BOARD OF STUDIES

IN

B.Sc BOTANY

2024-2025

DEPARTMENT OF BOTANY

SYLLABUS FOR B.Sc BOTANY Honours
&
B.Sc BOTANY

PITHAPUR RAJAH'S GOVERNMENT COLLEGE

Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc -Botany / V Semester (W.E.F. 2024-25)

Course 6B: Vegetable Crops – Cultivation Practices

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Identify different vegetable plants and realize their value in human nutrition.
2. Analyse the types of soils to cultivate vegetable crops.
3. Demonstrate skills on agronomic practices for cultivation of vegetable crops.
4. Acquire knowledge on water, weed and disease managements in vegetable farming.
5. Comprehend aspects related to harvesting and storage of produce.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05) (*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Introduction to Olericulture (10h)

1. Vegetables and Olericulture: Definitions, nutritive value of vegetables and economic significance of vegetable farming.
2. Classification of vegetable crops (Botanical, based on climatic zones and economic parts used).
3. Types of vegetable gardens (kitchen gardening, terrace gardening, market gardening and truck gardening); implements used in vegetable gardening; vegetable forcing – a brief concept.

Unit – 2: Cultivation of leafy vegetables (10h)

1. Leafy vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the following leafy vegetable crops: (a) *Amaranthus* (b) Palak (c) *Hibiscus cannabinus* (d) Fenugreek: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 3: Cultivation of fruity vegetables (10h)

1. Fruity vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the fruity vegetable crops: (a) Okra (b) Tomato (c) Chillies (d) Brinjal: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield- storage, disease and pest control and seed production

Unit – 4: Cultivation of peas and beans (10h)

1. A brief account of locally cultivated peas and beans.

2. Study of the following crops: (a) *Dolichos* (b) Cluster bean (c) French bean: Systematic position, nutritive value, origin, area, production, improved Varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 5: Cultivation of root and tuber crops (10h)

1. A brief account of locally cultivated root and tuber crops.
2. Study of the following crops: (a) Carrot (b) Radish (c) Sweet potato (d) Potato: Systematic position, family, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

III. References:

1. Bose T K et al. (2003) Vegetable crops, Naya Udhyog Publishers, Kolkata.
2. Singh D K (2007) Modern vegetable varieties and production, IBN Publisher Technologies, International Book Distributing Co, Lucknow.
3. Premnath, Sundari Velayudhan and D P Sing (1987) Vegetables for the tropical region, ICAR, New Delhi
4. Shanmugavelu, K. G. 1989. Production Technology of Vegetable Crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Rana MK. 2008. Scientific Cultivation of Vegetables. Kalyani Publ., New Delhi
6. Rubatzky VE and Yamaguchi M. (Eds.). 1997. World Vegetables: Principles, Production and Nutritive Values. Chapman & Hall, London.
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc.Botany / V Semester (W.E.F. 2024-25)

Course 6B: Vegetable Crops – Cultivation Practices
Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. List out, identify and handle different garden implements.
2. Identify the important vegetable crops grown in their locality.
3. Demonstrate various skills in cultivation of vegetable crops.
4. Identify pests, diseases and their remedies that are specific to a vegetable crop.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Identification of seeds of important local vegetable plants and preparation of herbarium.
2. Identification of local vegetable crops and handling of garden tools.
3. Analysis of garden soil for ratios of physical characteristics by sieve separation.
4. Determination of chemical characters of garden soil (pH, EC, Organic Carbon, SAR).
5. Planning and layout of a vegetable crop farm.
6. Preparation of nursery bed (raised, sunken and flat beds) and sowing of seeds.
7. Transplanting and care of vegetable seedlings.
8. Intercultural operations in vegetable plots.
9. Estimation of Total Soluble Solids (TSS) by Refractometer in a fruit and a leafy vegetable.
10. Estimation of Vitamin - C in a fruit and a leafy vegetable by DCIP method.
11. Identification of pests and disease-causing organisms on any two vegetable plants.
12. Seed extraction in tomato and brinjal.

VI. Lab References:

1. Akhilesh Sharma (Ed.), 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
2. Biswajit Saha and Shri Dharampal Singh, 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
3. Saini RS, K.D. Sharma, O.P, Dhankhar and R.A. Kaushik (Eds.). 2001. Laboratory Manual of Analytical Techniques in Horticulture. Agrobios, Jodhpur
4. Ranganna S. 1986. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata-McGraw Hill, New Delhi
5. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: (*Lab/ field training of students by teacher: (Lab: 10 + field: 05 hours***)**

1. **For Teacher**: Training of students by the teacher in the laboratory/field for a total of not less than 15 hours on the field techniques/skills of vegetable plants identification, vegetable gardening, agronomic practices, water, weed and disease management; harvesting and storage of produce.
2. **For Student**: Students shall (individually) visit a horticulture university/ research station or vegetable crop farm in their locality, observe different vegetable crops/ varieties of a vegetable crop, intercultural operations, pests and diseases, harvesting and storage etc., write their observations and submit to the teacher a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations, findings and acknowledgements.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts or farmers.
2. Assignments (including technical assignments like tools in vegetable gardening and their handling, agronomic practices, modern irrigation methods, organic farming practices etc.)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on cultivation practices for vegetable crops.
5. Collection of material/figures/photos related to different vegetable crop species, writing and organizing them in a systematic way in a file.
6. Visits to horticulture universities, research organizations, private vegetable farming units etc.
7. Invited lectures and presentations on related topics by field/industrial experts

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc. -Botany / V Semester (W.E.F. 2024-25)

Model Question Paper Pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Vegetable Crops – Cultivation Practices

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

1. Demonstration of nursery bed making/transplanting of seedlings 'A' 8
2. Determination of physical or chemical characters of a given soil sample / Preparation of slide and identification of pest/disease-causing organism in plant part given 'B' 10
3. Estimation of Total Soluble Solids/Vitamin-C in a given plant sample 'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   D. Identification of a garden tool
   E. Identification of seed/specimen of a vegetable crop species
   F. Identification of a weed/irrigation method
   G. Identification of a pest/disease causing organism
5. Record + Viva-voce 5+3 = 8

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc. -Botany / V Semester (W.E.F. 2024-25)

Vegetable Crops – Cultivation Practices

Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability /entrepreneurship)
1	Botany	V	Vegetable crops : Cultivation Practices	Introduction to Olericulture	Knowledge & Application	Lecture, Field Visits	Skill, Employability
2	Botany	V	Vegetable crops : Cultivation Practices	Cultivation of leafy vegetables	Knowledge & Application	Lecture, Field Visits	Skill, Employability
3	Botany	V	Vegetable crops : Cultivation Practices	Cultivation of fruity vegetables	Knowledge & Application	Lecture, Field Visits	Skill, Employability
4	Botany	V	Vegetable crops : Cultivation Practices	Cultivation of peas and beans	Knowledge & Application	Lecture, Field Visits	Skill, Employability
5	Botany	V	Vegetable crops : Cultivation Practices	Cultivation of root and tuber crops	Knowledge, Application & Innovation	Lecture, Field Visits	Skill, Employability

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course6B	**TITLE OF THE COURSE** **Vegetable Crops – Cultivation Practices**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	3

Course Objectives:

1. Understanding Plant Physiology and Growth Requirements
2. Soil Health and Fertility Management
3. Integrated Pest Management (IPM)
4. Sustainable Cultivation Practices
5. Post-Harvest Handling and Quality Control

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Identify different vegetable plants and realize their value in human nutrition.
CO2	Analyse the types of soils to cultivate vegetable crops.
CO3	Demonstrate skills on agronomic practices for cultivation of vegetable crops.
CO4	Acquire knowledge on water, weed and disease managements in vegetable farming.
CO5	Comprehend aspects related to harvesting and storage of produce.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	3	3	2	2	2
CO2	3	2	2	3	3	2	2	3	3	3
CO3	2	3	3	2	2	3	3	2	2	2
CO4	3	2	3	3	2	3	2	3	3	3
CO5	2	3	2	2	3	3	2	2	2	2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc. -Botany / V Semester (W.E.F. 2024-25)

Course 7B: Vegetable Crops – Post Harvest Practices

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Understand various practices for vegetable produce from harvesting to marketing.
2. Demonstrate skills on storage, processing and preservation of vegetables.
3. Summarize causes for spoilage of vegetables before and during storage and methods to prevent and control them.
4. Make use of preservation methods to reduce the loss of vegetable produce.
5. Explain about value added products, packaging and marketing of vegetables.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)
(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Introduction to Post Harvest Practices (10h)

1. Post-harvest technology: Definition; importance, scope and future status of post-harvest management of vegetables.
2. Study of maturity standards of vegetables; harvest techniques of vegetables, methods stages, signs of harvesting; harvesting and its relationship with quality, sorting and grading.
3. Careful handling of harvested vegetables; pre-harvest and post-harvest factors responsible for ripening.

Unit – 2: Methods of storage (10h)

1. Climacteric and non-climacteric types of vegetables.
2. Methods of storage to prolong shelf life of harvested vegetables; on-farm storage, evaporatively cooled stores, ventilated storage, pit storage etc.
3. Refrigerated storage, refrigeration cycle, controlled and modified atmosphere, hypobaric storage.

Unit – 3: Processing of vegetables (10h)

1. Causes for spoilage of vegetables and control measures during storage; post-harvest disease and pest management.
2. Techniques to prevent deterioration; vegetable processing equipment; minimal processing of vegetables.
3. Safe chemicals and microbial limits; application of growth regulators for quality assurance; grading.

Unit -4: Preservation and value-addition (10h)

1. Importance and scope of vegetable preservation in India; principles underlying general methods of preservation.
2. Methods of preservation; food additives and food colours.

3. Fried products, process of frying; dried vegetables; sauces and chutneys, pickles and salted vegetables; by-product and waste utilization.

Unit – 5: Marketing (10h)

1. Packing line operations, packaging of vegetables and their products; transportation; codex norms for export of perishables.
2. Demand supply analysis of important vegetables; market potential of various vegetables products.
3. Important marketing agencies and institutions; importance of cooperative marketing.

III. References:

1. Salunkhe DK and Kadam SS. (Ed.). 1998. Hand Book of Vegetable Science and Technology: Production, Composition, Storage and Processing. Marcel Dekker, New York.
2. Arthey D and Dennis C. 1996. Vegetable Processing. Blackie/Springer-Verlag, New York
3. Verma LR and Joshi VK. 2000. Post-harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Company, New Delhi
4. Srivastava RP and Kumar S. 2003. Fruit and Vegetable Preservation: Principles and Practices. International Book Distribution Company, Lucknow.
5. Giridharilal GS, Siddappa and Tandon GL. 1986. Preservation of Fruits and Vegetables. ICAR, New Delhi.
6. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc.-Botany/ V Semester (W.E.F. 2024-25)

Course 7B: Vegetable Crops – Post harvest Practices – Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Identify stages of maturity in vegetable crops.
2. Handle material for storage of vegetables.
3. Identify physical and biological causes for spoilage of vegetables.
4. Make some value-added products of vegetables.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Maturity selection and harvest, harvesting practices.
2. List and cost of equipment, utensils, and additives required for small scale processing industry.
3. Estimation of total carbohydrates (Anthrone method) in a stored vegetable and un- stored vegetable.
4. Estimation of protein (Lowry method) in a stored vegetable and un-stored vegetable.
5. Identification of packaging materials, containers for packaging.

6.Preparation of pickle from a vegetable.

7. Preparation of tomato sauce, ketchup and chutney.

VI. Lab References:

1. Swati Barche, Reena Nair and P. K. Jain, 2016. A Practical Manual on Post Harvest Value Addition and Processing of Horticulture Crops. Agrobios (India), Jodhpur
2. Antonio L. Acedo Jr., Md. Atiqur Rahman, Borarin Buntong and Durga Mani Gautam, 2016. Vegetable Postharvest Training Manual, AVRDC - The World Vegetable Center, Taiwan
3. Akhilesh Sharma (Ed.), 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
4. Biswajit Saha and Shri Dharampal Singh, 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
5. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: (*Lab/ field training of students by teacher: (Lab: 10 + field: 05 hours*)

1. **For Teacher**: Training of students by teacher in the laboratory/field for a total of not less than 15 hours on the field techniques/skills of harvesting indices of vegetables, storage methods, tools and techniques for processing, causes for spoilage and methods to control, preservation methods, marketing chain and in making value added products.
2. **For Student**: Students shall (individually) visit any one of the places like horticulture university/ research station; vegetable storage units in public and private sector; vegetable processing industries in their locality and observe harvesting practices, storage methods, processing and preservation; grading,

value added products and marketing. Write their observations and submit to the teacher a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format.

3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations, findings and acknowledgements.
5. Unit tests (IE).

b). Suggested Co-Curricular Activities:

1. Training of students by related industrial experts or farmers.
2. Assignments (including technical assignments like tools and techniques for storage, processing and preservation, causes for spoilage and methods to avoid losses, value added products of some vegetables, packaging and marketing etc.)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on cultivation practices for vegetable crops.
5. Collection of material/figures/photos related to harvesting, storage, processing and preservation of vegetable crop produce, writing and organizing them in a systematic way in a file.
6. Visits to horticulture universities, research organizations; storage, processing industries in public or private sector; industries making value added products of vegetables etc.
7. Invited lectures and presentations on related topics by field/industrial experts.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc. -Botany / V Semester (W.E.F. 2024-25)

Model Question Paper Pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Vegetable Crops – Post Harvest Practices

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

1.	Preparation of pickle from a vegetable. 'A'	8
2.	Maturity selection and harvest, harvesting practices.	10
3.	Estimation of carbohydrates/protein content in a vegetable sample 'C'	12
4.	Scientific observation and data analysis	4 x 3 = 12
	D. Identification of harvesting stage	
	E. Identification of equipment for processing	
	F. Identification of PGR/chemical used for PHT of vegetables.	
	G. Identification of a packaging material/value added product.	
5.	Record + Viva-voce	5+3 = 8

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc -Botany / V Semester (W.E.F. 2024-25)

Vegetable Crops – Post Harvest Practices

Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability /entrepreneurship)
1	Botany	V	Vegetable crops : Post Harvest Practices	Introduction to Post Harvest Practices	Knowledge & Application	Lecture, Field Visits, Hands on Practices	Skill, Employability
2	Botany	V	Vegetable crops : Post Harvest Practices	Methods of storage	Knowledge & Application	Lecture, Field Visits, Hands on Practices	Skill, Employability
3	Botany	V	Vegetable crops : Post Harvest Practices	Processing of vegetables	Knowledge & Application	Lecture, Field Visits, Hands on Practices	Skill, Employability
4	Botany	V	Vegetable crops : Post Harvest Practices	Preservation and value-addition	Knowledge & Application	Lecture, Field Visits, Hands on Practices	Skill, Employability
5	Botany	V	Vegetable crops : Post Harvest Practices	Marketing	Knowledge, Application & Innovation	Lecture, Field Visits, Hands on Practices	Skill, Employability

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course7B	**TITLE OF THE COURSE Vegetable Crops – Post Harvest Practices**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	3

Course Objectives:

1.Understanding Post-Harvest Physiology.
2.Post-Harvest Handling Techniques.
3.Storage and Preservation Methods.
4.Quality Control and Assurance.
5. Post-Harvest Technologies and Innovations.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand various practices for vegetable produce from harvesting to marketing.
CO2	Demonstrate skills on storage, processing and preservation of vegetables.
CO3	Summarize causes for spoilage of vegetables before and during storage and methods to prevent and control them.
CO4	Make use of preservation methods to reduce the loss of vegetable produce.
CO5	Explain about value added products, packaging and marketing of vegetables.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	3	3	2	2	3
CO2	2	3	3	2	2	3	2	2	3	3
CO3	3	3	2	2	3	2	3	2	3	2
CO4	2	3	2	3	2	2	2	3	3	2
CO5	3	2	2	3	2	3	3	2	2	3