Semester-wise Revised Syllabus under CBCS,2020-21

Four Year B.Sc. Course Code:
Domain subject: Biotechnology
IV year B.Sc., - Semester-V

Course 6B Organic Farming

(Skill enhancement course (Elective), 05 credits)
Maximum Marks Theory: 100 + practical: 50

I. Learningoutcomes

Students after successful completion of the course will be able to

1. Understand the soil profile and nutrients insoil
2. Appreciate the importance of organic manure and biofertilizers
3. Produce vermi compost, farmyard manure from biowaste
4. Acquire skill on isolation and maintenance of biofertilizers

***II.* Syllabus:** *(Total 90 hrs. (includingTeaching, Lab, Field Training and unit testsetc.)*

UNIT -1-Soil: (10h)

Definition, soil formation, composition and characteristics. Types of soils. Distribution of soil groups in India. Acidic, Alkaline and heavy metal contaminated soil. Methods of reclamation. Effects of chemical dependant farming on yield and soil health.

UNIT-2 -Plant Nutrition (10h)

Macro and micro nutrients, functions of nutrients in plant growth and development. Nutrient uptake and utilization by plant. Types of fertilizers. Organic, inorganic and bio fertilizers. Chemical fertilizer. Advantages & disadvantages of their use. Importance of organic and bio fertilizers.

UNIT -3 -Organic Farming (10h)

Definition, concept, benefits. Integrated farming system (combination of organic and inorganic). Mixed farming system. Concept of different cropping systems in relation to organic farming, Inter cropping, crop rotation. Organic farming process. Organic fertilizers, crop nutrients and effective microorganisms in Organic farming.

UNIT- 4 -Organiccompost (10h)

Definition, types of compost, farm yard compost, green leaf compost, animal husbandry,animal housing, animal feeding, animal health, breeding goals.

Vermi compost: Introduction, vermi composting material, species of earthworms, small scale, large scale composting process. Vermi castings, harvesting, processing and drying. Nutrient content of vermi compost. Field application methods.

UNIT –5-Biofertilizers (10h)

Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia.* Cynobacterialbiofertilizers- *Anabaena, Nostoc, Hapalosiphon*and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Mechanism of nitrogen fixation and phosphorus solubilization.

CBOS Biotechnology

Practical syllabus: Course 6B Organic farming

III. Skilloutcomes:

On successful completion of the practical course, student shall be able to

1. Estimate NPK levels in thesoil
2. Demonstrate the collection and processing of rawmaterial
3. Develop skill of vermi compostproduction
4. Learn the technique of establishing organicfarms
5. Equip with the skill of preparation of microbialmedia

IV. Practicalsyllabus:

1. Collection of different soilsamples
2. Qualitative estimation of nitrogen, phosphorus and potassium in soilsamples
3. Collection of fruit, vegetable and other domesticwaste
4. Preparation of compost beds and introducingearthworms
5. Collection of vermicastings
6. Sieving, drying and packing of vermicompost
7. Visit to animal shed and observing farm yard manureproduction
8. Preparation of media and isolation of biofertilizers

V. References:

1. Principles of Organic Farming:: by E Somasundaram,DUdhayaNandhini,MMeyyappan;**2021**
2. Organic farming in India:: by Arpita Mukherjee;2017
3. Biofertizer and biocontrol agents for agriculture;; by AM Pirttilä ·2021
4. Trends in Organic Farming in India;; by S. S. Purohit,2006
5. Biofertilizers for Sustainable Agriculture and Environment;; by BhoopanderGiri
Ram Prasad, Qiang-Sheng Wu, AjitVarma;2019

VI. Co-curricularactivities:

a) Mandatory:(Training of students by teacher on field relatedskills;15hrs)

1. **For teacher;** Training of students by teacher in laboratory and field for a total of 15hrs on soil sample collection, NPK analysis, collection of biodegradable waste, vermi composting, collection of castings, processing, drying& packing. In addition teacher should demonstrate the media preparation, sterilization, and isolation of microorganisms fromsoil.
2. **For students:** Visit to local organic farm, collection of earthworms, observing the crop growth raised in organic farms. Submission of field work report of 10 pages in the prescribedformat.
3. Maximum marks for field workreport:05
4. Suggested format for field work report: Title page, student details, content page, introduction, work done, findings, conclusion and acknowledgements.
5. Unit test(IE)

b) Suggested co-curricularactivities:

1. Comparing mineral content in different agriculturalsoil
2. Learning techniques of basic instruments handling related to fieldwork
3. Preparation of videos on compost preparation andapplication
4. Visit to local organicfields
5. Attending special lectures, group discussions and seminars on organicfarming.

VII. Suggested Question PaperPattern:

Max.Marks: 75

Time: 3hrs.

SECTIONA

(Total: 5x5=25Marks)

(Answer any five questions. Each answer carries 5 marks
(At least 1 question should be given from each Unit)

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SECTION B (Total: 5x10 = 50 Marks)

(Answer any five questions. Each answer carries 10 marks
(At least 1 question should be given from each Unit)

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Question papers as per APSCHE lp

Suggested Question Paper Model for Practical Examination
Semester – V/ Biotechnology **Course – 6B** (Skill Enhancement Course)

Organic Farming

Max. Time:3Hrs. Max. Marks:50

1. Estimate the pH of soil in givensample'A' 8 M
2. Estimate the nitrogen content in given soilsample'B' 8 M
3. Perform streak plate technique forisolation'C' 12 M

4. Scientific observation anddataanalysis 4 x 3 = 12M
   A. Identify different earth worm species/photograph
   B. Sieving and processing of vermi compost -photograph
   C. VAMidentification
   D. Farmyardmanure
5. Record+Viva-voce 6+4 = 10M

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ASPEN APSCHE model lp

Semester-wise Revised Syllabus under CBCS, 2020-21

Four Year B.Sc. Course Code:
Domain subject: Biotechnology
IV year B.Sc. -Semester-V

Course 7B: Bio fertilizers and Bio pesticidesproduction

(Skill enhancement course (Elective), 05 credits)
Maximum Marks Theory: 100 + practical:50

I. Learningoutcomes:

On successful completion of the practical course, student shall be able to

1. Understand the importance of bio fertilizers for sustainableagriculture.
2. Appreciate the role of VAM in Psolubilisation
3. Define bio pesticide and itsnature
4. Produce bio fertilizers and bio pesticides on largescale
5. Able to prepare inoculums for fieldapplication

II. **Syllabus:** (*Total 90 hrs (including Teaching, Lab, Field Training and unit testsetc.)*

UNIT -1-Biofertilizers (10h)

Introduction, history, concept, scope of bio fertilizers in India. Classification, microorganisms used as bio fertilizers. Bacterial, fungal and algal bio fertilizers. Symbiotic and a symbiotic microorganisms. Mechanism of nodulation and nitrogen fixation.

UNIT – 2- Mycorrhizalbiofertilizers (10h)

Importance, types, characteristic features of ecto and endomycorrhiza. Mechanism of phosphorus solubilisation. Uptake of phosphates by the roots. Consortium based inoculums andsignificance.

UNIT-3 -Bio pesticides (10h)

Definition, concept, history, scope and importance of bio pesticides.
Classification - botanicals, bacterial, fungal and viral based bio pesticides. Mechanism of action of *Bacillus thuringiensis*and *Trichodermaviridae*as bio control agents.

UNIT -4 - Massproductiontechniques (10h)

Media, types, preparation. Methods of isolation, streak plate, spread plate and pour plate techniques, purification and identification of microorganisms used as bio fertilizers and bio pesticides. Mass production and packing techniques.

UNIT- 5 - Field applicationmethods (10h)

Preparation of carrier based inoculum. Sphagnum, peat, vermiculite as inoculums carriers. Dosage standardisation. Seed treatment, foliar application, root dressing and soil application techniques. Storage and maintenance of inoculum.

Practical syllabus: Course 7B Bio fertilizers and Bio pesticides Production

III. Skilloutcomes:

On successful completion of the practical course, student shall be able to

1. Prepare bacterial and fungalmedia
2. Isolate and identify symbiotic and free living nitrogen fixingbacteria
3. Isolate fungal bio control agents from soilsamples.
4. Develop skill for large scale production of microorganisms

5. Learn field application techniques of biofertilizers andbiopesticides

IV. Practicalsyllabus:

1. Preparation of Nutrient agar, YEMA, and PDAmedia
2. Isolation of *Rhizobium* from rootnodules
3. Isolation of *Azatobacter*from soil samples
4. Isolation of*Trichoderma*
5. Gram staining ofbacteria
6. VAM rootstaining
7. Raising of legume seedlings with *Rhizobium*treatment
8. Visit to commercial bio control units and Krishiseva Kendra

V. References:

1. Biofertilizers: Commercial Production Technology and Quality Control, 2017 byDr. P.Hyma
2. BiofertilizersTechnology, 2010, by S.Kaniyan, K.Kumar and K. Govindarajan
3. Biofertilizers for Sustainable Agriculture, 2017; by Arun KSharma
4. Advances In Plant Biopesticides 2021, by Dwijendra Singh, SpringerIndia
5. A Textbook of Integrated Pest Management, 2013by Ram Singh &VikasJindalG.S.Dhaliwal

VI. Cocurricularactivities:

a) **Mandatory:** (Training of students by teacher on field related skills:15hrs)

1. **For teacher:** Training of students by teacher on preparation of different microbial media, isolation techniques – streak plate , spread plate, pour plate, Grams staining of bacteria , VAM and Trichoderma observation. Preparation of Rhizobium inoculum and application to legumeseedlings.
2. **For students:** Raising of seedlings of Leguminaceae species, maintaining of the seedlings in nursery/green house. Comparing the growth of seedlings treated with biofertilizer and chemical fertilizer. Visit to Bio fertilizer and Bio pesticides commercial lab. Submission of field work report of 10 pages in the prescribedformat.
3. Maximum marks for field workreport:05
4. Suggested format for field work book; Title page, student details, content page,introduction, work done, findings, conclusion and acknowledgements.
5. Unit test(IE).

b) Suggested co-curricularactivities;

1. Training of students by the industrialexperts
2. Identification and collection of botanical pesticides
3. Assignments/seminars/group discussion /quiz on bio fertilizers and biopesticides
4. Preparation of videos, charts on inoculum development and fieldapplication
5. Attending invited guest lectures on the concerntopics

VII. Suggested Question PaperPattern:

Max.Marks: 75 Time: 3hrs.

SECTION A (Total: 5x5=25Marks)

(Answer any five questions. Each answer carries 5 marks (At least 1 question should be given from each Unit)

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SECTION B (Total: 5x10 = 50 Marks)

(Answer any five questions. Each answer carries 10 marks (At least 1 question should be given from each Unit)

1.	
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Question Paper Aspen APSCHE by

Suggested Question Paper Model for Practical Examination Semester – V/ Biotechnology **Course – 7B** (Skill Enhancement Course)

Bio fertilizers and Bio pesticides Production

Max. Time:3 Hrs. Max. Marks: 50

1. Identify the given microbial sample based on morphologicalcharacteristics'A' 8 M
2. Identify the given culture based on microscopicobservation'B' 8 M
3. Perform the section cutting of rootnodule'C' 12 M

4. Scientific observation anddataanalysis 4 x 3 = 12M
   A. Identify the given algal fertilizer/photograph
   B. Identify the fungal biofertilizer -photograph

C. VAMidentification
D. Seedtreatment

5. Record+Viva-voce 6+4 = 10M

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Question papers As per APSCHE.