



University of Management & Technology
School of Science
Department of Life Sciences

BT-302 Immunology

Lecture Schedule	Wednesday 08:00-09:15 Thursday 08:00-09:15	Semester	Fall 2019
Pre-requisite	---	Credit Hours	3
Instructor	Miss. Braira Wahid	Contact	braira.wahid@umt.edu.pk
Office	2S-39	Office Hours	08:00-17:00
Course Description	<p>The purpose of the advances in Immunology course is to provide a basic knowledge of the immune response and its involvement in health and disease. This course deals with both innate and adaptive immune responses and covers an introduction of cells and organs of the immune system, antigens and antibodies organization and expression of immunoglobulin genes, principle of antigen-antibody Interactions, the cell biology of Antigen Processing and Presentation including molecular structure and assembly of MHC molecules, the biology of cytokines, leukocyte-endothelial interactions, and the pathogenesis of immunologically mediated diseases.</p>		
Expected Outcomes	<p>The students who will take this course will:</p> <ol style="list-style-type: none"> 1. Demonstrate a comprehensive and practical understanding of basic immunological principles involved in research and clinical/applied science. 2. Attain a working knowledge of current immunological principles as they relate to the cells and molecules of the immune system. 3. Differentiate between humoral and cell mediated immunity. 4. Acquire understanding about how cells and molecules of the immune system interact in defending the body against invading microorganisms. 5. Acquire understanding about how cells and molecules of the immune system malfunction in autoimmune diseases and how they become inadequate in immune deficiency states. 		
Textbook(s)	<ol style="list-style-type: none"> 1. Kuby Immunology, by Barbara A. Osborne, Richard A Goldsby, Thomas J. Kindt, Janis Kuby. 7th edition, 2012. 2. Cellular and molecular immunology, by Abul Abbas, Andrew Lichtman, and Jordan Pober. 8th Edition, 2015. 3. Molecular Cell Biology, by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, Hidde Ploegh, Paul Matsudaira. 7th edition, 2012. 		
Grading Policy	<ul style="list-style-type: none"> • Quizzes & Assignment(s): 20% • Presentation 5% • Midterm: 30% • Final Exam: 45% 		

Course Schedule

Lecture #	TOPICS	Readings
Week 1	Overview of the Immune System, Innate Immunity, Adaptive Immunity, Cells and Organs of the Immune System, Systemic Function of the Immune System	Kuby Ch.1&2
Week 2	Antigens, Immunogenicity Versus Antigenicity, Factors That Influence Immunogenicity, Epitopes, Pattern-Recognition Receptors	Kuby Ch. 3
Week 3	Antibodies, Basic Structure of Antibodies, Obstacles to Antibody Sequencing, Immunoglobulin Fine Structure, Antibody-Mediated Effector Functions, Antibody Classes and Biological Activities, Antigenic Determinants on Immunoglobulins, Monoclonal Antibodies	Kuby Ch. 4
Week 4 Week 5	Organization and Expression of Immunoglobulin Genes, Genetic Model Compatible with Ig Structure, Multigene Organization of Ig Genes, Variable-Region Gene Rearrangements, Mechanism of Variable-Region DNA, Rearrangements, Generation of Antibody Diversity, Class Switching among Constant-Region Genes, Expression of Ig Genes, Synthesis, Assembly, and Secretion of Immunoglobulins, Regulation of Ig-Gene Transcription, Antibody Genes and Antibody Engineering	Kuby Ch. 5
Week 6	Antigen-Antibody Interactions: Principles and Applications, Strength of Antigen-Antibody Interactions, Cross-Reactivity, Precipitation Reactions, Agglutination Reactions, Radioimmunoassay, Enzyme-Linked Immunosorbent Assay, Western Blotting, Immunoprecipitation, Immunofluorescence	Kuby Ch. 6
Week 7	Major Histocompatibility Complex, General Organization and Inheritance of the MHC, MHC Molecules and Genes, Detailed Genomic Map of MHC Genes, Cellular Distribution of MHC Molecules, Regulation of MHC Expression, MHC and Immune Responsiveness, MHC and Disease Susceptibility	Kuby Ch. 7
Week 8	Antigen Processing and Presentation, Self-MHC Restriction of T Cells, Role of Antigen-Presenting Cells, Evidence for Two Processing and Presentation Pathways, Endogenous Antigens: The Cytosolic Pathway, Exogenous Antigens: The Endocytic Pathway, Presentation of Nonpeptide Antigens	Kuby Ch. 8
9	Mid Term Exam Introduction to cytokines	Kuby Ch. 12

Week 10	T-Cell Receptor, Early Studies of the T-Cell Receptor, Organization and Rearrangement of TCR Genes, T-Cell Receptor Complex: TCR-CD3, T-Cell Maturation, Activation, and Differentiation, T-Cell Maturation and the Thymus, Thymic Selection of the T-Cell Repertoire, TH-Cell Activation, T-Cell Differentiation, Cell Death and T-Cell Populations	Kuby Ch. 9&10
Week 11	B-Cell Generation, Activation, and Differentiation, B-Cell Maturation, B-Cell Activation and Proliferation, The Humoral Response, In Vivo Sites for Induction of Humoral Responses, Germinal Centers and Antigen-Induced B-Cell Differentiation, Regulation of B-Cell Development, Regulation of the Immune Effector Response	Kuby Ch. 11
Week 12	The Complement System, The Functions of Complement, The Complement Components, Complement Activation, Regulation of the Complement System, Biological Consequences of Complement Activation, Complement Deficiencies	Kuby Ch. 13
Week 13	Hypersensitive Reactions, Gell and Coombs Classification, IgE-Mediated (Type I) Hypersensitivity, Antibody-Mediated Cytotoxic (Type II) Hypersensitivity, Immune Complex-Mediated (Type III) Hypersensitivity, Type IV or Delayed-Type Hypersensitivity (DTH)	Kuby Ch. 16
Week 14	Vaccines, Active and Passive Immunization, Designing Vaccines for Active Immunization, Whole-Organism Vaccines, Purified Macromolecules as Vaccines, Recombinant-Vector Vaccines, DNA Vaccines, Multivalent Subunit Vaccines	Kuby Ch. 18
Week 15	Cancer and the Immune System, Cancer: Origin and Terminology, Malignant Transformation of Cells, Oncogenes and Cancer Induction, Tumors of the Immune System, Tumor Antigens, Immune Response to Tumors, Tumor Evasion of the Immune System, Cancer Immunotherapy	Kuby Ch. 22

Overview of the immune system as the body's main defense mechanism elements of innate and acquired immunity; cells and organs of the immune system; properties of antibodies and antigens together with their structure, function and interactions; genetics of antibody structure and diversity; expression of immunoglobulin genes; VDJ recombination; antigen processing and presentation; major histocompatibility complex; monoclonal and polyclonal antibodies; T-cell receptors, maturation, activation, and differentiation; B-cell generation, activation, and differentiation; complement system, hypersensitivity, cytokines, resistance and immune response to infectious diseases, cell-mediated effector response, leukocyte migration and inflammation, vaccines, diseases of the immune system - autoimmunity, transplantation immunology