

### **COURSE 9: IMMUNOLOGY**

Theory

Credits: 3

3 hrs/week

### I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

- 1. Learn about types of immunity and cells of immunity
- 2. Learn about Antigen and Antibody
- 3. Learn about cell, humoral immunity and MHC molecules
- 4. Learn about Hypersensitivity and vaccines
- 5. Learn about immunological techniques

# II. Syllabus

### <u>UNIT I</u> Immune system:

- 1. History and scope of immunology, cells of imthe mune system -Tcells, B cells
- 2. Immunity, innate immune mechanism, Acquired immune mechanism
- 3. Organs of the immune system (Bone marrow, spleen thymus MALT)

### **<u>UNIT II</u>** Antibody and Antigen:

- 1. Antibody structure and classes(Ig G,Ig M Ig A Ig E I g D, Antibody diversity
- 2. Antigen Types of Antigens Antigenicity (factors affecting antigenicity).
- 3. Antigenic determinants adjuvants and haptens, epitopes

### **<u>UNIT III</u>** Immunity:

1. Humoral immunity, cell-mediated immunity -TC-mediated immunity, NK cell-mediated immunity, ADCC,

2. brief description of cytokines, Interleukins

3. Major histocompatibility complex (MHC )-Structure and Functions of Class I ,II , MHC Molecules

### <u>UNIT IV</u> Hypersensitivity and vaccination :

- 1. General features of hypersensitivity, various types of hypersensitivity,
- 2. Vaccination: Discovery, principles, significance,
- 3. Types of Vaccines -live, attenuated, killed, recombinant, subunit

### **<u>UNIT V</u>** Immunological Techniques

1. Antigen-antibody reactions: Precipitation, agglutination, complement fixation, immunodiffusion, - Radial immune diffusion, ouchterlony, double immune diffusion

- 2. Hybridoma technology: Monoclonal antibodies and their applications in immunodiagnosis.
- 3. ELISA, RIA, immunoelectrophoretic, Rocket electrophoresis



# **III**. Skills Outcome

On Successful Completion of this Course, the Student shall be able to

- 1. Learn about the determination of blood group
- 2. Learn about immunodiffusion methods
- 3. Learn about production of antibodies



### **COURSE 9: IMMUNOLOGY**

Practical Credits: 1 2 hrs/week

**IV. Practical Syllabus**: Hours 2 hours per week = 30 hours

- 1. Antigen antibody reaction determination of Blood group, Cross reactivity
- 2. Pregnancy test
- 3. Widal test
- 4. Ouchterloney immunodiffusion
- 5. Radial immunodiffusion
- 6. ELISA
- 7. Isolation of casein by isoelectric precipitation
- 8. Production of antibodies and their titration

### V. REFERENCES

1. Kuby immunology, Judy Owen, Jenni Punt, Sharon Stranford., 7th edition (2012), Freeman and

Co., NY

2. Textbook of basic and clinical immunology, 1st edition (2013), Sudha Gangal and Shubhangi

Sontakke, University Press, India

3. Immunology, 7th edition (2006), David Male, Jonathan Brostoff, David Roth, Ivan Roitt,

Mosby, USA.

- 4. Immuno diagnostics, 1996, By S.C. Rastogi, Publ: New Age
- 5. Introduction to Immunology- 2002, C. V. Rao- Narosa Publishing House

### VI. CO-Curricular Activities

- a) Suggested C0-Curricular Activities
- 1. Assignments
- 2. Seminars, Group Discussions on related topics
- 3. Charts on cell mediated immunity
- 4. Models on antibodies



### **COURSE 10: BIOINFORMATICS AND BIOSTATISTICS**

Theory

Credits: 3

3 hrs/week

### I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

- 1. Learn about concept and branches of bioinformatics
- 2. Learn about searching sequences using databases
- 3. Learn about computer phylogenetics
- 4. Learn about the measurement of central tendency
- 5. Learn about test hypothesis

# II. Syllabus

# <u>UNIT – I</u>

1. Scope of computers in biological research, Introduction to Bioinformatics: Definition, nature and scope of bioinformatics.

- 2. Bioinformatics versus computational biology.
- 3. Branches of bioinformatics. Basic concepts in bioinformatics.

### <u>UNIT – II</u>

- 1. Basic concepts of system biology. Protein Data Bases -visualization of proteins using database
- 2. Overview of computer-aided drug design.
- 3. Searching sequence database using BLAST. Concept of genomics and proteomics

### <u>UNIT – II</u>I

- 1. Computational phylogenetics various applications.
- 2. Phy lip software. Microarray,
- 3. Bio informatics Experimental design & Over view of data analysis.

### <u>UNIT – IV</u>

- 1. Measurement of central tendency (mean, mode and range)
- 2. Dispersion (standard error and standard deviation).
- 3. Probability and distribution. Poisson and binomial distributions. Normal distribution

### <u>UNIT – V</u>

- 1. Population and sampling test of significance. Test hypothesis.
- 2. Student t-test for small samples. ANOVA ,Chi<sup>2</sup> test for analysis, correlation and regression.
- 3. Computer applications in Biotechnology



# **III**. Skills Outcome

On Successful Completion of this Course, Student shall be able to

- 1. Learn about problems of mean median mode
- 2. Learn about test hypothesis
- 3. Learn about sequence Retrieval from NCBI



# COURSE 10: BIOINFORMATICS AND BIOSTATISTICS

Practic	al Credits: 1	2 hrs/week		
1.	Mean, Median, Mode			
2.	Standard deviation, variance and coefficient of variation			
3.	Testing of hypotheses regarding population mean			
4.	Testing of hypotheses about the difference between population means			
5.	Chi-square test			
6.	Testing of Correlation Coefficient			
7.	Fitting of simple linear regression			
8.	Sequence retrieval (protein and gene) from NCBI, Structure download (protein and	DNA)		
from PDB				
V. REFERENCES				
1. Fowler, J., Cohen, L. and Jarvis, P. (1998). Practical Statistics for Field Biology. John Wiley and				
Sons, 2nd ed				
2. Bland, M. (2006). An Introduction to Medical Statistics. Oxford University Press, 3rd ed.				
3. Finney, D.J. (1980). Statistics for Biologists. Chapman and Hall Ltd.				
4. Wayne, W, Daniel (1999). Biostatistics: A Foundation for Analysis in Health Sciences. John Wiley				
and Sons, 7th ed.				
VI. (	CO-Curricular Activities			

# a) Suggested C0-Curricular Activities

- 1. Assignments
- 2. Seminars, Group Discussions on related topics
- 3. Charts on data bases



# **COURSE 11: MEDICAL BIOTECHNOLOGY**

Theory

Credits: 3

3 hrs/week

### I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

- 1. Learn about diseases caused by microbial sources
- 2. Learn about epidemiology, pathogenicity, laboratory, diagnosis, prevention and control of bacterial diseases
- 3. Learn about fungal, viral and protozoan diseases
- 4. Learn about gene therapy and vectors used in gene therapy
- 5. Learn about drug discovery, therapeutic applications

### II. Syllabus

### UNIT-I

- 1. Diseases, introduction, types : genetic, chromosomal aberrations, numerical and structural autoimmune disorders
- 2. Disease caused by microbial sources . mechanism of pathogenicity, pathogenic islands , molecular basis of diseases
- 3. Antimicrobial compounds and their mode of action

### Unit -II

- 1. Characteristics of infectious diseases, herd immunity
- 2. Disease cycle ( source of disease , reservoir, carries) , transmission of pathogens ( air borne , contact transmission , and vector transmission)
- 3. Bacterial diseases epidemiology, pathogenicity, laboratory, diagnosis, prevention and control of the following diseases tuberculosis, typhoid, tetanus, leprosy

### Unit -III

- 1. General account of fungal diseases : mycosis , subcutaneous and deep
- 2. General account of viral and protozoan diseases- pneumonia, mumps, AIDS, malaria
- 3. Brief account of sexually transmitted diseases

#### Unit -IV

- 1. Gene therapy Exvivo, Invivo, Insitu gene therapy
- 2. strategies of gene therapy, gene augmentation
- 3. Vectors used in gene therapy, biological vectors retrovirus, adeno virus, herpes. Synthetic vectors liposomes, receptor medicate gene transfer



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# Unit -V

- 1. Introduction to drug discovery. Stem cell based drug discovery, drug screening and toxicology
- 2. Therapeutic applications neurological disorders Parkinson's diseases , Alzheimer's disease
- 3. Antiviral therapy for AIDS, DNA/RNA based diagnosis, hepatitis

# **III** . Skills Outcome

On Successful Completion of this Course, Student shall be able to

- 1. Learn about Laboratory Safety Regulations
- 2. Learn about staining techniques
- 3. Learn about Culture of bacteria and its cultural characteristics
- 4. Learn about serological diagnosis of diseases



# **COURSE 11: MEDICAL BIOTECHNOLOGY**

Practical	Credits: 1	2 hrs/week

- 1. Laboratory Safety Regulations
- 2. Culture media & isolation of pure culture
- 3. Smear Preparation & Simple stain
- 4. Gram stain
- 5. Culture of bacteria and its cultural characteristics
- 6. C Reactive protein test
- 7. Widal test
- 8. Serological diagnosis of tuberculosis
- 9. Serological diagnosis of HIV

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# V. REFERENCES

- 1. Text book of microbiology R. Ananthanarayana and C.K. Jayaram Paniker, Orient longman 1997
- 2. Medical microbiology, vol 1 microbial infections : Mackie and MaCarty, Churcil Livingsione 1996
- 3. Bailey and Scotts Diagnostic microbiology : Baron EJ Peterson LR and Finegold SM Mosby 1990
- 4. Broude A.I (1981) Medical microbiology and infectious diseases, W.B Saunders & Co Philadelphia

# VI. CO-Curricular Activities

# a) Suggested Co-Curricular Activities

- 1. Assignments
- 2. Seminars, Group Discussions on related topics
- 3. Charts / models on bacterial/fungal/ viral / protozoan diseases