PG AND RESEARCH DEPARTMENT OF BOTANY

HOLY CROSS COLLEGE (AUTONOMOUS)

Affiliated to Bharathidasan University
Nationally Accredited (3rd Cycle) with 'A' Grade by NAAC
College with Potential for Excellence.
Tiruchirapalli - 620002.

SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY

Programme: B.Sc. Botany

PO No.	Programme Outcomes *Upon completion of the B.Sc. Degree Programme, the graduate will be able to*
PO-1	Obtain quality education in the basic areas of Botany
PO-2	Acquire practical skills to gather information, assess, create and execute new ideas to develop entrepreneurial skills
PO-3	Receive training in pedagogy, research skills and methodology
PO-4	Develop a local, regional, national and international perspective and be competent enough in the area of plant science, genetic engineering and nanotechnology
PO-5	Learn to respect and conserve nature and the environment
PO-6	Identify the angiosperms by applying keys
PO-7	Learn the basic principles of food science

PSO No.	Programme Specific Outcomes *Upon completion of these courses the student would*
PSO-1	Acquire academic excellence with an aptitude for higher studies, research and to meet competitive exams

PSO-2	Become aware about plant diversity and its conservation through plant tissue Culture
PSO-3	Obtain Knowledge in the internal structure and functions of various plant components, inheritance of characters and techniques of plant breeding
PSO-4	Apply statistical skills and analyze the biological data
PSO-5	Acquire knowledge on traditional herbal plants for common ailments and aware of nutritive plant foods
PSO-6	Obtain Knowledge through taxonomical studies will help them to emerge as fundamental taxonomists
PSO-7	Acquire knowledge on food preservation, food additives and food laws
PSO-8	Analyse the phytoconstituents of plants and plant drug adulteration

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI – 2

SCHOOL OF LIFE SCIENCES

DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM

UG COURSE PATTERN 2020-21

Sem	Part	Course	Title of the course	Code	Hrs/ week	Credit	Mark
I	I	Language	Tamil paper I/ Hindi paper I / French paper 1	U20TL1TAM01/ U20HN1HIN01 / U20FR1FRE01	3	3	100
	II	English	General English I	U20EL1GEN01	3	3	100
	III	Major Core -1	Plant Diversity I	U20BO1MCT01	5	5	100
		Major Core -2	Microbiology and Plant Pathology	U20BO1MCT02	4	4	100
		Major Core – 3	Main Practical I	U20BO1MCP03	4	3	100
	IV	Allied-1	Chemistry Paper - 1 (for Botany students)	U20CH1ALT01	4	2	100
		Allied – 2	Chemistry Paper - 2 (for Botany students)	U20CH1ALP02	4	2	100
			Plant Biochemistry (Botany offering to Biochemistry)	U20BO1ALT02			
		Environmental Studies	Environmental studies	U20RE1EST01	2	1	100
		Value Education	Bible/Catechism/Ethics	U20VE2LVE01/ U20VE2LVB01/ U20VE2LVC01	1		-
	VI	Extension Activities					-
		Extra Credit	Internship / Field Work / Field Project 30 Hours - Extra Credit	U20SP1ECC01		2	100
			Total		**30**	**23+2**	**800 +100**
II	I	Language	Tamil paper II/ Hindi paper II / French paper II	U20TL2TAM02/ U20HN2HIN02 / U20FR2FRE02	3	3	100
	II	English	General English II	U20EL2GEN02	3	3	100
	III	Major Core – 4	Food and Nutrition	U20BO2MCT04	5	4	100
		Major Core – 5	Pharmacognosy	U20BO2MCT05	4	4	100
		Major Elective – 1	Course within School - Home Gardening and Nursery Maintenance/ Organic farming	U20BO2MET01/ U20BO2MET02	4	3	100
		Allied - 3	Chemistry Allied – III	U20CH2ALT03	4	2	100

		Major SBE – 1	MSBE - 1 - Techniques in Botany/Urban Gardening and Cultivation of Microgreens	U20BO2SBT01/ U20BO2SBT02	2	1	100
	IV	SBC - 2	Soft Skills Development	U20RE2SBT01	2	1	100
		SBC – 3	Sustainable Rural Development and Student Social Responsibility	U20RE2SBT02	2	1	
		Value Education	Bible/Catechism/Ethics	U20VE2LVB01/ U20VE2LVC01/ U20VE2LVE01	1	1	100
	V	Extension Activities					
		Extra Credit	Internship / Field Work / Field Project 30 Hours - Extra Credit	U20SP2ECC02		2	100
			Total		**30**	**23+2**	**900 +100**

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – I

Course Title	**MAJOR CORE 1- PLANT DIVERSITY – I**
Total Hours	**75**
Hours/Week	**5 Hrs /Wk**
Code	**U20BO1MCT01**
Course Type	**Theory**
Credits	**5**
Marks	**100**

General Objectives:

To enable the students to understand the classification, study of the genera belonging to various classes of algae, fungi & lichens, their habitat, thallus structure, reproduction and economic importance.

Course Objectives:

The learner will be able to

CO No.	**Course Objectives**
CO-1	Understand the thallus organisation, reproduction and life cycle patterns of various genera of algae
CO-2	Remember and understand the structure, reproduction and life cycles of various algae and evaluate the techniques related to the cultivation of freshwater algae.
CO-3	Remember and understand the morphology and reproduction of the various genera of fungi.
CO- 4	Describe the morphology, reproduction and lifecycle of fungi.
CO- 5	Remember and understand the classification and different types of lichens and analyze the economic importance of lichens.

UNIT – I Algae **15 Hrs**

Outline classification of Algae (Fritsch, 1979). Salient features of various classes of algae. Distribution of algae. Thallus organization in algae- unicellular, colonial & multicellular. Structure, reproduction and life cycle patterns of the following genera: *Nostoc, Chlamydomonas, Chlorella, Volvox, Ulva* and *Cladophora*.

Extra reading/Key words: *Nitrogen fixation, Pollution indicators*

UNIT – II Algae **15 Hrs**

Structure, reproduction and life cycle patterns of the following genera: *Caulerpa, Diatom, Dictyota* and *Polysiphonia*. Techniques in algae: Cultivation of freshwater algae – Spirulina (SCP). Uses of algae as food, fodder, medicine, pollution indicators and fertilizer.

Extra reading/Key words: *Life cycle patterns of parasitic algae, seaweeds*

UNIT – III Fungi **15 Hrs**

Outline classification of fungi (Ainsworth, 1971). Salient features of the main classes of fungi. Mode of nutrition and occurrence of Fungi. Morphology and reproduction of the following genera: *Albugo, Saccharomyces* and *Penicillium.*

Extra reading/Key words: *Pathogenic fungi, Fungal Sinusitis.*

UNIT – IV Fungi **15 Hrs**

Morphology and reproduction of the following genera: *Peziza, Puccinia, Polyporus*. Techniques in fungi: Cultivation and identification of fungi – soil, water and spoiled foods. Importance of fungi in human life- medicine, agriculture and food industry.

Extra reading/Key words: *Cultivation and identification of yeast.*

UNIT – V Lichens **15 Hrs**

Classification and structure of lichens. Nature of association of algal and fungal partners. Structure (External and Internal) & reproduction of *Usnea.* Economic importance of lichens.

Extra reading/Key words: *Dust lichens, sul phur dust lichens, wart lichens*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain the thallus organization in algae.	PSO-1, PSO-3	R, U
CO-2	Describe the structure, reproduction and life cycles of various algae.	PSO-1, PSO-3	R, U
CO-3	Discuss the techniques related to the cultivation of freshwater algae.	PSO-1	U
CO-4	List the salient features of the main classes of fungi.	PSO-1	R
CO-5	Describe the morphology and reproduction of the various genera of fungi.	PSO-1, PSO-3	U
CO-6	Discuss the cultivation and identification methods of fungi	PSO-1	U
CO-7	Explain the classification and different types of lichens	PSO-1	R, U
CO-8	Summarize the economic importance of lichens	PSO-1	U
CO-9	Develop the employability skills by cultivating the algae and fungi	PSO-1	C

References

Prescribed Books:

1. Vashishta, B. R. 2010. Botany for degree students Algae. S. Chand and Company Ltd, New Delhi.
2. Vashista, B. R. and Sinha, A. K. 2016. Botany for degree students Fungi. S. Chand and Company Ltd, New Delhi.

Books for Reference:

1. Alexopoulos, C. J. 1971. Introductory Mycology – John Wiley and Sons Inc. New York, London.
2. Kumar, H. D. and Singh, H. N. 1982. A text Book on Algae, Affiliated East West Press Pvt. Ltd. New Delhi.
3. Smith, G. M. 1978. Cryptogamic Botany Vol – 1. Tata Mc Graw- Hill Pub. Company Ltd. New Delhi.
4. Webster, J. 1993. Introduction to Fungi – Cambridge University press, Cambridge.

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2

SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – I

Course Title	**MAJOR CORE 1 – MICROBIOLOGY AND PLANT PATHOLOGY**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO1MCT02**
Course Type	**Theory**
Credits	**4**
Marks	**100**

General Objectives:

This paper deals with history of microbiology, structure, nutrition and reproduction of bacteria, types of virus and their structure and reproduction. It imparts the knowledge on methods of studying microbes and applied aspects of microbiology on milk, food, beverages, antibiotics and enzymes. It also deals with the role of microbes in plant diseases.

Course Objectives :

The learner will be able to

CO No.	**Course Objectives**
CO-1	Classifies microbe based on morphological characters
CO-2	Describes the structure, nutrition and reproduction of bacteria and viruses
CO-3	Analyze and apply the quality of milk, fermented foods, single cell protein & it's preservation methods
CO-4	Understand the uses of microbes with reference to beverages, antibiotics, vaccines & tanning
CO-5	Understand and analyze the disease cycle of bacterial and fungal pathogens of plants.

UNIT – I History of Microbiology: **12 hrs.**

Discovery of microbes (Anton Von Leeuwenhoek). Theory of spontaneous generation.Theory of Biogenesis vs. Abiogenesis (Louis Pastuer) Fermentation, pasteurization.Discovery of vaccination (Edward Jenner).Development of vaccines for Anthrax and Rabies.Discovery of diseases (Robert Koch's Postulates).Germ theory.Discovery of antibiotics (Alexander Fleming).Microbial diversity – general classification of microbes. Whittaker's Five kingdom concept.

Extra reading (Key Words): two kingdom and three kingdom concepts

UNIT – II Microorganisms and staining techniques: Bacteria: **12 hrs.**

Morphology – size, shape, motility. Ultra structure of a bacterial cell – cell inclusions.Bacterial nutrition – phototrophs, chemotrophs. Reproduction: Asexual – fragmentation and binary fission. **Viruses:** Types, structure, reproduction and life cycle of bacteriophages (T-even phages) and plant viruses (TMV). Knowledge about phycoviruses and mycoviruses.**Staining:** Simple and differential staining: mechanism of gram staining.

Extra reading (Key Words): Arboviruses, FMDV

UNIT – III Food Microbiology: **12 hrs**

Introduction of Food microbiology and its relevance to everyday life.- Pasteurization of milk (reductase and phosphatase test) Milk products – processing and production of yogurt. Fermented foods – Bread and Idly. : Common food borne pathogens, Food spoilage: Food poisoning and food intoxication. Food preservation methods: Physical and Chemical. Applications of food Microbiology.

Extra reading (Key Words): Dualistic activity of Enterococcus in food, Listeriasis.

UNIT – IV Industrial Microbiology: **12 hrs**

Structure and use of fermentor. Large scale production and importance: ethanol (cane bagasse), Beverages – wine and beer, Antibiotics – narrow spectrum (Penicillin) and broad spectrum (streptomycin). Vaccine – polio. Enzyme: amylase – brewing (*Bacillus subtilis*) Protease – tanning (*Aspergillusoryzae*).Role of microorganisms in hydrocarbon degradation.

Extra reading/Key words:Biofilm, Industrial work horse

UNIT – V Plant Pathology: **12 hrs**

Concept and pathogenesis. Etiology, Causative organism, symptoms and control

measures of the following diseases. Fungal disease – red rot of sugarcane, tikka disease of ground nut, bacterial disease – citrus canker and viral disease – tobacco mosaic.

Extra reading/Key words: *Innate mechanism in plants, Crown Oomycetes.*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Classifies microbe based on morphological characters	PSO 1, PSO5	R, U
CO-2	Describes the structure, nutrition and reproduction of bacteria and viruses	PSO 1, PSO5	R
CO-3	Analyze the quality of milk and fermented foods	PSO 1, PSO3, PSO 6	U
CO-4	Explain cultivation and purification of single cell protein.	PSO 1, PSO3	R
CO-5	Relate the uses of microbes with reference to beverages, antibiotics, vaccines & tanning	PSO 1, PSO5	R,U
CO-6	Illustrate the disease cycle of bacterial and fungal pathogens of plants.	PSO 1 PSO 6	U
CO-7	Develop the employability skills by learning the structure, reproduction and applied aspects of microbes	PSO-1	C

Prescribed Books:

1. Tauro, P., Kapoor, K. K. and Yadav, K. S. 1997. An introduction to Microbiology. Wiley eastern Company Ltd., New Delhi.
2. Sharma, P. D. 1993. Microbiology and Plant Pathology. Rastogi Publications.
3. Balachandar. D. 2007. Introductory Microbiology, New India Publishing.
4. Prakash S. Bisen, MousumiDebnath, G. B. Prasad. 2012. Microbes: Concepts and Applications. John Wiley & Sons Publishers.
5. Jacquelyn G. Black. 2008. Microbiology: Principles and Explorations. 7th Edition John Wiley & Sons Publishers.P.422.

Books for Reference:

1. Powar and Daginawala. 1993. General Microbiology Vol I and II. Himalaya Publishing house, New Delhi.
2. Tortora, G.J., Funke, B.R. and Case, C.L. 2004. Microbiology –An Introduction. 8th Edition. Pearson education Pvt. Ltd. New Delhi.
3. Geffery Manners J. 1993. Principles of Plant Pathology. Cambridge University Press.
4. Rangaswami G and Mahadevan A.2003. Diseases of crop plants in India. Prentice Hall of India Pvt.Ltd.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – I

Course Title	**MAJOR CORE – 3 - PRACTICAL PARER-1**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO1MCP03**
Course Type	**Practical**
Credits	**3**
Marks	**100**

General Objectives:

To enable the students to understand thallus organization, internal and the reproductive structures of algae, fungi, lichen, bryophytes, pteridophytes and gymnosperms.

Course Objectives:

The learner will be able to

CO No.	**Course Objectives**
CO-1	Remember and understand the thallus organization, internal structure and reproduction of algae.
CO-2	Remember and understand the internal structure and reproduction of fungi.
CO-3	Understand the morphology of thallus& apothecium of Usnea
CO-4	Understand the growth pattern and cultivation techniques of bacteria & fungi and to test the quality of milk
CO-5	Remember, understand, identify and study the different types of plant diseases.

UNIT – I **12 Hrs**

Algae: Observation andidentification of the algal forms: *Nostoc* filament, *Chlamydomonas*, *Chlorella*and *Volvox* coenobium with daughter colony, *Ulva*thallus, *Cladophora* filaments, *Caulerpa*thallus, *Diatom*, *Dictyota*thallus with oogonialsorus and *Polysiphonia* with carposporophyte.

Sectioning: *Ulva* thallus and *Caulerpa* rhizome

UNIT – II **12 Hrs**

Fungi: Observation and identification of the fungal forms: *Albugo*- infected crucifer leaf, *Sacchromyces*, *Penicillium* conidia, *Peziza*apothecium, *Polyporus* basidiocarp, *Puccinia* infected leaves showing uredia, telia, pycnidia and aecidia.

Sectioning: *Albugo*infected leaves.

UNIT – III **12 Hrs**

Fungi: *Puccinia* infected leaves showing uredia, telia, pycnidia and aecidia stages.

Lichens: Observation & identification of lichen form **:** *Usnea***–** Morphology of thallus & apothecium.

UNIT – IV **12 Hrs**

Microbiology: Cultivation of Microorganisms: Bacterial culture on agar-slant/agar-plate streak.Cultivation and Identification of Fungi. Staining Techniques: Simple Satining, Gram staining- Gram positive/ Gram negative. Microbiological examination of milk: By Methylene-blue dye reduction test.

UNIT – V **12 Hrs**

Plant Pathology: Etiology, Causative organism, symptoms and control measures of the following diseases: Fungal disease – red rot of sugarcane andtikkadisease in ground nut, bacterial disease – citrus canker and viral disease – tobacco mosaic.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Identify important algal forms by their morphological and anatomical features	PSO-1, PSO-3	R, U
CO-2	Describe the morphology and reproduction of the various genera of fungi.	PSO-1, PSO-3	R
CO-3	Illustrate the structure and reproduction in lichens	PSO-1, PSO-3	U

CO-4	Develop the practical skills by observing the morphological, anatomical and reproductive structures of plant diversity	PSO-1, PSO-3	R, U
CO-5	Analyze the growth pattern of Bacteria and Fungi	PSO-3	R
CO-6	Understand the cultivation techniques of bacterial and fungal organisms	PSO-1, PSO-3	U
CO-7	Examine the quality of milk	PSO-1, PSO-3	R, U
CO-8	Categorize, identify, draw and explain the plant disease.	PSO-1, PSO-3	R, U

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – I

Course Title	**ALLIED- PAPER II - PLANT BIOCHEMISTRY**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO1ALT02**
Course Type	**Theory**
Credits	**2**
Marks	**100**

General Objectives:

To enable the students to understand the basic structure of plant cell, metabolic processes in plants and the role of different biosynthetic pathways in plants.

Course objectives:

CO No.	Course Objectives
CO-1	Remember and understand the general structure of plant cell and photosynthesis
CO-2	Remember and understand the plant respiratory processes
CO-3	Understand, apply and analyze the mechanism of nitrogen fixation by plants
CO- 4	Remember and understand the different secondary metabolites of plants
CO- 5	Understand and apply the different stress biochemical processes in the higher plants

UNIT – I Plant cell and photosynthesis **12 hrs**

Structure and function of plant cell and cell organelles. Structure, types, properties and biological importance of carbohydrates. Photosynthesis – Photosynthetic apparatus, light reaction (cyclic and non - cyclic) and Dark reaction (Calvin cycle).

Extra reading (Key Words):Photosynthesis and Carbon assimilation

UNIT –II Respiration: **12 Hrs**

Overview of glycolysis, Regulation of plant glycolysis, Translocation of metabolites across mitochondrial membrane, TCA cycle, Mitochondrial Electron Transport chain in plants and its regulation.

Extra reading (Key Words): Alternative NAD(P)H oxidative pathways; Cyanide resistant respiration.

UNIT – III Nitrogen metabolism: **12 Hrs**

Biological nitrogen fixation by free living organisms and in symbiotic association; Structure and function of the enzyme nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase. Primary and secondary ammonia assimilation in plants by GS-GOGAT pathway.

Extra reading (Key Words): Urea cycle, Nitrogen metabolism in biomass production.

UNIT – IV Plant harmones and Secondary metabolites: **12 Hrs**

Plant hormones: Biosynthesis, storage, breakdown, transport and role of auxins, gibberllins, cytokinins, ethylene, abscissic acid. Properties and biological functions of Alkaloids, Phenols and terpenoids.

Extra reading (Key Words): Plant secondary metabolites as toxins.

UNIT – V Plant Stress Biochemistry: **12 Hrs**

Biochemical basis of abiotic stress – Osmosis (drought, salinity), Temperature – Heat stress. Defense mechanism of plants against disease attack (enzymes and phenols).

Extra reading (Key Words): Stress physiology, Cold stress

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes (CO): The learners will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recall and relate the plant cell organelles, light and dark reactions	PSO 1, PSO 3	R, U
CO-2	Relate the photosynthetic process of light and dark reactions	PSO 1, PSO 3	U
CO-3	Explain the stages involved in the process of aerobic respiration	PSO 1, PSO 3	U
CO-4	Compare the process of nitrate assimilation	PSO 1, PSO 3	U, An
CO-5	Outline the mechanism of biological nitrogen fixation	PSO3	R, U
CO-6	Explain the secondary metabolites in plants	PSO 1, PSO 3	U
CO-6	Compare the secondary phytochemical compoundsin plants	PSO 1 PSO 6	U
CO-7	Explain the biochemical stressof plants	PSO 1	U
CO-8	Explain the biochemical defense mechanism in plants	PSO 1	U

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand; Ap Apply; An – Analyse; E- Evaluate; C – Create

Prescribed Books:

1. Verma, V. 1985. A text book of Plant Physiology. Emkay Publications, New Delhi.
2. Hans Walter Heldt and Birgit Piechulla, 2016. Plant Biochemistry. Academic Press.

Books for Reference:

1. Dey P M Et Al., 2013. Plant Biochemistry. Elsevier Science.
2. Sharma, P.D. 1992. Ecology and environment. Rastogi Publication, Meerut.
3. Pandey, B. P, 2010. College Botany. Vol. III. S. Chand and Company Ltd, New Delhi.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – II

Course Title	**MAJOR CORE – 4 - FOOD AND NUTRITION**
Total Hours	**75**
Hours/Week	**5 Hrs /Wk**
Code	**U20BO2MCT04**
Course Type	**Theory**
Credits	**4**
Marks	**100**

General Objectives:

To enable the students to learn the various aspects of foods, their nutritive value, preservation, processing of food and food-adulteration, laws and standard.

Course Objectives:

The learners will be able to

CO No.	Course Objectives
CO-1	Understand, apply the knowledge on different classes of food and their functions
CO-2	Remember the nutritive value and sources of food products
CO-3	Understand various methods of food preservation
CO- 4	Apply and evaluate the toxic substances in food and food adulteration,types of additive
CO- 5	Outline food safety measures.

UNIT – I Food as a source of energy: **15hrs**

Energy value of food, major classes of food – carbohydrates, proteins, fats, oils, minerals (Ca, Fe & I) & vitamins – fat soluble (A,D,E, K) & water soluble (Vit – C, Vit- B - riboflavin, niacin & thiamine) – sources, requirements, recommended Dietary allowances for nutrients, functions & deficiency symptoms.

Extra reading/Key words: *Human milk oligosaccharides (HMO)*

UNIT – II Food & food products: 15 hrs

Nutritive value - Plant as source of food: Cereals- rice, wheat & their products. Pulses – black & green gram. Fruits - Banana, Guava & Citrus. Vegetables – *Amaranthus*, Brinjal, lady's finger & oils – sun flower oil, bran oil & vanaspathi. Cooked foods: types of cooking, loss of nutrients in cooking.
Extra reading/Key words: *millets, olive oil, musturd oil*

UNIT – III Food preservation: 15hrs

Importance, principles of preservation. Methods of preservation- low, high temperature, drying, concentration, fermentation & radiation. Uses of oil & spices. Salt & sugars as preservatives. Preparation of Jam, Jellies, Pickles & squashes.
Extra reading/Key words: *ultrasonics, cold plasma*

UNIT – IV Food additives: 15 hrs

Definition, need & types. Food toxicants: Naturally occurring toxicants in food, fluorosis. Food adulteration: Toxic substances in certain foods. Simple physical tests for detection of food adulterants. Fast foods –problems and diseases.
Extra reading/Key words: *packed junk foods, nanopacking*

UNIT – V Food safety: 15 hrs

Sanitation & hygiene, Food borne diseases – microorganisms and moulds. Food poisoning. Food laws & Food standards. Knowledge about consumer council & consumer protection. Food allergy. Role of International & National Agencies like FAO, WHO, UNICEF, CFTRI & FSSAI.

Extra reading/Key words*:* *food safety acts*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes (CO): The learners will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Distinguish the different classes of food.	PSO 1PSO 6	R, U
CO-2	Summarize the functions of food	PSO 1 PSO 7	U,An
CO-3	Describe the nutritive value and sources of food products	PSO 1 PSO 5	U
CO-4	Discuss the various methods of food preservation	PSO 1 PSO 5	R, U
CO-5	Classify the toxic substances in food and food adulteration	PSO 1 PSO 7	An
CO-6	Describe the different types of food additives	PSO 1 PSO 5	R, U
CO-7	Discuss the role of International & National Agencies	PSO 1 PSO 5	R, U

PO – Programme Outcomes; CO – Course Outcome; R- Remember; U- Understand;
Ap – Apply; An – Analyse; E- Evaluate; C – Create

Prescribed Books:

1. Sumathi, R., Madambi & Rajagopal, M. V. 1997. Fundamentals of foods & nutrition. New Age International Pvt. Ltd., New Delhi.

Books for Reference:

1. vanced text book in food & nutrition Vol. I & II. The Bangalore Printing & Publishing Co. Ltd., Bangalore.

2. The art & Science of Cooking – A student manual. 1993. Department of food & nutrition. Blackwell publisher, New Delhi.

3. Sree Lakshmi, B. 1997. Food Science. New Age International Pvt. Ltd., New Delhi.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – II

Course Title	**MAJOR CORE – 5 - PHARMACOGNOSY**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO2MCT05**
Course Type	**Theory**
Credits	**4**
Marks	**100**

General Objectives:

To enable the students to learn the classification, constituents, collection, processing and uses of crude drugs obtained from various plant parts.

Course Objectives:

The learner will be able to

CO. No.	Course Objectives
CO-1	Understand the types of natural drugs, it's collection and processing
CO-2	Analyze the phytoconstituents of therapeutic values
CO-3	Analyze and evaluate the drug adulteration
CO- 4	Remember the indigenous traditional drugs
CO- 5	Understand and apply the pharmaceutical aids of plants

UNIT – I Pharmacognosy: 12 hrs

Definition and importance. Sources of natural drugs. Classification of crude drugs – morphological, therapeutical and chemical. Collection and processing of crude drugs.

Aroma therapy and its significance.

Extra reading/Key words: *History of pharmacognosy in china, Forensic and eco pharmacognosy*

UNIT – II Drug constituents: 12 hrs

Carbohydrates, glycosides, lipids – fixed oils, volatile oils, resins, gums, alkaloids, tannins and polyphenols.

Extra reading/Key words: *Plant metabolomics, hormones.*

UNIT –III Drug adulteration: 12 hrs

Definition and types. Methods of drug evaluation– physical, morphological and microscopical. Preliminary detection of Alkaloids, glycosides and tannins.

Extra reading/Key words: *drug Quality control, detection of flavanoids*

UNIT – IV Indigenous traditional drugs of India: 12 hrs

A study on the distribution, biological source, characters, chemical constituents and medicinal uses of the following: Amla (*Emblica officinalis*), Brahmi (*Hydrocotyl asiatica*), Tulasi *(Ocimum sanctum*), Garlic (*Allium sativum*), Vasaka (*Adhatoda vasica*), Ginger (*Zingiber officinale*), Clove (*Syzygium aromaticum*), Pepper (*Piper nigrum*), Sandal wood (*Santalum album*), Cinchona (*Cinchona officinalis*) and Lemon grass oil (*Cymbopogon citratus*).

Extra reading/Key words: *Psychoactive drugs, plants as neutraceuticals.*

UNIT – V Plant resources as technical products and Pharmaceutical aids: 12hrs.

Natural plant pesticides (Pyrethrum and Neem). Allergenic extracts and their effects (pollen and fungal extracts). Fibers: Vegetable fibers –Cotton and Jute; Animal fiber –Silk. Surgical dressings & sutures.

Extra reading/Key words: *hemp, wool, garlic insecticide spray, tomato leaf insecticide spray.*

Note: Texts given in the Extra reading /Key wordsmust be tested only through Assignment and Seminars.

Course Outcomes:

The learner will be able to

CO. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Define the types of natural drugs	PSO 1 PSO 5	R, U
CO-2	Explain the collection and processing of crude drugs.	PSO 1 PSO 5	U

CO-3	Summarize and analyse the phytoconstituents of therapeutic values of plant drugs	PSO 1 PSO 8	U, An
CO-4	Analyze the drug adulteration	PSO 1 PSO 8	An
CO-5	Lists the indigenous traditional drugs	PSO 1 PSO 5	R
CO-6	Explain the medicinal properties of traditional drug	PSO 1 PSO 5	R, U
CO-7	Discuss the various plants as technical products	PSO 1 PSO 5	R, U
CO-8	Describe the plants as pharmaceutical aids	PSO 1 PSO 5	R, U
CO-9	Develop the employability by learning the classification, constituents, collection, processing and uses of crude drugs obtained from various plant parts	PSO-1	C

Prescribed Books:

1. Roseline, A. 2011. Phamacognosy. MJP Publishers, Chennai.
2. Kokate, C. K., Purohit, A. P. & Gokhale, S. B. 1998. Pharmacognosy. Nirali Prakashan, Pune.

Books for Reference:

1. Wallis, T. E. Text book of Pharmacognosy. CBS Publishers & Distributers. Jain Bhawan, New Delhi.
2. Hill.A.F, 1996. Economic Botany –Tata Mc Grew –Hill publishing company Limited,New Delhi.
3. Mohammed Ali. Text book of Pharmacognosy. CBS Publishers & Distributers, New Delhi.
4. Edwin Jerald, E and Sheeja Edwin Jerald, 2007. Text book of Pharmacognosyand Phytochemistry. CBS Publishers and Distributors Pvt. Ltd.
5. Biren N. Shah and Seth, A. K. 2010.Text book of Pharmacognosy and Phytochemistry. Elsevier Publishers.
6. Michael Heinrich, Joanne Barnes, Jose M. Prieto Garcia, Simon Gibbons and Elizabeth M. Williamson. 2018. Fundamentals of Pharmacognosy and Phytotherapy. Elsevier Publishers.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM
B.Sc. BOTANY

First Year - Semester – II

Course Title	**ME- 1 - HOME GARDENING AND NURSERY MAINTENANCE**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO2MET01**
Course Type	**Theory cum Lab**
Credits	**3**
Marks	**100**

General Objectives:

To enable the students to learn about cultivation of plants at different conditions, propagation of plants by various methods, laying of kitchen garden and ornamental garden. Considerable emphasis is also given on the cultivation of vegetables and fruits, floriculture and role of growth hormones in horticulture. It also imparts knowledge on management of gardens and horticultural organizations.

Course Objectives:

CO No.	**Course Objectives**
CO-1	Understand and apply the different types of cultivation methods of plants for nursery and flower arrangements
CO-2	Understand and apply the vegetative propagation methods of plants for gardening
CO-3	Remember and Understand cultivation of vegetables and fruits
CO- 4	Understand the different cultivation methods of ornamental plants in home Gardening and Production methodology of floriculture
CO- 5	Remember the role of growth hormones in horticulture, importance of post harvesting techniques, common diseases and different horticultural organizations.

UNIT – I: **12hrs.**

Establishment & maintenance of nursery, cultivation of potted plants, bonsai culture, Propagation structures; green house, glass house, cloth house, plastic house, mist chamber, cold frames, hot beds; Nursery (tools & implements; Flower arrangements – dry and fresh flower arrangements.

Extra reading/Key words: *Modern Bonsai, Bonsai Artist*

UNIT-II: **12hrs.**

Preparation of soil, home manures from vegetable waste, compost and fertilizers. Propagation of plants by seeds, vegetative propagation – cutting (Hibiscus & Rose), layering (Jasmine) & grafting (Rose & Ixora).

Extra reading/Key words: *Hydroponics, Sphagnum mass*

UNIT-III: **12hrs.**

Kitchen garden, lay outs and garden designing. Classification of vegetables, cultivation of tropical vegetables – Leafy vegetable – *Alternanthera*, Root vegetable –Radish, Fruit vegetable – Brinjal & Lady's finger. Cultivation of fruits- Banana and Citrus. Post harvest management practices of fresh vegetables.

Extra reading/Key words: *Healthy lawns, Landscape design*

UNIT-IV: **12hrs.**

Ornamental garden: Layout and establishment, Construction and Maintenance of Home garden, rockery garden and terrace garden. Floriculture - Production, Management and marketing.

Extra reading/Key words: *Mulching, Pruning*

UNIT-V: **12hrs.**

Role of hormones in horticulture. Importance of post harvesting technology. Management of common diseases in horticultural crops. Horticultural organizations: IIHR, NHB, NHM.

Extra reading/Key words: *Horticultural Society, AIPH*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Discuss the steps involved in the establishment of nursery and the propagating structures	PSO3, PSO5	Ap
CO-2	Differentiate the various types of flower arrangements	PSO3, PSO5	U, Ap
CO-3	Explain different vegetative propagation of plants	PSO 3, PSO 5	U, Ap
CO-4	Outline the kitchen garden designing	PSO 3, PSO 5	U, Ap
CO-5	Describe the various culture methods of fruits and vegetables	PSO 3, PSO 5	U, Ap
CO-6	Explain the method of establishing ornamental garden	PSO 5	R,U
CO-7	Explain the production methodology of floriculture technology	PSO 5	U, Ap
CO-8	Discuss the construction and maintenance of home garden.	PSO 3, PSO 5	U, Ap
CO-9	Describe the importance of Post harvesting technology in horticultural crops	PSO 3, PSO 5	U, Ap
CO-10	Discuss the role of Horticultural organizations	PSO 3, PSO 5	U, Ap
CO-11	Discuss the common diseases in horticultural crops	PSO 3, PSO 5	U, Ap

References:

Prescribed Books:

1. Mani Bhusahan Rao, K.1991. Text book of Horticulture-MacMillan India Ltd., Madras.
2. Arumugam, N. and Kumaresan, V.2010. Fundamentals of horticulture and Plant breeding. Saras Publications.

Books for Reference:

1. Edmond J.B., Senn, T.L. and Andrews, F.S. 1964 Fundamentals of Horticulture- Tata Mc Graw –Hill Publishing Compani Ltd., New Delhi.
2. Peter M. and Tessa Eve. 2007.Garden planning and Garden design. Southwater Publishing. London.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – II

Course Title	**ME – 2 - ORGANIC FARMING**
Total Hours	**60**
Hours/Week	**4 Hrs /Wk**
Code	**U20BO2MET02**
Course Type	**Theory**
Credits	**3**
Marks	**100**

General Objective:

To enable the students to understand the components in Organic farming, its nutrients and its importance in human life, Worldwide and regional practices regarding organic farming, uses and policies related to organic farming.

Course Objectives:

The learner will be able to

CO No.	**Course Objectives**
CO-1	Understand the basic principles behind the origin and importance of organic farming practices and need of the hour
CO-2	Understand the models and type of organic farming practices prevailing Nationally and Internationally and its advantages and disadvantages.
CO-3	Preparation of nutrients and soil for organic farming with the available resources.
CO-4	Understand the standards and agencies meant for organic farming and the health benefits of food products
CO-5	Understand the bioinformatics basics and its application in biology.

UNIT – I Principles of Organic Farming 12hrs.

The Basis of Farming- Life and Farming, Ecology and the Fertility of the soil, Food and the soil organic cycle, Crop, Pest and Fertilizers. Agriculture and Climate change. Differences in Life style. Forest and Agriculture – The attitude towards farming and organic Farming concept.

Extra reading /Key Words: *Diseases related to farming practices,*

UNIT – II Models and types of Organic farming 12hrs.

Organic Farming Models - Natural Farming - Fukuoka-Japan, Australian Organic Farming, Ecological Farming Palekar Model. Types of Organic farming – Pure organic farming, Integrated farming system and Mixed farming system, its definition concept and benefits. Advantages and disadvantages.

Extra reading /Key Words: *Zero budgeting organic farm*

UNIT – III Nutrients and soil preparation for Organic farming 12hrs.

Sources of nutrients - Organic Manure –FYM/Rural compost, City compost, Oil cakes, Animal wastes, and Vermi composts. Green Manure – Leguminous crops in crop rotation. *In-situ* incorporation of crop residues. Liquid Manure. Bio fertilizers and their use as nutrients. Soil preparation, soil and water conservation strategies.

Extra reading /Key Words: *Detrimental effects of chemicals in farming*

UNIT – IV Crops for organic farming and marketing 12hrs.

Indigenous Crops – Selection & Processing, Food Crops , Cash Crops, Mono crops, Mixed Crops,

Herbs and Spices. Income generation activities: Apiculture, Mushroom production, Terrace farming. Vertical gardens. Marketing, Imports and exports, Policies and incentives of Organic production,

Extra reading /Key Words: *Integrated pest management, domestic certification.*

UNIT – V – Maintenance of Standards and Agencies of Organic farming 12hrs.

Farm inspection and certification, National and International level Agencies and institutions related to organic farming. Indian National Standards for organic products. Organic Food Quality and Human Health. Food Safety and Food Policy limited Use of Resources,

Extra reading /Key Words*: Food safety act, IFOAM*

Note: Text given in the Extra reading /Key words must be tested only through Assignment and Seminars.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Describe the importance of organic farming and its positive effects	PSO 1, PSO 3	R, U
CO-2	Explain the models and types of organic farming practice.	PSO 1, PSO 3	R, U
CO-3	Discuss the nutrients and soil types for organic farming with the resources available	PSO 1, PSO 3	R, U
CO-4	Explain the soil preparation and conservation strategies for this farming .	PSO 1, PSO3	R, U
CO-5	Describe the crops, its selection and maintenance	PSO 1, PSO 4	R, U
CO-6	Describe the income generation activities and its marketing strategies	PSO 1 PSO 4	R, U
CO-7	Explain the maintenance and agencies responsible for inspection and certification and also the food quality of products from organic farming.	PSO-1	C

Practical

1. Prepare vermi-compost at lab scale from various kinds of agro-waste.
2. Estimation of heavy metals.
3. Maintenance of biofertilizer strains, culture of biofertilizers and their applications.
4. Visit to Apiculture area
5. Visit to terrace farming area
6. Cultivation and submission of 10 plants grown out of organic farming individually at the end of the semester.

Books for Reference:

1. Bavec, F. and Bavec, M. (2007). Organic Production and Use of Alternative Crops.CRC Press, Boca Raton, FL.
2. Joshi, M., Setty, T.K.P. and Prabhakarasetty (2006). Sustainability through Organic farming.1st Edition.Kalyani Publishers, Ludhiana, India.
3. Lampkin Nicolas.1990.Organic Farming. The University of Wisconsin – Madison. Farming Press.
4. Altieri Miguel**.** 1987. Agroecology: The Scientific Basis of Alternative Agriculture. Westview Press. Boulder, CO.
5. Soule, Judith D. and Piper, Jon K. 1992. Farming in Nature's Image: An Ecological Approach to Agriculture**.** Island Press, Washington, D. C.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year - Semester – II

Course Title	MSBE - 1 - TECHNIQUES IN BOTANY
Total Hours	30
Hours/Week	2 Hrs /Wk
Code	U20BO2SBT01
Course Type	Practical
Credits	1
Marks	100

General Objectives:

To enable the students to give skills on the preparation of solutions, measurement of stomata and epidermal hairs using micrometer, fresh hand sections and localization of organic compounds, microtome sectioning, DNA separation through electrophoresis and application of statistics and bioinformatics in botany.

Course Objectives:

The learner will be able to

CO No.	Course Objectives
CO-1	Understand and apply the preparation of chemical solutions
CO-2	Understand and analyze the phytochemicals in plant tissues
CO-3	Apply the knowledge and skills in microtome sectioning
CO- 4	Understand the method of isolation of DNA from plant cell
CO- 5	Apply the SPSS package in data analysis

Unit – I Preparations of chemical solutions: **6 hrs**

Stock solutions: molar, normal, percentage, ppm. Preparation of buffer solutions (Phosphate and acetate).

Unit – II Micrometry and Histochemistry: **6 hrs**

Measurements and drawing of stomata, epidermal hairs and pollen of different species using Camera Lucida and digital camera. Histochemical localization of starch, Protein & lipid.

Unit – III Sectioning and staining: **6 hrs**

Hand section- Double staining with safranin and fast green. Sectioning using rotary microtome – Fixing specimens and preparation of paraffin blocks and affixing ribbons.

Unit – IV Biotechnology: **6 hrs**

Isolation of DNA, separation of DNA (saliva/cauliflower)- Agarose gel electrophoresis.

Unit – V Biostatistics and Bioinformatics: **6 hrs**

Statistical calculation through SPSS. Alignment- Pair-wise, BLAST.

Course Outcomes:

The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain the preparation of different chemical solution	PSO 1	U, Ap
CO-2	Demonstrate the methods of measuring plant parts and histochemical localization of phytochemicals	PSO 1, PSO 8	U, An
CO-3	Explain the method of microtome sectioning	PSO 1, PSO 3	U, AP
CO-4	Describe the isolation and identification of DNA	PSO 1, PSO 3	U, AP
CO-5	Evaluate the statistical data through SPSS	PSO 1, PSO 4	U, An
CO-6	Develop the employability and practical skills by learning the preparation of solutions, measurement of plant organs using micrometer, microtome sectioning, electrophoretic techniques, application of statistical data and bioinformatics	PSO-1	C

Prescribed Books:

1. Gahan P.B.1984. Plant histochemistry & cytochemistry – An introduction. Academic Press, London.
2. Wilson K. & Walker J. 1994. Practical biochemistry. 4th edition, Cambridge University, London.
3. Krishnamurthy, K.V. 1988. Methods in Plant Histochemistry. Viswanathan Publishers, Madras.
4. Ramakrishnan, P. 2003. Biostatistics. Saras Publications, Nagercoil.

Books for Reference:

1. Van Norman R.W. 1971. Experimental biology. IInd Edition, Prentice Hall, Inc., New Jersey.
2. Berlyn & Mische, 1976. Botanical microtechnique & cytochemistry. Iowa State University Press.
3. Plummer, D. T. 1982. An introduction to Practical biochemistry. Tata Mc Graw – Hill publishing company, Ltd, New Delhi.
4. Mani. K. and Vijayraj. D., 2002. Bioinformatics to beginners, Kalaikathir pathippagam, Coimbatore.

(For Candidates admitted from the academic year 2020-21 onwards)

HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2
SCHOOL OF LIFE SCIENCES

PG AND RESEARCH DEPARTMENT OF BOTANY
CHOICE BASED CREDIT SYSTEM

B.Sc. BOTANY

First Year – Semester – II

Course Title	**MSBE - 1 - URBAN GARDENING AND CULTIVATION OF MICROGREENS**
Total Hours	**30Hrs**
Hours/Week	**2 Hrs /Wk**
Code	**U20BO2SBT02**
Course Type	**Theory**
Credits	**2**
Marks	**100**

Course Objectives:

It deals with the importance of mirogreens which are tiny greens rich in nutrients. It also gives knowledge on different steps involved in the cultivation of microgreens, harvest and marketing. It also encourages students to learn a skill to cultivate microgreens at their home level (micro entrepreneurship).

Course Objectives:

CO No.	**Course Objectives**
CO-1	Understand and apply the scope and importance organic urban gardens and enables cities to produce their own food
CO-2	Understand the preparation of growth medium and container designing for microgreens
CO-3	Remember the collection of organic waste and composting
CO- 4	Remember and Understand the selection of plants for cultivation
CO- 5	Remember and Understand the life cycle of plants, pest and disease management of cultivated plants

UNIT – I **6 hrs.**

Organic urban gardens **–** scope and importance**,** enables cities to produce their own food- a way to increase awareness on agriculture and the government's programs to ensure food security in the country.

Extra reading/Key words: *Roof top planters, Balcony planters*

UNIT –II **6 hrs.**

Selection of Growing medium and container design- Soil – Coir pith – Fortification – Growth promoters and irrigation

Extra reading/Key words: *Hydroponic growing media***,** *Vermiculite*

UNIT – III **6 hrs.**

Collection of Organic waste and composting - Earthworm development and organic manures.

Extra reading/Key words: *Compost pails***,** *Rockwool*

UNIT – IV **6 hrs.**

Selection of Plants– Green leafy vegetables – Fruits and vegetables – Medicinal plants – Annual, Perennial and Climbers.

Extra reading/Key words: *Mulching, Prunning*

UNIT – V **6 hrs.**

pH of the soil and life cycle of plants- pest and disease management- Harvest – Marketing and tie -up.

Extra reading/Key words: *Horticultural Society, AIPH*

Note: Texts given in the Extra reading /Key words must be tested only through Assignment and Seminars

Course Outcomes: The learner will be able to

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Discuss the scope and importance organic urban gardens and enables cities to produce their own food	PSO3, PSO5	Ap
CO-2	Explain the selection of growing medium and container designing	PSO3, PSO5	R,U
CO-3	Outline the collection of organic waste and composting	PSO 5	U, Ap
CO-4	Discuss the selection of plants for urban gardening	PSO 3, PSO 5	Ap
CO-5	Describe the pest and disease management	PSO 3, PSO 5	U, Ap
CO-6	Explain the method of harvesting and marketing	PSO 5	R,U

References:

Prescribed Books:

Espiritu, K. 2019. Field Guide to Urban Gardening. Cool Springs Press. USA.
Mani Bhusahan Rao, K.1991. Text book of Horticulture-MacMillan India Ltd., Madras.
Arumugam, N. and Kumaresan, V.2010. Fundamentals of horticulture and

Plant breeding. Saras Publications.

Books for Reference:

Edmond J.B., Senn, T.L. and Andrews, F.S. 1964 Fundamentals of Horticulture-

Tata Mc Graw –Hill Publishing Compani Ltd., New Delhi.

Peter M. and Tessa Eve. 2007.Garden planning and Garden design. Southwater

Publishing. London.

McSheehy, J.2020.Vegetable Gardening for Beginners, Rockridge Press,

Emeryville, Californi

Stross, A. 2018. The Suburban Micro-Farm: Modern Solutions for Busy People

Kindle Edition. Twisted Creek Press; Cincinnati, Ohio,