

GUJARAT TECHNOLOGICAL UNIVERSITY

BIO-TECHNOLOGY (04)
IMMUNOLOGY
SUBJECT CODE: 2150402
B.E. 5th SEMESTER

Type of course: B.E. (Biotechnology)

Prerequisite: Basic Concepts of 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)		
PA	ALA	ESE		OEP						
3	0	2	5	70	20	10	20	10	20	150

Content:

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.	10 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, Antigenic Determinants on Immunoglobulins.	7 hrs	14%
3.	UNIT III 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, Complement deficiencies, Structure, function and application of cytokines, regulation of immune response, immune tolerance.	8 hrs	17%
4.	Unit IV Antigen – Antibody Interaction: Precipitation, Agglutination, RIA, ELISA, Western Blot, Immunofluorescence, FACS Immuno-electron microscopy.	9 hrs	19%

	Hybridoma Technology: Monoclonal Antibody, SCID Mice and SCID-human Mice		
5.	Unit V : Hypersensitive Reactions: Introduction & meaning of hypersensitivity & allergy, Type-I, II, III and IV hypersensitive reactions and their remedies. Autoimmunity. Transplantation immunology.	8 hrs	17%
6.	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. How to increase immunity: Food habits and Living style	6 hrs	12%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
21	28	7	7	7	-

Reference Books:

1. Immunology by Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne & Janis Kuby published by W.H. Freeman & company.
2. Text Book of Microbiology by Ananthnarayan & Paniker published by Universities Press private limited.
3. Brock Biology of Microorganisms by Michael T. Madigan, John M. Martinko 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.

CourseOutcome: After learning the course students should be able to:

1. Develop a fundamental understanding of cells and organs of immune system
2. Understand the way body acts against diseases
3. Understand Interactions of antigen and antibody.
4. Understand Improper immune responses.
5. Applications like vaccination and antibody production

List of Experiments

1. To perform and determine the blood group of ABO and Rh system.
2. Total count of leucocytes.
3. Total count of erythrocytes.
4. Differential count of leucocytes.
5. Estimation of hemoglobin by Drabkin's method.
6. Determination of erythrocytes sedimentation rate.
7. To determine the bleeding time by Duke's method.
8. To determine the clotting time by capillary method.

9. To perform cross matching test by saline tube method.
10. To perform WIDAL test by saline tube method.
11. To perform RPR test for Syphilis diagnosis.
12. Latex agglutination test.
13. Serological diagnosis of enteric fever by WIDAL test.
14. To perform ELISA.
15. Tri dot test.
16. Ouchterlony double diffusion technique.
17. Isolation and identification of medically important microorganisms.

Open Ended Problems:

Students are free to select any project related to Immunology based on its application in the field of Biology. Some of the suggested projects are:

- Comparison of actual blood component level to the standard level.
- Comparison between different detection methods.

List of Open Source Software/learning website:

Students can refer to video lectures available on the websites including NPTEL. Students can refer to the CDs which are available with some reference books. Students can develop their own flow-sheets for demonstration of various immunological reactions and pathways.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.