Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

B.Sc. (Life Science / Biotechnology / Chemistry)

BSBT403 – Immunology, Biostatistics and Bioinformatics

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSBT 403	DC	Immunology, Biostatistics and Bioinformatics	60	20	20	30	20	4	1	2	7

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. To give an introductory course in Immunology
2. To give an introductory course in Biostatistics and Bioinformatics

Course Outcomes:

1. Students will have a comprehensive idea about basics of Immunology
2. Students will learn about the basic tools of Biostatistics and Bioinformatics

Unit-I

Origin of Immunology, Concept of Innate and Adaptive immunity, Cell mediated and Humoral Immunity. Basic concept of cytokines. Primary and secondary immune response, Clonal selection of lymphocytes. Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT and MALT.

Unit-II

Characteristics of antigens (Foreignness, Molecular size and Heterogeneity), antigenicity, immunogenicity, hapten, epitopes, Adjuvant, T-dependent and T- independent antigen. Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal, Polyclonal and Chimeric antibodies. Antibody mediated effector functions.

Antigen - Antibody interactions: Principles of Precipitation and Agglutination. Precipitation reactions-Radial immunodiffusion, double immunodiffusion, immunoelectrophoresis; Agglutination reactions-Hemagglutination, passive agglutination, bacterial agglutination.

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ELISA, ELISPOT, Western blotting, Immunofluoresence, Radio Immuno Assay.

Unit – III

Structure and Functions of major histocompatibility complex MHC 1 & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways). Complement components, function, complement activation- (i) Classical, (ii) Alternate and (iii) lectin pathways (characteristics & functions).

Immune diseases: Hypersensitivity: definition, types, examples. Auto-Immune disease and Immuno-deficiencies with examples.

Vaccines: Active and passive immunization (definition, characteristics, examples and functions). Attenuated and inactivated viral or bacterial vaccines (definition, characteristic, functions, examples).

Unit – IV

Population and sample designs .Measure of Central tendency – mean, mode and median. Measures of dispersion, standard deviation and standard error.

Addition and multiplication theorems and their applications. Test of significance, Chi square test, students t –test, Analysis of variance.

Normal distribution and deviation from normality.

Unit – V

Introduction to Bioinformatics and its Applications.

Nucleic acid and protein data bases, Structure, enzyme, organism and species data bases.

Sequence alignments for proteins and nucleic acids. Visualization of protein structure.

BSBTL 406 Practical:

1. Estimation of hemoglobin
2. Total count of WBC and RBC
3. Differential WBC count
4. Flocculation Reaction – VDRL
5. Agglutination Reaction – Widal test, Blood Grouping
6. Immuno-diffusion Techniques – ODD and RID
7. ELISA
8. NCBI , GenBank and SWISSPROT
9. Sequence alignment with BLAST
10. Visualizing structures with RASMOL

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Books:

1. Immunology – Kuby J.
2. Fundamental Immunology – Paul WE.
3. Fundamentals of Immunology – Coleman et al.
4. Immunology – Weir and Steward.
5. Immunology, A Textbook – Rao CV.
6. Lecture notes in Immunology – Todd IR.
7. Essentials of Immunology – Roitt IM.
8. Immunology – Understanding of Immune System – Elgert KD.
9. Principles of Biostatistics – Pagano et.al.
10. Introduction to Biostatistics – Forthoter and Lec.
11. Bioinformatics – Baxevanis.
12. Bioinformatics – Higgins and Taylor.
13. The Internet and the new Biology: Tools for Genomic and Molecular Research – Peruski and Peruski.

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