



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Science

Level: Under Graduate

Branch Name: Honors/ Honors With Research (Biotechnology)

Course / Subject Code: BS04001021

Course / Subject Name: Immunotechnology

W.e.f. Academic Year:	2025-26
Semester:	4
Category of the Course:	Core Courses

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				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	70	30	30	200

Course Content:

Sr. No.	Course Content	No. of Hours	% of 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)	8	16
2	Antigen-Antibody interaction and Immune cells Characteristics of antigen, antigen and immunogen, 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- α and β , chemokines and Interferons) introduction and role of cytokines in immune	10	23



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	response		
3	Antigen processing and Presentation Major Histocompatibility Molecules, Organization of MHC genes, Structure and function of MHC gene product, T-cell maturation, activation and differentiation, B-cell maturation, activation and differentiation	10	22
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.	8	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, Immunofluorescence, ELISA	9	20

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 Outcome:

After Completion of the Course, Student will able to:

Sr. No	Course Outcomes	RBT Level
1	Use immune molecules or cells for diagnosis and therapy especially for cancer	RM,UN
2	Working towards developing vaccines against many diseases	RM,UN, AP



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3	Work in laboratories specifically using immune techniques like Radioimmunoassay, ELISA etc	RM,UN, AN
4	Carry out basic research in understanding still unexplored areas of immunology	UN, AP, AN

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

List of Experiments:

1. Ouchterlony Double Radial Immunodiffusion
2. Mancini Single Radial Immunodiffusion.
3. Demonstration of different types Enzyme linked immunosorbent assay
4. Antibody structure and binding: computer-based study
5. T- cell epitope prediction
6. Toxicity analysis of peptide sequences
