

## DISCIPLINE SPECIFIC CORE COURSE – 17

### Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Defense mechanisms in living organisms (BS-DSC-602)	4	2		2		SEM V

### Learning Objectives

The Learning Objectives of this course are as follows:

- to focus on the integrative working and regulation of both the innate and induced/adaptive defense mechanism that operate in the vertebrate system as well as in the plant kingdom.
- to differentiate between innate and induced/adaptive immune mechanisms and their importance in maintaining a healthy system in both the animal and plant kingdoms.

### Learning outcomes

Upon completion of the course, the students will be able to:

- Get an overview of the immune system and learn about the various cells, organs and tissues of the immune system.
- to describe the basic mechanisms, differences and functional interplay of innate and adaptive immunity.
- Students will be able to define the pathways of humoral and cell-mediated immune responses.
- Students will learn about the various preexisting structural and induced defenses in plants, the genetic basis of plant-pathogen interaction and how pathogens can cause disease in plants.

## SYLLABUS OF DSC- 17

### Theory

**TOTAL HOURS: 30**

**CREDITS: 2**

#### **Unit I: Introduction to Defense Mechanisms**

**No. of weeks: 1**

Overview of immunity. Source of infection and spread of infection in plants and animals.

#### **Unit II: Innate Defense mechanisms in plant**

**No. of weeks: 2.5**

Pre-existing structural defenses -waxy coat, cuticle, epidermal layer, hydathodes, thorns, sclereids,mineral crystals (idioblasts,) and cell wall. Biochemical defenses- secondary metabolites (terpenoids, glycosides, phenolics and alkaloids) Innate Immunity in Plants- Pattern triggered immunity (PTI)

#### **Unit III: Adaptive Defense mechanisms in plant**

**No. of weeks: 4**

Factors causing plant stress: biotic stress. Classification of biotic stresses, major pests and diseases of economically important crops, interaction in host-pathogen systems, Flor's gene for gene concept, R gene mediated resistance, effector triggered immunity (ETI), receptor-elicitor model, Cytological protection and induced resistance. Concept of signal transduction and other host- defense mechanisms. Heat shock proteins, Basic ROS cycle and adaptation during stress, Systemic Acquired Resistance (SAR), Phytoalexins Jasmonic acid, MAPKS, SROS, HPL, systemins, mechanism of production and scavenging of NO.

#### **Unit IV: Innate Defence mechanisms in animals**

**No. of weeks: 3**

Anatomical barriers, soluble molecules and membrane associated receptors (PRR). Complement system - biological consequences and regulation of the pathway. Haematopoiesis, cells of the innate immune system, primary lymphoid organs. inflammatory response; connections between innate and adaptive immunity.

#### **Unit V: Adaptive Defence mechanisms in animals**

**No. of weeks: 4.5**

Antigens and haptens, Factors that dictate immunogenicity, B and T cell epitopes. Structure and distribution of classes of immunoglobulins (Ig). Secondary lymphoid organs and tissues B cell maturation and generation of antibody diversity. Generation of humoral immune response. Histocompatibility antigens – structure and function, T cell maturation – Positive and Negative selection of thymocytes, Antigen Presentation by the exogenous and endogenous pathways, cell mediated immunity, role of NK cells and Antibody dependent cellular cytotoxicity.

### **PRACTICALS**

**TOTAL HOURS: 60**

**CREDIT: 2**

1. Characterization of diseases symptoms and identification of pathogenic organisms (bacterial- *Xanthomonas campestris*; viral- TMV; fungal- *Puccinia, graminis tritici*, pest and nematodes- *Meloidogyne* spp.).
2. Survey of structural plants defences: viz. cuticle, wax, lignin, bark, thorns, prickles, trichomes, armour in different plants species including thigmonasty, camouflage, mimicry.

3. Precipitation reactions – DID and SRID.
4. Immuno-electrophoresis (IEP), Counter current IEP, Rocket IEP
5. Agglutination reaction.
6. Cell isolation and viable Counting- Spleen/PBMC
7. Survey report on infections in plants and animals

## REFERENCES

1. B.B.Buchanan, W. Gruissem & R.L.Jones. (2015). Biochemistry and Molecular Biology of Plants. Oxford: Wiley Blackwell.
2. Coico, R & Sunshine, G., John (2009). Immunology: A Short Course. New Jersey: Wiley & sons.
3. Kindt, T.J., Goldsby, R.A. & Osborne, B.A.(2007) . Kuby Immunology. New York: W.H Freeman.
4. Leslie Hudson & Frank C. Hay (1980). Practical Immunology. Oxford: Blackwell Scientific
5. Lincoln Taiz & Eduardo Zeiger.(2010). Plant Physiology. Sunderland, Massachusetts: Sinauer associates Inc.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.