

Course Name : Advanced Immunology
Course Number : BY 506
Credits : 3-0-0-3
Prerequisites : IC 136 - Understanding Biotechnology & its Applications or
or Consent of Faculty member
Intended for : B. Tech. 3rd and 4th year, MS/M.Tech., Ph.D.
Distribution :
Semester : Odd/Even

Preamble: The purpose of the course is to give advanced knowledge in the area of immunology and will give the students insights into how such knowledge can be applied to problems in the field of biotechnology and biomedicine. Much emphasis is given on introducing immunology and its role in translational engineering. This course will enhance the thinking process of the student in both basic and applied aspects of immunology. At the end of the course student should be able to have independent thinking about the mechanism of immunology involved in various process. The interest and understanding developed will motivate the student to take up advanced immunology courses that has wide application in medicine and industry.

Course Outline:

UNIT I (8 lectures) INTRODUCTION TO IMMUNOLOGY

Objective: To know about the immune system and why we should read immunology

Cells of immune system; innate and acquired immunity; primary and secondary lymphoid organs; antigens: chemical and molecular nature; haptens; adjuvants; types of immune responses; theory of clonal selection

Session No	Topics to be covered	Time (min)	Teaching Aids
1	Introduction to immunology	50	BB & Chalk
2	Cells of immune system	50	LCD
3	Innate immune system	50	LCD
4	Primary and secondary lymphoid organs	50	LCD
5	Adaptive immune response	50	LCD
6	Types of immune responses	50	LCD
7	Theory of clonal selection	50	LCD
8	Review	50	LCD

UNIT II (16 lectures) IMMUNE RESPONSES

Objective: To study about the cellular and humoral responses of immune system

Development, maturation, activation and differentiation of T-cells and B-cells; TCR; antibodies: structure and functions; antibodies: genes and generation of diversity; antigen-antibody reactions; monoclonal antibodies: principles and applications; antigen presenting cells; major histocompatibility complex; antigen processing and presentation; regulation of T-cell and B-cell responses.

Session No	Topics to be covered	Time	Teaching Aids
1	Introduction to cellular responses	50	BB & LCD
2	Development, maturation of T-cells and B-cells	60	LCD
3	Activation, differentiation of T-cells and B-cells	50	LCD
4	T-Cell Receptor and its diversity	50X2	LCD
5	Antibodies: structure and functions	50	LCD
6	Antibodies: genes and generation of diversity	50	LCD
7	Antigen-antibody interaction	50	BB & LCD
8	Antigen presenting cells	50	LCD
9	Major histocompatibility complex and its importance	50	BB & Chalk
11	Antigen processing and presentation	50	BB & Chalk
12	Regulation of T-cell responses.	50	BB & Chalk
13	Maturation and signaling of T-cells	50	LCD
14	Regulation of B-cell responses	50	
15	Review		

UNIT III (15 lectures) INFECTION AND IMMUNITY

Objective: To learn about infection and immune responses to an antigen, immunodeficiency and vaccines

Injury and inflammation; immune responses to infections: immunity to viruses, bacteria, fungi and parasites; cytokines; complement; immunosuppression, tolerance; allergy and hypersensitivity; Immunodeficiencies; resistance and immunization; Vaccines.

Session No	Topics to be covered	Time	Teaching Aids
1	Immune responses to pathogens	50	LCD
2	Immunity to viruses	50	LCD
3	Immunity to bacteria	50	LCD
4	Immunity to fungi and parasites	50	LCD
5	Cytokines and their biological roles	50	LCD
6	Complement system: classical and alternative pathway	50	LCD

7	Immunosuppression and tolerance	50	LCD
8	Allergy and hypersensitivity	50	LCD
9	Injury and inflammation-I	50	LCD
10	Injury and inflammation-II	50	LCD
11	Immunodeficiencies	50	LCD
12	Resistance and immunisation;	50X2	LCD
13	Vaccines.	50	LCD
14	Review		LCD

UNIT IV (4 lectures) Immuno-technology

Objective: To learn about Autoimmunity

Autoimmunity, Autoimmune disorders and diagnosis

Session No	Topics to be covered	Time	Teaching Aids
1	Principles and concept of ELISA	50	BB & Chalk
2	Principles and concept of WB, IP, Co-IP	50	LCD
3	Principles and concept of FACS	50	LCD
4	Review		

Modules:

Textbooks:

1. Kuby J, Immunology, WH Freeman & Co. 7th edition. MacMillan press.
2. Janeway, Charles A., et al. *Immunobiology: The Immune System in Health and Disease*. New York, NY: Garland Science
3. Roitt's Essential Immunology (Essentials) -Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt, publisher: Wiley-Blackwell, 2006

REFERENCES:

- 4.1. Fundamental Immunology- William E Paul, publisher: Lippincott Williams & Wilkins, 2008
- 5.2. Immunology, Infection, and Immunity -Gerald B. Pier, Jeffrey B. Lyczak, Lee M. Wetzler, publisher: ASM Press, 2004
- 6.3. Lecture Notes: Immunology, 5th Edition -Ian Todd, Gavin Spickett, publisher: Wiley - Blackwell, 2005
- 8.4. Immunology: A Short Course-Richard Coico, Geoffrey Sunshine, publisher: Wiley-Blackwell, 2009

Articles: Relevant articles and scientific papers will be provided during class room teaching