



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3140410

IMMUNOLOGY

4<sup>TH</sup> SEMESTER

**Type of course:** Professional Core Course

**Prerequisite:** Basic Knowledge of Biochemistry and Cell Biology

**Rationale:** It is one of the basic subjects of Biotechnology. It involves various aspects of immune system, cells and organs involved in immune system, the way body acts against diseases, interactions of antigen and antibody, Improper immune responses like hypersensitivity and autoimmunity, applications like vaccination and antibody production.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

**Contents:**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	UNIT I Introduction to immunity Characteristics of innate and adaptive immunity, Humoral and Cell mediated immune response, Hematopoiesis, Cells and Molecules of the immune system, Primary and Secondary lymphoid organs, Inflammation, Characteristics of T&B cell epitopes, T &B cell maturation, activation and differentiation.	9 hrs	21%
2	UNIT II Characteristics and types of Antigens, Factors affecting the immunogenicity, Haptens and adjuvants, ABO blood group antigens, Epitopes, Structure, functions and characteristics of different classes of antibodies, Organization and expression of Ig Gene, Antigenic Determinants on Immunoglobulins.	7 hrs	14%
3	UNIT III	8 hrs	17%



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	Structure and Function of MHC molecules, Exogenous and Endogenous pathways of antigen processing and presentation, Complement system: Complement components, Complement activation, Regulation of Complement, activation, Complement and inflammation, and Complement deficiencies, Structure, function and application of cytokines, regulation of immune response, immune tolerance.		
<b>4</b>	Unit IV Antigen – Antibody Interaction: Precipitation, Agglutination, RIA, ELISA, Western Blot, Immunofluorescence, FACS Immuno-electron microscopy, Hybridoma Technology: Monoclonal Antibody, SCID Mice and SCID human Mice	9 hrs	19%
<b>5</b>	Unit V : Hypersensitive Reactions: Introduction & meaning of hypersensitivity & allergy, Type-I, II, III and IV hypersensitive reactions and their remedies. Autoimmunity. Transplantation immunology.	7 hrs	17%
<b>6</b>	Unit VI : Vaccines: Introduction & history of vaccination, Active and passive immunization, Whole organism vaccine, Purified macromolecules as vaccine, Recombinant vector vaccine, DNA vaccine, Synthetic peptide vaccine, Multivalent subunit vaccine.	6 hrs	12%

**Suggested Specification table with Marks (Theory): (For BE only)**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>5</b>	<b>40</b>	<b>20</b>	<b>20</b>	<b>15</b>	<b>0</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

**Reference Books:**

1. Immunology by Richard A. Goldsby, Thomus J. Kindt, Barbara A. Osborne & Janis Kuby published by W.H. Freeman & company.



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2. Text Book of Microbiology by Ananthnarayan & Paniker published by Universities Press private limited.
3. Brock Biology of Microorganisms by Michael T. Medigan, John M. Martinco published by Pearson Prentice Hall.
4. Microbiology by Prescott Harley Klein published by McGraw Hill Companies.
5. Immunology and Immunotechnology by Ashim K. Chakravarty Published by Oxford University press.

## **Course Outcome:**

<b>Sr. No.</b>	<b>CO Statement</b>	<b>Marks % Weightage</b>
CO-1	To Understand basics of immunity and immune system.	10%
CO-2	To understand characteristics of antigen and antibody and reactions between them.	35%
CO-3	Analyze role of complement system in immune response	20%
CO-4	Able to apply various immunotechniques	20%
CO-5	Understand importance of vaccination and types of vaccines	15%

## **List of Experiments**

1. To perform and determine the blood group of ABO and Rh system.
2. Total count of leucocytes.
3. Differential count of leucocytes.
4. Determination of erythrocytes sedimentation rate.
5. To determine the clotting time by capillary method.
6. To perform cross matching test by saline tube method.
7. Serological diagnosis of enteric fever by Widal test.
8. To perform ELISA.
9. Ouchterlony double diffusion technique.
10. To perform immunoelectrophoresis.

## **List of Open Source Software/learning website:**

1. NPTEL
2. MIT Open course lecture