

SYLLABUS
For
B.Sc. [Botany]



Offered by

NEHRU GRAM BHARATI

**(DEEMED TO BE UNIVERSITY),
KOTWA-JAMUNIPUR-DUBAWAL
PRAYAGRAJ-221505
UTTAR PRADESH**

Session 2019–20 & onwards

The syllabus of B. Sc. Botany based on **Semester** pattern comprises of **Six Semesters**. The examination in **1st, 2nd 3rd and 4th semesters** shall consist of 03 core theory papers, each with 02 credits (3x2= 6 credits); one Practical of 03 credits (2x1=2 credits); The **5th and 6th semester** consists of 3 core papers for 03 and 03 credits and one Practical paper with 03 credit (3x4= 12 credits) in each.

Each 03 credit theory paper is equivalent to 75 marks and the laboratory course consists of modules from the three core papers. The Examination in each theory paper and laboratory course shall be of three hours duration.

Following is the tabular summary of the four semesters followed by detailed syllabus of each course:

1st SEMESTER

Paper	Code	Paper Title	Credit	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 101	Mycology & Microbiology	02	36	10	40	50
Paper II	BOB 102	Phycology	02	36	10	40	50
Paper III	BOB 103	Bryology	02	36	10	40	50
Practical	BOB 101,102 and 103	Laboratory	02				50
Total			08				200

2nd SEMESTER

Paper	Code	Paper Title	Credit	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 201	Plant Pathology & Lichen	02	36	10	40	50
Paper II	BOB 202	Pteridology	02	36	10	40	50
Paper III	BOB 203	Gymnospermae and Palaeobotany	02	36	10	40	50
Practical	BOB 201,202 and 203	Laboratory work	02				50
Total			08				200

3rd SEMESTER

Paper	Code	Paper Title	Credit	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 301	Morphology & Embryology of Angiosperms	02	36	10	40	50
Paper II	BOB 302	Taxonomy of Angiosperms	02	36	10	40	50
Paper III	BOB 303	Plant Anatomy	02	36	10	40	50
Practical	BOB 301, 302 and 303	Laboratory	02				50
Total			08				200

4th SEMESTER

Paper	Code	Paper Title	Credit	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 401	Plant Physiology	02	36	10	40	50
Paper II	BOB 402	Genetics & Cell Biology	02	36	10	40	50
Paper III	BOB 403	Economic Botany	02	36	10	40	50
Practical	BOB 401,402 and 403	Laboratory	02				50
Total			08				200

5th SEMESTER

Paper	Code	Paper Title	Credit	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 501	Ecology and Environment	03	54	15	60	75
Paper II	BOB 502	Biochemistry & Plant Tissue Culture	03	54	15	60	75
Paper III	BOB 503	Ethno botany & Plant propagation	03	54	15	60	75
Practical	BOB 501, 502 and 503	Laboratory	03				75
Total			12				300

6th SEMESTER

Paper	Code	Paper Title	Credits	Lectures	Maximum Marks		
					Internal Assessment	End Semester Exam	Total
Paper I	BOB 601	Plant diversity & Forestry	03	54	15	60	75
Paper II	BOB 602	Molecular Biology & Biotechnology	03	54	15	60	75
Paper III	BOB 603	Plant Breeding and Elementary biostatics	03		15	60	75
Practical	BOB 601, 602 and 603	Laboratory	03				75
Total			12				225

B.Sc. Semester I

FIRST PAPER

BOB 101-Mycology & Microbiology

UNIT- I

Fungi -General Character, Classification and economic importance of Fungi

UNIT - II

Important features and life history of Mastigomycotina - *Pythophthora*, *Zygomycotina*- *Mucor*

UNIT - III

Important features and life history of Ascomycotina- *Aspergillus*, *Peziza* **Basidiomycotina** – *Puccinia* **Deuteromycotina** – *Fusarium*

UNIT -IV

Definition, Importance and study of bacteria, Nutrition, structure, reproduction and economic importance of bacteria

UNIT –V

Definition, Importance and study of viruses, Mycoplasma: Character, structure, reproduction and economic importance

Suggested Readings

1. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India
6. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text Book of Microbiology. S Chand and Co, New Delhi.
7. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
8. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky P.V. and Jackson, R.B. (2008). Biology, 8th edition. Pearson Benjamin Cummings, USA..
9. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

SECOND PAPER

BOB 102-Phycology

UNIT-I

Algae-A general character, classification, structure and Economic importance.

UNIT - II

General characters, classification, vegetative structure, reproduction and economic importance of *Nostoc* (Cynophyceae)

UNIT-III

General characters, classification, vegetative structure and life history *Vaucheria* (Xanthophyceae),

UNIT-IV

General characters, classification, vegetative structure and life history *Ectocarpus*, *Sargassum* (Phaeophyceae)

UNIT-V

General characters, classification, vegetative structure and life history *Polysiphonia* (Rhodophyceae)

Suggested Readings

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley, J.M, Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill International.
3. Vashishta B.R., Sinha A.K. and Singh V. P. (2008). Botany for Degree Students. Algae. S Chand and Co, New Delhi.
4. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text Book of Microbiology. S Chand and Co, New Delhi.

5. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
6. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky P.V. and Jackson, R.B. (2008). Biology, 8th edition. Pearson Benjamin Cummings, USA..
7. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

THIRD PAPER

BOB 103-Bryology

UNIT -I

Bryophytes: General character, classification, vegetative structure

UNIT -II

Reproduction and economic importance of Bryophytes

UNIT -III

Life history of *Riccia*, *Marchantia* (Hepaticopsida)

UNIT-IV

Study of Morphology, Anatomy, Reproduction of *Anthoceros* (Anthroceratopsida)

UNIT-V

Study of Morphology, Anatomy, Reproduction of *Polytrichum* (Bryopsida)

Suggested Readings

1. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot, Allahabad.
2. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, New Delhi.
3. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press, Cambridge

PRACTICALS

SCHEME OF EXAMINATIONS (Based on course I, II, III)

B.Sc. Semester II

FIRST PAPER

BOB 201- Plant Pathology & Lichens

UNIT I

Elementary Plant Pathology-Definition, General Symptoms of fungal, viral and bacterial diseases

UNIT II

General control measures of Diseases

UNIT III

A study of following diseases, pathogens, symptoms disease cycles and control- black wart diseases of potato, White rust of crucifiers, Tikka disease of groundnut, Wilt of pigeon pea.

UNIT IV

A study of following diseases, pathogens, symptoms disease cycles and control- Leaf curl and yellow vein disease of angiosperms

UNIT V

Lichens

General structure, classification, reproduction and economic importance

Suggested Readings

1. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
- . Richardson D. H. S,
6. The Biology of Mosses. Janice. M. Glime, 2006
7. Bryophyte Ecology. Goffinet B. & Shaw. A. J. 2008, Bryophyte Biology.

SECOND PAPER BOB 202-Pteridology

UNIT -I

Pteridophyta: Important characters, classification

UNIT-II

Stelar Organisation and Economic Importance.

UNIT-III

Systematic Position, Occurrence, Morphology, anatomy and reproduction of *Rhynia*.

UNIT-IV

Pteridophyta: Structure classification occurrence, anatomy and reproduction in *Lycopodium* and *Selaginella*

UNIT -V

Structure classification occurrence, anatomy and reproduction *Equisetum* and *Marselia*.

Suggested Readings

1. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
2. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot, Allahabad.
3. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, New Delhi.

4. Rashid, A, 2011, An Introduction to Pteridopyta, 2nd edition, (Reprint), Pub. Vikas Publishing House Pvt. Ltd., Noida.
- 5 Gifford, Ernest, M., Foster, Adriance.S., 1989, Morphology and Evolution of vascular plant. W. H. Freeman; Third Edition.
6. Ogura, Yuzuru., 1972, Comparative Anatomy of Vegetative Organs of The Pteridophytes. Gebr.Borntraeger; 2nd edition.
7. Rashid, A.1999, An Introduction to Pteridophta: Diversity,Development,Differentiation. Vikas Publishing House Pvt Ltd.
8. Parihar, Narayan Singh., 1977, The Biology and Morphology of The Pteridophyte. Central Book Depot.
9. Eames, A.J. (1936) Morphology of Vascular plant-lower group. Tata McGraw Hill, New Delhi

THIRD PAPER

BOB 203-Gymnospermae & Palaeobotany

UNIT I

Gymnosperm: General Character, Classification and economic importance

UNIT II

Heterospory and origin of Seed habit Evolution and diversity of Gymnosperm.

UNIT -III

Classification, Morphology, Anatomy, Reproduction and life cycle of *Cycas*

UNIT -IV

Classification, Morphology, Anatomy, Reproduction and life cycle of *Pinus*, Classification, Morphology, Anatomy, Reproduction and life cycle of *Ephedra*

UNIT -V

Paleobotany - General account, Geological time scale, Fossils, Types of Fossils, Fossilization and famous India Paleobotanist with contribution.

Suggested Readings

1. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International Publishers, New Delhi, India.
2. Chamberlain, Charles Joseph, b.(1863), Gymnosperm; Structure and Evolution. Chicago, III., The University of Chicago Press
3. ChhayaBiswas and B.M.Johri. The Gymnosperm. Springer; 1997, edition (16 April 2014)
4. Pant DD. (2002), An Introduction to Gymnosperms, Cycas, and Cycadales, BirbalSahni Institute of Palaeobotany
5. Stewart W.N., Palaeobotany and evolution of plant. Cambridge University Press, New York. 405 p.(1)
6. Stewart, W.N., and G.W. Rothwell. 1993 Palaeobotany and the evolution of plant. 2nd ed. Cambridge University Press, New York. 521 p.(1)

7. Andrews ,H.N.,jr.1974 Palaeobotany 1947-1972 Annals of the Missouri Botanical Garden 61:179-202.(8)

8. Thomas N.Taylor.Edith L. Taylor.MichaelKringsPalaeobotany:The biology and Evolution of Fossil Plants Amsterdam ; Boston, Mass.

PRACTICALS
SCHEME OF EXAMINATIONS (Based on course I, II, III)

B.Sc. Semester III

FIRST PAPER

BOB 301-Morphology & Embryology of Angiosperms

UNIT - I

Morphology

Definition, The basic body of a flowering plant, Morphology of leaf stem, root and flowers

UNIT - II

Inflorescence, Types of inflorescence, Special types of Inflorescence

UNIT - III

Structure of anther, Microsporogenesis, Formation of pollen grains (Male - Gametophyte).

Structure of Pistil, Ovules, Megasporogenesis and development of embryo sac

UNIT - IV

Pollination, Pollen germination and pollen tube growth, Self incapability, Double fertilization

UNIT - V

Development of endosperm and embryo in monocotyledons and dicotyledons, Fruit development and maturation

Suggested Readings

1. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi.

2. Pandey, A.K. (1997). Introduction to Embryology of Angiosperms. CBS Publishers & Distributors, New Delhi.

3. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.

4. Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.

5. Johri, B.M. I (1984). Embryology of Angiosperms, Springer-Verlag, Netherlands.

SECOND PAPER

BOB 302- Taxonomy of Angiosperms

UNIT- I

Plant Identification- Keys and taxonomic literature, Principal and rules of botanical nomenclature

UNIT - II

Taxonomic ranks, type concept, Principle of Priority : Herbarium

UNIT - III

Classification of Angiosperms- Salient features of the system proposed by Bentham & Hooker, Engler & Prantl, Hutchinson

UNIT - IV

Systematic Position, Diagnostic Characters of Families : Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae and Rubiaceae

UNIT- V

Systematic Position, Diagnostic Characters of Families: Asclepiadaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Poaceae

Suggested Readings

1. Singh, (2012). *Plant Systematics: Theory and Practice* Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
2. Jeffrey, C. (1982). *An Introduction to Plant Taxonomy*. Cambridge University Press, Cambridge.
3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). *Plant Systematics-A Phylogenetic Approach*. Sinauer Associates Inc., U.S.A. 2nd edition.
4. Radford, A.E. (1986). *Fundamentals of Plant Systematics*. Harper and Row, New York.
5. Sambamurty A.V.S.S. (2005). *Taxonomy of Angiosperms*. I. K. International Pvt. Ltd., New Delhi. Singh, V., Pande, P. C. & Jain, D. K. (2008). *Taxonomy and Economic Botany*. Rastogi Publications, Meerut.
6. Pandey, B. P. (2009). *A Textbook of Botany Angiosperms*. S. Chand and Company Ltd., New Delhi.
7. Hall, B.G. (2011). *Phylogenetic Trees Made Easy: A How-To Manual*. Sinauer Associates, Inc. USA
8. Any local/state/regional flora published by BSI or any other agency

THIRD PAPER

BOB 303-Plant Anatomy

UNIT -I

Primary structure of stem, root and leaf, secondary structure of stem, root and leaf

UNIT -II

Wood, Sap wood and heart wood

UNIT - III

Abnormal structure and secondary in monocots and dicots

UNIT -IV

Special reference to **Nyctanthes, Boerhaavia, Bouainvillaea, Casuarina and Darcaena anatomy**

UNIT – V

Cork cambium activity and its products

Suggested Readings

1. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
2. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
3. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
4. Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.
5. Any local/state/regional flora published by BSI or any other agency

PRACTICALS
SCHEME OF EXAMINATION
(Based on course I, II and III)

B.Sc. Semester IV

FIRST PAPER

BOB 401-Plant Physiology

UNIT-I

Plant - Water Relations: Types of Water, Importance of water to plant physical properties of water, diffusion, osmosis, absorption, hydroponics.

Mineral Nutrition: Essential elements, micro and macro elements. Effects of essential elements in plants

UNIT-II

Transport of organic substances: Mechanics of phloem transport. Source sink relationship, factors affecting translocation

UNIT -III

Transpiration - Physiology of stomate, factors affecting the stomatal mechanism.

Photosynthesis - Historical aspects, Photosynthetic UNITS, concepts of both photosystem., Z-Scheme, Calvin-cycle, C-4 cycle, CAM Plants. Photorespiration

UNIT -IV

Respiration - Respiratory Quotient, Aerobic and anaerobic respiration, Glycolysis, Krebs' Cycle, ETS, Oxidative Phosphorylation, Pentose- Phosphate Pathway(PPP). **Nitrogen**

Metabolism - Nitrogen fixation(Biological), nitrogen-cycle, Importance of nitrate reductase and its regulation, Ammonium assimilation

UNIT - V

Growth and Development - Definition, Pathway of growth and development, seed dormancy and development, plant movements, photoperiodism, physiology of flowering phytohormones, auxins, gibberellins, cytokins, abscisic acid and ethylenes, History and mechanism of actions. Phytochrome - Physiological role and mechanism of action

Suggested Reading

1. Buchanan, B.B. and Gruissem, W. (2015). *Biochemistry and molecular biology of plants*. Willy Blackwell ASPB USA.
2. Campbell, M.K. and Farrell, S.O. (2007). *Biochemistry*. Thomson Brooks/cole, USA.
3. Dey, P.M. and Harborne, J.B. (2000). *Plant biochemistry*. Academic Press, UK.
4. Goodwin, T.W. and Mercer, E.I. (2003). *Introduction to plant biochemistry*. CBS Publishers & Distributors, New Delhi, India.
5. Ross and Salisbury. (2009). *Plant Physiology*. Cengage Learning (Thompson), New Delhi, India.
6. Segel, I.H. and Segel, E. (1993). *Enzyme kinetics: Behavior and analysis of rapid equilibrium and steady-state enzyme systems*. Wiley-Interscience, USA.
7. Taiz, L., Zeiger, E. Mollar, I. M. and Murphy, A. (2015). *Plant physiology and Development* 6th edition. . Sinauer Associates Inc., USA.

SECOND PAPER

BOB 402-Cell Biology & Genetics

UNIT - I

Cell

Types of cell, structure and functions of different cell organelles, Chloroplast, mitochondria, ribosome, Golgi bodies, endoplasmic reticulum, peroxisomes, microtubules, vacuoles and cell wall.

UNIT - II

The structure and function of nucleus - Ultra-Structure, Nucleolus, nuclear membrane and nucleosomes.

UNIT -III

Chromosome - Morphology, Centromere and telomere, Types of chromosome alteration, deletion. duplications, translocation, inversion and polyploidy, sex chromosomes

UNIT -IV

Cell division - Cell cycle, mitosis, meiosis

UNIT -V

Genetics: Mendelism, Modification of Mendel's Law

Suggested Readings

1. G.M. Cooper. (2015). *The cell: A Molecular Approach*. 7th Edition. Sinauer Associates.
2. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). *Molecular Biology of Cell*. 6th Edition. WW. Norton & Co.
3. Campbell, M.K. (2012) *Biochemistry*, 7th ed., Published by Cengage Learning.
4. Campbell, P.N. and Smith, A.D. (2011). *Biochemistry Illustrated*, 4th ed., Published by Churchill Livingstone
5. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). *Biochemistry: A short course*, 2nd ed., W.H.Freeman.
6. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011) *Biochemistry*, W.H.Freeman and Company
7. Nelson, D.L. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*, 5th

- Edition., W.H. Freeman and Company.
8. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
 9. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell. 8th edition. Pearson Education Inc. U.S.A.
 10. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics. 8th edition. John Wiley & sons, India.
 11. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. 10th edition. W. H. Freeman and Co., U.S.A.
 12. Gupta, P.K. (2018) Genetics. 5th Edition, Rastogi Publications, Meerut.
 13. Hartl, D.L. and Jones, E.W. (1999). Essential Genetics, 2nd Edition, Jones and Barlett Publishers, Boston.
 14. Jain, H.K. (1999). Genetics: Principles, Concepts and Implications. Science Pub Inc.
 15. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. 9th edition. Benjamin Cummings, U.S.A.
 16. Singh, R. J. (2016). Plant Cytogenetics, 3rd Edition. CRC Press, Boca Raton, Florida, USA.
 17. Singh, R.J. (2017). Practical Manual on Plant Cytogenetics. CRC Press, Boca Raton, Florida, USA.
 18. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. 5th edition. John Wiley & Sons Inc., India.
 19. Strickberger, M.W. (1985) Genetics, 3rd Edition. Pearson Printice Hall (printed in India by Anand Sons).

THIRD PAPER

BOB 403- Economic Botany

UNIT - I

Economic Botany- A General account and botany of food plants - Wheat, rice maize Red Gram, Cajanuss

UNIT - II

Oil yielding Plants- Mustard, Ground Nut, Coconut

UNIT - III

Medicinal Plants- Rauwolfia, Poppys, Belladona, Turmeric

UNIT - IV

Beverages and masticatories- Tea, Coffee, Tobacco

UNIT - V

Fibres: Cotton, Jute. **Woody Plants:** Sal, Teak, Shisham

Suggested Readings

1. Chrispeels, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett Publishers.

2. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). Aush Gyanya : Handbook of Medicinal and Aromatic Plant Cultivation.
3. Kochhar, S.L. (2016). Economic Botany: A Comprehensive Study. 5th Edition. Cambridge
4. Samba Murty, AVSS and Subrahmanyam, N.S. (1989). a text book of Economic Botany. Wiley Eastern Ltd., New Delhi
5. Sambamurty, AVSS and Subrahmanyam, N.S. (2008). A Textbook of Modern Economic Botany. 1st Edition, Paperback . CBS Publishers & Distributors Pvt.Ltd.; 1st edition (4 September 2008)
6. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

PRACTICALS
SCHEME OF EXAMINATION
 (Based on course I, II and III)

B.Sc. Semester V

FIRST PAPER

BOB 501-Ecology and Environment

UNIT - I

Ecology, Ecosystem with reference to grassland, forest and Pond

UNIT -II

Energy flow, productivity and ecological pyramids, Ecological Niche and Biological indicators

UNIT - III

Biogeo-chemical cycles - C, N, P and water cycles

UNIT - IV

Ecological Factors: Climate, topographic, biotic and edaphic

UNIT -V

Pollutions - Air, water, noise and soil with control

Suggested Readings

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.

SECOND PAPER

BOB 502-Biochemistry & Plant Tissue Culture

UNIT -I

Enzymes - Nomenclature, characters, nature, mechanism of action and regulation of the enzyme activity.

UNIT -II

Carbohydrates - Classification, Properties and biological role

UNIT -III

Proteins and lipids - Classification, Properties and biological role

UNIT -IV

Chemical composition of nucleic acids .Chlorophyll Nature, Types of chlorophyll, Chemical Composition, Atomic Structure and importance

UNIT - V

Definition, Basic aspects of plant tissue culture, cellular totipotency, Economic importance. Salient achievements in crop

Suggested Readings

1. G.M. Cooper. (2015). The cell: A Molecular Approach. 7th Edition. Sinauer Associates.
2. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). Molecular Biology of Cell. 6th Edition. WW. Norton & Co.
3. Campbell, M.K. (2012) Biochemistry, 7th ed., Published by Cengage Learning.
4. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
5. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
6. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011) Biochemistry, W.H.Freeman and Company
7. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
8. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
9. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell. 8th edition. Pearson Education Inc. U.S.A.
10. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York.
11. H. W. Heldt and B. Piechulla.(2019). Plant Biochemistry. 4th Edition. Paperback. Academic Press.
12. B. Buchanan, W. Gruissem and R. L. Jones (Eds) (2015) Biochemistry and Molecular Biology of Plants. Second Edition. Paper back. Wiley-Blackwell.
12. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.

THIRD PAPER

BOB 503-Ethno botany and Plant propagation

UNIT -I

Definition, history and scope- A general-account of edible, medicinal and narcotic plants and by Indian tribal

UNIT -II

Modern Trends in Taxonomy, Cytology, Phytochemistry, Embryology and taximetrics

UNIT -III

PLANT- PROPAGATION - Preparation of the nursery beds, seed propagation vegetative-propagation

UNIT - IV

Cutting, eye-cutting, bud-culture, Budding and grafting

UNIT - V

Morphogenesis, Embryo-Culture, root and leaf cutting

Suggested Readings

1. Jain, S.K. (1995). Manual of Ethnobotany, Scientific Publishers, Jodhpur.
2. Jain, S.K. (1981). Glimpses of Indian. Ethnobotany, Oxford and I B H, New Delhi.
3. Jain, S.K. (1989). Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
4. Jain, S.K. (1990). Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
5. Colton, C.M. (1997). Ethnobotany – Principles and applications. John Wiley and sons.
6. Rama, R, N and Henry, A.N. (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.
7. Sinha, R. K. (1996). Ethnobotany; The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur.
8. Faulks, P.J. (1958). An introduction to Ethnobotany, Moredale pub. Ltd.
9. Chadha, K.L. (2002). Hand Book of Horticulture. ICAR.
10. Peter, K.V. (2008). (Ed.). Basics of Horticulture . New India Publ. Agency.
11. Hartmann, H.T. and Kester, D.E. (1989). Plant Propagation – Principles and Practices. Prentice Hall of India.

PRACTICALS
SCHEME OF EXAMINATION
(Based on course I, II and III)

B.Sc. Semester VI

FIRST PAPER

BOB 601-Plant diversity & Forestry

UNIT - I

Water conversation, soil erosion and soil conservation

UNIT - II

Plant adaptations - xerophytes, hydrophytes, halophytes and epiphytes

UNIT - III

Plant succession and its types

UNIT - IV

Population ecology - Growth curves, Ecotype, ecads, community ecology - community characteristics, frequency, density, cover, life forms.

UNIT - V

Forestry - Definitions, forest - types in India, Management and economic importance, afforestation, agroforestry and social forestry in India, their scope and uses.

Suggested Readings

1. Simpson, M.G. (2006). *Plant Systematics*. Elsevier Academic Press, San Diego, CA, U.S.A.
2. Singh, G. (2012). *Plant Systematics: Theory and Practice*. 3rd edition. Oxford & IBH Pvt. Ltd., New Delhi.
3. Sambamurthy A.V.S.S. (2005). *Taxonomy of Angiosperms*. I. K. International Pvt. Ltd., New Delhi.
4. Singh M. P. & Abbas S. G. *Essentials of Plant Taxonomy and Ecology*. Daya Publishing House, New Delhi.
5. Belcher, B.M. (1998). A production-to-consumption systems approach: Lessons from the bamboo and rattan sectors in Asia. In: Wollenberg, E and A. Ingles (eds.). *Incomes from the forest: methods for the development and conservation of forest products for local communities*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.
6. Chomitz, K.M., with P. Buys, G. De Luca, T. S. Thomas, and S. Wertz-Kanounnikoff. (2007). Incentives and constraints shape forest outcomes. In: *At loggerheads? Agricultural expansion, poverty reduction and environment in tropical forests*. The World Bank, Washington, DC. Available at: http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2006/10/19/000112742_20061019150049/Rendered/PDF/367890Loggerheads0Report.pdf.
7. FAO (1986). *Guidelines to Practical Project Appraisal*. Natraj Pub.
- Kerr JM, Marothia DK, Singh K, Ramaswamy C and Beritley WR. 1997. *Natural Resource Economics : Theory and Applications in India*. Oxford & IBH.
8. Nautiyal, J.C. (1988). *Forest Economics – Principles and Applications*. Natraj Publications, Dehra Dun.
9. Sagreiya, K.P. (1979). *Forests and Forestry*. National Book Trust, India, New Delhi, P1-307.
10. Sharma, L.C. (1980). *Forest Economics, Planning and Management*. International Book Distributors, Dehra Dun.

SECOND PAPER

BOB 602-Molecular Biology & Biotechnology

UNIT - I

DNA, the genetic material: DNA structure, replication, protein interaction, genetic code, satellite and repetitive DNA, RNAs, Structure and functions

UNIT - II

Gene expression: Structure of gene, transfer of genetic information, transcription, translation, protein synthesis, tRNA, ribosomes, regulation of gene expression in prokaryotes and eukaryotes

UNIT - III

Genetic Variations: Mutations types of mutations. Extranuclear genome - presence and functions

UNIT - IV

Mitochondrial and Plasmid DNA, Cytoplasmic inheritance

UNIT -V

Tools and techniques of recombinant DNA technology, cloning of vectors, genomic and cDNA library, transposable elements

Suggested Readings

1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, 6th edition. Pearson Benjamin Cummings, CSHL Press, New York, U.S.A.
2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, 5th edition. John Wiley and Sons Inc., U.S.A.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics, 9th edition. Benjamin Cummings. U.S.A.
4. Russell, P. J. (2010). i-Genetics- A Molecular Approach, 3rd edition. Benjamin Cummings, U.S.A.
5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis, 10th edition. W. H. Freeman and Co., U.S.A.
6. J. E. Krebs, E.S. Goldstein and S.T. Kilpatrick. (2017). Lewin's Genes XII. 12th Edition: Jones and Bartlett.

THIRD PAPER

BOB 603-Plant Breeding and Elementary biostatistics

UNIT -I

Plant-Breeding- Concept, Methods and objectives of somatic hybridization and hybrid vigour

UNIT - II

Elementary Biostatistics - Classification of data, Mean, Median and mode

UNIT - III

Standard deviation and Standard error

UNIT - IV

Variance and co-relation

UNIT - V

χ^2 test and Experimental designs

Suggested Readings

1. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.
2. Das, L.D. Vijendra (2006) Plant Breeding. New Age International Publishers, New Delhi.
3. Sharma, J.R.(1994) : Principles and practices of Plant Breeding. Tata McGraw-Hill Publishing Company Ltd. , New Delhi
4. Singh, B.D. (2012). Plant Breeding: Principles and Methods. Kalyani Publishers. 9th edition.
5. Singh, Phundan (1996): Essentials of Plant Breeding. Kalyani Publishers, New Delhi
6. Dannel, W.W.(1987). Biostatistics, New York, John Wiley Sons.

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