Basics Concepts and Applications of Agrochemicals		Semester	III
Course Code	BAG301	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination nature (SEE)	Theory		

Course Objectives:

- To understand the basic concepts of agrochemicals and their applications in agriculture.
- To study naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.
- To understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.
- To understand the impact of agrochemicals on environmental, animal, and human health
- To understand the regulatory mechanism of agrochemicals at national and international levels
- To acquire necessary basic knowledge on agrochemicals so as to evolve engineering strategy for their optimal and judicial applications in field as well as storage conditions, based on integrated learning outcomes from other courses.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for teaching basic concepts.
3. Arranging visits to farmers' fields to expose pupils to real time farming situations.
4. Adopt collaborative (Group Learning) Learning in the class.
5. By giving assignments and presentation tasks to students.
   Exploring information from research publications and regulatory documents

Module-1

Naturally Occurring Crop Protection Agents

Economic loss of agricultural produce due to pest problems: insects, diseases, rodents and weeds; Sources and utility of naturally occurring insecticides, bactericides, fungicides, nematicides, rodenticides; Role of naturally occurring pesticides in fostering organic farming; Working principles of botanical insecticides such as natural pyrethroids, nicotine, rotenone, neem and karanj; Pest control properties of plant hormones, phytoalexins and essential oils; Advantage and limitations of naturally occurring crop protection agents; juvenile hormones (JH), juvenile hormone mimics and anti-JH; chemosterilants, insect antifeedants, insect attractants and repellents; microbial pesticides and biocontrol agents.

Module-2

Synthetic Crop Protection Agents

History, scope and principles of chemical insect control; Synthetic insecticides, bactericides, fungicides, nematicides, rodenticides, weedicides; Classification of major groups of insecticides (organo-chlorine, organo-phosphorus, organo-carbamates, synthetic pyrethroids, neonicotinoids), fungicides (inorganics, dithiocarbamates, OP's, phenols, quinines, carboxamides, azoles, methoxyacrylates); Mode of action of different groups of insecticides, fungicides and nematicides; Chitin synthesis inhibitors, insecticide synergists, and fumigants; Plant growth regulators – auxins, gibberellins, cytokinins, ethylene, abscisic acid; Brassinolides;

Module-3

Chemicals used for storage and preservation

Major storage pests of economic importance causing damage during storage of food grains; Strategies involving storage bags, storage structures, and storage conditions; Pesticides and fumigants used in controlling insects and rodents during storage; Chemicals used for preserving freshness and promoting ripening in vegetables and fruits,respectively

Module-4

Agrochemical Formulations
Basic concepts of pesticide formulation - classification, solid and liquid formulations; preparation, properties, uses; controlled release formulations; Formulants - carriers/ diluents, surfactants, encapsulants, binders, anti-oxidants, stabilizers; Application - devices and quality of deposits; Types of spray appliances, seed treatment and dressing; nanotechnology in crop protection, Tools to develop and measure nanoparticles. Basic concepts of fertilizer formulations: enhancing fertilizer use efficiency and reducing environmental pollutions

Module-5

Agrochemicals – Regulation and Quality Control
Production, consumption and trade statistics of pesticides and fertilizers; banned and restricted pesticides, registration and quality control of insecticides; Laws, Acts and Rules governing registration and regulations of agrochemical production and use; key provisions of the Insecticides Act (1968), Environmental Protection Act (1986). Food Safety and Standards Act, WHO, FAO, CODEX and national/international guidelines.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

- Understand the basic concepts of agrochemicals and their applications in agriculture.
- Understand naturally occurring and synthetic chemical agents used for protecting crops in field as well as in storage.
- Understand the role of naturally occurring crop protecting chemical agents in fostering organic farming.
- Understand the impact of agrochemicals on environmental, animal, and human health
- Understand the regulatory mechanism of agrochemicals at national and international levels
- Acquire necessary basic knowledge on agrochemicals so as to evolve engineering strategies for their optimal and judicial applications in field as well as storage conditions, based on learning outcomes from other courses

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:
Books

1. **"Agrochemicals and Pest Management"** by T.V. Sathe. Daya Publishing House (2003)

ISBN: 8170353092, 9788170353096

2. "**Agrochemicals and Sustainable Agriculture**" By N.K. Roy. Associated Publishing Company (2021). **ISBN:** 9788186580110
3. "**Sittig's Handbook of Pesticides and Agricultural Cheamicals**" EdittedBy Stanley A. Greene and Richard P. Pohanish. Elsevier (2005). ISBN: 978-0-8155-1516-6
4. "**Agrochemicals**" By Singh Ranjit. LAP Lambert Academic Publishing. ISBN: 9786139851997
5. "The Complete Technology Book on Pesticides, Fungicides, Herbicides (Agrochemicals) with Formulae, manufacturing Process, Machinery and Equipment Details" By Himadri Panda. 2nd Revised Edition. Published by NIIR Project Consultancy Services (2022), ISBN: 9788195577538
6. "**A textbook of Fertilizers**" By Deepak Ranjan Biswas. New India Publishing Agency, New Delhi.

"**Pesticide Regulation Handbook**" By Greene Jan. Taylor and Francis Ltd, ISBN: 9781315896366, 9781315896366

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

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