NORTH MAHARASHTRA UNIVERSITY, JALGAON

Faculty of Science & Technology

SYLLABUS FOR CORE SUBJECT (D.S.C.): BOTANY

As Per The U. G. C. Guidelines

Based on
Choice Based Credit System (CBCS)

F. Y. B. Sc. BOTANY SEMESTER-WISE SYLLABUS
(Theory and Practical)

Semester-I:

Bot. 101: Microbial Diversity, Algae & Fungi
Bot. 102: Plant Taxonomy
Bot. 103: Practical Based on Bot. 101 & 102

Semester-II:

Bot. 201: Diversity of Archegoniates
Bot. 202: Plant Ecology
Bot. 203: Practical Based on Bot. 201& 202

W. E. F. June, 2018

Year-I: Core Subject (DSC)
Structure of F. Y. B.Sc. under CBCS
w.e.f. June 2018

Year	Semester	Paper	Code	Title	Marks	Credits
I	I	I	Bot.101	Microbial Diversity, Algae & Fungi	60: 40	2
		II	Bot.102	Plant Taxonomy	60: 40	2
		III	Bot.103	Practical (LAB – I)	60: 40	2
	II	I	Bot.201	Diversity of Archegoniates	60: 40	2
		II	Bot.202	Plant Ecology	60: 40	2
		III	Bot.203	Practical (LAB – II)	60: 40	2

NORTH MAHARASHTRA UNIVERSITY, JALGAON
Syllabus of F.Y.B.Sc. Botany w.e.f. June, 2018
Semester –I
Paper-I
Bot. 101: Microbial Diversity, Algae & Fungi Total: 30 L

Aims and Objectives:

1. To study the diversity among Microbes.
2. To study systematic, morphology and structure of Bacteria, Viruses, Algae and Fungi.
3. To study the life cycle pattern of Bacteria, Viruses, Algae and Fungi.
4. To study the useful and harmful activities of Bacteria, Viruses, Algae and Fungi.

Unit 1: Microbes **2L**

1.1:Introducdtion and main groups of microbes : Prions, Viroids, Viruses, Rickettsias, mycoplasmas , Bacteria,cyanobacteria .

1.2: Classification of microorganisms – R.H.Whittaker's (1969) five kingdom concept.

Unit 2: Viruses **7L**

2.1 Introduction, Discovery and Characteristics of Viruses.

2.2 General morphology of viruses: Helical, Polyhedral, Enveloped and Complex viruses.

2.3 Nature of viruses (living and nonliving)

2.4 Ultra structure of viruses

2.5 DNAVirus (T-Phase)and RNA Virus(TMV)

2.6 Reproduction of Bacteriophase : Lytic and Lysogenic cycle.

2.7 Economic importance

2.8Plant diseases caused by viruses w.r.t. symptoms, causal organism and control measures of

i. Yellow vein mosaic disease of Lady's finger

ii. Leaf curl of Tomato

Unit 3: Bacteria **7L**

3.1 Introduction, discovery and General Characters.

3.2 Classification of Bacteria on the basis of morphology.

3.3Structureof Bacterial Cell

3.4 Gram positive and Gram negative Bacteria

3.5 Reproduction - Asexual and Sexual (Conjugation)

3.6 Economic Importance of Bacteria - useful and harmful activities

3.7Study of Bacterial diseases w.r.t. causal organism, symptoms and control measures of

i) Citrus canker

ii) Black arm of Cotton

Unit 4: Algae **7L**

4.1 Introduction, definition and General Characters of algae
4.2 Habitats of algae: Aquatic, Terrestrial and algae unusual habitats
4.3Thallus structure in algae.
4.4 Reproduction: Vegetative, Asexual and Sexual
4.5Classification of algae according to G. M. Smith (1955) up to classes with reasonsgiving at least two examples from each class.
4.6 Economic importance of algae
i. Agricultureii. Industries iii. Medicineiv. Energy Production
4.7 Study of life cycle w.r.t. Systematic position, thallus structure and Reproductionof ***Nostoc,***and***Spirogyra.***

Unit 5: Fungi **7L**

5.1 Introduction, definitionand General Characters
5.2 Thallus structure and mode of nutrition
5.3Classification of Fungi , according to G.M. Smith upto classes with reasonsselecting at least two example of each class.
5.3 Economic importance of Fungi (Agriculture, Industries, Food & Medicine)
5.4 Study of life cycle w. r. t. Systematic position thallus structurereproduction*of Rhizopus,* and *Agaricus.*
5.5 Lichens: Definition, Characters, Types - Crustose, Foliose,Fruticose and economics importance.
5.6 Definition , General account, significance of Mycorrhiza , Types : Ecto and Endomycorrhiza.

Note: Student activates like seminars, quiz, debate, assignments, field work, study Project & models etc. are part of curriculum for all units in all papers.

Reference Books:

1. Agrwal, S. B. and Srivastav (1985)Modern Text Book of Botany Vol. I Algae, Fungi, Bacteria Viruses and Lichen, Universial Publication, Agra.
2. Biswas, S. B. and AmitaBiswas (1986 Ed.)An Introduction to Viruses, Vikas Publishing House (P) Ltd. New Delhi.
3. Vashita, B.R. (2010) S. A Text Book of Algae Chand and Company (P.)Ltd New Delhi.
4. Vashita ,B.R. (2010) S. A Text Book of Fungi Chand and Company (P.)Ltd New Delhi.
5. Sarabhai, B. P. &Arora C.K. (1995) . A Text Book of Algae Anmol Publication, New Delhi.
6. Salle, A.J. (1974) Fundamental Principles of Bacteriology (TMH Ed.) New Delhi.
7. Gangulee, H.C. and Kar, A.K.(1998) College Botany Vol. II New Central Book Agency, Kolkota.
8. Pandey B. P. (2014) College Botany Volume 1S. Chand publications, New Delhi.
9. Pandey, S. N. and Trivedi (1997) A Text Book of Botany Vol. I Vikas Publishing House, New Delhi.
10. Sharma, P D. (1998) A Text Book of Fungi Rastogi Publication, Meerut.
11.Sharma, P D. (2009) A Text Book of Algae Tata McGraw Hill Publication, New Delhi.

Paper II
Bot. 102: Plant Taxonomy

Total: 30L

Aims and Objectives:

1. To study the diversity of angiosperms.
2. To study the comparative account among the families of angiosperms.
3. To study the economic importance of the angiospermic plants.
4. To study the distinguishing features of angiosperm families.

Unit 1: Introduction (3 L)

1.1 Definition, Scope and Importance

1.2 Functions of Taxonomy

- 1.2.1 Identification
- 1.2.2 Nomenclature
- 1.2.3 Classification

Unit 2: Taxonomic hierarchy (5 L)

2.1 Principles (I to IV) & Rules (ICN)

2.2 Ranks of Classification: Major Categories

2.3 Binomial Nomenclature

2.4 Author Citation & Rejection of names.

Unit 3: Systems of Classification (5 L)

3.1 Types of Classification.

- 3.1.1 Artificial
- 3.1.2 Natural
- 3.1.3 Phylogenetic

3.2 Outline of Bentham & Hooker's system of classification up to series.

3.3 Merits and Demerits

Unit 4: Study of Plant Families w.r.t. systematic position, general characters, distinguishing characters and economic importance. (6 L)

4.1 Malvaceae

4.2 Solanaceae

4.3 Euphorbiaceae

4.4 Cannaceae

Unit 5: Herbarium (3 L)

5.1 Definition, Techniques and Functions.

5.2 Importance of Herbaria.

Unit 6: Botanical Gardens (3 L)

6.1 Definition and Functions.

6.2 Special Features of Following:

- 6.2.1 Indian Botanical Garden, Kolkata.
- 6.2.2 Royal Botanical Garden, Kew, England.

Unit 7: Numerical Taxonomy (2 L)

7.1 Definition & Application

Unit 8: Modern Trends in Taxonomy (3 L)

8.1 Taxonomic evidences from:

8.1.1 Palynology

8.1.2 Cytology

8.1.3 Phytochemistry

Reference Books:

1. Ganguly, H.C. & K. S. Das (1986) College Botany Vol.-.I (6th Edition), New CentralBookAgency, Calcutta, India.
2. Ganguly, H.C., K.S.Das and C.T.Datta (1968) College Botany Vol.I , New Central BookAgency, Calcutta, India.
3. Kumar, N.C.(1992) An Introduction to Taxonomy of Angiosperm. Himalaya PublishingHouse, Bombay, India.
4. Lawrence G.H.M. (1951) Taxonomy of Vascular plants. Macmillan, New York,USA.
5. Naik, V.N. (1984) Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
6. Pandey, B.P.(1997) Taxonomy of Angiosperms. S. Chand & Company Ltd., New Delhi,India.
7. Sharma, O.P. (1997) Plant Taxonomy. Tata McGraw-Hill Publishing Co. Ltd. New Delhi,India.
8. Shivarajan, V.V. (1984) Introduction to Principles of Plant Taxonomy. Oxford &IBHPublishing Co. New Delhi, India.
9. Singh, V. and Jain,D.K. (1992) Taxonomy of Angiosperms.Rastogi Publication, Meerut,India.
10. Subramanyam, N.S. (1997) Modern Plant Taxonomy.Vikas Publishing house, New Delhi,India.
11. MukerjeeSusilkumar(1984) College Botany Vol III Published by J.N. Sen. B.S.I.NewCentral Book Agency Calcutta.
12. Vashistha, P.C. (1992) Taxonomy of Angiosperms. R. Chand & Co. Publishers, New Delhi,India.

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Paper III
Bot. 103: Practical
(Based on Bot.101 and Bot.102)

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1. Study of equipments used in Microbiology: Spirit lamp, Inoculation Loop, Hot air oven, Laminar Air Flow (LAF) and Incubator.
2. A) Study of viruses and Bacteria using Electron Photomicrographs (TMV, Bacteriophage, Cocci, Bacillus, Spirillum Bacteria)
   B) Gram staining technique.

3&4 A) Study of Plant diseases w.r.t.causal organism and symptoms of the Following:

a. Viral
   i. Yellow vein mosaic disease of Lady's finger
   ii. Leaf curl of Papaya

b. Bacteria
   i. Citrus canker
   ii. Black arm of cotton

c. Fungi
   i. Green mould of citrus fruits
   ii. Wheat rust (Specimen / Slide)

B) Study of growth forms of lichens (Crustose, Foliose and Fruticose)

C) Study of Mycorrhiza: (Ectomycorrhiza and Endomycorrhiza) by Photographs.

5, 6:Study of systematic position, vegetative and reproductive structures of the following :

A. *Nostoc*
I)Specimem of *Nostoc* Ball
II) Mounting of thallus: Colony, Trichome& filament
III) Cell structure

B. *Spirogyra*
I) Mounting of thallus (Vegetative)
II) Filament & Cell Structure
III) Congugation (P.S)

C.*Rhizopus*
I)Asexualthallus: Mycelium, Sporangia & Spores
II) Zygospore (P.S)

D.*Agaricus*
I) Specimen of full grown Mushroom
II) V. S. of gill : Mycelium, Basidia&basidiospores

7. How to Describe Angiospermic Plants.
8, 9, 10.Study of Plant families w. r. t. Systematic position, Morphological characters, Floral formula and floral diagram.
i. Malvaceae ii. Solanaceae
iii. Euphorbiaceaeiv. Cannaceae

11. Preparation of artificial key based on vegetative & reproductive characters.
12. Herbarium and its techniques.

Submission: 1. Any five wild plants herbarium/photographs..
2. Any Three Algae & Two Diseased Plant parts
3. Tour report

Note: *Short or long excursion tour and visit to any botanical garden is compulsory.*

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Semester – II
Paper I
Bot. 201: Diversity of Archegoniates

Total: 30 L

Aims and Objectives:

1 To study salient features of Archegoniates.
2 To make students aware of the status of higher cryptogams& gymnosperms as a group in plant kingdom.
3 To study the life cycles of selected genera.
4 To study economic and ecological importance of Archegoniates.

Unit 1: Introduction to Archegoniate (3L)

1.1 Diagnostic features of archegoniate and Transition to land habit
1.2 Alternation of generations.

Unit 2: Bryophytes (10L)

2.1Distinguishing features of the group
2.2 Range of thallus organization.
2.3 Classification of Bryophyta according to G. M. Smith (1955) upto classes with reasons, giving at least two examples from each class.
2.4 Study of life cycle :*Riccia*&*Funaria w.r.t* Morphology, anatomy and reproduction (Development not expected).
2.5 Economic importance of bryophytes and Ecological significance of *Sphagnum*

Unit 3: Pteridophytes (10L)

3.1 Distinguishing features of the group
3.2 Classification of Pteridophytes according to G. M. Smith (1955) upto classes with reasons, giving at least two examples from each class.
3.3 Study of ancient plant *Rhynia* w.r.t. systematic Position and Morphology.
3.4 Study of life cycle: *Selaginella*&*Adiantum*w.r.t.Morphology, anatomy and reproduction(Development not expected).
3.5 Types of Steles.
3.6 Economic importance of Pteridophytes

Unit 4: **Gymnosperms** (7L)

4.1 Introduction and distinguishing features
4.2 Classification of Gymnosperms by K.R.Sporneupto order giving reason with suitable examples.
4.3 Study of life cycle: *Cycas*and *Pinus*. w.r.t.Morphology, anatomy and reproduction (Development not expected).
4.4 Economic importance.

Reference Books:

1. Kumar, H.D. (1999). Introductory Phycology.Affiliated East-West.Press Pvt. Ltd. Delhi.2nd edition.
2. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.

3. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
4. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
5. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot,Allahabad.

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Paper-II
Bot. 202: Plant Ecology

Total: 30 L

Aims and Objectives:

1 To know scope and importance of the discipline.
2 To study plant communities and ecological adaptations in plants.
3 To know about conservation of biodiversity.
4 To study the botanical regions of India and vegetationtypes of Maharashtra.

Unit 1: Introduction (2 L)

1.1 Definition and historical background
1.2 Scope & importance

Unit 2: Ecological factors

2.1. Abiotic factors (Humidity, light & temperature) (8 L)
2.2. Biotic factors (Symbiosis, epiphytes & parasitism)
2.3. Edaphic factors (Soil components, soil formation and soil profile)
2.4 Shelford law of tolerance
2.5 Adaptation of hydrophytes (*Hydrilla*&*Eichhornia*) and Xerophytes (*Nerium*&*Opuntia*)

Unit 3: Plant communities (5 L)

3.1 Characteristics of community
3.2 Species diversity
3.3 Growth form, Structure & dominance.
3.4 Ecological Succession: Hydrosere andXerosere

Unit 4: Ecosystem (10L)

4.1 Introduction & definition
4.2 Components of ecosystem
4.3 Types of ecosystem
a) Pond ecosystem
b) Grassland ecosystem
4.4 Food chain and food webs.
4.4 Ecologicalpyramids production and productivity.
4.5 Biogeochemical cycle: Carbon and Nitrogen

Unit 5: Phytogeography (5 L)

5.1 Basic Principles of Phytogeography
5.2Botanical regions of Inida
5.2 Vegetational types in Maharashtra
5.3Endemism: Causes and Types

Reference Books:

1) Agrawal, K. C. (1996) Environmental Biology, Agro-Botanical Publisher, Bikaner India.
2)Ambasta, R. S. (1990) Environmental and pollution, Student's friends and co.

Varanasi, India
3) Ambasta, R. S. (1988)A Text Book of Plant Ecology, Students Friends and co. Varanasi, India.
4) Dash, M. C. (1993) Fundamentals of Ecology, Tata MaGrow Hill, Publishing co. Ltd., New Delhi, India
5) Kumar, H. D. (1997) General Ecology, Vikas Publising House,(P) Ltd., New Delhi, India
6) Odum, E. P. (1996) Fundamental of Ecology, Natraj Publishers, Dehra-dun, India
7) Sharma, P. D. (2010) Ecology and Enivornment 8th ed. Rastogi Publication, Meerut, India
8) Kapur, P. and Govil, S. R. (2000) Experimental Plant Ecology. S. R. Jainfor, CBS, Publisher and Distributors, New Delhi, India.
9) Kormondy, E. J. (1996) Concepts of Ecology, 4th ed. Prentice Hall, U.S.A.
10) Mishra, R. and G.S. Puri,(2012) Indian Manual of plant Ecology. Scientific Publishers (India)
11) Moore, P. W. and S. B. Chapman (1986) Method in Plant Ecology. Blackwell Scientific Publication.
12) Kochhar, P. L. Plant Ecology, Genetic and Evolution, S. Nagin and Co. Ltd., New Delhi, India.
13) Nath, Ravindra(1992)Modern College Botany, IInd Edition, Kalyani Publisher, New Delhi, India.
14. Patil C.R.,PataskarP.G., Nagraja T.G.&Sathe S. S.(2004) Plant Physiology & Ecology, PhadakePrakashan, Kolhapur.
15. Verma, V. (1988) A Text Book of Plant Ecology, Emkay Publication, Delhi.

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Paper III
Bot. 203: Practical
(Based on Bot.201 and Bot.202)

1. **Study of *Riccia*:**Systematic Position,External &Internal morphology
   a) Mounting of rhizoids & scales
   b) T. S. of Thallus
   c) V. S. ofantheridia [P. S.]
   d) V.S.of archegonia [P.S.]
   e) V.S.of sporophyte [P.S.]
2. **Study of *Funaria*:**Systematic Position,External & Internal morphology
   a) T. S. of axis [P.S.]
   b) V.S. antheridial head [P.S.]
   c) V.S.ofarchegonial head [P.S.]
   d) V.S.of Capsule [P.S.]
3. **Study of *Selaginella*:** Systematic Position,External & Internal morphology
   a) T. S. of Stem
   b) Mounting of sporangia
   c) V. S. of Strobilus [P. S.]
4. **Study of *Adiantum*:** Systematic Position,External & Internal morphology
   a) T. S. of Rachis [P. S.]
   b) T. S. of Sorus [P. S.]
5. **Study of *Cycas*:** Systematic Position,External & Internal morphology
   a) T. S. of Rachis
   b)T. S. of leaflet
   c) Male cone microsporophyll [P. S.] OR Specimen
   d) Female cone megasporophyll [P. S.] OR Specimen
   e) V. S. of Ovule [P. S.]
6. **Study of *Pinus*:**Systematic Position,External & Internal morphology
   a) T. S. of Needle
   b) Mounting of pollen grain
   c) T. S. of Stem [P.S.]
   d) Male cone, microsporophyll [P. S.] OR Specimen
   e) Female cone, megasporophyll [P. S.] OR Specimen
   f) V. S. of Ovule [P. S.]

7.Demonstration, working and uses of the following ecological instruments.

   a) Soil thermometer
   b) Maximum and minimum thermometer
   c) Cup anemometer
   d) Hair hygrometer
   e) Rain Gauge

8. Determination of pH and analysis of two soil samples for carbonates, Nitrates &sulphates.

9. Study of morphological adaptations of hydrophytes and xerophytes (One each).

10. Study of biotic interactions with suitable example: Stem parasite , Root parasite, Epiphytes , Insectivorous plants.

11. Determinethe frequency & density of herbaceous vegetation by listcountquadratemethod.

12. Field visit.

Note*:1. Submission of any five plants from Archegoniates*

2. Tour report.

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