

अंतरी पेटवू ज्ञानज्योत

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON**

SYLLABUS FOR

**F.Y.B.Sc.
BOTANY**

(With effect from June 2009)

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON**

Syllabus to be implemented from academic year 2009-2010

Scheme of Courses

F.Y.B.Sc.

SEMESTER - I

**DIVERSITY OF LOWER CRYPTOGRAMS
AND ECONOMIC BOTANY**

BOT : 111 Diversity of lower cryptogams

BOT : 112 Economic Botany

SEMESTER - II

**DIVERSITY OF HIGHER CRYPTOGRAMS
AND APPLIED BOTANY**

BOT : 121 Diversity of Higher Cryptogams

BOT : 122 Applied Botany

**BOT : 103 PRACTICALS BASED ON
BOT.111, BOT.112,
BOT.121, BOT.122**

NORTH MAHARASHTRA UNIVERSITY, JALGAON
Syllabus for F.Y.B.Sc. Botany

SEMESTER- I
BOTANY : 111 Diversity of Lower Cryptogams

(Total Periods:40)

**AIMS
AND**

Objectives:

- 1) To Know the diversity among the lower cryptogams.*
- 2) To know the life cycle pattern of lower cryptogams.*
- 3) To know the morphology and systematics of lower cryptogamic plants.*
- 4) To introduce the basic knowledge of plant world.*
- 5) To know the useful and harmful activities of lower cryptogams.*

Chapter-1 : Diversity in lower cryptogams: 2

Introduction and Definition

Section I : Algae

Chapter-2 : Algae : 2

2.1 Introduction, Definition, General characters

2.2 Habit and habitat

2.3 Thallus structure

2.4 Reproduction

Chapter-3 : Classification of Algae : 5

3.1 Classification of Algae, according to G.M. Smith upto classes with reasons, selecting at least two examples of each.

Chapter-4 : Study of life history of <i>Ulothrix</i> :	4
4.1 Systematic position	
4.2 Habit and habitat	
4.3 External morphology	
4.4 Reproduction: Vegetative, Asexual and Sexual	
Chapter-5 : Study of life history of <i>Sargassum</i> :	5
5.1 Systematic position	
5.2 Habit and habitat	
5.3 External and internal morphology	
5.4 Reproduction: Vegetative and Sexual (Development of sex organs not expected)	
Chapter-6 : Economic importance of algae :	2
6.1 Application of algae w.r.t. agriculture, industries, food and medicine	
Section II : Fungi	
Chapter-7: Fungi:	2
7.1 Introduction, Definition, General characters	
7.2 Habit and habitat	
7.3 Thallus structure	
7.4 Reproduction	
Chapter-8 : Classification of fungi:	4

8.1 Classification of Fungi, according to G.M. Smith upto classes, with reasons, selecting at least two examples of each.

Chapter-9 : Study of life history of *Albugo* : **6**

9.1 Systematic position

9.2 Habit and habitat

9.3 External morphology

9.4 Reproduction: Asexual and Sexual

Chapter-10 : Study of life history of *Eurotium*: **6**

10.1 Systematic position

10.2 Habit and habitat

10.3 Structure of thallus

10.4 Reproduction: Asexual and Sexual

Chapter-11: Economic importance of fungi: **2**

11.1 Application of fungi w.r.t. agriculture, industries, food and medicine

Reference Books:

- Dube, H.C. (1990). An Introduction to Fungi. Vikas Pub. House Ltd. New Delhi.
- Gangulee, H.C. and Kar, A.K. (2001). College Botany Vol. II. Books and Allied Press Ltd. Kolkata.
- Kumar, H.D. (1988). Introductory Phycology. Affiliated East-West Pres Ltd. New Delhi.
- Kumar, H.D. and Singh, H.N. (1976). A Text Book of Algae. Affiliated East-West Pres Ltd. New Delhi.
- Mehrotra, R.S. and Aneja, C.R. (1990). An Introduction To Mycology, Wiley Eastern Ltd. New Delhi.
- Pandey, B.P. (1994). A Text Book of Botany-Algae. S.Chand and Co. Ltd. New Delhi.
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- Pandey, S.N. and Trivedi, P.S. (1997). A Text Book of Botany Vol. I , Vikas Publishing House (P.) Ltd. New Delhi.
- Pandey, S.N., Trivedi, P.S. and Mishra, S.P. (1995). A Text Book of Algae, Vikas Publishing House (P.) Ltd. New Delhi.
- Sharma, O.P. (1989). A Text Book of Fungi. Tata Mc Graw-hill Publishing Company Limited, New Delhi. 6
- Sharma, O.P. (1990). A Text Book of Algae. Tata Mc Graw-hill Publishing Company Limited, New Delhi.
- Sharma, P.D. (1998). The Fungi. Rastogi Publications, Merrut.
- Smith, G.M. (1995). Cryptogamic Botany. Vol. I (Algae and Fungi). Mc Graw-Hill Book Company, New york and London.
- Vashistha, B.R. (1995). Botany for Degree Students-Algae. S. Chand and company (P.) Ltd. New Delhi.
- Vashistha, B.R. (1995). Botany for Degree Students-Fungi (9th Ed.) S. Chand and company (P.) Ltd. New Delhi. 7

SEMESTER-I
BOTANY : 112 Economic Botany

(Total Periods:40)

AIMS

AND

Objectives:

- 1) To Know, in general, role of plants in economic welfare of mankind.*
- 2) To know origin of cultivated plants of the world.*
- 3) To make aware the students about “Green Revolution In India”.*
- 4) To know plants products and their importance from industrial point of view.*
- 5) To study different industrial processes w.r.t. food, food adjuncts, beverages, fibres, oils, rubber, paper etc.*
- 6) To study chemical contents of economically useful plant parts and their utilities including by-products.*

Chapter-1 : Economic Botany:

4

1.1 Definition and Scope

1.2 Role of plant in human welfare

1.3 Origin of cultivated plants

1.4 Green revolution in India

Chapter-2 : Industrial plant products:

1

A) Industrial revolution brought by crops like-

Rubber, Sugar cane, Cotton

B) Starch :	<ul style="list-style-type: none"> i) Chemistry and characteristic ii) Types of starch grains iii) Manufacture of starch from Maize iv) By products of starch 	5
C) Sugars:	<ul style="list-style-type: none"> i) Chemistry and characteristics ii) Plant sources- Cane sugar iii) Manufacture of Cane sugar iv) Byproducts of sugar industry 	5
D) Oils:	<ul style="list-style-type: none"> i) Definition, chemistry and characteristics ii) Types iii) Fixed oil: Ground nut oil- Sources and process iv) Volatile oil: Rose oil- Sources and process 	5
E) Fibres:	<ul style="list-style-type: none"> i) Occurrence and structure ii) Classification iii) Sources, Characteristics, Harvesting, Extraction and uses of Cotton and Coir 	5
F) Rubber:	<ul style="list-style-type: none"> i) Sources and properties ii) Manufacturer of Para rubber (Hevea) iii) Uses of rubber 	5
G) Paper:	<ul style="list-style-type: none"> i) Sources of raw material ii) Manufacture of wood pulp: Pulping and treatment iii) Kinds of paper, paper products & Uses 	5

Chapter-3 : Sources of food: 5

3.1 Cereals:

- i) Botanical characteristics of the plant
- ii) Importance of cereals
- iii) Structure, chemical contents of grains and uses of Wheat and Rice

3.2 Pulses:

- i) Botanical characteristics of plant
- ii) Importance
- iii) Chemical contents of seed and uses of Pigeon pea and Chick pea

Reference Books:

- 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 (2nd Ed.) Mc Graw Hill Company Pvt. Ltd. New York.
- Kochhar, S.L. (1998). Economic Botany In The Tropics (2nd Ed.). Macmillan India Ltd, Delhi, Mumbai.
- Pandey, S.N. and Archana (1996). Economic Botany. Vikas Publishing House, New Delhi.
- Parthasarathy, S. V. (1972). Sugar Cane In India, K.C. P. Ltd., Madras.
- Pal, B. P. (1996) Wheat Monograph. Council of Agricultural Research, New Delhi.
- 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. 14
- Sharma, B. K. and P. B. Awasthi (1984). Economic Botany , Prakash Book Depot, Bareilly.

SEMESTER- II
BOTANY : 121 Diversity of Higher Cryptogams

(TOTAL PERIODS : 40)

AIMS

AND

Objectives:

- 1) To Know the diversity among the higher cryptogams.*
- 2) To know the life cycle pattern of higher cryptogams.*
- 6) To know the morphology and systematics of higher cryptogamic plants.*
- 7) To introduce the basic knowledge of plant world.*
- 8) To know the useful activities of higher cryptogams.*

Chapter-1 : Diversity in higher cryptogams: 2

Introduction and Definition

Section I : Bryophytes

Chapter-2 : Bryophytes : 1

2.1 General characters of Bryophytes

Chapter-3 : Classification of Bryophytes: 3

3.1 Classification of Bryophytes, according to G.M. Smith upto classes,
with reasons, selecting at least two examples of each.

Chapter-4 : Study of life history of *Riccia*: 6

4.1 Systematic position

4.2 Habit and habitat

- 4.3 External and internal structure of gametophyte
- 4.4 Vegetative reproduction
- 4.5 Sexual reproduction
- 4.6 Structure of mature sporophyte
- 4.7 Alternation of generation (Development of sex organs not expected)

Chapter-5 : Study of life history of *Funaria*: 7

- 5.1 Systematic position
- 5.2 Habit and habitat
- 5.3 External and internal structure of gametophyte
- 5.4 Vegetative reproduction
- 5.5 Sexual reproduction
- 5.6 Structure of mature sporophyte
- 5.7 Alternation of generation
(Development of sex organs not expected)

Section II : Pteridophytes

Chapter-6: Pteridophytes: 2

- 61 General characters of Pteridophytes

Chapter-7: Classification of Pteridophytes: 4

- 71 Classification of Pteridophytes, according to G.M. Smith upto classes,
with reasons, selecting at least two examples of each.

Chapter-8: Study of life history of *Selaginella*:

8

8.1 Systematic position

8.2 Habit and habitat

8.3 External and internal structure of sporophyte

8.4 Asexual reproduction: Position and structure of strobilus,
Megasporangium and Microsporangium

8.5 Germination of spores

8.6 Male gametophyte and female gametophyte

8.7 Position and structure of sex organs

8.8 Fertilization

8.9 Structure of mature embryo

8.10 Alternation of generations

8.11 Heterospory and its significance
(Development of sex organs not expected)

Chapter-9 : Study of life history of *Adiantum*:

7

9.1 Systematic position

9.2 Habit and habitat

9.3 External and internal structure of sporophyte

9.4 Asexual reproduction: Position and structure of sorus

9.5 Structure of sporangium and spores

9.6 Germination of spores

9.7 Structure of mature gametophyte

9.8 Position and structure of sex organs

9.9 Fertilization

9.10 Alternation of generations
(Development of sex organs not expected)

Reference Books:

- Gangulee, H.C. and Kar, A.K. (2001). College Botany Vol. II. Books and Allied Press Ltd. Kolkata.
- Pandey, S.N. and Trivedi, P.S. (1997). A Text Book of Botany Vol. II , Vikas Publishing House (P.) Ltd. New Delhi.
- Parihar, N.S. (1977). Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
- Parihar, N.S.(1984). An Introduction To Embryophyta Vol. I Bryophyta. Central Book Depot, Allahabad. 10
- Rashid, A. (1996). An Introduction To Bryophyta. Vikas Publishing House Ltd. New Delhi.
- Rashid, A. (1996). An Introduction To Pteridophyta. Vikas Publishing House Ltd. New Delhi.
- Saxena, A.K. and Sarbhai, R.M.(1992). A Text Book of Botany Vol.II Embryophyta. Ratan Prakashan Mandir, Agra.
- Smith, G.M. (1995). Cryptogamic Botany. Vol. II (Bryophytes and Pteridophytes). Mc Graw-Hill Book Company, New york and London.
- Sporne, K.R. (1995). The Morphology of Pteridophyta. The Hutchinson University Library, London, U.K.
- Vashistha, B.R. (1997). Botany For Degree Students-Bryophyta. S. Chand and company (P.) Ltd. New Delhi.
- Vashistha, P.C. (1984). Pteridophytes. S. Chand and company (P.) Ltd. New Delhi.

SEMESTER-II
BOTANY : 122 Applied Botany

(Total Periods:40)

AIMS

AND

Objectives :

- 1) To acquire the knowledge, current status and future of applied botany.*
- 2) To know the importance of interdisciplinary approach.*
- 3) To develop the knowledge of industrial applications.*
- 4) To develop the skill among the students for self employment and entrepreneurship.*

Chapter-1 : Applied botany **1**

1.1 Introduction, Scope and importance

Chapter-2 : Organic manures and Biofertilizers: **9**

A) Organic manures:

A-1 Introduction and Importance

A-2 Types: Humus, Compost, Farm yard manure, Green manure

B) Biofertilizers:

B-1 Definition and Importance

B-2 Types

B-3 Methods of cultivation of :

I) B.G.A.:

i) Preparation of culture media- Dey's (modified) medium

ii) Isolation, Innoculation

iii) Mass cultivation of BGA (Venkatraman,1963)

iv) Utilization of BGA in Agriculture

II) Rhizobium culture:

i) Isolation from root nodules of leguminous plant

- ii) Pure culture (YEMA medium)
- iii) Mass production
- iv) Methods of application in Agriculture

Chapter-3 : Fermentation technology: 8

- 3.1 Introduction, Definition and Types: Aerobic and Anaerobic
- 3.2 Microbes involved in fermentation
- 3.3 General process of fermentation
- 3.4 Industrial production of Ethanol w.r.t. :
 - i) Microorganisms involved
 - ii) Substrate
 - iii) Optimum condition (Temp., pH)
 - iv) Fermentation process
 - v) Recovery of product
 - vi) Uses of Ethanol

Chapter-4 : Mushroom cultivation: 6

- 4.1 Introduction
- 4.2 Edible and non-edible mushrooms
- 4.3 Nutritional value of mushroom
- 4.4 Important edible mushroom used for cultivation
- 4.5 Spawn and spawn making

4.6 Methods of cultivation of *Pleurotus* (Dhingri mushroom)

Chapter-5 : Plant tissue culture:

8

5.1 Introduction and Definition

5.2 Concept of Totipotency

5.3 General techniques of plant tissue culture:

i) M.S. medium: composition and preparation

ii) Explant

iii) Surface sterilization

iv) Inoculation

v) Incubation

vi) Callus formation

vii) Subculture

viii) Organogenesis and formation of plantlet,

ix) Hardening

5.4 Application of plant tissue culture in Agriculture, Horticulture and Medicines

Chapter-6 : Herbal cosmetics:

8

6.1 Introduction and Definition

6.2 Types of herbal cosmetics w.r.t.: Botanical source, characteristics, plant part used and uses of following:

A) Skin care: i) Korphad ii) Sandal wood iii) Turmeric iv) Cucumber

B) Hair care: i) Henna ii) Hibiscus iii) Amla iv) Shikakai

C) Dental care : i) Neem ii) Babool iii) Khair iv) Bakul

6.3 Preparation of Aloe vera gel (For skin)

6.4 Preparation of Jaswand gel (For hair)

Reference Books:

- Arora, J.S. (1990). Introductory Ornamental Horticulture. Kalyani Publishers
- Atkin, F.C. (1972). Mushroom Growing Today. Faber and Faber Ltd. London, U.K.
- Butcher, D. N. and Ingram D.S. (1976). Plant Tissue Culture . Edward Arnold Ltd. London , U.K.
- Jacob Thankamma(1975). Foods, Drugs And Cosmetics: A Consumer Guide. The Mac millan Company Of India Ltd. Delhi, Bombay.
- Jain Urjita (1997). Beauty Through Herbs, Institute of Herbal Science A-10 Raj Industrial Complex, Military Road, Marol, Andheri , Mumbai.
- Kofler, L.A. and Hickey, R.J.(1954). Industrial Fermentations, Vol.I. Chemical Publishing Co. Inc. New York.
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- Pathak, Y. G. (1998). Mushroom Production And Processing Technology, Agribios, Jodhapur.
- Somani, L.L., Bhandari S.C. and K. K. Vyas (1990). Biofertilizers, scientific publication , Jodhapur.
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- Thomas, E. and Davay M.R. (1975). From single cell to plants. Wykeham Pulications London Ltd. , London and Winchester.
- White, P.R. (1943). A Handbook of Plant Tissue Culture. Ronald Press New York.

**BOT : 103 Practicals (Based on Theory papers
BOT: 111,BOT:112, BOT:121 ,BOT:122)**

AIMS AND

Objectives:

- 1) *To observe the morphological diversity among lower and higher cryptogams.*
- 2) *To observe the life cycle patterns of lower and higher cryptogams.*
- 3) *To test chemically the various plant products.*
- 4) *To study botanical source/s, characteristics and utilities of plants under study.*
- 5) *To develop the knowledge of industrial application.*
- 6) *To develop skill among the student for self employment and entrepreneurship.*
- 7) *To visit plant-based industries and prepare a scientific report of visit.*

Practical No.1 Study of Algal Biodiversity w.r.t. Systematic position, Morphology:

- 1) *Spirogyra* 2) *Chara* 3) *Voucheria*
- 4) *Sargassum* 5) *Nostoc* 6) *Batrachospermum*

Practical No.2 Study of life cycle of *Ulothrix*

- i) Mounting of thallus (Vegetative)
- ii) Reproduction (P.S.)

Practical No.3 Study of life cycle of *Sargassum*

- i) External morphology
- ii) T.S.of Axis
- iii) V.S.of male conceptacle (P.S)
- iv) V.S.of female conceptacle (P.S.)

Practical No.4 Study of Fungal Biodiversity w.r.t. Systematic position, morphology (Any Six)

- 1) *Stemonitis* 2) *Achlya* 3) *Rhizopus* 4) *Uncinula* 5) *Peziza*
- 6) *Agaricus* 7) *Ustilago* 8) *Cercospora*

Practical No.5 Study of life cycle of *Albugo*

- i) Symptoms
- ii) T.S. of infected plant part
- iii) Sexual reproduction (P.S.)

Practical No. 6 Study of life cycle of *Urotium (Aspergillus)*

- i) Habit- mounting for asexual reproduction
- ii) Ascocarp (Cleistothecium) (P.S.)

Practical No.7 Study of Bryophytes Biodiversity w.r.t. Systematic position, Morphology

- 1) *Marchantia* 2) *Anthoceros* 3) *Sphagnum*

Practical No.8 Study of life cycle of *Riccia*

- i) External morphology
- ii) V.S. of thallus
- iii) V.S. of thallus showing antheridia (P.S.)
- iv) V.S. of thallus showing archegonia (P.S.)
- v) V.S. of thallus showing sporophyte (P.S.)

Practical No.9 Study of life cycle of *Funaria*

- i) External morphology
- ii) T.S. of axis
- iii) V.S. of antheridia (P.S.)
- iv) V.S. of archegonia (P.S.)
- vi) V.S. of capsule (P.S.)

Practical No.10 Study of Pteridophyte Biodiversity w.r.t. Systematic position Morphology

1) *Psilotum* 2) *Lycopodium* 3) *Osmunda*

Practical No. 11 Study of life cycle of *Selaginella*

- i) External morphology
- ii) T.S. of stem
- iii) Mounting of spores
- iv) V.S. of strobilus (P.S.)

Practical No.12 Study of life cycle of *Adiantum*

- i) External morphology
- ii) T.S. of rachis
- iii) Sporangium (P.S.)

Practical No.13 To observe types of starch grains in Maize, Potato, Rice and aleurone layer in Maize kernel

Practical No.14,15 Chemical test of the following

- i) Starch ii) Reducing sugars and non-reducing sugars
- iii) Oil iv) Protein

Practical No.16 To test cellulose from Cotton fibres by using

- i) Sulfuric acid and Iodine
- ii) Chlor-Zinc Iodine reagent

Practical No.17&18 Comment on following w.r.t. botanical name, family, economically useful part/ product and chemical constituent of the following

- a) Maize plant/Kernels
- b) Sugarcane/Sugar
- c) Ground-nut/ pods
- d) Rose plant/Rose flower
- e) Cotton-bolls, seeds, fibres
- f) Coconut fruit/kernels/coir
- g) Rubber
- h) Pigeon pea
- i) Chick pea

Practical No.19 Preparation of *Rhizobium* culture

Practical No.20 Mass culture of B.G.A (Venkatraman method)

Practical No.21 Cultivation of *Pleurotus*

Practical No.22 Study of basic techniques of plant tissue culture

- i) Preparation of explant (nodal sector/ maize seed/ carrot)
- ii) Surface sterilization
- iii) Inoculation

Practical No.23 Preparation of *Aloe vera* gel

Practical No.24 Preparation of Jaswand gel

N.B.

i) P.S. : Permanent slide

ii) To visit industry such as Starch/Sugar/Cotton mill/Dal mill etc is compulsory.

iii) Scientific report of the visit should be submitted at the time of practical examination.

iv) Duly certified journal is compulsory at the time of practical examination