

**NORTH MAHARASHTRA UNIVERSITY,  
JALGAON**



(NAAC Re-Accredited)

“A” Grade

**FACULTY OF SCIENCE**

**SYLLABUS FOR  
F.Y.B.Sc. (BOTANY)**

**To Be Implemented From  
Academic Year 2015-16**

## **THEORY COURSES**

### **SEMESTER- I**

#### **PAPER-I**

**BOT:111. Bacteria, Viruses and Algae**

#### **PAPER-II**

**BOT:112. Plants for Human Welfare**

### **SEMESTER - II**

#### **PAPER-I**

**BOT:121. Fungi, Lichens and Plant Pathology.**

#### **PAPER-II**

**BOT:122. Industrial Botany**

## **PRACTICAL COURSES**

**PRACTICAL-I: BOT.113 (Based on BOT.111 & 112)**

**PRACTICAL-II: BOT.116 (Based on BOT.121 & 122)**

**SEMESTER-I**  
**F.Y.B.Sc. BOTANY**  
**PAPER-I BOT.111. BACTERIA, VIRUSES AND ALGAE**

**(Total Lectures : 45)**

**OBJECTIVES**

- i. To study the diversity among Bacteria, Viruses and Algae.
- ii. To study systematic, morphology and structure, of Bacteria, Viruses and Algae.
- iii. To study the life cycle pattern of Bacteria, Viruses and Algae.
- iv. To study the useful and harmful activities of Bacteria, Viruses and Algae .

**Chapter-1. Bacteria**

**10L**

- 1.1 Introduction and General Characters.
- 1.2 Classification of Bacteria on the basis of morphology
- 1.3 Nutrition- Autotrophic and Heterotrophic
- 1.4 Structure of Bacterial Cell
- 1.5 Gram positive and Gram negative Bacteria
- 1.6 Reproduction - Asexual and Sexual (Conjugation)
- 1.7 Economic Importance of Bacteria - useful and harmful activities
- 1.8 Study of Bacterial diseases w.r.t. causal organism, symptoms and control measures of (i) Citrus canker, (ii) Black arm of Cotton

**Chapter-2. Viruses**

**10L**

- 2.1 Introduction and Discovery of Viruses.
- 2.2 The Nature of Viruses. ( living & nonliving)
- 2.3 Ultra structure and chemical composition
- 2.4 Types of viruses on the basis of shapes
- 2.5 Bacteriophages
- 2.6 Reproduction of Bacteriophages- Lytic cycle and Lysogenic cycle
- 2.7 Study of viral diseases w.r.t. causal organism, symptoms and control measures of (i) Yellow vein mosaic disease of Lady's finger, (ii) Leaf curl of Tomato

**Chapter- 3 Algae**

**10L**

- 3.1 Introduction and General Characters of algae
- 3.2 Thallus structure of algae
- 3.3 Reproduction- Vegetative, asexual and sexual
- 3.4 Economic importance of algae in (i) Agriculture, (ii) Industries, (iii) Medicine, (iv) Energy Production

**Chapter-4 Classification of algae** **5 L**

**4.1 Classification of algae according to G. M. Smith (1955) up classes with reasons giving at least two examples from each class.**

**Chapter-5 Study of life cycle of *Spirogyra*** **5 L**

- 5.1 Systematic position
- 5.2 Thallus structure
- 5.3 Reproduction: Vegetative and Sexual (conjugation)

**Chapter-6 Study of life cycle of *Sargassum*** **5 L**

- 6.1 Systematic position
- 6.2 Thallus structure ( external & internal)
- 6.3 Reproduction: Vegetative and Sexual.
- 6.4 Structure of male and female conceptacles.
- 6.5 Alternation of Generations

**Reference Books:**

Agrwal, S. B. and Srivastav (1985 )Modern Text Book of Botany Vol. I Algae, Fungi, Bacteria Viruses and Lichen, Universal Publication, Agra.

Biswas, S. B. and Amita Biswas (1986 Ed.)An Introduction to Viruses, Vikas Publishing House (P) Ltd. New Delhi.

Gangulee, H.C. and Kar, A.K.( 1998 ) College Botany Vol. II New Central Book Agency, Kolkota

Pandey B. P. (2014) College Botany Volume 1S. Chand publications, New Delhi

Pandey, S. N. and Trivedi (1997) A Text Book of Botany Vol. I Vikas Publishing House, New Delhi

Salle, A.J. (1974) Fundamental Principles of Bacteriology (TMH Ed.) New Delhi

Sarabhai, B. P. & Arora C.K. ( 1995 ) . A Text Book of Algae Anmol Publication, New Delhi

Sharma, P D. (1998) A Text Book of Fungi Rastogi Publication, Meerut.

Sharma, P D. (2009) A Text Book of Algae Tata Mc Graw Hill Publication, New Delhi

Vashita ,B.R. (2010) S. A Text Book of Fungi Chand and Company (P.) Ltd New Delhi

Vashita, B.R. (2010) S. A Text Book of Algae Chand and Company (P.) Ltd New Delhi

**SEMESTER-I**  
**F.Y.B.Sc. BOTANY**  
**PAPER-II BOT. 112. PLANTS FOR HUMAN WELFARE**

(Total Lectures : 45)

**OBJECTIVES :**

- 1) To know the role plants in human welfare.
- 2) To acquaint students with various plants of economic use
- 3) To know importance of plants & plant products
- 4) To study chemical contents of the plant products
- 5) To know about utility of plant resources

**Chapter-1: Introduction plants for human welfare** **4L**

- 1.1 Introduction, scope & importance
- 1.2 Plants of plant products in human welfare as food, fodder, Fibers, medicines oils, spices, condiments and non alcoholic beverages.
- 1.3 Vavilov's concept of origin of cultivated plants.
- 1.4 Green revolution in India.

**Chapter-2: Food plants** **10 L**

- 2.1 Cereals- Botanical source, centre of origin, chemical contents and uses of  
(i) Wheat, (ii) Rice
- 2.2. Pulses-Botanical source, centre of origin, chemical, contents and uses of  
(i) Pigeon pea, (ii) Chick pea
- 2.3. Vegetables -Botanical source, centre of origin, chemical contents and uses of  
(i) Spinach, (ii) Brinjal
- 2.4. Fruits -Botanical source, centre of origin, chemical contents and uses of  
(i) Banana, (ii) Guava
- 2.5. Fodder -Botanical source, centre of origin, chemical contents and uses of  
(i) Lucerne, (ii) Berseem

**Chapter-3 Spices of condiments** **4L**

- 3.1. Definition and importance
- 3.2 Botanical source chemical contents, plant parts used and uses of  
(i) Capsicum, (ii) Coriander, (iii) Cardamom, (iv) Cinnamon

**Chapter-4 Oils & Fibres** **4L**

- 4.1 Oils- Definition, characteristics, botanical source, parts used, chemical contents and uses of (i) Groundnut oil, (ii) Castor oil.
- 4.2 Fibres- Occurrence, structure, classification of fibres, important sources and uses of  
(i) Cotton, (ii) Coir.

**Chapter-5: Non alcoholic beverages** **3 L**

5.1 Botanical source, active principles and uses of i) Tea ii) Coffee.

**Chapter-6 Medicinal plants** **9L**

6.1 Introduction

Botanical source, characteristics of plants, active principles, plant parts used and uses of

(i) Hirda, (ii) Behada, (iii) Amla, (iv) Aloe, (v) Neem, (vi) Adulsa

**Chapter-7 Timber** **5L**

7.1. Introduction

7.2 Botanical source, characteristics and uses of (i) Teak, (ii) Shisam

**Chapter-8 Bio-energy** **6 L**

8.1. Introduction Definition and scope.

8.2. Energy plantation concept, important characteristics and sources of bio-energy

(i) Jatropha, (ii) Karanj

**Reference Book:**

Aiyer, A.K.Y.N. (1954) Field Crops In India. The Bangalore Printing & Publishing Company Bangalore.

Bendre, Ashok and Ashok Kumar (1998-1999) Economic Botany For Under Graduate Students. Rastogi Publications, Meerut, India.

Hill, A.F. (1952), Economic Botany (2<sup>nd</sup> Ed.) Mc Graw Hill Company Pvt.Ltd. New York.

Kochhar. S.L. (1998) Economic Botany In The Tropics (2<sup>nd</sup> Ed) Macmillan India Ltd, Delhi, Mumbai.

Pal, B.P. (1996) Wheat Monograph. Council of Agricultural Research, New Delhi.

Pande B.P. (2006) Botany for degree Students, S.Chand & Co.Ltd. Ramnagar New Delhi. 110055.

Pandey, S.N. and Archana (1996) Economic Botany, Vikas Publishing House, New Delhi.

Parthasarathy, S.V. (1971) Sugar Cane In India, K.C.P.Ltd., Madras.

Patil D.A. and D.A. Dhale (2012) Spices And Condiments: Origin, History & Applications. Daya Publishing House, Delhi, India.

Patil, D.A. (2010) Medicinal Plants: History, Culture And Usage. Mangalam Publishers & Distributors, Delhi, India.

Patil, D.A. (Ed.) (2008) Herbal Cures: Traditional Approach. Avishkar Publishers & Distributors, Jaipur, India.

Patil, M.V. and D.A. Patil (2013) Herbal Materia Medica of Maharashtra. Daya Publishing House, Division of Astral International P.Ltd., New Delhi, India.

Pruthi, J.S. (1976) Spices and Condiments, National Book Trust, Delhi.

Sambamurthy, A.V.S.S. and Subramanyam, N.S. (1989). A Textbook of Economic Botany, Wiley Eastern Ltd. New Delhi.

Sharma, B. K. and P. B. Awasthi (1984). Economic Botany, Prakash Book Depot, Bareilly.

**SEMESTER-II**  
**F.Y.B.Sc. BOTANY**  
**PAPER-I BOT.121. FUNGI, LICHENS AND PLANT PATHOLOGY**

**(Total Lectures : 45)**

**OBJECTIVES**

- i. To Study the Biodiversity of Fungi
- ii. To know the Economic Importance of Fungi
- iii. To study the features of Lichens
- iv. To know the terminologies in plant pathology
- v. To know the scope and importance of Plant Pathology
- vi. To study the control measures of plant diseases

**Chapter - 1 Fungi 4L**

- 1.1 Distinguishing characters
- 1.2 Occurrence
- 1.3 Structure of thallus
- 1.4 Nutrition
- 1.5 Reproduction - Vegetative, Asexual and Sexual

**Chapter – 2 Classification of fungi according to G. M.Smith (1955) up to classes with reasons  
giving at least two examples from each class 4L**

**Chapter-3 Study of life cycle of *Rhizopus* 5L**

- 3.1 Systematic position
- 3.2 Occurrence
- 3.3 Thallus structure
- 3.4 Reproduction-Asexual and Sexual

**Chapter-4 Study of life cycle of *Agaricus* 6L**

- 4.1 Systematic position
- 4.2 Occurrence
- 4.3 External and internal morphology of sporophore/ Basidiocarp
- 4.4 Reproduction

**Chapter-5 Economic importance of fungi 4L**

- i) Agriculture

- ii) Industries
- iii) Food
- iv) Medicine
- v) Deterioration

**Chapter 6- Lichens** **5L**

- 6.1 Definition, Habit and Habitat
- 6.2 Occurrence
- 6.3 Types of Lichens
- 6.4 Thallus structure
- 6.5 Ecological and Economic importance of Lichens

**Chapter 7- Plant Pathology** **4L**

- 7.1 Definitions, Scope & Importance of Plant Pathology
- 7.2 Causes of Diseases
  - a) Abiotic-moisture, temperature, pH, mineral deficiency
  - b) Biotic-bacteria, viruses, mycoplasma, fungi, nematodes.

**Chapter 8-Concept of disease** **5L**

- 8.1 Classification of plant diseases
- 8.2 Definition and terminology in plant pathology
  - i) Causal organism ii) Parasite iii) Pathogen iv) Inoculum v) Penetration
  - vi) Infection vii) Incubation period viii) Disease Cycle
- 8.3 General Symptoms of Diseases caused by bacteria, viruses and fungi

**Chapter 9- Study of Plant Diseases w.r.t. causal organism, symptoms and control measures of** **4L**

- 9.1 Bacterial disease- Angular leaf spot of cotton
- 9.2 Viral disease- Leaf curl of Papaya
- 9.3 Mycoplasma disease- Little leaf of Brinjal
- 9.4 Nematodal disease- Root knot of vegetables

**Chapter 10- Study of Plant Diseases w.r.t. causal organism, symptoms and control measures of following fungal diseases** **4L**



- (i) White rust of Crucifers, (ii) Powdery mildew of Teak, (iii) Smut of Jawar,  
(iv) Tikka disease of Groundnut

**Reference Books:**

- Agrios, G. N. (2006). Plant Pathology. Academic Press, London, U.K.
- Alexopolus, C. J. , Mims, C. W. and Blackwel (1999). Intriductory Mycology. JohnWiely & Sons. Inc. U. K.
- Bilgrami, H. S. and Dube, H. C. (1970). Modern Plant Pathology, Vikas Publishing House Pvt. Ltd.; New Delhi, India.
- Buttler, E. J. (1973). Fungi and Diseases in Plants. Thacker and Co., Calcutta, India.
- Dube , H. C. (1990). An Introduction to Fungi, Vikas Publishing House Pvt. Ltd.; New Delhi, India.
- Mehrotra, R. K. (1994). Plant Pathology. Tata Mc. Graw- Hill Publishing Co. Ltd. New Dehli, India.
- Mehrotra, R. S. and Aneja, C. R. (1998). An Introduction to Mycology. Wiley Eastern Ltd. Dehli, India.
- Mehrotra, R. S. and Aneja, R. S. (1998). An Introduction to Mycology. New Age Intermediate Press Ltd. Dehli, India.
- Pandey, B. P. (1994).A Text Book of Botany- Fungi. S. Chand and Co. Ltd. New Delhi, India.
- Sharma, O. P. (1989). A Text Book of Fungi. Tata Mc. Graw- Hill Publishing Co. Ltd., New Delhi, India.
- Sharma, P. D. (1998). The Fungi. Rastogi Publications, Meerat, India.
- Sing, R. S. (1996). Plant Pathology. Oxford and IBK Pub. Co. New Delhi, India.
- Smith, G. M. (1995). Cryptogamic Botany Vol. I (Algae and Fungi). Mc. Graw-Hill Book Company, New York and London, USA and UK.
- Vashistha, B. R. (1995). Botany for Degree Students- Fungi (9<sup>th</sup> Eds.) S. Chand and Co. (P.) Ltd. New Delhi, India.
- Webster, J. (1985). Introduction to Fungi, Cambridge University Press, Cambridge, UK.

**SEMESTER-II**  
**F.Y.B.Sc. BOTANY**  
**PAPER-II BOT.122. INDUSTRIAL BOTANY**

(Total Lectures : 45)

**OBJECTIVES:**

- 1) To provide thorough knowledge about various plant groups from primitive to highly evolved plants
- 2) To make the students aware of applications of different plants in various industries
- 3) To highlight the potential of these studies to become an entrepreneur
- 4) To equip the students with skills related to laboratory as well as industries based studies
- 5) To make the students aware about conservation and sustainable use of plants
- 6) To create foundation for further studies in Botany
- 7) To address the socio-economical challenges related to plant sciences
- 8) To facilitate students for taking up and shaping a successful career in Botany

**1. Introduction to Industrial Botany** **2L**

- 1.1 Concept, Scope and Importance of Industrial Botany.

**2 Organic manure and Biofertilizer Industry** **9L**

**2.1 Organic Manures**

- i) Introduction and importance
- ii) Types: Compost, Farm Yard Manure and Green manure

**2.2 Biofertilizers**

- i) Definition and Importance
- ii) Types of biofertilizers
- iii) Methods of cultivation of
  - A) Blue Green Algae. (BGA)**
    - a) Preparation of culture media- De's medium (modified)
    - b) Isolation and Inoculation
    - c) Mass Cultivation of BGA (G. S. Venkatraman, 1963)
    - d) Utilization of BGA in Agriculture
  - B) Rhizobium Culture**
    - a) Isolation from root nodules of Leguminous plants
    - b) Pure culture (YEMA Medium)
    - c) Mass production
    - d) Methods of application in Agriculture
    - e) Agronomic importance

**3. Fermentation Industry** **7L**

- 3.1 Introduction, Definition and Types: Aerobic and Anaerobic
- 3.2 Microbes involved in fermentation.

- 3.3 Industrial production of Ethanol and Penicillin w. r. to
  - i) Pure culture
  - ii) Substrate
  - iii) Sterilization
  - iv) Fermentation
  - a) Recovery of end product

#### **4 Mushroom Industry**

**7L**

- 4.1 Introduction
- 4.2 Edible and Non-Edible Mushrooms
- 4.3 Nutritional value of Mushrooms
- 4.4 Important edible Mushroom used for cultivation
- 4.5 Spawn and spawn making
- 4.6 Methods of cultivation of
  - i) Agaricus (Button mushroom)
  - ii) Pleurotus (Dhingri Mushroom)
  - a) Volvariella (Paddy straw mushroom)

#### **5. Rubber Industry**

**6L**

- 5.1 Source of raw material and properties
- 5.2 Manufacture of para rubber
- 5.3 Uses of rubber

#### **6 Bio-pesticide Industry**

**6L**

- 6.1 Concept of bio-control; Integrated Pest Management (IPM).
- 6.2 Importance of bio pesticides.
- 6.3 Source and uses of Azadirachtin as bio-pesticide
- 6.4 Commercial significance.

#### **7. Fruit Processing Industry**

**8L**

- 7.1 Fruit processing, Concept and need
- 7.2 Cold Storage
- 7.3. Types of fruit processing [ Canned fruits, dried fruit chips, fruit pulp, squash, jam, jelly, pickle and ketchups.]

#### **Reference Books:**

Atkin, F.C. (1972). Mushroom Growing Today. Faber and Faber Ltd. London, U.K.

Casida L.E. (1968) Industrial Microbiology. John Willey & Sons

Gaur A.C.. Biofertilizers in Sustainable Agriculture. IARI, New Delhi

Hui. Y. H. (2008) Handbook of Fruits and Fruit Processing John Wiley & Sons, 04-Aug-2008.

- Kofler, L.A. and Hickey, R.J.(1954). Industrial Fermentations, Vol.I. Chemical Publishing Co. Inc. New York, USA.
- Mitra Debabrata, Guha J. and Chaudhari S. K. (1991).Studies In Botany Vol. II. Moulik Library, Kolkata.
- Mukharji S. K. (2004). College Botany Vol . III. New Central Book Agency (P) Ltd. Kolkata, India.
- Pandey,S.N. and Archana (1996).Economic Botany. Vikas Publishing House, New Delhi, India.
- Pathak, Y. G. (1998). Mushroom Production And Processing Technology, Agribios, Jodhapur, India.
- Somani, L.L., Bhandari S.C. and K. K. Vyas (1990).Biofertilizers, Scientific Publication, Jodhapur, India.
- SubbaraoN.S. (1995). BiofertilizersIn Agriculture And forestry. Oxfordand IBH publishing Company Pvt. LTd. New Delhi
- Sueli Rodrigues; Fabiano Andre Narciso Fernandes (2012). Advances in Fruit Processing Technologies. CRC Press
- Zhiqiang A.N. (2004) Handbook of Industrial Mycology. CRC Press Gary Leatham (1993) Frontiers in Industrial Mycology. Springer

## PRACTICAL COURSES

### Objectives

- 1) To study the morphological diversity among Bacteria , Viruses, Algae and Fungi
- 2) To observe vegetative and reproductive parts of various life forms of Bacteria ,Viruses, Algae and Fungi
- 3) To detect chemical contents in various plant products of economic use
- 4) To study botanical source/s, characteristics and utilities of Plants/ plant products
- 5) To know the industrial applications of various plants and plant products
- 6) To visit nearby locality to observe algal and fungal diversity as well as plant diseases occur in nature and make a report of it
- 6) To visit either of the industries and prepare a scientific report

### SEMESTER-I: PRACTICAL COURSE BOT.113

#### (Practicals based on BOT:111 & BOT.112)

#### Practicals based on BOT.111

- Practical 1** Gram staining in Bacteria ( Root nodules, Sugercane juice, curd )
- Practical 2** Study of Bacterial Disease w.r.t. Causal organism, Symptoms and control measures of
- i) Citrus Canker
  - ii) Black arm of Cotton
- Practical 3** Study of viral diseases w.r.t. Causal organism and Symptoms
- i) Yellow vein leaf mosaic disease in Lady's finger
  - ii) Leaf curl of Tomato
- Practical 4** Study of fungal diversity w.r.t Systematic position and morphology of Following i) *Zygnema* ii) *Euglena* iii) Desmids iv) *Vaucheria* v) *Ectocarpus* vi) *Nostoc* vii) *Batrachospermum*
- Practical 5** Study of Life cycle of *Spirogyra*
- i) Thallus Structure
  - ii) Reproduction ( Congugation) ( p.s.)
- Practical 6** Study of Life cycle of *Sargassum*
- i) External & Internal morphology
  - ii) T.S. of Male & Female Conceptacles (p.s )

#### Practicals Based on BOT.112

- Practical 7** Identify, describe botanical source, chemical contents and uses of
- i) Wheat ii) Rice iii) Chickpea iv) Pigeon pea
- Practical 8** Identity, describe botanical source, chemical contents and uses of
- (I)-i) Spinach ii) Brinjal iii) Banana iv) Guava
  - (II) i) Lucerne ii) Berseem

- Practical 9** Identify botanical source, plant part used, active principle and uses of  
i) Capsicum ii) Coriander iii) Cardamom iv) Cinnamon
- Practical 10** (I) Identify botanical source, plant part used, chemical contents and uses of  
i) Ground nut oil ii) Castor oil  
(II) Identify botanical source, plant part used and uses of i) Cotton ii) Coir.
- Practical 11** Identify botanical source, plant part used and uses of  
i) Tea, ii) Coffee, iii) Teak iv) Shisam
- Practical 12** (I) Identify botanical source family, plant Part used active principle and uses of following medicinal plants  
i) Hirda ii) Behada iii) Amla iv) Aloe v) Neem vi) Adulsa  
(II) Identify botanical source, plant part used and uses following Petro-crops  
i) *Jatropha*, ii) Karanj.

## SEMESTER-II: PRACTICAL COURSE BOT.116

(Based on BOT.121 & BOT.122)

### Practicals Based on BOT.121

- Practical 1** Study of fungal diversity w.r.t Systematic position and morphology of following  
i) *Stemonitis* ii) *Achlya* iii) *Morchella* iv) *Puccinia* v) *Alternaria*
- Practical 2** Study of life cycle of *Rhizopus*  
i) Mounting of sporangia  
ii) Zygosporangium (p.s.)
- Practical 3** Study of life cycle of *Agaricus*  
i) External morphology of sporophore / basidiocarp  
ii) Internal morphology of sporophore / basidiocarp (p.s.)
- Practical 4** Study of Lichens  
i) Different types- Crustose, Foliose and Fruticose  
ii) Internal morphology of Lichen thallus and apothecium (p.s.)
- Practical 5** Study of plant diseases w.r.t. causal organisms, symptoms and control measure of  
i) Viral- Leaf curl of Papaya  
ii) Bacterial- Angular leaf spot of cotton  
iii) Mycoplasma- Little leaf of Brinjal  
iv) Nematodal- Root knot of vegetables
- Practical 6** Study of plant diseases w.r.t. causal organisms, symptoms and control measure of :  
i) White rust of crucifers

- i) Powdery mildew of Teak
- iii) Smut of Jowar
- iv) Tikka disease of Groundnut

**Practicals based on BOT.122**

**Practical 7 Demonstration of**

- i) Mass culture of B.G.A. (Venkatraman)
- ii) *Rhizobium* culture.

**Practical 8 Demonstration of presence of Ethenol/Penicillin in fermentation medium**

**Practical 9 Cultivation of *Agaricus/Pleurotus/Volvariella***

**Practical 10 Identify the botanical source, plant part used and uses of rubber**

**Practical 11 Preparation of biopesticide Azadiractin**

**Practical 12 Demonstration of Jam/Jelly/ Squash/ Ketchup**

**Notes:**

- 1) A botanical excursion to study plant diversity and visit to any one industry as per syllabus is compulsory
- 2) Scientific report of the visit/s should be submitted at the time of practical examination.
- 3) Duly certified journal is compulsory at the time of practical examination

**Scope:**

- 1. Entrepreneurships regarding plant based industries
- 2. Job opportunities in following industries like Biofertilizer industry, mushroom industry, biopesticide industry, fermentation industry, food industry, Pharmaceutical industry, unconventional energy industry and Pollution control board etc.

**Equivalent Theory & Practical Courses**

**Class : F.Y.B.Sc.**

**Subject : Botany**

<b>Paper</b>	<b>New Course (To be implemented from June 2015)</b>	<b>Old Courses</b>
<b>I BOT.111</b>	<b>Bacteria, Viruses and Algae</b>	<b>BOT.111 Lower Cruptogams</b>
<b>II BOT.112</b>	<b>Plants for Human Welfare</b>	<b>BOT.112 Higher Cryptogams</b>
<b>I BOT.121</b>	<b>Fungi, Lichens and Plant Pathology</b>	<b>BOT.121 Cell Biology</b>
<b>I BOT.122</b>	<b>Industrial Botany</b>	<b>BOT.122 Economic Botany</b>
<b>Practical-I BOT.113</b>	<b>Based on BOT.111, BOT.112</b>	<b>Practical Based on BOT.111, BOT.112</b>
<b>Practical-II BOT.116</b>	<b>Based on BOT.121, BOT.122</b>	<b>Practical Based on BOT.121, BOT.122</b>