**POST GRADUATE PROGRAMME**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**(With effecting from 2020……….)**

**SYLLABUS**

**M. Sc. BOTANY**

**KOLHAN UNIVERSITY – CHAIBASA**

**JHARKHAND**

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**Kolhan University, Chaibasa**

**M. Sc. Botany (Semester Wise Distribution of Courses)**

**Part – I**

**Semester – I**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Name Of Paper** | **Credit** | **Hrs./ Week** | **Full Marks** | **ESUE\*** | **SIA \*(For Theory) /Viva - Voce (For Practical)** |
| CCBOT101 | **MICROBIOLOGY, PHYCOLOGY & MYCOLOGY** | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CCBOT102 | **BRYOPHYTES & PTERIDOPHYTES** | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CCBOT103 | **GYMNOSPERM & PALEOBOTANY** | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| CCBOT104 | **TAXONOMY & ECONOMIC BOTANY** | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| CC(P)-5  [CC(P)-105] | **Practical Based on CCBOT101,102,103 & CCBOT104** | 6 | 12 | 100 | 80 | 20 |

**Semester – II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Name Of Paper** | **Credit** | **Hrs./ Week** | **Full Marks** | **ESUE\*** | **SIA \*(For Theory) /Viva - Voce (For Practical)** |
| CCBOT201 | **DEVELOPMENTAL BIOLOGY(EMBRYOLOGY)** | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CCBOT202 | ANATOMY | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CCBOT203 | PLANT PHYSIOLOGY | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| CCBOT204 | BIOCHEMISTRY | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| CC(P)-10  [CC(P)-205] | Practical based on CCBOT206,207,208 &CCBOT209 | 6 | 12 | 100 | 80 | 20 |

**\*ESUE -** End Semester University Examination **Group A** Cytogenetics & Molecular Genetics

**\*SIA** - Sessional Internal Assessment **Group B** Microbiology & Plant Pathology

**Kolhan University, Chaibasa**

**M. Sc. Botany (Semester Wise Distribution of Courses) Part – II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Name Of Paper** | **Credit** | **Hrs./ Week** | **Full Marks** | **ESUE\*** | **SIA \*(For Theory) /Viva - Voce (For Practical)** |
| CCBOT301 | Cytology & Molecular Biology | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CCBOT302 | Genetic Engineering & Biotechnology | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-1**  **(DSE-301)-“A”** | **Group A** Cytogenetics & Molecular Genetics | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-2**  **(DSE(P)-302)-“A”** | **Group A** Cytogenetics & Molecular Genetics | 6 | 12 | 100 | 80 | 20 |
| **Discipline Specific Elective-1**  **(DSE-301)-“B”** | **Group B** Microbiology | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-2**  **(DSE(P)-302)-“B”** | **Group B Practical based on** Microbiology | 6 | 12 | 100 | 80 | 20 |
| **PROJECT(PR)-1**  **[PR-301]** |  | 6 | 12 | 100 | 80 | 20 |

**Semester – III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Name Of Paper** | **Credit** | **Hrs./ Week** | **Full Marks** | **ESUE\*** | **SIA \*(For Theory) /Viva - Voce (For Practical)** |
| CC13(CC-401) | Environmental Biology | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| CC14(CC-402) | Evolution & biodiversity conservation | 4 | 5(L)+1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-3**  **(DSE-401)-“A”** | **Group A** Plant Genetics Resources & Crop improvement | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-4**  **(DSE(P)-402)-“A”** | **Group A** Plant Genetics Resources & Crop improvement | 6 | 12 | 100 | 80 | 20 |
| **Discipline Specific Elective-3**  **(DSE-301)-“B”** | **Group B** Plant pathology | 4 | 5(L) +1(T) | 100 | 70 | 30 |
| **Discipline Specific Elective-4**  **(DSE(P)-402)-“B”** | **Group B** **Practical based on** Plant pathology | 6 | 12 | 100 | 80 | 20 |
| **PROJECT(PR)-2**  **[PR-401]** | **Based on Elective Group** | 6 | 12 | 100 | 80 | 20 |

**Semester – IV**

**\*ESUE -** End Semester University Examination **Group A** Cytogenetics & Molecular Genetics

**\*SIA** - Sessional Internal Assessment **Group B** Microbiology & Plant Pathology

Part I

**SEMESTER I**

**CCBOT101**

**MICROBIOLOGY,PHYCOLOGY & MYCOLOGY**

**Full Marks: 70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one mark each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**MICROBIOLOGY**

1. Cell **S**tructure and Reproduction in Bacteria.
2. TMV & Bacteriophage – Structure and is multiplication.
3. Methods of transmission of plant viruses.
4. General account of Mycoplasma and its role in causing plant disease

**PHYCOLOGY**

1. Silent feature of classification of Algae (Fritsch, 1935)
2. Range of thallus structure, Reproduction and economic Importance of Algae in **Cyanophyta & Chlorophyta.**
3. General Concept of life cycles pattern in Algae.

**MYCOLOGY**

1. Silent feature and classification of fungi(Alexopolus)
2. Origin, Evolution and Reproduction of Fungi.
3. Heterothallism and parasexuality.
4. Micorrhiza & their significance
5. Economic importance of Fungi.

6. Symptoms, etiology and disease management of following diseases:

(a). Late blight of potato

(b). Black rust of wheat

(c). Early blight of Potato

(d). Citrus canker

(e). Leaf curl of Papaya

**CCBOT102**

**Full Marks: 70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one mark each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**BRYOPHYTES**

1. General feature, origin and classification of Bryophytes (smith,1955 parihar,1965.)
2. Range of thallus structure in Bryophytes.
3. Distribution of photosynthetic tissues in Bryophytes.
4. Evolutionary trend of progressive sterilization of sporogenous tissues
5. Ecology and economic importance of Bryophytes with special mention of *Sphagnum*

**PTERIDOPHYTES**

1. Classification of Pteridophytes (Smith, 1955, Sporne 1975)
2. Heterospory and seed habit.
3. Stellar organization and Evolution of Stele in Pteridophytes.
4. Telome theory: its merits and demerits.

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**SEMESTER - I**

**CCBOT103**

**GYMNOSPERMS & PALEOBOTANY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all eight question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**GYMNOSPERM**

1. Outline Classification of Gymnosperm and their distribution in India
2. Fossil Gymnosperms – ***Lyginopteris, Glossopteris, Williamsonia, Pentoxylon***
3. General account of Ginkgoales.
4. Economic importance and evolutionary trends of Gymnosperm.

**PALEOBOTANY**

1. **Basic principles of Paleobotany-conditions of fossilization, different types of**

**sedimentary rocks bearing fossils. (Osmania University)**

2. Modes of fossilization-kinds of Fossils-Techniques involve din the study of plant

Fossils, Paleobotanical nomenclature.

3. Principles of sratigraphy- Lithosratigraphy and chronosratigraphy

**SEMESTER - I**

**CCBOT104**

**TAXONOMY & ECONOMIC BOTANY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all eight question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **The Species Concept**

Taxonomic hierarchy, Concept of Species, Genus and Family and other categories, Principals used in assessing relationship. Delimitation of Taxa and attribution of Rank, International Code of Botanical Nomenclature (ICBN).

**2. Recent trends in Taxonomy** with special reference to Numerical taxonomy, Palyno-

taxonomy, Chemotaxonomy, Cyto-taxonomy & molecular taxonomy

**3. Phytogeography**: Principal bio-geographical zones, Endemism

**4. Distinctive Taxonomic features and economic importance of following families:**

Magnoliaceae, Apocynaceae, Asclepiadaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Dipterocarpaceae, Lamiaceae, Euphorbiaceae, Rubiaceae, Orchedaceae, Cyperaceae & Poaceae.

**ECONOMIC BOTANY**

1. **Role of plants in relation to human welfare.**
2. **Importance of forestry, their utilization and commercial aspects.**
3. **Uses of timber and petro plants.**
4. **Avenue tree**
5. **Ornamental plant of India**
6. **Alcoholic beverage through ages.**
7. **Tannins, resins, fruit & nuts yielding plants.**
8. **Medicinal plants and aromatic plants.**

**2. IUCN (international union for conservation of nature & natural resources.)**

**3. Ethnobotany in plant conservation.**

**Practical based on CCBOT101, CCBOT102, CCBOT103 & CCBOT104**

**CCBOT(P)105**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

1. Staining of gram positive/gram negative bacteria 10

OR

Identification viral/bacterial / fungi disease.

1. Study of algal materials from the algal mixture (A) identification of at least one genera giving diagnostic features. 10
2. Identify the provided Bryophyte (B) to you after thorough investigation made through temporary mounts. 10
3. Write a monograph on provided Pteridophyte material (C) to you after thorough investigation made through temporary mounts 20

OR

Identify the Gymnosperm material (D) provided to you after thorough investigation made through temporary mounts.

1. Study and identification of two genera of fungi. 10
2. Sports 1 – 5 10
3. Viva–voce. 10
4. Practical records, herbarium, field report, charts etc. 20

**SEMESTER II**

**CCBOT201**

**DEVELOPMENTAL BIOLOGY (EMBRYOLOGY)**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Micro-sporogenesis and Micro-gametogenesis, Mega-sporogenesis and Mega- gametogenesis.**
2. **Palynology: Pollen morphology and texture of pollen wall, Germination of pollen grain and double fertilization.**
3. **Endosperm: types, Cytology and morphogenetic nature.**
4. **Apomixis: Definition, causes, experimental induction and practical value of Poly-embryony.**

**CCBOT202**

**ANATOMY & BIOSTATISTICS**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Organization of shoot apical meristem (SAM) and root apical meristem(RAM)**
2. **Leaf development and phyllotaxy**
3. **Mechanical tissue and their distribution, cambium and their role in growth**
4. **Anomalous secondary growth with reference Dracaena stem, Tinospora root & Bignonia**
5. **Leaf and wood anatomy.**
6. **Periderm: Formation, function and healing of wounds.**

**BIOSTATISTICS**

* 1. **Biostatistics and its role in Biology**
  2. **Measures of central tendency and dispersal, mean, median and mode**
  3. **Probability distributions & Sampling distributions**
  4. **Chi square test, contingency table & analysis of variance**
  5. **Correlation and Regression: Calculation of coefficient, correlation and linear regression**

**SEMESTER II**

**CCBOT203**

**PLANT PHYSIOLOGY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Absorption of water, Ascent of sap, Transpiration: types, mechanism of transpiration, factors affecting transpiration, guttation.**
2. **Mineral nutrition of plants: deficiency symptoms and diseases. Micro and Macro-elements.**
3. **Photosynthesis: photophosphorylation, C3, C4, and CAM path way, photorespiration.**
4. **Respiration; glycolysis, fermentation, Krebs cycle**
5. **Nitrogen metabolism: amino acid metabolism,**
6. **Protein synthesis in prokaryotes & eukaryotes.**
7. **Biological nitrogen fixation.**
8. **Stomatal movement and biological clocks**

**CCBOT204**

**BIOCHEMISTRY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Phytohormones: Role of Auxin, Gibberellins, Cytokinins, ABA, Ethylene.**

**2. Enzymes: nature, properties, classification, mode and mechanism of**

**action.**

**3. Germination, Seed dormancy, Photoperiodism, Vernalisation, senescence**

**4. Lipid metabolism: biosynthesis of fatty acids, oxidation of fats, triglycerides, glyoxylate cycle,**

**α and β -oxidation of lipids.**

**5.Vitamins and Coenzymes: structure, occurrence of all water soluble and fat soluble vitamins and**

**coenzymes activity.**

SEMESTER II

CC (P) BOT205 [CC(P)-205]

**Practical based on CCBOT201, CCBOT202, CCBOT203 & CCBOT204**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

1. Prepare temporary slides of the given material ecological anatomy. 10
2. Leaf of *Casuarina*
3. Stem of *Hydrilla*
4. Stem *of Calotropis*
5. Leaf *of Nerium.*
6. Anomalous secondary growth 10
7. *Boerhaavia*
8. *Achyranthus*
9. *Amaranthus*
10. *Dracaena*
11. Economic importance of given materials (Any two) 10
12. Embryo dissection 10
13. Physiological Experiment 20

* To compare the rate of imbibition of starchy and oily seeds. (Gram seeds, Mustard seed, wheat, ground nuts.)
* To compare the rate of cuticular and non-cuticular transpiration. (*Opuntia* stem).
* To study the phenomenon of plasmolysis. (*Tradescantia* or *Rhoeo discolour* peel*)*

1. Test for glucose or reducing sugar, Starch & Protein 10
2. Viva–voce. 10
3. Practical records, herbarium, field report, charts etc. 20

Part II

SEMESTER III

**CCBOT301**

**CYTOLOGY & MOLECULAR BIOLOGY**

**Full Marks: 70 Credits: 4 Time: 03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**CYTOLOGY**

1. **Organization of Plant Cell, Including Structure and Functions of Cell Organelles.**
2. **Cell Wall: Structure and Function**
3. **Plasma Membrane: Structure, Models and Functions: Sites of ATPase, Ion Carriers; Channels and Pumps; Receptors.**
4. **Ribosome: Site of protein synthesis, initiation, elongation, termination.**
5. **Chromatin organization, packaging of DNA, Histones, Euchromatin, Heterochromatin.**
6. **Cell Division and Cell Cycle: -Mitosis, Meiosis, Cell Cycle Regulation, Role of Cyclin and Cdk.**
7. **Structure and Function of Cell Organelles: Mitochondria, Chloroplast, Lysosome, ER.**

molecular biology

1. **RNA - types, structure and function.**
2. **Protein sorting, targeting of protein organelles.**
3. **Karyotype analysis, chromosomal aberration: structural and numerical.**
4. **Robertsonian translocation, RNA splicing, site specific recombination.**
5. **C value paradox, proto-oncogenes, oncogenes, Tumour suppressor genes, Cancer.**
6. **DNA replication and repair mechanism.**

SEMESTER III

**CCBOT302**

**GENETIC ENGINEERING & BIOTECHNOLOGY**

**Full Marks: 70 Credits: 4 Time:03 Hour**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**GENETIC ENGINEERING**

1. **Tools of Genetic Engineering: Restriction endonuclease, Gel electrophoresis, ligases, probes, cloning vectors: plasmids, cosmids, phage vectors, BAC, YAC vectors.**
2. **Nucleic Acid Hybridization: Northern, Southern, and Western blotting techniques.**
3. **Gene transformation in Plants: Vector mediated gene transformation, Agrobacterium the natural genetic engineer, methods of direct gene transfer in plants, Transgenic plants, T DNA, Z DNA**

BIOTECHNOLOGY

1. **Biotechnology: Basic concepts, principles and scopes.**
2. **Plant cell and tissue culture: totipotency, somatic embryogenesis, artificial seeds and their advantages and limitations.**
3. **Anther and pollen culture: introduction, protocol for anther and pollen culture, significance, use of haploids in crop improvements**
4. **Protoplast culture: introduction, isolation and culture of protoplasts, somatic hybridization, cybrid techniques, advantages and uses.**
5. **Somaclonal variations: introduction, causes, method of selection and uses of somaclonal variation.**
6. **Intellectual property rights (IPR), possible ecological risks and ethical concerns.**

SEMESTER III

**DSE-1[DSE-301-“A’]**

**GROUP A - SPECIAL PAPER (THEORY)**

**CYTOGENETICS & MOLECULAR GENETICS**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Genetic fine structure: Cistron, Recon & Muton); transposons, plasmids, episomes, mitochondrial and chloroplast DNA.**
2. **DNA damage and repair: thymine dimer ,6-4 photoproducts, photo reactivation, excision repair**
3. **Concept about molecular mutation: physical mutagens: ionizing and non-ionizing radiations, radioactive and biological half-life. Effect of various kinds of radiations on plants, chromosomes and DNA, ld50. Chemical and environmental mutagenesis, site directed mutagenesis.**
4. **Mendelian principle: Dominance, Segregation, Independent assortment, gene, allele, multiple allele, pseudo-alleles, co-dominance, incomplete dominance, Gene interaction, pleiotropy, phenocopy, linkage and crossing over.**
5. **Gene mapping**
6. **Human genetics: pedigree analysis, karyotypes, genetic disorders, quantitative genetics, heritability and its measurements.**

SEMESTER III

DSE(2) PRACTICAL

DSE(P)-302[‘A’]

**GROUP A (SPECIAL PAPER) - PRACTICAL**

**PRACTICAL BASED ON CYTOGENETICS & MOLECULAR BIOLOGY**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

1. Onion root tip squashing + Me
2. Mitosis & Meosis (Onion root tip, Lentil root tip, *Vicia faba* )
3. Chi square test, work up to standard error (height, no of leaves, branches).
4. Permanent slides of mitosis, and meiosis.
5. Interaction of genes incomplete dominance or duplicate factors or complementary factors.
6. Karyotype analysis.
7. Prepare a temporary slide from a given material(A) and draw any two stages of the cell division.
8. Prepare a temporary slides of a given material (B) and study the two stages of cell division.
9. Perform the chi square test for the given material (C1 & C2)
10. Perform the hybridization technique of the given material(D)
11. Viva –voce
12. Class record

SEMESTER III

PROJECT

**GROUP A (SPECIAL PAPER) - PRACTICAL**

**PRACTICAL BASED ON CYTOGENETICS & MOLECULAR BIOLOGY**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

SEMESTER III

**DSE-1(DSE-301)-“B”**

**MICROBIOLOGY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. **Role of microbes in agriculture, industry and medicines.**
2. **Mycorrhiza: a general account and its role.**
3. **Microbes pathogenic to human beings with special reference to HIV & AIDS.**
4. **Symptoms caused by: -**
5. **Plant pathogenic bacteria**
6. **Plant virus**
7. **Mycoplasma**
8. **General account of infection and immunology, antigen–antibody reaction, serology**
9. **Transmission of plant viruses.**
10. **Important plant diseases caused by plant pathogenic bacteria: -**
11. **Bacterial blight of Potato**
12. **Tundu diseases of Paddy**
13. **Citrus canker**
14. **Leaf spot of Tomato**
15. **Important plant diseases caused by plant viruses and mycoplasma**
16. **Leaf curl of Tomato**
17. **Leaf curl of Papaya**
18. **Yellow vein mosaic of Bhindi**
19. **Grassy shoot of Sugarcane**

SEMESTER III

**DSE(P)-302-[“B”]**

**GROUP B - SPECIAL PAPER (PRACTICAL)**

**MICROBIOLOGY**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

1. To stain & study bacteria. (curd).
2. Microscopic examination of curd. material-milk.
3. Identify the host plant pathogen. write symptoms and control measure of the following plant diseases.
4. Tobacco mosaic
5. Leaf curl of papaya
6. Little leaf of Brinjal
7. Red rot of sugarcane
8. Citrus canker
9. Tikka disease of groundnut.

SEMESTER III

PROJECT[PR-301]

**GROUP B (SPECIAL PAPER) - PRACTICAL**

**PRACTICAL BASED ON MICROBIOLOGY**

**Full Marks: 100 Credits: 6 Time: 06 Hours**

SEMESTER IV

**CC13---[CCBOT401]**

**ENVIRONMENTAL BIOLOGY & EVOLUTION (THEORY)**

**Full Marks: 70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**The Environment And Population:**

1. Physical and biotic environment;
2. Biotic and Abiotic interaction,
3. concept of habitat and niche,
4. Population ecology, characteristics or a population; population growth curves.

**Ecological Factors and Ecosystem Organization:**

1. Climatic factors, Topographic factors, Edaphic factors, Biotic factors,
2. Trophic structure, Food chain and Energy flow in ecosystem, Ecological pyramids, Biogeochemical cycle in terrestrial and aquatic ecosystem,
3. types of soil, Major biomes.
4. Water ecological adaptations (Hydrophytes, Xerophytes, Mesophytes, Halophytes),
5. Ecological Succession, concept of climax.
6. Community ecology, symbiosis, level of species diversity and its measurements.
7. Environmental pollution, global environmental change, Root cause of biodiversity loss, acid rain, ozone layer depletion, green house effect, global warming.

SEMESTER IV

**CC14---[CCBOT402]**

**EVOLUTION & BIODIVERSITY CONSERVATION**

**Full Marks: 70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**EVOLUTION**

1. ORIGIN OF LIFE AND EVOLUTIONARY THOUGHTS: -
   1. Lamarck; Darwin concepts of variation, Adaptation, origin of cells and unicellular
   2. Evolution, evolution of prokaryotes, origin of Eukaryotic cells, evolution of unicellular eukaryotes.
   3. Evolution: Methods of studying and mechanisms: -The Evolutionary Time scale; Eras, periods and epoch; Major Events in evolutionary Time scale, origin of new genes and proteins, population genetics population, speciation.

**BIODIVERSITY CONSERVATION**

1. Concept of biodiversity (α, β, γ) diversity, Mega diversity zones and hot spots..
2. Principle for conservation, IUCN &Red data book, Remote sensing, national park, sanctuaries, biosphere reserves, coral reef, BSI, CSIR, DBT, NBPGR (National bureau of plant genetic resources),
3. Convention on biological diversity(CBD), Kyto protocol and carbon trading.
4. Forest managements: -forest types found in India, strategies for conservation and management of forest with special reference to deforestation, Chipko movement, Social forestry and biosphere reserve.

SEMESTER IV

**DSE(3)-DSEW—401 “A”**

**GROUP A - SPECIAL PAPER (THEORY)**

**GROUP A-PLANT GENETICS RESOURCES & CROP IMPROVEMENTS**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

**PLANT GENETIC RESOURCES**

1. Plant Genetic Resources (PGR): Definition and significance, Global and Indian Scenario.
2. Theory of Centres of Origin of crop Plants. Law of Homologous series of Genetic Variation.
3. Reproductive systems in crop plants.
4. Self incompatibility system in plants.
5. Male Sterility and its significance.
6. The Gene Bank: Basic Concept and Objectives. Role of Gene Banks in Plant Genetic Resource Conservation. Procedure of making cDNA library and its advantages. Chromosome specific library. Concept of Genomic Library.

**CROP IMPROVEMENTS**

1. Principle and objectives of crop improvements
2. Plant Introduction and Acclimatization, Procedure and purpose Merit and Demerits.
3. Concept of inbreeding, Heterosis & Hybrid Vigour and their applications in crop Improvements.
4. Somatic Embryogenesis, Artificial seed &Hybrid seed Technology and their role in crop improvements.
5. Mutation Breeding: Use of chemical and physical mutagen, introduction of mutation. Limitation of Mutation Breeding, Achievements more through Mutation Breeding.
6. Application of Genetic Engineering Techniques in crop improvement.

SEMESTER IV

**DSE-4 DSE(P)-402 “A”(PRACTICAL(A)**

**GROUP A - SPECIAL PAPER (PRACTICAL)**

**PLANT GENETICS RESOURCES & CROP IMPROVEMENTS**

**Full Marks: 100 Credits: 4 Time:06 Hours**

SEMESTER IV

**DSE-3 (THEORY)-B**

**DSE-401 “B”**

**GROUP** B **- SPECIAL PAPER**

**PLANT PATHOLOGY**

**Full Marks:70 Credits: 4 Time:03 Hours**

In all **eight** question of equal value will be set, out of which a student shall have to answer five questions. Q1 will be compulsory, consisting of 10 questions of one marks each. Any four questions shall have to be answered by the examinees out of the remaining eight questions carrying 15 marks each.

1. History and modern approaches of pathology**.**

**2. General symptoms of plant diseases caused by fungi.**

**3. Mechanism of attack: -**

* 1. **Enzymes: Role of enzymes in pathogenesis.**
  2. **Toxins: Types and their role in pathogenesis.**

**4. Physiology of Diseased Plants with special references to:**

* 1. **Osmo regulation**
  2. **Respiration**
  3. **Photosynthesis**
  4. **Nitrogen and Phenol metabolism**

**5. Mechanism of Defence:**

* 1. **Structural Defence Mechanism**
  2. **Biochemical Defence Mechanism**

**6. Control Measures of Plant Diseases: -**

* 1. **Cultural practices**
  2. **Biological**
  3. **Chemical control(fungicide)**
  4. **Plant Quarantine**

**7. Important Plant Diseases caused by the Fungi (symptoms, Etiology and Control)**

* 1. **Late Blight of Potato**
  2. **Loose Smut of Wheat**
  3. **Rust of Linseed**
  4. **Tikka disease of Groundnut**
  5. **Blast of Rice**
  6. **Red Rot of Sugarcane**
  7. **Early Blight of Potato**
  8. **Covered Smut of Wheat**

SEMESTER IV

**DSE-4 (PRACTICAL)-GR(B)**

**DSE(P)—402 “B”**

**GROUP** B **- SPECIAL PAPER (PRACTICAL)**

**PLANT PATHOLOGY**

**Full Marks: 100 Credits: 6 Time:06 Hours**

1. Make suitable stained preparations of material ‘A’ study the symptoms: Investigate the etiology of the disease and comment upon the host parasite relationship. Identify the pathogen given suitable diagrams and reasons. 10
2. Determine the value of one small division of ocular micrometer in microns. Measure ten spores of the given materials ‘B’. Find out the average size of the material given to you. 10
3. Isolate the pathogen from the given materials ‘C’ in an agar plate. 10
4. Comment upon the sports.1-5 10
5. Give the name of the disease and causal organism of the specimens 1-5. 10
6. Make suitably stained temporary preparations of materials E &F to exhibit the structure of the pathogen in it. Identify the pathogen giving suitable diagrams and reasons. Leave your preparation for examination. 10
7. Prepare slide of the bacterial specimen ‘G’. Stain it with the gram stain to show whether it is gram positive or gram negative. 10
8. Class records, slides, charts or models, herbaria and field reports. 10
9. **Viva Voce (Internal assessment) 20**

SEMESTER IV

**PROJECT (2)**

**PR—2[PR—401]**

**(TO BE ASSIGNED ON ELECTIVE CORE PAPER)**

**Full Marks: 100 Credits: 6 Time:06 Hours**