UNIVERSITY OF MUMBAI
No. UG/104 of 2015-16

CIRCULAR:-

A reference is invited to the Syllabi relating to the Bachelor of Vocation program in various faculties vide this Circular No UG/47 of 2014, dated 10th November, 2014 and the Principals of the affiliated Colleges in Arts, Science & Commerce and the Heads of recognized Institutions concerned are hereby informed that the recommendation made by the Faculty of Science at its meeting held on 11th August, 2015 has been accepted by the Academic Council at its meeting held 31st August, 2015 **vide** item No.4.9 and that in accordance therewith, the revised syllabus as per the Credit Based Semester and Grading System for the Bachelor of Vocation program in faculties of Arts/Commerce/Science in the course of Green House Management, which are available on the University's web site (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

MUMBAI – 400 032
15th October, 2015

REGISTRAR

To,

The Principals of the affiliated Colleges Arts, Science & Commerce and the Heads of Recognized Institutions concerned.

A.C/4.9/31/08/2015

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No. UG/ 104-A of 2015 MUMBAI-400 032 15th October, 2015

Copy forwarded with Compliments for information to:-

1) The Deans, faculties of Arts, Science & Commerce,
2) The Professor-cum-Director, Institute of Distance & Open Learning (IDOL)
3) The Director, Board of College and University Development,
4) The Co-Ordinator, University Computerization Centre,
5) The Controller of Examinations.

REGISTRAR

...PTO

AC 31/08/2015
Item No. 4.9

UNIVERSITY OF MUMBAI

ORDINANCES, REGULATIONS, SCHEME AND SYLLABUS FOR THE B. Voc Course IN GREEN HOUSE MANAGEMENT

(Under the Credit Based Semester and Grading System (CBSGS) with effect from the academic year 2015–2016)

Objectives:

With the ever increasing world population and changing climate – unpredictable weather conditions, the planet faces a challenge to feed billions and billions of people with less and less land available. 92% of the crops grow in the open fields. Farmers struggle with the adverse climatic conditions every year.

Green house technology has helped man to overcome this problem. It is possible to grow plants in countries which are extremely cold / hot and even in deserts. An ideal artificial micro climate is made possible within the green house depending upon the requirement of the plants being grown.

Green House construction is relatively inexpensive and green houses are easy to install and have lower maintenance costs. Optimum water usage is usage and can be shifted easily. The product of the green house is uniform and consistent as it is grown under protected conditions free from the stress of the harsh environment. This ensures not only a high yield but also an excellent crop quality. One is able to manipulate the conditions in the green house to get all year round crop including off season production of flowers, fruits and vegetables.

In India it is aimed that, agricultural productivity should equal to that of the countries which are considered as economic powers of the world. The greenhouse system may be one key element to sustain food in the growing population/economy.

Furthermore, green house technology is an ideal opening for budding entrepreneurs in a developing country like India. Employment generation, enhancement of skilled manpower and superlative performance of green house products in the International markets resulting in economic growth are positive offshoots of this course.

The main objective of the B. Voc course in Green House Management is to develop trained human resources for the Green House Industry.

The three year Bachelor of Vocational Studies programme is such that the student will be awarded a Certificate on completion of their first year, a Diploma on completion of the second year and a Degree on the successful completion of the course.

The educational objective of the degree program is to:

1)Provide advanced understanding of the propagation practices and green house Management

2) growth and/or development within the practical context of the cultural and business practices applied in a horticultural discipline.

UNIVERSITY OF MUMBAI
ORDINACES, REGULATIONS, SCHEME AND SYLLABUS FOR
B. VOC COURSE IN GREEN HOUSE MANAGEMENT

(O) Title: BVoc. in Green House Management.

(R) Duration:

i) Six Months - Certificate course

ii) One year full time – Diploma course

iii) Two years full time –Advanced Diploma course

iii) Three years full time --Degree course

(R) Total credits and study hours per semester:

Component	Credits	Study Hours
Skill Component	Total 18	270 hours
	Theory 08 – 4 papers of 2 credits each	120 hours
	Practical and project work –10 credits	150 hours
General Education Component	Total 12	180 hours
	Theory 06 – 3 papers of 2 credits each	90 hours
	Practicals and Project work –6 credits	90 hours
Total per semester for all the three years	30 Credits	450 hours

(O) Eligibility:

Following candidates are eligible for admission

- HSc in Arts (Humanities) or Science or Commerce (10+ 2 in any stream) .
- Admission will be granted on merit on the basis of the total marks of all subjects at the HSc examination and as per the guidelines of the University of Mumbai.
- SY B voc- F Y B Voc in GHM/ Agriculture Diploma/ Agri Poly/ Equivalent diploma in related fields(admission after an entrance exam in Skills acquired)

(R) Intake capacity: 50

(R) Teacher's Qualification:

Core Faculty:

- MSc in Horticulture or Agriculture / Horticulture

OR

- MSc in Botany with NET/SET cleared and a minimum of 04 years of teaching experience of Horticulture- theory and practical.

OR

- MSc in Botany with a minimum of 04 years of teaching experience and with relevant training in the field of Horticulture.

OR

- Exemption from NET/SET will be granted to candidates who hold a PhD degree in Horticulture or related subjects provided they were registered for PhD before 11th July 2009.

Visiting Faculty:

- Horticulturist or Agriculturist with specialization in the relevant field.

UNIVERSITY OF MUMBAI

Course Code	UNIT	TOPICS	Credits	L / Wk
UVGHM101 to 103& UVGHMP101 Skill Component			**18**	
UVGHM101		**Soil Science**	**2**	**2**
	I	Introduction to Soil Science and Soil Physics		
	II	Soil Chemistry & Soil Microbiology		
UVGHM102		**Soil Cultivation & Natural Methods of Plant Propagation**	**2**	**2**
	I	Cultivation of Soil		
	II	Natural Methods of Plant Propagation		
UVGHM103		**Fundamentals of Green House Technology –I**	**2**	**2**
	I	Concepts of Green House and its benefits		
	II	Types of Green House		
UVGHM P101	**Practicals based on theory of Skill Component**		**12**	
UVGHM104 to 106 &UVGHMP102 General Education Component			**12**	
UVGHM104		**Communication Skills & Basics of Computer-I**	**2**	**2**
	I	Core Communication Skills-I		
	II	Basics of computers –I		
UVGHM105		**SEMESTER I** **Nursery Operations-I**	**2**	**2**
	I	Basics of Plant Biology		
	II	Types of Nurseries and Nursery Plants		
UVGHM106		**Home Gardening-I**	**2**	**2**
	I	Bonsai		
	II	Kitchen Gardening/Terrace gardening		
UVGHMP102	**Practicals based on theory of General Education Component**		**6**	

Syllabus for the F.Y.B.Voc.
Program: B.Voc.
Course : Green House Management
(Credit Based Semester and Grading System with effect from the academic year 2015–2016)

SEMESTER II

Course Code	UNIT	TOPICS	Credits	L/Wk

UVGHM201 to 203 & UVGHMP201 Skill Component			18	
UVGHM201	**Fundamentals of Green House Technology –II**		**2**	**2**
	I	Green House Environment- I		
	II	Green House Environment – II		
UVGHM202	**Green House Management Basics & Economics of Green House Setup**		**2**	**2**
	I	Green House Media and Nutrition		
	II	Economics of Green House Setup		
UVGHM 203	**Propagation Techniques**		**2**	**2**
	I	Artificial Methods of Plant Propagation – I		
	II	Artificial Methods of Plant Propagation – II		
UVGHM P201	**Practicals based on theory of Skill Component**		**12**	

UVGHM204 to UVGHM206 &UVGHMP202 General Education Component			12	
UVGHM204	**Communication Skills-II**		**2**	**2**
	I	Elements in Written Communication-I		
	II	Basics of computers –II		
UVGHM205	**Nursery Operations-II**			
	I	Plant Breeding	**2**	**2**
	II	Nursery Management and Operations		
UVGHM206	**Home Gardening – II**		**2**	**2**
	I	Waste Management		
	II	Landscaping-I		
UVGHMP202	**Practicals based on theory of General Education Component**		**6**	

Semester I UVGHM101	L	Cr
Paper I -- SOIL SCIENCE	**30**	**2**
UNIT I Introduction to Soil Science and Soil Physics • Pedology • Soil Genesis • Factors of soil formation • Soil profile and its development. • Functions of Soil • Types of Soils of India • Soil Physics ○ Composition of soil, Soil texture, Influence of soil texture on soil	**15**	

structure, Soil, air water, movement of water in the soil, soil erosion by water. Effect of soil temperature on soil properties and on plant growth, soil conductivity ○ Soil physical constraints affecting crop production.		
UNIT II Soil Chemistry and Soil Microbiology • Soil Chemistry ○ Chemical composition of soil, soil colloids, cation exchange capacity, soil salinity, acidic and alkaline soils and its remediation. • Soil Microbiology ○ Soil biota, soil microbial ecology, types of organisms, microbial interaction, soil characteristics influencing growth and activities of micro flora and fauna, biochemical composition, biodegradation of soil organic nutrients ○ Soil fertility: evaluation, soil testing, plant and tissue tests and biological methods.	**15**	
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Semester I UVGHM102	**L**	**Cr**
Paper II – Soil Cultivation &Natural Methods of Plant propagation	**30**	**2**
UNIT I Cultivation of Soil	**15**	
• Implements required for soil cultivation • Types of soil cultivation- Types of digging, mulching, soil sterilization • Soil Fertility ○ Definition, Essential elements in plant nutrition, ○ Nutrient cycles in soil. ○ Maintenance of soil fertility- Crop rotation, use of Manures and Fertilizers ▪ Use of manures and fertilizers, ▪ Classification of manures and fertilizers (Bulky organic manures- FYM, compost, slurry from biogas plant, animal excreta, green manures; fertilizers- straight, complex and mixed. Biofertilizers (nitrogen fixing, phosphate solubilising) , mycorrhiza • Methods of application of fertilizers		
UNIT II Natural Methods of Plant Propagation • Introduction to Plant Propagation • Introduction to Methods of Plant Propagation • Propagation by Seed:	**15**	

○ Origin and development of the seed, ○ Seed Germination, types of seed germination, ○ Seed Dormancy – types and methods to overcome, ○ Seed Viability- causes for loss of viability, methods to prolong seed viability ○ Seed storage ○ Seed Health, Seed testing and Seed Certification ○ Seed Technology- Seed Production and Seed Handling, ○ Growing Seedlings in Nursery, ○ Transplanting and Hardening, ○ Advantages and Disadvantages of Seed Propagation.		
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Semester I UVGHM103	L	Cr
Paper III -- Fundamentals of Green House Technology- I	**30**	**2**
UNIT I Fundamentals Of Green House Technology • Introduction to Green House, concepts and Importance • Green House World Scenario, Status in India • Planning and Designing ○ Site selection, Structures and Glazing ○ Planning and Designing: Introduction, Basics of greenhouse design ; Bench Design	**15**	
UNIT II :Types of Green House • Types of Green House based on ○ shape ○ utility ○ construction ○ covering material • **Structure and Construction of Green House** ○ Location, frame work for various types of green house, ○ covering material, ○ construction of typical glass house/poly house/ net house, ○ construction of pipe framed greenhouse, ○ Construction of floors and Layout, ○ Design and development of low cost green house structures. ○ Automated greenhouses, microcontrollers, waste water recycling.	**15**	
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	Semester I UVGHMP101	Cr
	PRACTICAL – Skill Component	12
1	Identification of types of soil	
2	Estimation of Soil pH	
3	Water Holding Capacity of soil	
4	Testing organic content using soil testing kit	
5	Identification of Fertilizers by physical and chemical methods: Urea, Ammonium Sulphate, Potassium Sulphate, Super Phosphate	
6	Plants used as green manure, Biofertilizers	
7	Propagation by seeds	
8	Vegetative Propagation : Using Bulbils, bulbs, tubers (stem and root), rhizome, Corm .	
9	Study of different types of greenhouses	
10	Study of components of greenhouse, their fabrication, erection and construction details.	
11	Study of greenhouse core material and covering material	
12 to 15	**Submission of a project related to any topic related to the syllabus. It should be duly certified and presented at the time of practical examination.**	
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GENERAL COMPONENT

Semester I UVGHM104	L	Cr
Paper IV -- Communication Skills & Basics of Computer-I	**30**	**2**
UNIT I Core Communication Skills-1 • Basic Language Skills: Grammar and Usage ○ Ability to fill in the blanks, correct errors, choose correct forms out of alternative choices, join clauses, rewrite sentences as directed, and replace indicated sections with single words / opposites / synonyms • Verbal Communication Interactions for a variety of purposes ○ Interpersonal communication,Small group communication Intellectual communication • Cross-cultural communication • Non verbal communication ○ Personal appearance, Listening skills, Active listening, Reflecting, Clarifying, Etiquettes and mannerisms ○	**15**	
UNIT II Basics of Computers-I ○ Characteristics of Computers, Basic Applications of Computer, ○ Components of Computer System, Classifications of computers ○ The User Interface, Windows Setting ○ Hands on workshop on using handheld devices like Tablets, Smartphone etc. (Android and Windows) **Working with MS Word:** ○ Word Processing Basic Opening Documents and Closing documents ○ Moving Around in a Document Using a Document/Help Wizard Text ○ Creation and Manipulation Formatting the Text Handling Multiple Documents ○ Table Manipulation Printing	**15**	
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Semester I UVGHM105	L	Cr
Paper V -- Nursery Operations-I	**30**	**2**
UNIT I : Basics of plant biology • Plants and their habits • Morphology of Plants – Vegetative Organs ○ Roots- types and modifications ○ Stems- Types and their modifications ○ Leaves- Types and modifications • Morphology of Plants – Reproductive Structures ○ Inflorescence- Types ○ Flower- A modified shoot, Parts of a flower- Calyx, Corolla, Androecium and Gynoecium- • Pollination • Fertilization **UNIT II : Types of Nurseries and Nursery Plants** • Types of Plant Nurseries - ▪ Fruit plant nurseries, Vegetable nurseries, Ornamental plant nurseries Cacti and succulents, ferns, palms and foliage plants. Medicinal and Aromatic plants nurseries, Forest plant nurseries, • Types of Nurseries According to the Type of Sale – ○ Whole sale nurseries , Private nurseries, Mail order nurseries, Hi Tech Nurseries • Types of Nursery Plants ○ Annuals, biennials, perennials , herbaceous ,woody perennials and bulbous plants, ornamental trees, shrubs ,Climbers ,Ferns, Medicinal & Aromatic plants	**15**	
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Semester I UVGHM106	L	Cr
Paper VI -- Home Gardening-I	**30**	**2**
UNIT I : Bonsai • Introduction • Types of Bonsai • Method of making Bonsai • Aftercare **Unit II: Kitchen / Terrace gardens** • Concept of Kitchen / Terrace gardening/ courtyard/ Back yard gardens/Vertical gardens	**15**	

• Selection of container, plant and media • Method • Aftercare		
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Semester II UV GHM201	L	Cr
Paper I -- Fundamentals of Green House Technology –II	**30**	**2**
UNIT IGreen House Environment-I • Heating : Sources of heat • Cooling: Types of cooling • Environmental control: Air temperature, sunlight, Carbondioxide, Relative humidity, Wind, Rain	**15**	
UNIT II Green House Environment-II	**15**	
• Light and Temperature: ○ Light: Light requirement, automation, C3 and C4 plants, ways to control Photorespiration. ○ Photoperiodism: Classification of plants into Long Day and Short Day Plants, Night Break, Perception of Photoperiodic Response, Effect of Light quality on Night Break, Phytochrome and its role in flowering, florigen. Practical Applications. ○ Temperature: Heating and cooling of green house, ventilation and air movement. ○ Vernalization.		

Semester I UV GHMP102		Cr
PRACTICAL PAPER II- General Education Component		6
1	Study of Root Morphology	
2	Study of Stem Morphology	
3	Study of Leaf Morphology	
4	Study of Flower Morphology	
5	Garden/ Nursery implements	
6	Potting & Repotting	
7	Kitchen garden/ Terrace gardening/ Bonsai	
8- 12	**Submission of a report on identification of** commercially important green house plants (minimum 5 of each) Herbs , Shrubs, Climbers, Epiphytes, Aquatic plants, Succulents, Cacti, ornamentals, house plants, vegetables and fruits)	
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Semester II UVGHM202

Semester II UVGHMP201

Semester II UVGHM203

	L	Cr
Paper II – Green House Management Basics & Economics of Green House	30	2
PRACTICAL – Skill Component	30	2
Paper III – Artificial Methods of Plant Propagation		

Set Up

1. Study of Greenhouse cooling, heating and ventilation system
2. Different equipments used in the greenhouse - Lighting system, temperature control, Humidity, CO_2
3. Identification of green house pests and diseases
4. Bed preparation in green house
5. Use of PGRs for rooting.
6. Electrical conductivity of medium used in hydroponics
7. Water quality, Water sanitation
8. Layering
9. Advantages of Layering over cuttings
10. Irrigation
11. Fertigation, management of nutrients through fertigation, Humidification
12. At least 3 Field visits to various Green Houses and writing of a report on the same.
13. **Project on Green house construction – a model of any type studied by the student. It should be duly certified and presented at the time of practical examinations.**

UNIT I Green House Nutrition — **15**

- Preparation of soil for planting, Soil sterilization in Green House, Bed preparation, planting, Spacing, Care & Training
- Plant nutrition, Fertilizers, Nutrient deficiencies and toxicities, Carbon dioxide
- Water quality, Water sanitation
- Irrigation, Methods of irrigation, Rules of watering, Hand watering, Perimeter watering, Overhead sprinklers, Boom watering, Drip irrigation, Micro irrigation
- Fertigation, management of nutrients through fertigation, Humidification
- Advanced protected agricultural systems such as plastic mulches, row cover.
- Hydroponics

Green House : Pest and Disease Management

- Pest and Soil Organisms of Green house plants: Slugs, Insects, Bees, flies, Caterpillars, Millipedes, centipedes, Nematodes
- Diseases of Green house plants: Bacterial, Fungal and viral diseases
- Management of pest and diseases –Physical, chemical, Biological, IPM
- Method of pesticide application: Types of equipments

UNIT II: Artificial Methods of Plant Propagation –II — **15**

Cutting

- Types- Stem cutting, Simple, Compound (Serpentine), Tip, Trench, Mound, Air-layering, Leaf cutting
- Advantages of cuttings over other methods of propagation
- Physiology of rooting of cuttings
- Use of PGRs for rooting.

Layering

- Types- Simple, Compound (Serpentine), Tip, Trench, Mound, Air-layering,
- Advantages of Layering over cuttings

Grafting

- Advanced protected agricultural systems such as plastic mulches, row cover.
- Tools required for Grafting,
- Types- Splice, Whip/tounge, side, veneer, cleft, bark, epicotyl.
- Approach, Repair Grafting- Inarching, bridge and bracing.
- Union between Stock and Scion
- Graft incompatibility.
- Stock Scion Relationship Advantages and Disadvantages

Budding

- Tools required for Budding,
- Types- T-budding, shield, patch, ring budding.
- Bud selection and Certification
- After care of Budded Plants
- Advantages and Disadvantages of Budding

Semester II UVGHM204

	L	Cr
Paper IV -- Communication Skills & Basics of Computers II	30	2
UNIT I Elements in Written Communication-I	15	

- Structure(the way the content is laid out)
- Style(The way it is written)
- Content(What you are writing about)
- Purpose and types
- Writing formal applications,
- Writing Statement of Purpose (SOP)
- Writing resume

Semester **II UVGHM206**	**L**	**Cr**
Paper VI -- **Home Gardening –II**	**30**	**2**

UNIT I Waste Management **15**

- **Composting-**
  - Ingredients
  - Composting technologies-Methods
  - Home Composting
  - Properties
  - Benefits
- **Vermicomposting-**
  - Methods of vermicomposting
  - Suitable species
  - Climate & Temperature
  - Large scale / commercial vermicomposting
  - Small scale / Home systems
  - Properties
  - Benefits

Semester II UVGHM205	**L**	**Cr**
Paper V – Nursery Operations-II	**30**	**2**

UNIT I Plant Breeding **15**

- Basics of Plant Breeding
  - Acclimatization:
  - Hybridization
  - Heterosis and Hybrid Seed Production
- Breeding Methods
  - Mutation Breeding
  - Polyploidy Breeding

UNIT II : Landscaping-I **15**

- Concept of landscaping
- Methods of Preparing a lawn
- Types of grass used
- After care

UNIT II Nursery Management & Operations

- Role of Nurseries in Horticulture Development
- Plant Nutrition and its Management in Nursery
  - Media for growing plants- soil, sand, peat, sphagnum moss, vermiculite, perlite, pumice, cocopeat
- Nursery operations
  - Equipments and tools in nursery operations
  - Methods of Propagation of nursery plants, Potting , repotting
  - Nursery irrigation system
  - Methods of application of fertilizers

	Semester II UVGHMP202	**Cr**
	PRACTICAL PAPER II- General Education Component	**5** 6
1	Identification of Nursery Plants	
2	Composting/Vermicomposting	
3	Basic testing of prepared compost – pH, organic content	
4	Identification of lawn grass	
5	Preparing a lawn	

6 to 9	**Internship** in any one of the topics mentioned in theory syllabus.	
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References

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- George Acquaah. *Horticulture, Principles and Practices* . Eastern Economy Eddition.
- Iyengar Gopalswamy. *Complete Gardening in India*
- Alex Lauric and Victor h Ries. *Floriculture, Fundamentals and Practices* . Agrobios, India
- Ramachandrappa and Nanjappa. *Fertigation Technology*, Agrobios, India
- Prasad S and Kumar U . *Green House Management for Horticultural Crops*. Agrobios India
- Biswas T D and Mukherjee S K . *Text Book of Soil Science* by, Tata Mc Graw-Hill Publishing Company Limited.
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Scheme of Examinations

Theory + Practical Total Marks 700/ Semester

Theory Course:	**Per Paper Total 100 Marks**
For Internal Assessment / Paper	**20 marks**
Project/ Assignments	50 marks
Active participation in class	05 marks
External Assessment	**75Marks**
Practical Course:	**Per Practical 50 Marks**
External Assessment	30 marks
Project/ Internship/ Report Submission (during External Assessment Examination)	20 marks.

Note:

1. 30 Lectures/ Sem is equivalent to 2 Lect/week.
2. Practical shall be of 3h duration
3. A minimum of four three field excursions(with at least one beyond the limits of Mumbai) for Green house studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of fifteen students.
4. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of FYBVoc GHM and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of FYBVoc GHM as per the minimum requirements. In case of loss of journal a candidate must produce a certificate from the Head of the Department/ Institute that the practicals for the academic year were completed by the student. However though such a candidate will be allowed to appear for the practical examination, the marks allotted for the journal will not be granted.

UNIVERSITY OF MUMBAI

Syllabus for the S.Y.B.Voc.
Program: B.Voc.
Course : Green House Management

(Credit Based Semester and Grading System with effect from the academic year 2015–2016)

SEMESTER III

Course Code	UNIT	TOPICS	Credits	L /Wk
UVGHM301 to 304 & UVGHMP301 Skill Component			**18**	
UVGHM301		**Nutrients for green house crops**	**2**	**2**
	I	Availability and Absorption of Nutrients, Nitrogen Metabolism		
	II	Functions and Deficiency Symptoms of Essential Minerals.		
UVGHM302		**Pollination in green house**	**2**	**2**
	I	Methods of Pollination in Green house		
	II	Specific pollination methods in green house grown crops.		
UVGHM303		**Organic fertilizers & irrigation systems**	**2**	**2**
	I	Naturally Occurring Organic Fertilizers and Production of Organic Fertilizers		
	II	Types & Components of Irrigation Systems		
UVGHM P301	**Practicals based on theory - Skill Component**		**12**	**10**
UVGHM304-306 &UVGHMP302GeneralEducationComponent			**12**	
UVGHM304		**Communication skills III & Basics of Computers-III**	**2**	**2**
	I	General communication Skill –III		
	II	Basics of Computer- III		
UVGHM305		**Sustainable development-I**	**2**	**2**
	I	Sustainable Development –I		
	II	Sustainable Development –II		
UVGHM306		**Home Gardening – III**	**2**	**2**
	I	Tropical Indoor Plants: Culture & Factors for Growing		
	II	Landscaping-II		
UVGHMP302	**Practicals based on theory of General Education Component**		**6**	**6**

SEMESTER IV

Course Code	UNIT	TOPICS	Credits	L / Wk
UVGHM401 to 404& UVGHMP401 Skill Component			**18**	
UVGHM401	**Soilless Culture (Hydroponics) Of Green House Crops**		**2**	**2**
	I	Hydroponics : Commercial Aspects and Recent Advancements.		
	II	Hydroponics: Techniques and Media.		
UVGHM402	**Organic Cultivation Of Green House Crops**		**2**	**2**
	I	Principles & Advantages of Organic cultivation		
	II	Methods of Organic Cultivation		
UVGHM403	**Propagation, Planting And Caring Of Green House Plants-I**		**2**	**2**
	I	Ornamental ferns , foliage plants and Cacti		
	II	Flowering Plants, Fruit crops ,Vegetables and exotic vegetables		
UVGHM P401	**Practicals based on theory of Skill Component**		**10**	**10**
UVGHM404to406 &UVGHMP402 General Education Component				
UVGHM404	**Communication Skills-IV And Basics Of Computer –IV**			
	I	General Communication Skill - IV	**2**	**2**
	II	Basics of Computer – IV		
UVGHM405	**Sustainable Development –II**			
	I	Sustainable Development –III	**2**	**2**
	II	Sustainable Development –IV		
UVGHM406	**Home Gardening - IV**		**2**	**2**
	I	Interior Scaping I :Gardening in tubs/urns, Bottle Gardens, Terrariums & Miniature Gardens		
	II	Interior Scaping II: Hanging Baskets, Vertical Gardens, Window Gardens		
UVGHMP402	**Practicals based on theory of General Education Component**		**6**	**6**

Semester III UVGHM301	**L**	**Cr**
Paper I - Nutrients For Green House Crops	**30**	**2**

UNIT I Availability and Absorption of Nutrients and Nitrogen Metabolism • **Detection, Occurrence and Availability of Essential Elements** • **Mineral Salt absorption and translocation** ○ Types of Absorption : passive and active ; ○ Factors affecting salt absorption ○ Translocation • **Nitrogen Metabolism** ○ Nitrogen Nutrition ○ Biological Nitrogen fixation by Leguminous plants ○ Amino acids and amides ○ Choice of Nitrogen fertilizers and time of application ○ Proteins	**15**	
UNIT II Functions and Deficiency Symptoms of Essential Minerals • Major and Minor elements required by plants • Functions and Deficiency Symptoms of the following Essential Minerals: Nitrogen, Phosphorus, Calcium, Magnesium, Potassium, Sulphur, Iron, Manganese, Copper, Zinc, Boron, Molybdenum	**15**	
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Semester III UVGHM302	**L**	**Cr**
Paper II -- Pollination In Green House	**30**	**2**
UNIT I Methods of Pollination in Greenhouse • Agents of pollination: Bumble bee, honey bee, ants and man • Commercial pollinating devices : Electric toothbrush, Paint brush, Flicking support strings, Air Movement	**15**	
UNIT II Specific Pollination Methods in Greenhouse grown crops • Case Study : Tomato, Musk melon, Water melon, Bitter gourd	**15**	
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Semester III UVGHM303	**L**	**Cr**
Paper III -- Production Of Organic Fertilizers & Irrigation Systems	**30**	**2**

UNIT I Naturally occurring organic fertilizers • Manures, Slurry, Worm castings, Peat, Seaweed, Humic Acid, Guano, Swage, Sludges **Production of Organic Fertilizers** • Compost, Bloodmeal, Bone meal, Humic acid, Sea weed extracts , Natural enzyme digested proteins- Fish meal, Feather meal • Decomposing Crop Residue (Green Manure), Vermicompost	**15**	
UNIT II Types and Components of Irrigation Systems: • **Types of irrigation systems** ○ large field systems (center pivot and wheel line), ○ turf, ○ vegetable and orchards (flood, spray ,stake and pop-up, drip) ○ greenhouse flood beds and floors, mechanized booms, hanging basket conveyors, mist, and fog systems. ○ Choosing the appropriate system. • **Components of irrigation systems:** ○ Pipes, tubes and fittings, nozzles, solenoid valves, controllers **Irrigation System Design** • **Irrigation system design: flow and pressure**. ○ Irrigation system design considerations: filters, backflow prevention. ○ On/off control mechanisms, Automated irrigations controllers: (Timers , RH and VPD sensors) ○ Components of a drip system, drip system lay out ,operating drip system/ types, wetting patterns,Benefits • **Fertigation systems**: Injectors and plumbing; Controlling pH, EC, and pathogens. Determining fertilizer rates, Chemigation • **Water quality**: alkalinity and solutes.	**15**	
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	Semester III UVGHMP301	Cr
	PRACTICAL Paper I – Skill Component	10
1- 3	Effect of Mineral Deficiency on plants	
4	Pollination in green house	
5 - 6	Comparative Study of growth parameters in different potting media	
7	Preparation of Organic Fertilizers.	
8	Analysis of Organic content, pH, WHC of the prepared organic fertilizers	
9	Estimation of NPK in the fertilizers using flame photometer.	
10	**Field visits to study different types of irrigation systems and submission of a report on the same.**	
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Semester III **UVGHM304**	**L**	**Cr**
Paper IV - Communication Skills - III & Basics Of Computers- III	**30**	**2**
UNIT I General communication Skill III • Preparing for Group Discussions, debates and conferences • Preparing for Presentations • Preparing for Interviews • Making posters, advertisements • Webpage designing • Conducting interviews	**15**	
UNIT II Basics of Computers-III • Excel Basics : Elements of Electronics Spread Sheet, Manipulation of cells Providing Formulas, Spread sheets for Small accountings • Google drive , Google forms.	**15**	
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Semester III **UVGHM305**	**L**	**Cr**
Paper V -- Sustainable Development-I	**30**	**2**
UNIT I Sustainable Development I • Introduction to sustainable development • Principles of sustainable development • Government Regulations.	**15**	
UNIT II Sustainable Development II - • Key environmental issues ○ Pollution- Air, Water, Soil ○ Ecological degradation -Agriculture ,Deforestation ○ Green house gas emission ○ Adverse impact of use of fertilizers, pesticides, irrigation & other industries on environment	**15**	
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Semester III UVGHM306	**L**	**Cr**
Paper VI – Home Gardening - III	**30**	**2**
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UNIT I Tropical Indoor Plants: Culture and **Factors for Growing** • **Understanding interior environments** ○ plants for different light conditions • **Dealing with indoor plants** ○ Potting Media, Container selection, Managing plant nutrition, Pruning indoor plants, Factors for growing indoor plants. • **Making The Best Use Of Indoor Plants** ○ Deciding the location of the indoor plant, Managing colour, Using mirrors, Plants in baskets, Miniature gardens.		
UNIT II Landscaping-II ○ Principles ○ Making a landscape	**15**	
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	Semester III UVGHMP302	**Cr**
	PRACTICAL PAPER II- General Education Component	6
1	Containers for indoor plants	
2	Types and preparation of hanging baskets	
3	Study of pot hydroponics	
4	Miniature gardens and landscapes	
5	growing Orchids and Palms	
6	Submission: A survey of Tropical Indoor plants.	
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Semester IV UVGHM401	L	Cr
Paper I -- Soilless Culture (Hydroponics) Of Green House Crops	**30**	**2**

UNIT I Hydroponics: Commercial Aspects and Recent Advancements
• History and Origin
• Soil less Culture, its advantages and Disadvantages
• Nutrient Solutions –
  ○ Major and Minor nutrients,
  ○ Role of nutrients.
• Commercial Aspects
• Advancements
• Hydroponics in Green house
	15	

UNIT II Hydroponics : Techniques and Media • **Techniques in Hydroponics** – Static solution culture, Continous –flow Solution culture, Aeroponics, Passive sub-irrigation, Ebb and flow or flood and drain irrigation, Run to waste, Deep water culture, Bubbleponics. • **Media used for Hydroponics**: Clay, Rock wool, Coir, Perlite, Pumice, Vermiculite, Sand, Gravel, Brick shards, Polystyrene packing peanuts, wood fibre.	**15**	
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Semester IV UVGHM402	L	Cr
Paper II –Organic Cultivation Of Green House Crops	**30**	**2**
UNIT I Principles and Advantages of Organic cultivation • Principles and practices • Importance in modern crop production • Advantages of organic fertilizers • Inconveniences of organic fertilizers.	**15**	
Methods of Organic Cultivation • Planting, managing soil quality, soil fertility management, weed management, diseases and pest control, organic pesticides Organic certification procedure.	**15**	
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Semester IV UVGHM403	L	Cr
Paper III -- Propagation, Planting And Caring Of Green House Plants - I	**30**	**2**
UNIT I Ornamental Ferns , Foliage Plants And Cacti • Propagation, Planting and Caring of ornamental ferns and Foliage plants – (five examples) • Propagation, Planting and Caring of cacti (Five examples)	**15**	
UNIT II Flowering Plants, Fruit crops, Vegetables and Exotic vegetables • Preparation of soil ,cultivation , planting and caring of : ○ Green house flowering plants ○ Fruit crops ○ Vegetables and exotic vegetables (Five examples of each)	**15**	
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	Semester IV UVGHMP401	Cr
	PRACTICAL Paper I – Skill Component	10
1 to 3	Growing any one of the following in Hydroponics solution: A leafy vegetable, a fruity vegetable , a medicinal herb	
4 to 7	Growing of Ferns and foliage plants in the green house.	
	Growing of Vegetables and exotic vegetables in the green house.	
8 to 10	Cacti, grafting of cacti and monitoring their growth	
	Report Submission of the above	
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Semester IV UVGHM404	L	Cr
Paper IV **- Communication Skills –IV & Basics of Computers - IV**	**30**	**2**
UNIT I General Communication Skill- IV • Planning and writing documents • Summary writing • Understanding Audience speaker relationship • Media Writing	**15**	
UNIT II Basics of Computer –IV • Starting e-business • Use of Computers for Business Development and Advertising.	**15**	
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Semester IV UVGHM405	L	Cr
Paper V -- Sustainable Development -II	**30**	**2**
UNIT I Sustainable Development –III • **Conservation** ○ Soil, Water, Biodiversity	**15**	
UNIT II Sustainable Development –IV • **Reducing the use of non-renewable energy sources** ○ Gobar gas ○ Biocoal	**15**	
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Semester IV UVGHM406	**L**	**Cr**
Paper VI -- Home Gardening - IV	**30**	**2**
UNIT I Interior Scaping I : **Gardening in Tubs or Urns, Bottle Gardens, Terrariums and Miniature Gardens** • Choice of containers • Choice of media • Making of gardens in tubs,urns,bottles and terrariums, Making of miniature gardens in a dish. • Types and care of plants suitable for growth • Internal environment- humidity, ventilation	**15**	
UNIT II Interior Scaping II :	**15**	
• **Hanging Baskets** ○ Selecting containers, Preparing hanging baskets, Growing flowers, vegetables and fruits in hanging baskets • **Vertical Gardens** ○ Green walls and their importance, Types of media- Loose media, mat media, structural media, Advantages of vertical gardens • **Window Gardens** ○ Window farming, Choice of containers and light weight media ○ Importance		
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	Semester IV UVGHMP402	**Cr**
	PRACTICAL PAPER II- General Education Component	6
	Preparation and maintenance of	
1	Hanging baskets	
2	Miniature gardens	
3	Vertical Gardens	
4	Bottle Garden	
5	Terrarium	
	The above are to be submitted at the time of Semester end examination.	
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- Arora, J.S. (1990). *Introductory Ornamental Horticulture*. Kalyani Publishers.
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- Dahama A K. *Organic Farming for Sustainable Agriculture* . Agrobios India.
- George Acquaah. *Horticulture, Principles and Practices* . Eastern Economy Eddition.
- Gupta P K *Manures and soil fertilizers*.
- Hessayon D G . *The Flowering Plant Expert.* Expert Books.
- Hessayon D G. *The Garden Expert*. Expert Books.
- Hessayon D G *The House Plant Expert.* Expert Books.
- Iyengar Gopalswamy. *Complete Gardening in India*
- Prasad S and Kumar U . *Green House Management for Horticultural Crops*. Agrobios India
- Ramachandrappa and Nanjappa. *Fertigation Technology*, Agrobios, India
- Somani, L.L., Bhandari S.C. and Vyas K. K. (1990). *Biofertilizers*. Scientific publication , Jodhapur.
- Subbarao N.S. (1995). *Biofertilizers in Agriculture and Forestry*. Oxford and IBH publishing Company Pvt. LTd. New Delhi
- Randhava, GS and Mukhopadhay A. *Floriculture in India* Allied Publishers Limited

Scheme of Examinations

Theory + Practical Total Marks 700/ Semester

Theory Course:	**Per Paper Total 100 Marks**
For Internal Assessment / Paper	**20 marks**
Project/ Assignments	
Active participation in class	05 marks
External Assessment	**75 Marks**
Practical Course:	**Per Practical 50 Marks**
External Assessment	**30 marks**
Internship/ Report Submission (during External Assessment Examination)	**20 marks.**

Note:

5. 30 Lectures/ Sem is equivalent to 2 Lect/week.
6. Practical shall be of 3h duration
7. A minimum of four three field excursions(with at least one beyond the limits of Mumbai) for Green house studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of fifteen students.
8. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of SYBVoc GHM and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of SYBVoc GHM as per the minimum requirements. In case of loss of journal a candidate must produce a certificate from the Head of the Department/ Institute that the practicals for the academic year were completed by the student. However though such a candidate will be allowed to appear for the practical examination, the marks allotted for the journal will not be granted.