KOLHAN UNIVERSITY, CHAIBASA
JHARKHAND - INDIA

Revised Curriculum and Credit Frame Work

As per FYUGP, NEP-2020
(U.G. Botany Session- 2025-2026)

UNIVERSITY DEPARTMENT OF BOTANY
KOLHAN UNIVERSITY, CHAIBASA
WEST SINGHBHUM, JHARKHAND – 833202

UNIVERSITY DEPARTMENT OF BOTANY

Kolhan University, Chaibasa

Four-Year Under Graduate Programme (FYUGP)

As per Provisions of NEP-2020 to be implemented from Academic Year 2022-23

COMPOSITIONS OF BOARD OF STUDIES

1. **Dr. Vishnu Shankar Sinha**
   I/c Head, University Deptt. of Botany
   Kolhan University, Chaibasa

2. **Dr. Dr. Krishna Pyare, Associate Professor**
   Head, Department of Botany
   K. S. College, Seraikella

3. **Dr. Salomy Kujur, Assistant Professor**
   University Deptt. of Botany
   Jamshedpur Women's University, JSR.

4. **Dr. Rupali Patra, Assistant Professor**
   Department of Botany, J.W.U, Jamshedpur.

5. **Mrs. Pushpa Salo Linda, Assistant Professor**
   Department of Botany
   Jamshedpur Worker's College, JSR

6. **Dr. Dara Singh Gupta, Assistant Professor**
   University Deptt. Of Botany
   Kolhan University, Chaibasa

7. **Dr. Shalini Sharma, Assistant Professor**
   Department of Botany , Jsr. Co-operative college , Jamshedpur.

8. **Dr. Jaya Kachchhap, Assistant Professor**
   Department of Botany, L.B.S.M., College, Jamshedpur

(Dr. Vishnu Shankar Sinha)
I/C Head,
University Deptt. of Botany
Kolhan University, Chaibasa

UNIVERSITY DEPARTMENT OF BOTANY,
Kolhan University, Chaibasa
FYUGP 2023

INDEX

Sem	Code	Title of the Paper	Credits (Theory + practical)
I	MJ-1	Major Paper-1 (Phycology & Microbiology)	3 + 1
	AC-1	(Plant ecology & taxonomy)	3 + 1
	MDC -1	Multi-Disciplinary/Introductory Regular Course (Botany)	3 + 0
II	MJ 2	Major Paper -2 (Mycology & Phytopathology)	3 + 1
	AC- 2	Ethnobotany	3 + 1
	MDC -2	Multi-Disciplinary/Introductory Regular Course (Botany)	3 + 0

SEMESTER –I

INDEX

Sem	Code	Title of the Paper	Credits (Th+P)
I	MJ-1	Major Paper-1 (Phycology & Microbiology)	3 + 1
	AC-1	(Plant ecology & taxonomy)	3 + 1
	MDC -1	Multi-Disciplinary/Introductory Regular Course (Botany)	3 + 0

- **For End Semester Examination (ESE 60 Marks , 3 Hrs Exam) :**

  There will be **two** group of question. **Group A is compulsory** which will **contain** three questions. **Question No. 1 will be very short answer types** consisting of five questions of 1 mark each. **Question No. 2 & 3 will be short answer type** of 5 marks each. **Group B will contain descriptive type** five questions of fifteen marks (15) each, out of which any three are to answer.

- **For End Semester Examination (ESE 75 Marks , 3 Hrs Exam) :**

  There will be **two** group of question. **Group A is compulsory** which will contain three questions. **Question No. 1 will be very short answer type** consisting of five questions of 1 mark each. **Question No. 2 & 3 will be short answer type** of 5 marks each. **Group B will contain descriptive type** six questions of fifteen marks (15) each, out of which any four are to answer

SEMESTER - I

Paper Title – Major Paper 1 (MJ-1)

CREDIT-03 +1 [THEORY- 03]

Microbiology and Phycology

Course Outcomes: ---

On completion of this course, the students will be able to:

1. General characteristics features, structure and replication of Viruses.
2. Examine the general characteristics features of bacteria and their cell reproduction / Recombination.
3. To understand detail information of different classes of Algae like Cyanophyta, Chlorophyta, Xanthophyta, Phaeophyta and Rhodophyta.
4. Commercial cultivation and their economic importance of algae.

Full Mark - 75 **Time: - 3 Hrs**

Unit I: Viruses and Bacteria 20 Hrs

General characteristics; classification (Baltimore), structure and replication of DNA virus (T4 phage), lytic and lysogenic cycle of viruses ; RNA virus (TMV), General characteristic features of bacteria and their Cell structure; Reproduction and genetic recombination (conjugation, transformation and transduction).

Unit II: Algae, Cyanophyta and Xanthophyta 20 Hrs

Characteristic features of Algae & its Classification (by Fritsch), Ranges of thallus organization in Cyanophyta and Xanthophyta. Cell structure and Reproduction of *Spirulina*, *Nostoc* & *Vaucheria* .

Unit III: Chlorophyta and Phaeophyta and Rhodophyta 20 Hrs

General characteristics features of Chlorophyta, Phaeophyta and Rhodophyta; Occurrence & Range of thallus organization of Chlorophyta, Pheaophyta and Rhodophyta. Structure and Reproduction in *Volvox, Oedogonium, Chara, Ectocarpus* and *Polysiphonia.* Commercial cultivation and economic importance of green algae, red algae and brown algae.

Sessional Internal Assessment (SIA) Full Marks -15 Marks
A – Internal Written Examination – 10 Marks (1 Hrs)
B- Overall performance including regularity – 05Marks

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.

Paper Title – Botany Practical – MJ-I Lab

Credits – 01

Full Marks – 25 **Pass Marks - 10**

Microbiology

1. Electron micrographs / Models of viruses – T4 and TMV, Line drawings / Photographs of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary / permanent slides/photographs. Water bloom. Electron Micrographs or charts of ultrastructure of bacteria, binary fission, endospore, conjugation and economic importance.
3. Gram-staining of root nodule and curd.

Phycology

1. Microscopic observation of vegetative and reproductive structures of Nostoc*, Volvox, Oedogonium, Chara, Vaucheria,* E*ctocarpus*, and *Polysiphonia.*

SEMESTER – I

Paper Title — 1 (AC-1)
CREDIT-04 [THEORY- 03]
PLANT ECOLOGY AND TAXONOMY

Course Outcomes: ---

At the end of the course the students will be able to;

1. Comprehend the basic concepts of plant ecology, taxonomy and botanical
2. Nomenclature
3. Analyze the characteristics of different plant communities.
4. Examine the structure and functions of eco-system.
5. Evaluate the significance of herbarium
6. Analyze the implications of biometrics, numerical taxonomy and cladistics.

Full Mark - 75 **Time: - 3 Hrs**

Unit I: --- Introduction, Factors, Communities and Ecosystem 15 Hrs

Soil: Origin, formation, composition, soil profile. Water:--States of water in the environment Adaptation of hydrophytes and xerophytes. Succession: processes and types. Structure, trophic organization; energy flow; food chains and food web. Ecological pyramids. Gross and net productivity. Biogeochemical cycles of carbon and nitrogen.

Unit II: --- Phytogeography, Introduction to Plant Taxonomy 30 Hrs

Biogeographical zones and Endemism. Plant Taxonomy: -- Description, Identification, Nomenclature and Classification. Importance of Herbarium, important herbaria and botanical gardens of the world and India. Ranks, categories and taxonomic groups, Principles and rules of International Code of Nomenclature (ICN), binominal system, Typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Unit III: --- Classification, Biometrics, Numerical Taxonomy and Cladistics

15Hrs

Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (up to series), Takhtajan (up to superorder). Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms.

Sessional Internal Assessment (SIA) Full Marks -15 Marks

A –Internal Written Examination – 10 Marks (1 Hrs.)

B - Overall performance including regularity – 05 Marks

Suggested Readings:-

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4 edition. Hall, U.S.A.
2. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India.
3. Singh, J.S., Singh, S.P. and Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
4. Ambasht R. S. and Ambasht P. K. (1999) Environment and Pollution. C. B. S. Publishers & Distributers, New Delhi.
5. Dash, M. C. (2007). Fundamentals of Ecology. Tata Mc Graw Hill Publishing Company Limited.
6. Verma, P.S. and Agrawal, V. K. (2010). Environmental Biology. S. Chand and Company Ltd., New Delhi.
7. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
8. Singh, G. (2012). Plant Systematics: Theory and Practice. 3rd edition. Oxford & IBH Pvt. Ltd., NewDelhi.
9. Sambamurty A.V.S.S. (2005). Taxonomy of Angiosperms. I. K. International Pvt. Ltd., New Delhi.
10. Singh M. P. & Abbas S. G. Essentials of Plant Taxonomy and Ecology. Daya Publishing House, New Delhi.
11. Singh, V., Pande, P. C. & Jain, D. K. (2008). Taxonomy and Economic Botany. Rastogi Publications, Meerut.
12. Pandey, B. P. (2009). A Textbook of Botany Angiosperms. . S. Chand and Company Ltd., New Delhi.

Paper Title – Botany Practical –AC-1Lab

Credits – 01

Full Marks – 25 Pass Marks - 10

1. Determination of pH and analysis of two soil samples for carbonates chlorides, nitrates, Sulphates, organic matter and base deficiency by rapid field test.
2. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
3. Study of morphological adaptations of hydrophytes and xerophytes (four each).
4. Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (Orobanche), Epiphytes.
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method (species to be listed)
6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): -Brassicaceae – *Brassica*; Asteraceae – *Ageratum, Eclipta* and *Tridax*; Solanaceae -*Solanum nigrum*, ; Lamiaceae - *Ocimum;* Liliaceae - *Lilium* and *Allium.*
8. Mounting of a properly dried and pressed specimen of any wild plants with herbarium label

SEMESTER – I

Multi - Disciplinary / Introductory regular courses – 1

[MDC/IRC –I]

[Credit--03] Subject – Botany

Full Mark - 75 Time: - 3 Hrs

Course Outcomes:-

- **The Student completing this course is able to: –**

1. To develop a conceptual understanding of principle and importance of Botany. They will be able to demonstrate knowledge of selected topics of Microbiology, Cytology and Genetics, Plant physiology etc.
2. To understand the nature and basic concept of lower and higher groups of plants .
3. To develop understanding of impact of botany and science on society and develop respect for conservation of environment.
4. To understand the vegetative and reproductive Morphology, Anatomy of root, stem and leaves of angiospermic plant.

- **Unit-1**:- Salient features and classification of Microbes **7 Hrs**
  Salient features and classification of plants into major groups –
  Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms
- **Unit-2**:- Morphology of Flowering Plants, root, stem, leaves, fruits, seeds, inflorescence and flowers. Description of some families: - Malvaceae, Solanaceae and Poaceae. **6 Hrs**
- **Unit-3**:- Plant Anatomy---Meristematic tissues & Permanent tissues (Internal structure of dicotyledonous and monocotyledonous root and stem), Internal structure of dorsiventral and isobilateral leaves. Secondary growth in dicot stem. **7 Hrs**
- **Unit-4**:- Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids & nucleus (ultrastructure and function) . **9 Hrs**
- **Unit-5**:- Cell Division and Genetics: - Cell Cycle and Cell Division: Mitosis and Meiosis and their significance. Mendelism--Monohybrid and Dihybrid cross, Test cross & Back cross). **7 Hrs**
- **Unit-6**:- Plant Physiology:-Photosynthesis: Importance of Photosynthesis. Photosynthetic Apparatus Dark Reaction & Light Reaction. Respiration: Aerobic,
- **Chapter-7:-** Environmental Issues **-** Pollution (Air, Water, Soil, Sound, Thermal & Nuclear Pollution), Climate Change, Green House Effect, Global Warming, Acid Rain, Ozone Layer Depletion, Environmental Protection Acts & Forest Conservation Acts. **9 Hrs**

Remarks: - No Internal Exam.

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. College Botany---Vol-I, II and III---Ganguly, Kar & Santra—New Central Book Agency(P)Ltd.
8. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
9. STUDIES IN BOTANY—Vol-I & II—J. N. Mitra, D. Mitra & S. K. Choudhary---Moulik Library Kolkata
10. Botany for Degree Students—Algae----B.R.Vashishta, Dr. A.K. Sinha & Dr. V.P. Singh---S. Chand Publication, Ram Nagar-New Delhi
11. Ecology and Environment---P. D. Sharma—Rastogi Publication-Meerut
12. College Botany-Vol-I, II and III----Mukerjee—New Central Book Agency (P) Ltd.

SEMESTER- II
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Sem	Code	Title of the Paper	Credits (Th+P)
II	MJ 2	Major Paper -2 (Mycology & Phytopathology)	3 + 1
	AC- 2	Ethnobotany	3 + 1
	MDC -2	Multi-Disciplinary/Introductory Regular Course (Botany)	3 + 0

- **For End Semester Examination (ESE 60 Marks , 3 Hrs Exam) :**

  There will be **two** group of question. **Group A is compulsory** which will **contain** three questions. **Question No. 1 will be very short answer types** consisting of five questions of 1 mark each. **Question No. 2 & 3 will be short answer type** of 5 marks each. **Group B will contain descriptive type** five questions of fifteen marks (15) each, out of which any three are to answer.

- **For End Semester Examination (ESE 75 Marks , 3 Hrs Exam) :**

  There will be **two** group of question. **Group A is compulsory** which will contain three questions. **Question No. 1 will be very short answer type** consisting of five questions of 1 mark each. **Question No. 2 & 3 will be short answer type** of 5 marks each. **Group B will contain descriptive type** six questions of fifteen marks (15) each, out of which any four are to answer.

SEMESTER –II

Paper Title – Major Paper 2 (MJ-2)
CREDIT-04 [THEORY- 03 + PRACTICAL- 01]

Mycology & Phytopathology **Full Marks – 75**

Pass Marks - 30

Course Outcomes: ---

On completion of this course, the students will be able to;

1. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
2. Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.
3. Identify the common plant diseases according to geographical locations and device control measures .
4. Understand the economic and pathological importance of fungi, bacteria , and viruses .

Full Mark - 75 **Time: - 3 Hrs**
Pass marks: -25

Unit I: Introduction to fungi and classification 15 lectures

Introduction – General characters, ecology and significance ,range of thallus organization ,nutrition ,reproduction and classification (Alexopolus). Economic Importance of fungi.

Unit II: True Fungi 15 lectures

General characteristics; ecology significance and Life cycle of *Rhizopus , peziza , puccinia, & Cercospora.*

Unit III: Symbiotic associations 15 lectures

Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Economic importance of Lichen; Mycorrhiza- Ectomycorrhiza, Endomycorrhiza and their significance.

Unit IV: Phytopathology **15 lectures**

Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine. Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.

Sessional Internal Assessment (SIA) Full Marks -15 Marks
A –Internal Written Examination – 10 Marks (1 Hrs.)
B - Overall performance including regularity – 05 Marks

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

Botany Practical Based on – MJ-2

Credits – 01

Time- 3 Hrs **Full Marks – 25**

Pass Marks - 10

Group- "A" Based on MJ-2

Introduction to the world of fungi (Unicellular, coenocytic / septate mycelium, ascocarps & basidiocarps).

1. *Rhizopus:* study of asexual stage from temporary mounts and sexual structures through permanent slides.
2. *Aspergillus* and *Penicillium*: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
3. *Peziza*: sectioning through ascocarp.
4. *Alternaria*: Specimens/photographs and temporary mounts.
5. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.

6. *Agaricus*: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.
7. *Albugo*: Study of symptoms of plants infected with Albugo; asexual phase study through section/temporary mounts and sexual structures through permanent slides.
8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs).
9. Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.

SEMESTER -II

Paper Title – – 2 (AC-2)
CREDIT-04 [THEORY- 03 + PRACTICAL- 01]
Ethnobotany

Course outcomes: -

On completion of this course, the students will be able to:

1. Conceptualize Ethnobotany as an interdisciplinary science
2. Restate the established methodology of Ethnobotanical studies
3. Categories various indigenous ethnic groups and their environmental practices.
4. Understand the legalities associated with Ethnobotany.

Full Mark - 75 **Time: - 3 Hrs**
Pass marks: -30

Unit I: Ethnobotany 15 lectures

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.

Unit II: Methodology of Ethnobotanical Studies 12lectures

a) Field work
b) Herbarium
c) Ancient Literature
d) Archaeological findings
e) temples and sacred places.

Unit III: Role of Ethnobotany in Modern Medicine 20 lectures

Medico-ethnobotanical sources in India; Significance of the following plants in ethno botanical practices (along with their habitat and morphology) .

a) *Azadiractha indica*

b) *Ocimum sanctum*

c) *Vitex negundo.*

d) *Gloriosa superba*

e) *Pongamia pinnata*

f) *Cassia auriculata*

g) *Adhatoda vasica*

Unit IV: Ethnobotany and Legal Aspects 13 lectures

Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Bio-piracy, Intellectual Property Rights and Traditional Knowledge.

Sessional Internal Assessment (SIA) Full Marks -15 Marks
A –Internal Written Examination – 10 Marks (1 Hrs.)
B - Overall performance including regularity – 05 Marks

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 ethno botanists, Lucknow, India.
4. Jain, S.K. (1990). Contributions of Indian Ethnobotany. 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

Paper Title – Botany Practical – AC-2 Lab

Credits – 01

Full Marks – 25 **Pass Marks - 10**

Time-6 hours

Practical

1. Visit to the field and botanical garden in the nearby area and attempt to identify the plants
2. Attempt be made to grow the ethnobotanical plants
3. Visit the villages and rural areas to consult some senior people to discuss the traditional medicines being used since ages.
4. Prepare a list of plants that provide parts for traditional uses and construct a chart or check-list in terms of botanical significance, chemical constituent, medicinal use, and major industries available in India and the world; Economical-value strength.

SEMESTER – II

Multi - Disciplinary / Introductory regular courses – 1

[MDC/IRC –II]

[Credit--03] Subject – Botany

Full Mark - 75 **Time: - 3 Hrs**

Pass Marks: - 30

Course Outcomes:-

- **The Student completing this course is able to: –**

5. To develop a conceptual understanding of principle and importance of Botany. They will be able to demonstrate knowledge of selected topics of Microbiology, Cytology and Genetics, Plant physiology etc.
6. To understand the nature and basic concept of lower and higher groups of plants .
7. To develop understanding of impact of botany and science on society and develop respect for conservation of environment.
8. To understand the vegetative and reproductive Morphology, Anatomy of root, stem and leaves of angiospermic plant.

- **Unit-1**:- Salient features and classification of Microbes **7 Hrs**
  Salient features and classification of plants into major groups –
  Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms
- **Unit-2**:- Morphology of Flowering Plants, root, stem, leaves, fruits, seeds, inflorescence and flowers. Description of some families: - Malvaceae, Solanaceae and Poaceae. **6 Hrs**

- **Unit-3**:- Plant Anatomy---Meristematic tissues & Permanent tissues (Internal structure of dicotyledonous and monocotyledonous root and stem), Internal structure of dorsiventral and isobilateral leaves. Secondary growth in dicot stem. **7 Hrs**
- **Unit-4**:- Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids & nucleus (ultrastructure and function) . **9 Hrs**
- **Unit-5**:- Cell Division and Genetics: - Cell Cycle and Cell Division: Mitosis and Meiosis and their significance. Mendelism--Monohybrid and Dihybrid cross, Test cross & Back cross). **7 Hrs**
- **Unit-6**:- Plant Physiology:-Photosynthesis: Importance of Photosynthesis. Photosynthetic Apparatus Dark Reaction & Light Reaction. Respiration: Aerobic,
- **Chapter-7:-** Environmental Issues **-** Pollution (Air, Water, Soil, Sound, Thermal & Nuclear Pollution), Climate Change, Green House Effect, Global Warming, Acid Rain, Ozone Layer Depletion, Environmental Protection Acts & Forest Conservation Acts. **9 Hrs**

Remarks: - No Internal Exam.

Suggested Readings:-

13. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
14. Wiley, J.M, Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill International.
15. Vashishta B.R., Sinha A.K. and Singh V. P. (2008). Botany for Degree Students. Algae. S Chand and Co, New Delhi.
16. Sharma T.A., Dubey, R.C. and Maheshwari, D.K. (1999). A Text Book of Microbiology. S Chand and Co, New Delhi.
17. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
18. 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..
19. College Botany---Vol-I, II and III---Ganguly, Kar & Santra—New Central Book Agency(P)Ltd.
20. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
21. STUDIES IN BOTANY—Vol-I & II—J. N. Mitra, D. Mitra & S. K. Choudhary---Moulik Library Kolkata
22. Botany for Degree Students—Algae----B.R.Vashishta, Dr. A.K. Sinha & Dr. V.P. Singh---S. Chand Publication, Ram Nagar-New Delhi
23. Ecology and Environment---P. D. Sharma—Rastogi Publication-Meerut
24. College Botany-Vol-I, II and III----Mukerjee—New Central Book Agency (P) Ltd