

DEPARTMENT OF BOTANY

NEHRU GRAM BHARTI (Deemed to be University)

B.Sc. Syllabus (Choice Based Credit System)

(To be implemented from the Academic Year 2021-22)

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

5Paper	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 based on 101,102 and 103	BOB 104	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 based on 201,202 and 203	BOB 204	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 based on 301, 302 and 303	BOB 304	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 based on 401,402 and 403	BOB 404	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	BOBE1 503	Ethno botany & Plant propagation	03	54	15	60	75
Paper III	BOB 503E2-	Nursery, Gardening and Floriculture	03	54	15	60	75
Practical based on 501, 502 and 503	BOB 504	Laboratory	03				75
Total			12				300

6th SEMESTER

Paper	Code	Paper Title	Credit	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	BOBE1 603	Plant Breeding and Elementary biostatics	03		15	60	75
Paper III	BOBE2 603	FOOD PROCESSING AND PRESERVATION	03		15	60	75
Practical based on 601, 602 and 603	BOB 604	Laboratory	03				75
Total			12				225

B.Sc. Semester I
FIRST PAPER
BOB 101-Mycology & Microbiology

UNIT -I

FUNGI: A general introduction to fungi including structure, reproduction Importance and classification.

UNIT -II

The life histories of following genera: Lower Fungi: Albugo, Phytophthora, Mucor

UNIT -III

Higher Fungi: Ascomycetes: Saccharomyces, Sphaerotheca, Peziza

Basidiomycetes: Ustiago, Puccinia, Agaricus

Fungi Imperfecti: Cercospora, Aspergillus

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 by F.E Fritsch and G.M Smith

UNIT - II General characters, classification, vegetative structure, reproduction in Chlamydomonas, Oedogonium.

General characters, classification, vegetative structure, reproduction in *Nostoc* (Cynophyceae), oscillatoria.

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 *Batrachospermum* (Rhodophyceae), Economic importance of Algae.

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

Bryophyta: A general account and life cycle of Bryophytes;

UNIT –II

Hepaticopsida: Life history of genera; *Riccia, Marchantia, Peltia, Porella*

UNIT – III

Anthocerotopsida: Life history of genus; *Anthoceros*

UNIT –IV

Bryopsida: Life history of genera; *Sphagnum, Funaria*

Unit-V: Economic importance of Bryophytes

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

BOB 104-PRACTICALS

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

- 1.. Study and identification of any one microbiological material 5
3. Study and identification of any one algal/fungal material. 5
4. Mounting of scales/rhizoids/spores/section cutting of bryophytes material. 5
5. Spots - (1 to 6) Slides, figures and specimens. 12
6. Viva - voce. 5
7. Records 5
8. Compulsory Test. 5

References:

1. A Text Book of Botany Algae, Fungi, Bacteria, Mycoplasma, Viruses, Lichens and elementary Plant Pathology - Volume I , S.N. Pandey, P.S. Trivedi. 2. A textbook of Botany (Bryophyta, Pteridophyta, Gymnosperms and Paleobotany) - Volume II, S.N. Pandey, S.P Mishra, P.S Trivedi.
3. A textbook of microbiology - R.C Dubey. 4. The Fungi - Alexopolus and mims. 5. Bryophyta - N.S. Parihar 6. Gymnosperms - Vasistha 7. Gymnosperms - Chamberlin 8. Vistas in Plant Pathology and Mycology. - L.V. Gangawne, Veena Ganju 9. Practical Botany - Volume -I, H.N. Srivastava 10. Microbiology - C.B. Parwar. 11. Phycology - J.S Smith 12. The Structure and reproduction of algae. - Fritsch.

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 crucifers, 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

A general account of the pteridophytes with special reference to life histories of the following genera:

UNIT-II

Psilophyta: *Rhynia*

UNIT-III

Lycophyta: *Lycopodium, Selaginella*

UNIT-IV

Arthropphyta: *Eqisetum*

UNIT -V

Filicophyta: *Marsilea, Pteridium*

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. Steward 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.

BOB 204-PRACTICALS

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

1. Section cutting, staining, mounting and identification of any gymnosperms/ Pteridophyte material. 8
2. Study and identification of any Plant pathological material
3. Spots - (1 to 6) Slides, figures and specimens. 12
4. Viva - voce. 5
5. Records 5
6. Compulsory Test. 5

References:

1. A Text Book of Botany Algae, Fungi, Bacteria, Mycoplasma, Viruses, Lichens and elementary Plant Pathology - Volume I , S.N. Pandey, P.S. Trivedi. 2. A textbook of Botany (Bryophyta, Pteridophyta, Gymnosperms and Paleobotany) - Volume II, S.N. Pandey, S.P. Mishra, P.S. Trivedi.
3. A textbook of microbiology - R.C. Dubey. 4. The Fungi - Alexopolus and mims. 5. Bryophyta - N.S. Parihar 6. Gymnosperms - Vasistha 7. Gymnosperms - Chamberlin 8. Vistas in Plant Pathology and Mycology. - L.V. Gangawne, Veena Ganju 9. Practical Botany - Volume -I, H.N. Srivastava.

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 and its modifications

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 incompatibility, 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 :Ranunculacea, 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, Bignonia, 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. Pergamon 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

BOB 304-SCHEME OF EXAMINATION

(Based on course I, II and III)

1. Identification of the family along with floral diagram and floral formula. **6**
2. Anatomy of Dicot and monocot embryo. **5**
3. Temporary mounts of double stained sections of an anatomical material. Identification with suitable comments and sketches. **6**
4. Identification and comments upon spots 1-8, 3-3 from I and II 2 from the 3rd Paper. **8**
7. Practical record **5**
8. Field Study/Collection/models/Charts. **5**
9. **Viva-voce 6**

Reference:

1. A Text book of Botany Angiosperms - B.P Pandey
2. Objective Botany - Dr. A.B. Sinha and Dr. B.C Srivastava
3. Plant Physiology - Salusbury & Ross.
4. Plant Physiology and Biochemistry - Dr. R.N. Singh
5. Plant anatomy - B.P. Pandey
6. Plant Physiology and Biochemistry - S.P. Verma
7. Plant Anatomy - Cutler
8. Economic Botany - S.K. Singh, S. Srivastava.
9. Text Book of Biochemistry - G.S Sandhu
10. Practical Botany. - Volume - 2 H.N. Srivastava

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, water absorption, ascent of sap and translocation. Mineral Nutrition: Essential elements, micro and macro elements. Effects of essential elements in plants

UNIT-II

Transport of organic substances: Mechanics of phloem transport, sources-sink relationship, factors affecting translocation of solutes.

UNIT -III

Transpiration – types of transpiration, Physiology of stomata, factors affecting the stomatal mechanism and transpiration. Photosynthesis - Historical aspects, photosynthetic apparatus, concepts of both photosystem, Z-Scheme, Calvin-cycle, C-4 cycle, CAM and photorespiration in plants.

UNIT -IV

Respiration - Respiratory Quotient, Aerobic and anaerobic respiration, Glycolysis, Krebs's Cycle, ETS, Oxidative phosphorylation. Nitrogen Metabolism: Biological nitrogen fixation, nitrogen-cycle, nitrate and ammonium uptake and assimilation.

UNIT - V

Growth and Development - Definition, Pathway of growth and development, seed dormancy and development, plant movements, photoperiodism, physiology of flowering; phytohormones: , History and mechanism of actions of auxin, gibberellin, cytokinin, abscisic acid and ethylene. Photomorphogenesis: 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. Goodwin, T.W. and Mercer, E.I. (2003). Introduction to plant biochemistry. CBS Publishers & Distributors, New Delhi, India.
3. Ross and Salisbury. (2009). Plant Physiology. Cengage Learning (Thompson), New Delhi, India.
4. Jain, V.K. Fundamentals of plant Physiology (19th edition). S.Chand Publication, India.
5. 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

Cell division - Cell cycle, mitosis, meiosis

UNIT -IV

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

UNIT -V

Genetics: Mendelism, Modification of Mendel's Law. Gene interaction, Pleiotropy, Lethal gene, Linkage, Sex linkage, Sex determination

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, Belladonna, 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.

BOB 404-PRACTICALS SCHEME OF EXAMINATION (Based on course I, II and III)

1. Identification of the family along with economic value . 6
2. Genetical frequency analysis. 5
3. Microscopic examination cell and its organelle Identification with suitable comments and sketches. 6
4. One physiological experiment to be sent up and described by student. 5
5. Comments upon a pre-arranged physiological experiment/ Instrument/Appartues. 5
6. Identification and comments upon spots 1-8, 3-3 from I and II 2 from the 3rd Paper. 8
7. Practical record 5
8. Field Study/Collection/models/Charts. 5
9. **Viva-voce 6**

Reference:

1. Plant Physiology - Salusbury & Ross. 2. Plant Physiology and Biochemisty - Dr. R.N. Singh 3. Plant
9. Text Book of Biochemistry - G.S Sandhu 10. Practical Botany. - Volume - 2 H.N. Srivastava

B.Sc. Semester V FIRST PAPER

BOB 501-Ecology and Environment

UNIT - I

Introduction to Ecology, Ecosystem Ecology : Ecosystems with reference to grassland, forest and Pond.

UNIT –II

Biological interactions, Habitat and ecological Niche, Biological indicators, Plant and animal adaptations to different environmental conditions.

UNIT - III

Concepts of energy flow, productivity, ecological pyramids, food chain and food web Biogeochemical cycles - C, N, P and water cycles

UNIT - IV

Ecological Factors: Climate, topographic, biotic and edaphic, Ecological succession: concept, types, mechanism and models

UNIT -V

Environmental ecology, Pollutions – cause and control of air, water, noise and soil pollution, Biodiversity conservation

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. Singh, A. (2022). Concepts of Ecology and Environment. Pragati Publication.

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. W.W. 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 503E1-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.

BOB 503E2- Nursery, Gardening and Floriculture

Unit I:

1. Definition, objectives, scope and building up of infrastructure for nursery.
2. Planning and seasonal activities - Planting - direct seeding and transplants.
3. Nursery Management and Routine Garden Operations.

Unit II:

1. Definition, objectives and scope - different types of gardening.
2. Landscape and home gardening - parks and its components, plant materials and design .
3. Computer applications in landscaping.
4. Gardening operations: soil laying, manuring, watering.
5. Landscaping Places of Public Importance: Landscaping highways and Educational Institutions)
6. Some Famous gardens of India.

Unit III:

- 1 Sowing/raising of seeds and seedlings, transplanting of seedlings. 2. Air-layering, cutting, selection of cutting ,propagule collecting season, treatment of cutting rooting medium and planting of cuttings - Hardening of plants.
3. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils
4. .Green house - mist chamber, shed root, shade house and glass house for propagation.

Unit IV:

1. Ornamental Plants: Flowering annuals; herbaceous, perennials; Divine vines; Shade and ornamental trees.
2. Ornamental bulbous and foliage plants; Cacti and succulents.
3. Ornamentals-palms.
4. Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit V:

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers
2. Cultivation of Important cut flowers (Carnation, Aster, Dahlia, Gerbera, Anthuriums, Gladiolous, Marigold, Rose, Lilium)
3. Management of pests, diseases and harvesting.
4. Methods of harvesting.

BOB 504-PRACTICALS

SCHEME OF EXAMINATION

(Based on course I, II and III)

- Q-1. Study of ecological characters of one material with the help of suitable diagramme or one experiment of Ecology.
- Q-2. Chemical examination of sample polluted water to determine hydrogen ion concentration, alkalinity/acidity.
- Q.3 Microscopic examination of a sample of polluted water to comment upon the plankton diversity with sketches and identification (as far as possible) of the dominant forms.
- Q.4 Identification and comments upon the spots (1-8).

Q. 7- Viva-Voce

Q.8- Records

Q-9 Field study/Models/Charts etc.

References :

1. Plant Ecology, Soil Science, Cytogenetics, evolution and plant breeding - S.k Verma 2. Plant Ecology - Ambust 3. Cell Biology - C.B. Powar 4. A textbook of biotechnology - R.C. Dubey 5. Tools & Techniques of biotechnology - M.Sharma, N. Tripathi 6. A text book of botany - S.K. Singh, Seema srivastava 7. Genetic - C.B. Powar 8. Encyclopedia of Biotechnology(Set of 1 Volumes) - Varuna Mehta 9. Environmental Biology - S.N. Prasad. 10. Advanced Biotechnology - Sharma and Tripathi

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. Sambamurty 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/WDS/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 603E1-Plant Breeding and Elementary biostatics

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

X² 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. Daniel, W.W.(1987). Biostatistics, New York, John Wiley Sons.

603E2-FOOD PROCESSING AND PRESERVATION

UNIT I

Principles of food processing and preservation- Preservation by Low and high temperatures, Canning, osmotic pressure, dehydration & drying, Irradiation. & use of Preservatives, Food additives, Definition, types, importance and industrial uses of Food additives.

UNIT II

Methods of Plant food processing- different methods of processing of cereals, legumes, nuts and oilseeds.

UNIT III

Methods of Processing of milk & milk products-

UNIT IV

Methods of Fruits and Vegetables processing.

UNIT V

Methods of Processing of Animal Foods. Food fortification and enrichment -current trends & applications. fermented food products.

BOB 604-PRACTICALS
SCHEME OF EXAMINATION
(Based on course I, II and III)

Q-1. Emasculation of given material with description of the method adopted.

or

An exercise monohybrid, dihybrid crosses or working out the mode of inheritance of linked genes from test cross and/or F₂ data.

Q-2. Demonstration of one stage of mitosis or meiosis using appropriate plant material by acetocarmine smear method.

Q-3. Numerical Problem based on Elementary Biostatistics.

Q-4. Microscopic examination of a sample of polluted water to comment upon the plankton diversity with sketches and identification (as far as possible) of the dominant forms.

Q-5. Identification and comments upon the spots (1-8).

Q. 6- Viva-Voce

Q.7- Records

Q-8- Field study/Models/Charts etc.

References :

1. Plant Ecology, Soil Science, Cytogenetics, evolution and plant breeding - S.k Verma 2. Plant Ecology - Ambust 3. Cell Biology - C.B. Powar 4. A textbook of biotechnology - R.C. Dubey 5. Tools & Techniques of biotechnology - M.Sharma, N. Tripathi 6. A text book of botany - S.K. Singh, Seema srivastava 7. Genetic - C.B. Powar 8. Encyclopedia of Biotechnology(Set of 1 Volumes) - Varuna Mehta 9. Environmental Biology - S.N. Prasad. 10. Advanced Biotechnology - Sharma and Tripathi
