2. Identification of stored grain insect pests: *Sitophilus oryzae, Corcyra cephalonica, Trogoderma granarium, Callosobruchuschinensis.*
3. Culture of two crop insects of economic importance and submission of culture report.
4. Study of the life history of two different insect pests (Submission of life cycle stages from culture).
5. Visit to IARI (Pusa), and other ICAR Institutes.

Essential/recommended readings

1. Pedigo, L.P. (1996) *Entomology and Pest Management*. Prentice Hall.
2. S. Pradhan. *Insect Pest of Crops* (2011). National Book Trust.
3. Atwal, A.S. (1993) *Agricultural Pests of India and South East Asia*. Kalyani Publishers.

Suggestive readings

1. Dennis, S. Hill (2005) *Agricultural Insect Pests of the Tropics and Their Management*. Cambridge University press.
2. Tembhare, D. B. (2017). Modern Entomology. Himalaya Publishing House Pvt. Ltd. Mumbai.

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

GENERIC ELECTIVE (GE-02)

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
		Lecture	Tutorial	Practical/ Practice		
Insect Vectors and Diseases	**4**	**2**	**0**	**2**	NIL	**NIL**

Objectives:

Insect vectors spread a variety of diseases, resulting in millions of fatalities each year around the world, particularly in developing countries. The transmission by Insect-borne pathogen is increasing at an alarming rate, posing an increasing menace to human health. The transmission of

disease by the insects can only be controlled and prevented by studying their biology, modalities of pathogen transmission by them, evaluating associated risk factors and by devising efficient techniques to control these insects.

Learning Outcomes:

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

- Identify different insects and classify them based on their morphology and behaviour
- Describe the host-pathogen relationships and the role of the host reservoir on transmission of parasite
- Explain various modes of transmission of parasite by insect vectors
- Recognize various possible modern tools and methodologies for laboratory diagnosis, surveillance and treatment of diseases
- Define various terms related to insect transmitted diseases such as Zoonotic, Vertical and Horizontal transmission, host specificity etc.
- Identify the risk groups and design methodology to protect them.
- Spread awareness on public health programs about insect borne diseases and their control
- Employ the use of advanced management strategies in disease control with respect to parasite evolution.

Theory:

Unit 1. Introduction to Insects: **Hours: 08**

General Features of Insects, Classification of insects up to Orders- General features of orders, Morphological features: Head, legs and types of antennae. Types of Insects mouth parts w.r.t.feeding habits: siphoning type (butterfly), sponging type (housefly), biting and chewing type (cockroach), piercing and sucking type (mosquito), chewing and lapping type (honeybee).

Unit 2. Concept to Vectors: **Hours: 05**

Brief introduction to Carriers and Vectors (mechanical and biological vector); Insect reservoirs; Host-vector relationship; Vectorial capacity; Host Specificity; Modes of disease transmission - vertical and horizontal transmission; Insects as vectors: General adaptations in insects to act as vectors.

Unit 3. Dipterans as disease Vectors-I: **Hours: 05**

Dipterans as important insect vectors–Mosquitoes. Study of mosquito-borne diseases–Malaria, Dengue, Chikungunya, Filariasis, Viral encephalitis. Control and prevention/cure of diseases caused by mosquitoes.

Unit 4. Dipterans as disease vectors-II **Hours: 04**

Dipterans as important insect vectors –Sand flies (*Phlebotomus* or *Lutzomyia*), Houseflies (*Musca domestica*); Study of sand-fly borne diseases – Leishmaniasis, phlebotomus fever; Study of house fly as important mechanical vector; Myiasis; Control and prevention/cure of diseases caused by sandfly and house fly.

Unit 5. Siphonapterans as disease vectors. **Hours: 03**

Fleas as insect vectors; Study of flea-borne diseases – Plague, typhus fever; Control and prevention/cure of diseases caused by fleas.

Unit 6. Siphunculata as disease vectors: **Hours: 05**

Human louse (head, body and pubic louse) as disease vectors; study of louse-borne diseases: Typhus fever, relapsing fever, vagabond's disease, Phthiriasis; Control of human louse and prevention/cure of diseases caused by them.

Practical:

1. Study of different kinds of mouthparts and legs of insects through slides/specimens.
2. Study of insect vectors through permanent slides or photographs: Mosquitoes (Aedes, Culex, Anopheles), lice [head, body (*Pediculus*), pubic (*Pthirus*)], Flea (*Xenopsyllacheopis*), sand fly (*Phlebotomus*), house fly (*Musca domestica*).
3. Study of different diseases transmitted by the above insect vectors using photographs.
4. Project report on any one disease transmitted by an insect vector.
5. Optional field trip/Lab. visit institutes such as NIMR, NCDC.

Essential/recommended readings

- Mullen & Darden. *Medical and Veterinary Entomology* (3rd Ed.). Academic Press.
- Service, M.W. (1980). *A Guide to Medical Entomology*. Macmillan Press.

Suggestive readings

- Burgess, N. R. H. & Cowan, G. O. (1993). *A colour atlas of medical entomology*. Springer Science and Business Media, B. V.

E-content:

- http://publichealth.lacounty.gov/acd/Vector.htm
- https://www.cdc.gov/ncezid/dvbd/index.html

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

GENERIC ELECTIVE (GE-03)

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
		Lecture	Tutorial	Practical/ Practice		
Techniques for Insect Collection, Rearing and Preservation ALS ZOO GE 03	**4**	**2**	**0**	**2**	NIL	**NIL**

Objectives:

The course aims to give knowledge to the student about the broad categories of insects. They will be taught about the various insect collection techniques as well as their preservation for future studies. They will also be trained about the maintenance of insectary and rearing of insects for their use in research as well as for commercial purposes.

Learning outcomes:

- Students will understand the use of different tools and techniques for the collection and preservation of insects belonging to various economically important insect orders.
- Students will be equipped with rearing techniques of insects.
- They will be able to set up an insectary.

Theory:

Unit 1: Hours: 04

Class Insecta

Characteristics of class Insecta and outline classification upto orders

Unit 2: Hours: 06