like an immunologist and predict about nature of immune response that develops against bacterial, viral or parasitic infection, and prove it by designing new experiments

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				
				Theory		Tutorial/ Practical		Total Marks
L	T	P	C	University exams (ESE)	Progressive Assessment (PA)	External Practical /viva Exam(ESE)	Internal evaluation Practical /viva Exam(PA)	
4	0	8	8	70	30	30	20	150

Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	**Introduction to Immunology** Historical perspective and terminologies, Innate immune response and its role in protection, Adaptive immune response - Humoral and cellular component of immune response, complement system, cytokines, interferons; Innate v/s Adaptive immune response, hematopoiesis, Cells and organs of the immune system (primary and secondary lymphoid organ).	10	16
2	**Antigen-Antibody interaction and Immune Cells** Characteristics of antigen, antigen and immunogen,	15	25

	Epitopes, Haptens, adjuvants, Structure, Function and classification of immunoglobulins; Antigen antibody reactions, agglutination and precipitation, Biology of T and B lymphocytes, functions of T cells, and B cells. Antibodies, structure, types, and their functions. TCR structure. Antibody structure and types. Molecular basis of TCR and antibody diversity. Cytokines (IL-2, TNF-αand β, chemokines and Interferons) introduction and role of cytokines in immune response		
3	**Antigen processing and Presentation** Major Histocompatability Molecules, Organization of MHC genes, Structure and function of MHC gene product, T-cell maturation, activation and differentiation, B-cell maturation, activation and differentiation.	12	20
4	**Apoptosis and disorders related to Immune system** Regulation and control of apoptosis. Caspases, Activation of Apoptotic pathways by internal and external stimuli Immune Response against Infectious diseases: Bacterial, Viral and Protozoan infection, Immuno deficiency diseases (like SCID, AIDS), Autoimmune diseases: Organ specific disease (eg. Myasthenia gravis), and systemic autoimmune diseases (eg. Rheumatism), Hypersensitive reactions, Transplantation immunology: Graft rejection, Evidences and mechanism, prevention of graft rejection and Immunosuppressive drugs.	11	19
5	**Molecular basis of vaccination and techniques used in immunology** Immunodeficiency diseases, Immunization: active and passive immunization. Different types of vaccines with examples. Antigen-antibody reactions, Immunoelectrophoresis, ELISA, Immunoblotting, Immunohistochemistry, Radioimmunoassay, Monoclonal antibodies, and its production and uses. ELISA, RIA, Immunoflourescence, ELISA	12	20
	Total Hours:	60	

Textbook:

1. Kuby Immunology (2007) 6th ed., Kindt, T.L., Goldsby, R.A. and Osborne, B.A., W.H Freeman and Company (New York), ISBN:13: 978-0-7167-8590-3 / ISBN: 10:0-7617-8590-0.

Reference Books:

1. Immunology: A Short Course (2009) 6th ed., Coico, R and Sunshine, G., John Wiley&sons, Inc (New Jersey), ISBN: 978-0-470-08158-7.
2. Janeway's Immunobiology (2012) 8th ed., Murphy, K., Mowat, A., and Weaver, C.T., Garland Science (London & New York), ISBN: 978-0-8153-4243-4. Immunology: Jan Klain, Blackwell Scientific Publishers
3. Immunology: Ivan Roitt, (10th ed), Blackwell Scientific Press, 2010.

Course Outcomes:

No.	Course Outcomes	RBT Level*
1	Use immune molecules or cells for diagnosis and therapy especially for cancer	UN,RM,AN,AP
2	Working towards developing vaccines against many diseases	UN,RM,AN,AP
3	Work in laboratories specifically using immune techniques like Radioimmunoassay, ELISA etc	UN,RM,AN,AP
4	Carry out basic research in understanding still unexplored areas of immunology	UN,RM,AN,AP

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

1. Ouchterlony Double Radial Immunodiffusion
2. Mancini Single Radial Immunodiffusion.
3. Demonstration of Enzyme linked immunosorbent assay
4. Antibody structure and binding: computer based study

List of Laboratory/Learning Resources Required

1. https://onlinecourses.nptel.ac.in/noc22_bt40/preview