DISCIPLINE SPECIFIC ELECTIVE COURSE – 04

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		
Environmental health and Agrochemicals	**4**	**2**	**0**	**2**	**-**	**NIL**

Course objectives

The Learning Objectives of this course are as follows:

- Understand the mechanisms of pesticide entry and dispersion in environmental compartments.
- Explore the interactions between pesticide residues and soil/water/microbial systems.
- Assess the toxicological and ecological implications of pesticide residues.
- Implications of pesticide persistence on human health**.**
- Impact of Pesticide Residues on Human Health and Society

Learning outcomes

The Learning Outcomes of this course are as follows:

- Describe the environmental pathways of pesticide residues in air, water, and soil.
- Analyze the physicochemical and biological processes governing pesticide degradation and transport.
- Evaluate the impact of pesticide residues on ecosystems, food safety, and public health.
- Persistence of pesticides in environment.
- Propose sustainable practices and policy interventions to mitigate agrochemical pollution.

SYLLABUS OF DSE- 04

THEORY COMPONENT-

UNIT 1: (6Hours)

Residues of Agrochemicals in the Atmosphere:

Entry pathways of pesticides into the atmosphere, Fate of Pesticides in the atmosphere, Transport of vapors, Precipitation, Impact of airborne residues, air quality and climate, effect of residues on human health

UNIT 2: (6 Hours)

Residues of Agrochemicals in Water system:

Nature and origin of pollution of aquatic systems, Point and Non-Point pollution. Runoff, leaching, and effluent discharge into water bodies, Physicochemical properties influencing aquatic fate (solubility, hydrolysis, photolysis). Dynamics of pesticides in aquatic environment. Toxicological effects on aquatic flora and fauna

UNIT 3: (6 Hours)

Pesticides residues in the Soil:

Absorption, Retention, Transport and Degradation of pesticides in the soil, persistence and half-life of various pesticide classes in soil. Effect on microorganisms and Consequent effect on the soil condition, Fertility, nutrient cycle and crop productivity. Interactions between pesticides and soil organic/inorganic matter

UNIT 4: (12Hours)

A Persistence of Pesticides in the Environment:

Low, moderate and high persistent pesticides, Persistent organic pollutants, Physical, chemical, biochemical and environmental factors affecting pesticide of persistence in the environment.

B Pesticide Dissipation and Fate in The Environment:

Various dissipation processes, Role of drift, volatilization, adsorption, desorption, runoff etc.in pesticide dissipation, Leaching and risk of groundwater pollution, Dissipation time (Half-life-DT50, DT90), Rate kinetics (1st order, 2nd order), Behavior and fate of pesticides in soil and crops.

C Impact of Pesticide Residues on Human Health and Society:

Direct and indirect exposure pathways in humans (food, water, air, occupational). Acute and chronic health effects (carcinogenicity, neurotoxicity, endocrine disruption, genotoxicity, skin sensitization, reproductive and developmental toxicity).

PRACTICAL COMPONENT (60Hours)

1. To study degradation of airborne pesticides when exposed to UV radiation.
2. To observe chemical degradation (hydrolysis and photolysis) of pesticides in water
3. To measure how different soils, retain pesticides through adsorption.
4. To determine the degradation rate and persistence of a pesticide in soil.
5. To analyze enzyme activity or nutrient availability in pesticide-treated soil.
6. To study whether washing, peeling, or boiling reduces pesticide residues and protects food quality.
7. Writing the assigned an in-depth analysis of at least three pesticides to be allotted by instructor. It must cover the detailed aspects of: Chemical Structure, Impact on environment and its persistence, Toxicity, Human Health Implications and GHS labelling

ESSENTIAL/RECOMMENDED READINGS

1. Ogwu, M. C., &Izah, S. C. (Eds.). (2023). One health implications of agrochemicals and their sustainable alternatives (Vol. 34). Springer Nature.

2. WHO (World Health Organ.), FAO (U. N. Food Agric. Organ.). (2019). Global situation of pesticide management in agriculture and public health: report of a 2018 WHO-FAO survey WHO, Geneva. https://apps.who.int/iris/handle/10665/329971](https://apps.who.int/iris/handle/10665/329971)

3. Vaz Jr, S. (2019). Sustainable agrochemistry. Springer International Publishing, New York, US.

4. Naeem, M., Juan Francisco Jimenez Bremont, Abid Ali Ansari, &Sarvajeet Singh Gill. Agrochemicals in Soil and Environment.

5. Devi, P. I., Manjula, M., &Bhavani, R. V. (2022). Agrochemicals, environment, and human health. Annual Review of Environment and Resources, 47(1), 399-421.

6. Dowdall, C. M., & Klotz, R. J. (2016). Pesticides and global health: understanding agrochemical dependence and investing in sustainable solutions. Routledge. https://doi.org/10.4324/9781315422695

7. Yassi, A. (2001). Basic environmental health. Oxford University Press.

8. Akpan, G. E., Ndukwu, M. C., Etim, P. J., Ekop, I. E., &Udoh, I. E. (2023). Food Safety and Agrochemicals: Risk Assessment and Food Security Implications. In One Health Implications of Agrochemicals and their Sustainable Alternatives (pp. 301-333). Springer Nature Singapore.

9. Frumkin, H. (Ed.). (2016). Environmental health: from global to local. John Wiley & Sons.

10. Nriagu, J. O. (2019). Encyclopedia of environmental health. Elsevier.

11. Pretty, J. (Ed.). (2012). The pesticide detox: towards a more sustainable agriculture. Routledge.

12.Hamilton, D., & Crossley, S. (Eds.). (2004). *Pesticide residues in food and drinking water: human exposure and risks*. John Wiley & Sons.

13. Horrigan, L., Lawrence, R. S., & Walker, P. (2002). How sustainable agriculture can address the environmental and human health harms of industrial agriculture. Environmental Health Perspectives, 110(5), 445-456.

14.Schnoor, J. L. (Ed.). (1992). *Fate of Pesticides and Chemicals in the Environment*. John Wiley & Sons.

15. Shahamat U Khan. 1980. Pesticides in the Soil Environment (Editor: R. J. Wakeman) Elsevier.

KEYWORDS: Residues of Agrochemicals, Fate of Pesticides in the atmosphere, Toxicological effects, Transport and Degradation of pesticides, Persistence of Pesticides, Pesticide Dissipation in environmental

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