

**UNIVERSITY DEPARTMENT OF BOTANY  
RANCHI UNIVERSITY  
RANCHI**



**CHOICE BASED CREDIT SYSTEM**

Course of Study

For

**M.Sc. BOTANY**

From 2016 onwards

**Syllabus Revised by Board of Studies in Botany**  
**Ranchi University**  
**Ranchi**  
(w.e.f. 2016 Onward)

Sl. No.	Name	
1.	Dr. Anjani Kumar Srivastava University Professor & Head University Department of Botany Ranchi University, Ranchi	Chairman <i>A. Srivastava</i> 27/9/16
2.	Prof. Pramod Kumar Pandey University Professor University Department of Botany Ranchi University, Ranchi	Member <i>P. Pandey</i> 27/9/2016
3.	Prof. Shashi Kumar Sinha University Professor University Department of Botany Ranchi University, Ranchi	Member <i>S. Sinha</i> 27-9-2016
4.	Prof. Ashok Kumar Choudhary University Professor University Department of Botany Ranchi University, Ranchi	Member
5.	Prof. Jyoti Kumar University Professor University Department of Botany Ranchi University, Ranchi	Member <i>Jyoti Kumar</i> 27/9/16
6.	Prof. Hanuman Prasad Sharma University Professor University Department of Botany Ranchi University, Ranchi	Member <i>H.P. Sharma</i> 28/9/16
7.	Prof. (Mrs.) Kamini Kumar University Professor University Department of Botany Ranchi University, Ranchi	Member <i>Kamini Kumar</i> 27-9-16
8.	Prof. (Mrs.) Kunul Kandir University Professor University Department of Botany Ranchi University, Ranchi	Member <i>Kandir</i> 27-9-16
9.	Dr. Radha Krishna Jha Assistant Professor University Department of Botany Ranchi University, Ranchi	Member <i>R. Jha</i> 27/9/16
10.	Prof. A. K. Panigrahi Emeritus Professor Berhampur University Berhampur, Odisha	External Expert
11.	Prof. Anwar Mallick Professor & Head Department of Botany V. B. University, Hazaribagh	External Expert

*R. Jha*  
27/9/16

## COURSE OF STUDY

### (The component of Examination)

The course of study for the M. Sc. Degree will be in Botany (CBCS) with internal assessment according to the Syllabi prescribed from time to time;

#### A. Theory Core Paper/ Skill enhancement

External	70 Marks
Internal	30
Total	100
Duration of examination	3 Hours

#### B. Internal Test

Internal test (Best of two out of three)	Marks
Theory Exam	20
Attendance, behavior and extra-curricular activities	10 (5+5)
Total	30

#### C. Practical Internal and External

External	80
Internal	20
Total	100
Duration of examination	6 Hours

#### D. Marks allotted for attendance

% of attendance	Marks
100-91%	05
90-81%	04
80-71%	03
70-61%	02
Below 60%	No marks

*Rekha*  
27/9/16

*Ashwini*  
27/9/16

*H.P. Sharma*  
27/9/16

*Jyoti Kumar*  
27/9/16

*Khandu*  
27.9.16

*Kamini Kumar*  
27.9.16

*Khandu*  
27/9/2016

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27.9.2016

### E. Grades, Grade points and Percentage Marks

Grade (G)	Grade points (GP)	% Marks
O= Outstanding	10	100
A+ = Excellent	9	90-99.99
A	8.0	80-89.99
A	7.5	75-79.99
B+	7.0	70-74.99
B	6.0	60-69.99
C+	5.5	55-59.99
C	5.0	50-54.99
P=Pass	4.5	45- 49.99
F	0.0	Less than 45%
Ab	0.0	--

### F. Computation of Semester Grade Point Average (SGPA)

$$SPGA (Si) = \sum (Ci \times Gi) / \sum Ci$$

Where

$Ci$  = No. of credits of **ith** course

$Gi$  = No. of Grades of **ith** course

Example: SGPA \*

Course	Credit	Grade Letter	Grade point	Credit Point
Course 1	5	A	8	5x8=40
Course 2	5	B+	7	5x7=35
Course 3	5	B	6	5x6=30
Course 4	5	O	10	3x10=30
	20			135

Thus, SGPA =  $135/20 = 6.75$

### G. Computation of Cumulative Grade Point Average (CGPA)

$$SPGA (Si) = \sum (Ci \times Si) / \sum Ci$$

Where,

$Ci$  = No. of credits of **ith** of that semester

$Si$  = No. of **ith** semester

Example: CGPA

	Semester 1	Semester 2	Semester 3	Semester 4	Total
Credit (C)	20	22	25	26	83
SPGA (G)	6.9	7.8	5.6	6	26.9
CxG	138	171.6	140	156	605.6

Thus, CGPA =  $\frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6}{83}$

83

=  $605.6/83 = 7.29$

*Arjun*  
27/9/16

*Abhinav*  
27/9/16

*H.P. Sharma*  
27/5/16

*Arjun*  
27/9/16

*Kanishk*  
27.9.16

*Jyoti Kumar*  
27/9/16

*Kamini Kumar*  
27.9.16

*Arjun*  
27.9.2016



COURSE STRUCTURE OF M.Sc. UNDER CBCS, 2016				CREDIT	Hrs/Week		
SEM	PAPER	COURSE CODE	COURSES		L	+	T
I	1.	Foundation Course (FCBOT101)	Foundation Course	5	5	+	1
	2.	Core Course- 1 (CCBOT102)	Microbiology, Algae, Fungi and Plant Pathology	5	5	+	1
	3.	Core Course- 2 (CCBOT103)	Bryophytes, Pteridophytes, Gymnosperms and Fossils	5	5	+	1
	4.	Core Course(P)- 3 [CC (P)BOT104]	Practicals based on Papers 2 & 3	5	10		
II	5.	Elective Course - 1 (SEBOT201A-C)	Biofertilizer / Mushroom Cultivation	5	5	+	1
	6.	Core Course - 4 (CCBOT202)	Cytogenetics, Taxonomy, Ethnobotany and Medicinal Plants	5	5	+	1
	7.	Core Course - 5 (CCBOT203)	Plant Physiology, Biotechnology, Molecular Genetics/Biology	5	5	+	1
	8.	Core Course (P)- 6 [CC(P) BOT204]	Practicals based on Papers 6 & 8	5	10		
III	9.	Core Course- 7 (CCBOT309)	Fundamental and Applied Ecology, Biodiversity	5	5	+	1
	10.	Core Course- 8 (CCBOT310)	Anatomy, Embryology and Economic Botany	5	5	+	1
	11.	Core Course(P)- 9 [CC (P)BOT311]	Practicals based on Papers 9 & 10	5	10		
	12*.	Elective Course- 2 (ECBOT312)	Special Papers (A,B,C,D,E)*	5	5	+	1
IV	13.	Core Course -10 (CCBOT413)	Biochemicals and Molecular Techniques	5	5	+	1
	14*.	Elective course- 3 (ECBOT414)	Special Paper (A,B,C,D,E)*	5	5	+	1
	15*.	Elective Course (P) - 4 [EC (P) BOT415]	Special Practical Papers (A,B,C,D,E)*	5	5	+	1
	16.	Project Work (PW) BOT 416	Project/ Dissertation	10	10		
TOTAL				80	100	+	12

\*Special Papers (12, 14 & 15)- A. Algal biotechnology, B. Plant pathology & Microbiology, C. Cytogenetics, Plant Breeding, Molecular Biology & biotechnology, D. plant physiology, Biotechnology & Molecular Biology, E. Plant taxonomy, Ethnobotany & Medicinal Plants.

Dr. M. S.  
27/9/16

Abhinav  
27/9/16

Dr. P. Sharma  
27/9/16

Dr. N. S.  
27/9/16

Wander  
27.9.16

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27.9.16

Semester I  
Paper 1  
Course Code- FCBOT101

Full Marks : 70

Credits 5

Time : 03 Hrs.


In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

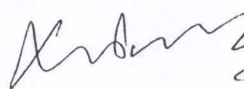
1. Economic importance of Bacteria.
2. Classification of algae as proposed by F.E.Fritsch.
3. Thallus organization and economic importance of Algae..
4. Classification of Fungi as proposed by Gwynne-Vaughan & Barnes
5. Classification of Bryophytes and alternation of generation.
6. Classification of Pteridophytes K.R. Sporne and alternation of generation.
7. Geological time period. Types and process of fossilization.
8. Classification of Gymnosperms K.R. Sporne (1975) and alternation of generation.
9. International code of Botanical Nomenclature- an Introduction.
10. Taxonomy and its relevance.
11. Ethnobotany: Definition, Method of study.
12. **Biomolecules:** Structure and Function of Primary Metabolites-Carbohydrates, Fats and Proteins.
13. Role of biotechnology in plant in plant and product improvement.
14. Green House Gases. Global warming and and sustainable development.
15. Cell division-A preliminary idea.
16. Introduction of Cancer Biology.
17. Biostatistics: Mean, Median, Mode.

Rishu  
27/9/16

Akhil  
27/9/16

H.P. Shaan  
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## Semester I

## Paper 2

Course Code- CCBOT102

## Microbiology, Algae, Fungi and Plant Pathology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all TEN questions are to be set, five from each group, covering entire course. Students are required to answer FIVE questions, selecting not more than TWO from each group. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

## GROUP-A

## Microbiology

1. Structure and Reproduction in Bacteria.
2. Mechanism of bacterial recombination: Conjugation, transformation and transduction.
3. Bacteriophage – Structure and its multiplication.
4. General account of Mycoplasma and its role in causing plant diseases.

## Phycology

1. Classification of Algae by Fritsch
2. Range of thallus structures and reproduction in
  - (a) Cyanophyta (b) Chlorophyta (c) Charophyta
  - (d) Phaeophyta (e) Rhodophyta.
3. General conception of life cycle pattern in algae.
4. Algal blooms.
5. Algal biofertilizers.
6. Algae as food, feed and uses in industry.

## GROUP-B

## Fungi

7. Saprolegniales, Peronosporales, Mucorales with special reference to Evolution in asexual reproductive structures in class Pycomycetes.
8. Sexual reproduction and types of fructifications in Ascomycetes.
9. Development of Basidium (Holobasidium, Phragmobasidium).

## GROUP- C

## Plant Pathology:

10. Symptoms, etiology and disease management of following diseases:
  - (i) Late blight of potato
  - (ii) Powdery Mildews of pea
  - (iii) Black rust of wheat
  - (iv) Early blight of Potato
  - (v) Citrus canker
  - (vi) Leaf curl of Papaya
  - (vii) Leaf curl of Tomato

Ram  
27/9/16

Akhil  
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H.P. Sharma  
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Jyoti Kumar  
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Krishna  
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K. S. K. S.  
27.9.16

Komini K.  
27.9.16



## Semester I

## Paper 3

Course Code- CC BOT103

Biology and Diversity of Bryophytes, Pteridophytes,  
Gymnosperms and Fossils

Full Marks: 70

Credits 5

Time: 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions, selecting not more than **TWO** questions from each group. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

**GROUP-A****Bryophytes**

1. Classification of Bryophytes.
2. Range of thallus structure in Bryophytes.
3. Evolution of Sporophyte evolution in Bryophytes.
4. Distribution of photosynthetic tissues in Bryophytes.

**GROUP-B****Pteridophyta**

1. Classification of Pteridophytes 1975 K.R. Sporne.
2. Evolution of stele in Pteridophyte.
3. Origin and evolution of sporophyte in pteridophyte – Telome Concept.
4. Heterospory and Seed Habit.

**GROUP-C****Gymnosperms and Fossils**

1. Classification of Gymnosperms.
2. Fossil – Mode of preservation, Geological time table, Distribution and examples of Indian Fossils
3. Brief account of families of Pteridospermales, Pentoxylales, Glossopotesidaceae and Caytoniaceae.
4. Comparative study of families of Gnetales: Gentaceae, Ephedraceae and Welwitschiaceae.
5. A general account of Ginkgoale.

Rishi  
27/9/16

Akhindase  
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Jyoti Kumar  
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Kamini K...  
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Semester I  
Practical Paper 4  
Course Code-CC BOT (P) 104

**Practical on Microbiology, Algae, Fungi, Plant Pathology,  
Bryophytes, Pteridophytes, and Gymnosperms**

Full Marks: 80 (100)

Credits 10

Time: 06Hrs.

1. Staining of gram positive/gram negative bacteria. <sup>A</sup> 06
  2. Identification viral/bacterial/fungi disease. <sup>B</sup> 06
  3. Study of algal materials from the algal mixture (A) identification of at least one genus giving diagnostic features. <sup>C</sup> 10
  4. Identify the provided Bryophyte (<sup>D</sup>B) to you after thorough investigation made through temporary mounts. 10
  5. Write a monograph on provided Pteridophyte material (<sup>E</sup>C) to you after thorough investigation made through temporary mounts 14
- OR
- Identify the gymnosperm material (<sup>F</sup>D) provided to you after thorough investigation made through temporary mounts.
6. Spots 1 – 5. 10
  7. Practical records, herbarium, field report, charts etc. 16
  8. Viva-voce. 08

Ruina  
27/9/16

Akhilavara  
27/9/16

H.P. Sharma  
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Jyoti Kume  
27/9/16

K. B. S. 27/9/2016

27/9/2016

Kandor  
27.9.16

Kamini Kesar  
27.9.16.

## Semester II

## Paper 5

Course Code- EC(SE)BOT<sup>201</sup>105 (A)

## Skill Enhancement

## Biofertilizers

Full Marks : 100

Credits 5

Time : 03 Hrs.

(Theory 70+ Internal Assessment 30)

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. General account about the eco-friendly organic agro-input as biofertilizer – *Rhizobium* inoculant, *Nostoc*, *Anabaena*, *Azotobacter*. identification, mass multiplication, Actinorrhizal symbiosis.
2. Industrial Application of microalgae.
3. Cyanobacteria (blue green algae), and association of BGA, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation.
4. Mycorrhizal association, types of mycorrhizal association, phosphorus nutrition, growth and yield..
5. Organic farming – green manuring and organic fertilizers. Recycling of bio-degradable municipal, agricultural and Industrial wastes. Water treatment and its use in agriculture.

Rupne  
27/9/16

Akhil Das  
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H.P. Sharma  
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Jyoti Kuma  
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Arjun  
27/9/2016

Kamini Kumar  
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Wandir  
27.9.16

**Semester II**  
**Paper 5**  
**EC (SE) BOT<sup>201</sup>105 (B)**  
**Skill Enhancement**  
**Mushroom Cultivation**

**Full Marks: 70**

**Credits 5**

**Time : 03 Hrs.**

**(Theory 70+ Internal Assessment 30)**

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Nutritional and medicinal value of edible mushrooms; poisonous mushrooms. Types of edible mushrooms available in India – *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Agaricus bisporus*.
2. Cultivation Technology: Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation – paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation – Low cost technology. Composting technology in mushroom production.
3. Storage and nutrition: Short – term storage (Refrigeration – upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutrition – Proteins – amino acids, mineral elements nutrition – Carbohydrates. Crude fibre content – Vitamins.
4. Research Centers – National level and Regional level.

*R. V. Me*  
27/9/16

*Abhinav*  
27/9/16

*H. P. Chakraborty*  
27/9/16

*Arundh*  
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*K. S. S. S.*  
27.9.16

*S. S. S.*  
27/9/2016

*J. S. K.*  
27/9/16

*K. S. S.*  
27.9.16



Semester II  
Paper 6  
Course code- CCBOT206 *202*  
Cytogenetics, Taxonomy, Ethnobotany and Medicinal Plants,

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set selecting **FIVE** questions from each group covering entire course. Students are required to answer **FIVE** questions. Students are required to answer not more than **TWO** questions from each group. All questions are of equal marks.

**GROUP- A**

1. Chromatin Organization, Chromosome structure and packaging of DNA, Histones, Heterochromatin.
2. Cell division and cell cycle: Mitosis, Meiosis, their regulation, Overview of cell cycle, control mechanisms: role of cyclins and cyclin dependent kinases.
3. Protein sorting: Targeting of proteins to organelles.
4. Mutations: Types, Detection, Molecular basis of mutation, Physical and Chemical Mutagenesis.
5. DNA damage and repair mechanism
6. Brief account of Proto-oncogenes, Oncogenes, tumor suppressor genes, cancer, metastasis.
7. Structure and numerical alterations in chromosomes: Origin, Occurrence, and production of haploid. Introduction and characterization of monosomies, trisomies. Origin and production of autopolyploids, allopolyploids.
8. Biostatistics: Standard deviation, Standard error, Chi square.

**GROUP- B**

1. **Systematics:** Outline, Classification of Angiosperms - Hutchinson, Takhtajan and Cronquist's system. Their merits and demerits.
2. **Botanical Nomenclature:** International code of Botanical Nomenclature - Principle, Rules of effective and valid publication. Retention and choice of names.
3. **Biosystematics:** Concepts, Biosystematics categories, Methods in Experimental Taxonomy.
4. Diagnostic characteristics, systematic phylogeny and economic importance of families, Magnoliaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Bignoniaceae, Lamiaceae, Verbenaceae, Polygonaceae, Euphorbiaceae, Rubiaceae, Orchidaceae, Araceae, Poaceae, and Commelinaceae.
5. **Ethnobotany:** Definition scope and method of study, socio-cultural organization of the Ethnic tribes of Jharkhand.

*Ramesh*  
27/9/16

*Akhilendra*  
27/9/16

*H.P. Sharma*  
28/9/16

*K. S. Singh*  
27/9/2016

*[Signature]*  
27/9/2016

*Jyoti Kumar*  
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*K. S. Singh*  
27.9.16

*Kamini Kumar*  
27.9.16



## Semester II

## Paper 7

Course code- CCBOT203

## Plant Physiology, Biochemistry, Biotechnology and Molecular Biology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions not more than **TWO** questions from each group. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

**GROUP- A: Plant Physiology**

1. **Transpiration:** Types of Transpiration, Evaporation and Transpiration, Mechanism of Transpiration and Stomatal, Physiology, Factors Affecting the Rate of Transpiration, Significance of Transpiration, Antitranspirant, Measurement of Transpiration.
2. **Translocation in Plant:** Phloem Transport: Phloem Sap Composition, Movement in Plant, Direction of Movement, Bidirectional Movement, Lateral Movement, Source – Sink relationship, Phloem loading, Phloem Unloading, Mechanism of Phloem Transport – Electroosmosis, Protoplasmic Streaming, Contractile Protein Variants, Mass Flow Hypothesis, Factors Affecting Translocation.
3. **Phytohormone:** History, Structure, Biosynthesis Physiological Responses and Mechanism of Action of Auxins.
4. **Physiology of Flowering:** Photoperiodism and Vernalization.
5. **Seed Dormancy and Germination:** Definition, Types, Mechanism and Method Breaking the Dormancy.

**GROUP-B: Plant Biochemistry**

6. **Photosynthesis:** The Pigment System, Light Reaction, Dark ( $C_3$  Cycle), Hatch and Slack Pathway ( $C_4$  Cycle), Photorespiration and Factors Affecting Rate of Photosynthesis.
7. **Respiration:** Glycolysis, Fermentation, Krebs Cycle, Electron Transport System, Hexose Monophosphate Shunt, Theories of Phosphorylation – The Chemical Coupling Theory, The Conformational Coupling Theory, The Chemiosmotic Theory, Factors Affecting the Rate of Respiration.

R. Me  
27/9/16Abhinav  
27/9/16H.P. Sharma  
27/9/16K. Me  
27/9/2016S. Me  
27/9/2016Jyoti K. Kaur  
27/9/16  
Kamini Kaur  
27/9/16

8. **Enzymes:** Nomenclature and Classification, Nature, Properties, Enzyme Energetic, Mode and Mechanism of Action, Factors Affecting Enzyme Activities.
9. **Nitrogen Metabolism:** Nitrogen Fixation: Non-biological Fixation; Biological Fixation – Symbiotic Nitrogen Fixers, Non-symbiotic Nitrogen Fixers, Biochemistry of Nitrogen Fixation.
10. **Lipid Metabolism:** Simple Lipids, Complex Lipids, Neutral Fats, Fatty Acids, Enzymatic Degradation of Fats,  $\beta$ -Oxidation of Fatty Acid and Oxidation of Fatty Acids, Biosynthesis of Fatty Acids.

#### GROUP-C: Biotechnology and Molecular Biology

11. Plant tissue culture and its significance
12. **Micropropagation:** Techniques, Multiplication by Axillary and Apical Shoots, Multiplication Through Callus Embryo Culture, Factors Affecting Shoot Multiplication.
13. **Haploidy: Anther culture, pollen Culture and ovary culture and its role in crop improvement**
14. Molecular Cytogenetics: Brief account of DNA replication in Prokaryotes. Nuclear DNA content, C-value paradox, Introns and RNA splicing, repetitive DNA, Restriction mapping, Regulation of gene expression in Prokaryotes
15. Molecular marker: RFLP, RAPD, AFLP and SSR
16. Genetic transformation: Biotic and abiotic methods

Ravi  
27/9/16

Akhil  
27/9/16

H.P. Sharma  
27/9/16

Jyoti Kuma  
27/9/16

Kandir  
27-9-16

Kamini Kuma  
27-9-16

27/9/2016

27/9/2016

## Semester II

## ✓ Practical Paper- 8

Course code- CC BOT (P) 208 <sup>204</sup>

## Cytogenetics, Taxonomy, Plant Physiology, Biotechnology and Molecular Biology

Full Marks: 80 (100)

Credit: 10

Time : 06 Hrs.

1. Problems based on Mendelian ratio and their modifications, statistical analysis and genetic explanation. 10
2. Show two stages of mitosis from the given onion root tip. 08
3. Compare and comment on the floral characters of the local flora A and B Provided and assign them to their respective families. 08
4. In a separate answer book provided, you have to write down botanical name family and uses of plants C, D, E, F, G provided to you. 08
5. Separation of chlorophyll pigments by Paper chromatography. 06
6. Phytochemical screening of secondary metabolites (alkaloids, phenols and saponins) : Any two 06

OR

7. Estimate the quantity of carbohydrate/ Protein through standard curve from the given sample with the help of spectrophotometer.
8. Comment upon the spots 1-5. 10
9. Practical records, herbarium. Charts model. Ingenuity design etc. 16
10. Viva-voce. 08

Rishu  
27/9/16Akhilendra  
27/9/16H.P. Sharma  
28/9/16Ankur  
27/9/16Jyoti Kumar  
27/9/16Kandir  
27-9-16S.C.  
27/9/16Kamini Kumar  
27.9.16



## Semester III

## Paper 9

Course code- CCBOT309

301

## Fundamental and Applied Ecology

Full Marks: 70

Credits 5

Time: 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Ecological factors; Climatic, Topographic, Edaphic and Biotic.
2. Population and Community ecology: population characteristics, Population dynamics, Community characteristics, composition, structure, origin and development of a community, methods of study of community.]
3. **Ecological succession:** Types and mechanisms of ecological successions (Hydrosere and Xerosere); Changes in ecological properties during succession.
4. **Ecosystem organization:** Types, Structure and Function. Flow of energy; Bio-geochemical cycles of C, N, P, S; mineral cycles (Pathway, Processes); Primary production, Decomposition and Feed chain, Food web of different types of ecosystems: Terrestrial (Forest and Grassland) and Aquatic (Freshwater); and Ecological pyramids.
5. **Ecological adaptations:** Hydrophytes, Xerophytes and Halophytes.
6. **Phytogeography:** Major plant communities of the world; Phytogeographic regions of the world; Floristic regions of India, vegetation of India.
7. **Air, Water, Soil, Sound and Radiation Pollutions:** Kinds, Sources, Quality parameters, Effect on plants & Ecosystem and Control measures.
8. **Climate Change (Global Environmental Problems):** Global warming, Green house Gases ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{O}_3$ ,  $\text{CFC}_s$ ,  $\text{N}_2\text{O}$ ), Sources, Trends & Role); Environmental effects of Global warming, Ozone depletion, Damage to the Ozone layer & Hole, Health effects of Ozone depletion and increased UV Radiation, Saving the Ozone layer.
9. **Non-conventional source of energy:** solar, wind, Nuclear, Biogas and petroplants
10. Strategies of Plant conservation: *In situ* conservation – Sanctuaries, National parks and Sacred groves and *Ex situ* conservation – Botanical gardens, Gene bank, Seed banks and tissue culture techniques..

Rev. Dr. S. S. S. S.  
27/9/16

Ashwini K. S.  
27/9/16

H. P. Sharma  
27/9/16

Jyoti K. S.  
27/9/16

K. S. S. S.  
27/9/16

K. S. S. S.  
27/9/16

K. S. S. S.  
27/9/16

K. S. S. S.  
27/9/16



11. **Natural resources and their Management:** Land resource, water resource, Air resource, agriculture and forestry resources and their management.
12. Indian Biological Diversity Act, Convention of Biological Diversity (CBD), People's Biodiversity Register. Green Book, Red Book, Blue Book.
13. **Bioremediation:** definition, need and scope of bioremediation; Phytoremediation, Microremediation.

Anshu  
27/9/16

Ashwini  
27/9/16

H. P. Sharma  
27/9/16

K. S. S.  
27/9/2016

K. S. S.  
27.9.16

K. S. S.  
27/9/16

Kamini K.  
27.9.16

Jyoti K.  
27/9/16

## Semester III

## Paper 10

Course code- CC BOT ~~410~~

## Anatomy, Plant Embryology and Economic Botany

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all TEN questions are to be set covering entire course. Students are required to answer FIVE questions selecting not more than TWO questions from each group. All questions are of equal marks.

Questions of the preceding years may be repeated to the tune of 25%.

**GROUP-A: Anatomy**

1. Shoot Development and theories of shoot Apex organization, Organization of root Apical Meristem,
2. Mechanical Tissue and their Distribution
3. Cambium,
4. Ecological adaptation
5. Anomalous Secondary growth with reference *Dracaena* stem, *Tinospra* root, *Bignonia*, and *Strychnos* stems. Ecological Anatomy.

**GROUP-B: Embryology and Economic Botany**

6. Microsporogenesis and Microgametophyte,
7. Megasporogenesis and Megagametophyte,
8. Fertilization,
9. Endosperm type, Physiology and cytology of endosperm,
10. Polyembryony - Types, adventative embryony, false embryony, twins & triplets, Sexual incompatibility,
11. Apomixis, Embryology in relation to taxonomy,
12. Experimental Embryology: Anther, Ovary, Ovule, Endosperm and Embryo Culture,
13. Fibre yielding plants: Timber yielding plants: Oil Yielding plants and Drug yielding plants

*Arin*  
27/9/16

*Akhil*  
27/9/16

*H.P. Sharma*  
27/9/16

*K. and*  
27.9.16

*Arin*  
27/9/2016

*Jyoti Kumar*  
27/9/16

*Kamini Kesar*  
27.9.16

Semester ~~IV~~ <sup>III</sup>Paper- ~~II~~ <sup>I</sup>CCBOT (P) ~~411~~ <sup>324</sup>Full Marks: ~~80~~ <sup>100</sup>

Credit: 10

Time : 06 Hrs.

**Practical on Ecology, Anatomy, Embryology and Economic Botany**

1. Cut T.S. section of the given material, make temporary mount, draw a well labeled diagram and describe ecological adaptation. 10
2. Determination of frequency/ density/ abundance of plants in the local field by quadrat method. 14 15
3. Cut T.S. section of the given material, make temporary mount, draw a well labeled diagram and describe anomalous structure. 10 15
4. Isolation of at least two stages of embryo from *Abelmoschus esculentum* 06 10
5. Give botanical names and families of plants and mention their economic importance. 06 10
6. Comment upon spots 1-5. 10
7. Practical record, chart and models etc. 16 20
8. Viva voce. 08 10

Ravi's  
27/9/16Abhinav  
27/9/16Arjun  
27/9/2016H. Sharma  
27/9/16Kandir  
27-9-16S. S. S. S.  
27-9-2016Tyoti Kumar  
27/9/16Kamini Kumar  
27.9.16

## Semester III

## Paper 12

Course code- EC BOT 312(A) 303(A)

## Special Theory Paper: Algal Biotechnology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all TEN questions are to be set covering entire course. Students are required to answer FIVE questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Principles and systems of classification by Fritsch & Chapman.
2. Cyanophyceae: Cell structure and thallus organization, heterocyst and akinete development and their role chromatic adaptation and reproduction.
3. Chlorophyceae: Range of thallus organization, methods of reproduction and perennation and life cycle.
4. Life cycle patterns and alternation of generation with particulars reference to Pheophyceae and Rhodophyceae.
5. Nuclear characteristics of green algae & blue green algae.
6. A detailed idea of algae causing diseases of plants and animals.
7. Algae and water pollution: Physico-chemical analysis of water bodies, pollution indices and pollution indicators and steps to control pollution.
8. Cyanobacteria in human welfare: Production of fine chemicals polysaccharides bioactive molecules pigments, and lipids.
9. Recent Biotechnological developments with algae as experimental material.
10. Role of algae in biological nitrogen fixation.
11. Culture of algae: Media preparation.
12. Methods of collection, isolation and cultural procedure for green algae and blue green algae.
13. Economic importance of Algae as:
  - (i) Food
  - (ii) Feed
  - (iii) Bio-fertilizer
  - (iv) Algae in agriculture and industry.
14. Molecular biotechnology with special reference to blue green algae.

R. M. S.  
27/9/16

Adhikar  
27/9/16

K. S. S.  
27-9-16

H. F. Charnia  
27/9/16

J. K. K.  
27/9/16

K. S. S.  
27/9/2016

K. S. S.  
27.9.2016

K. S. S.  
27.5.16



## Semester III

Paper 12

Course code- EC BOT 312 (B)

## Special Theory Paper: Microbiology and Plant Pathology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. General symptoms of Plant Diseases caused by Bacteria, Mycoplasma and Virus.
2. Koch's Postulates and its importance in identification of plant disease.
3. Classification of Gram+ve and gram-ve bacteria
4. Microbial mechanism of pathogenicity.
5. Mechanism of Attack: Mechanical forces exerted by the pathogen on host tissues.
6. Chemical weapons of pathogens:
  - (a) Enzymes: Role of Enzymes in pathogenesis
  - (b) Toxins: Types of toxins and their role in pathogenesis.
7. Defense mechanism in plants:
  - (a) Structural defense mechanism
  - (b) Chemical defense mechanism
  - (c) Phenolic compounds role defense
  - (d) Phytoalexins.

Rishi  
27/9/16

Akhilendra  
27/9/16

H.P. Sharma  
27/9/16

Kaundia  
27-9-16

Jyoti Kumar  
27/9/16

Kishan  
27/9/2016

Q. S.  
27.9.2016

Kamini Kumar  
27-9-16

## Semester III

Paper 12

Course code- EC BOT 312 (C)

Special Theory Paper: Cytogenetics, Plant Breeding,  
Molecular Biology and Biotechnology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Introduction to Cytogenetics and Cytological methods: pretreatment, fixation, stains & mechanism of staining.
2. Structural organization of eukaryotic Chromosomes, Histones Nucleosome concept, Importance of Telomeres and Centromeres, Heterochromatin.
3. Different forms of Chromosomes: Somatic metaphase (Salivary gland chromosomes), Meiotic prophase (Lamp brush), B-Chromosomes or Supernumerary Chromosomes.
4. Karyotype Analysis and Karyotype evolution.
5. Mechanism of Cell division: Mitosis, Meiosis, Cell-cycle, Regulation of Cell cycle.
6. Molecular basis of Chromosome pairing.
7. Mechanism of Genetic Recombination.
8. Alterations in Chromosome Structure: Deletion, Duplication, Translocation, Inversion.
9. Variations in Chromosome numbers. Aneuploidy, Trisomies (primary secondary, tertiary), Monosomies, Nullisomies Euploidy: Haploidy, Autopolyploidy, Allopolyploids and origin of cultivated plants: Wheat, Brassica, Cotton, Tobacco.
10. Theory of centre of origin of crop plants.
11. Self – incompatibility System.
12. Inbreeding & Heterosis.
13. Male sterility and its significance.
14. Analysis of Variance, Co-relation and Co-efficient.

Ram  
27/9/16

Akhindara  
27/9/16

H.P. Sharma  
27/9/16

Arjun  
27/9/16

Sandeep  
27/9/16

Kaushik  
27/9/16

Jyoti Kumar  
27/9/16

Kamini Kumar  
27.9.16

## Semester III

Paper 12

Course code- ECBOT 312(D)

## Special Theory Paper: Plant Physiology, Biotechnology and molecular Biology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all TEN questions are to be set covering entire course. Students are required to answer FIVE questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Definition of growth, development and differentiation.
2. Phototropism.
3. Geotropism.
4. Nastic Movements.
5. Photomorphogenesis.
6. Circadian Rythm.
7. Growth regulators (Phytohormones): History, structure, biosynthesis, physiological responses and mechanism of action of Auxins, Gibberellins; Cytokinins; Ethylene; Absciscic acid; Brassinosteroids and Jasmonic acid.
8. Apical dominance and various theories.
9. Transport of phytohormones.
10. Polarity.
11. Phytochrome: History of its discovery, isolation, purification and its biological roles.
12. Physiology of flowering: Photoperiodism and Vernalization.
13. Seed dormancy: Definition, types, mechanism and method of breaking the dormancy.
14. Seed Germination.

Rishu  
27/9/16

Ashwini  
27/9/16

H. R. Sharma  
27/9/16

Kandir  
27.9.16

Jyoti Kumbh  
27/9/16

Kamini Kesar  
27.9.16

27.9.2016



## Semester III

## Paper 12

Course code- EC BOT 312 (E)

Special Theory Paper: Plant Taxonomy, Ethnobotany  
and Medicinal Plants

Full Marks: 70

Credits 5

Time: 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. The species concept: Taxonomic hierarchy, species, genus family and other categories, principles used in assessing relationship, delimitation of taxa and attribution of rank.
2. Outline of classification: Bentham & Hooker and Hutchinson system. Merits and demerits.
3. Recent trends in taxonomy with special reference to: Morphology, Anatomy, Phytochemistry, Cytology and Embryology.
4. Botanical nomenclature: International code of botanical nomenclature, Principles, Rules and Recommendations, Priority, Typification, Rules of effective and valid publications, Retention and Choice of names.
5. Taxonomical features and economic importance of the dominant Angiospermic families of Jharkhand: Magnoliaceae, Apocynaceae, Rubiaceae, Verbenaceae, Convolvulaceae, Asclepiadaceae, Scrophulariaceae, Acanthaceae, Bignoniaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Araceae, Cyperaceae and Poaceae.
6. Definition, scope and method of study of ethnobotany.
7. Contribution of ethnic communities on traditional medicinal knowledge.
8. Preparation of herbarium including digital herbarium.
9. Methods of conservation of valuable plants.
10. Ethnomedicinal plants used in the following diseases:
  - (a) Diabetes
  - (b) Jaundice
  - (c) Malaria
  - (d) Skin diseases
  - (e) Gynaecological Problems

R. K. Me  
27/9/16

Abhinav  
27/9/16

H. D. Sharma  
27/9/16  
Kamini Kumar  
27.9.16

K. B. S.  
27/9/2016  
Kandir  
27.9.16

27/9/2016  
Jyoti Kumar  
27/9/16

## Semester IV

## Paper 13

Course code- CCBOT413 401

## Biochemicals and Molecular Techniques

Full Marks: 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Basic concept of Spectrophotometer and Electron microscope.
2. Chromatography: Paper, capillary, column, HPLC, HPLC-MS, GLC – basic concept, NMR.
3. Elementary concepts of electrophoresis: Polyacrylamide gel electrophoresis (PAGE), agarose gel electrophoresis.
4. Isolation and Purification: (a) Genomic and plasmid DNA (b) RNA.
5. Blotting: Principles, types of blotting, blotting membranes, immunoblotting – Southern, Northern, Western and Dot blots.
6. Electrophoresis
7. DNA sequencing: Various methods of DNA sequencing and finger printing.
8. DNA Silencing: RNA interference (RNA).
9. PCR

Rumi  
27/9/16

Ashwini  
27/9/16

H.P. Shalwa  
27/9/16

K. S. S. S.  
27/9/2016

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K. S. S. S.  
27-9-16

Jyoti K. K.  
27/9/16

Kamini K.  
27.9.16

## Semester IV

## Paper 14

Course code- EC BOT414 -A

## Special Theory Paper: Algal Biotechnology

Full Marks: 70

Credits 5

Time: 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Traditional use of in land algae.
2. Isolation and identification of filamentous algae from local sample (upto Sps. level).
3. Mass cultivation of microalgae.
4. Phytoplankton sampling and identification from local pond.
5. The role of microalgae in liquid waste treatment and reclamation.
6. Photo-biological nitrogen fixation:  
Introduction genetic structure of  $N_2$  fixation system, heterocyst differentiation, nitrate, nitrite and ammonia assimilation.
7. Biochemical and molecular aspects of abiotic stresses:  
(a) UV radiation  
(b) Temperature and desiccation stress.
8. Photo protective Mechanisms-Habitat diversity and significant physiological properties.
9. Cyanobacterial Genetics:  
(a) Modes of propagation in cyanobacteria and nature of genetic material.
10. Nutrient regulated phytoplankton growth: Common methods for mass cultivation of micro-algae.
11. Eutrophication: Causal factor, algal blooms.
12. Commercial production of *Spirulina*, *Scenedesmus*, *Chlorella*.

Rajni  
27/9/16

Ashwata  
27/9/16

H.S. Sharma  
27/9/16

K. S. Srinivas  
27/9/16

27/9/2016

Kandian  
27.9.16

Kamini Kumar  
27.9.16

Jyoti Kume  
27/9/16



## Semester IV

## Paper 14

Course code- EC BOT414- B

1112-3

## Special Theory Paper: Microbiology and Plant Pathology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. Characteristic features of plant pathogenic bacteria.
2. General characteristics of plant viruses:
  - (a) Classification of plant virus
  - (b) Structure and composition of Virus
  - (c) Virus replication
3. Transmission of plant viruses.
4. Antigen and antibody- the immune response.
5. Antibiotics and their general mode of action and their general mode of action: an overview.
6. Management of plant diseases:
 

(a) Cultural methods	(b) Chemical methods
(c) Quarantine	(d) Biological control
7. Symptoms, etiology and methods of control of the following plant disease caused by fungi:
  - (a) Downy mildew of maize
  - (b) Powdery mildew of peas (*Pisum sativum*)
  - (c) Loose smut of wheat
  - (d) Covered smut / Bunt of wheat
  - (e) Black stem rust of wheat
  - (f) Tikka disease of groundnut
  - (g) Wilt of arhar
  - (h) Red rot of sugarcane
  - (i) Early blight of potato
  - (j) Bacterial blight of paddy

Ramesh  
28/9/16

Ashwini  
27/9/16

H. S. Sharma  
28/9/16

Kamini K. K.  
27.9.16

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K. K. K.

Tyoti K.  
27/9/16

- (k) Tundu disease of wheat
- (l) Leaf spot of tomato
- (m) Citrus canker
- (n) Bacterial stalk rot of maize
- (o) Black rot / Bacterial wilt of crucifers
- (p) Yellow vein mosaic of bhindi
- (q) Tobacco mosaic
- (r) Rice tungro disease
- (s) Sugarcane mosaic disease
- (t) Leaf curl of papaya.

Rajni  
27/9/16

Akhilendra  
27/9/16

H.P. Sharma  
27/9/16

Kundan  
27/9/2016

Kundan  
27.9.16

Kamini Kesar

Jyoti Kuma  
27/9/16

## Semester IV

## Paper 14

Course code- EC BOT 414- C

1102-2

Special Theory Paper: Cytogenetics, Plant Breeding,  
Molecular Biology and Biotechnology

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. DNA replication in Eukaryotes.
2. RNA processing, RNA splicing, RNA Editing and ribozymes.
3. Insertion elements and Transposons: Transposons in prokaryotes, mechanism of transposition, genetic organization of Tn3 and its role in transposition.
4. Mutation: Molecular basis of mutation, Induced mutagenesis, Environmental mutagens.
5. DNA damage and repair.
6. General concept of genetic engineering and Recombinant DNA technology.
7. Restriction endonuclease I, II, III. DNA ligase reverse transcriptase, Gene cloning, Vectors, Plasmids, Cosmids, Phagemids.
8. Southern, Northern, Western Blotting, Gene amplification.
9. Principle of Plant Tissue Culture.
10. Endosperm culture.
11. Micropropagation: Techniques, Factors, Limitations and Significance.
12. Transgenic plants for crop improvement.
13. Somaclonal variation, significance and application.
14. Protoplast culture and Somatic Hybridization technique, Factors, Limitations and its role in crop improvement.

Rutina  
27/9/16

Akhmadara  
27/9/16

H.P. Shaenica  
27/9/16

K. S. S. S.  
27/9/16

Kamin Kees  
27.9.16

27/9/16

Joshi. K.  
27/9/16



## Semester IV

## Paper 14

Course code- EC BOT 414 - D 272-

## Special Theory Paper: Plant Physiology, Biotechnology and Molecular Biology

Full Marks: 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

1. History of plant tissue culture, significance and its present status in India.
2. Pathway of differentiation: Embryogenesis and Organogenesis.
3. *In vitro* pollination and fertilization and their significance.
4. Suspension culture and single cell culture.
5. Haploidy: Anther culture, Pollen culture, Ovary culture and its significance
6. Endosperm culture.
7. Protoplast culture and Somatic hybridization-technique, factors, limitation and its role in crop improvement.
8. Micropropagation: Technique, factors, limitation and its significance.
9. Recombinant DNA technology – gene cloning principle and techniques.
10. DNA finger printing, polymerase chain reaction.
11. Genetics of *Agrobacterium tumefaciens* and *A. rhizogenes*.
12. Plasmid mediated and DNA Mediated Genetic Transformation (DMGT) and production of transgenic plants.
13. Transgenic plants.
14. Secondary metabolite enhancement through tissue culture technique.
15. Molecular markers and its application. Industrial application of plant tissue culture.

Rune  
27/9/16Abhinav  
27/9/16H.P. Sharma  
28/3/16K. S. S. S.  
27.9.16K. S. S. S.  
27/9/2016K. S. S. S.  
27/9/2016Tyoti. Kuma  
27/9/16Kamini Kuma  
27.9.16

## Semester IV

## Paper 14

Course code- EC BOT 414- E

Special Theory Paper: Plant Taxonomy, Ethnobotany  
& Medicinal Plants

Full Marks : 70

Credits 5

Time : 03 Hrs.

In all **TEN** questions are to be set covering entire course. Students are required to answer **FIVE** questions. All questions are of equal marks. Candidates are required to answer questions as far as practicable in their own words.

- Outline of classification of angiosperms with their merits and demerits:
  - Cronquist system of classification
  - All phylogenetic groups (APG) system of classification.
- Origin and evolution of Angiosperms
- Molecular approaches in plant taxonomy: Application of DNA markers in angiosperm taxonomy, molecular phylogeny.
- Remote sensing – GIS.
- Ethnic community of world, Biological conservation of ethnic society of world.
- Role of some Govt. and other organization involved in the promotion of ethnobotany in India.
- Some important National Botanical Gardens, National Parks and Herbarium Centres of India.
- Phytochemistry and standardization of herbal drugs.
- Study of the following Nutraceutical and Under-utilized plants used by ethnic communities of Jharkhand state: Taxonomy with floral formula and floral diagram, Nutritional and medicinal values:

*Centella asiatica*, *Moringa oleifera*, *Elsine coracana*, *Madhuca indica*, *Psidium guajava*, *Syzygium cumini*, *Annona squamosa*, *Carica papaya*, *Embllica officinalis*, *Boerhavia diffusa*, *Aegle marmelos*, *Cassia tora*, *Ficus glabella*, *Dolichos biflorus*, *Cucumis sativus*.

- Detailed study of the following ethnomedicinal plants used by ethnic communities with floral formula, floral diagram, mode of drug preparation, dose and bioactive compounds:

*Andrographis paniculata*, *Asparagus recemosus*, *Rawolfia serpentina*, *Azadirachta indica*, *Achyranthes aspera*, *Cathranthus roseus*, *Tilnospora cordifolia*, *Mimosa pudica*, *Acorus calamus*, *Ocimum sanctum*, *Curcuma longa*, *Stevia sp.*, *Gymnema sylvestre*, *Bacopa monnieri*, *Vitex negundo*, *calotropis procera*.

R. Mehta  
27/9/16

Akhilendra  
27/9/16

H. P. Sharma  
27/9/16

Jyoti Kumar  
27/9/16

K. Andis  
27-9-16

Kamini Kumar  
27-9-16

27/9/2016

## Semester IV

## Paper 15

EC BOT(P)415- A

## Special Practical Paper – Algal Biotechnology

Full Marks: 80

Credits 10

Time : 06 Hrs.

Practicals are to be based on special theory paper 12 & 14. Questions in the practical paper may be asked as per the given model.

1. Taxonomy of fresh water algae of Ranchi. Identification & slide preparation of the given material. 06
2. Ocular and micrometer: Measurement and calibration. 06
3. Draw camera lucida sketches of vegetative & reproductive structure of given material. Measure and draw the scale of magnification. 06
4. Study of the chromosome structure: Pretreatment fixation, staining, squash technique and preparation of a temporary mount of the supplied material. 08
5. Development, location and identification of components / pigments by paper chromatography (TLC). 08
6. Estimation of protein by Lowry's method / determination of soluble sugar / carbohydrates. 07
7. Environmental Biotech: Preparation of pure culture medium (Pringsheem / molisch). 05
8. Comment upon the spots from 1-5. 10
9. Records, Collections, Chats, Models etc. 16
10. Viva voce. 08

Rutna  
27/9/16

Ashwini  
27/9/16

H.P. Sharma  
27/9/16

Kaundin  
27.9.16

Arjun  
27/9/2016

Jyoti Kumar  
27/9/16

27/9/16

Kamini Kumar  
27.9.16



## Semester IV

Paper 15

EC BOT(P)415 - B

## Special Practical paper – Microbiology &amp; Plant Pathology

Full Marks: 80

Credits 10

Time : 06 Hrs.

Practicals are to be based on special theory paper 12 & 14. Questions in the practical paper may be asked as per model given below:

1. Make suitable stained preparations of material "A". Study the symptoms of the disease and comment upon the host parasite relationship. Identify the pathogen giving suitable diagrams and reasons. Leave your preparation for examination. 10
2. Determine the value of one small division of ocular micrometer in microns. Measure ten spores of the given material "B". Find out the average size of the material given. 06
3. Make suitable stained temporary preparations of materials "C" to exhibit the structure of the pathogen in it. Identify the pathogen giving suitable diagrams and reasons. Leave your preparation for examination. 06
4. Prepare slide of bacterial specimen "D" stain it with the Gram stain and state whether it is gram positive or gram negative. 07
5. Isolate the pathogen from the given material "E" from culture plate. 06
6. Describe the structure, make a illustrative diagrams of given apparatus and describe its principle of working and uses. 06
7. Give the name of the disease and the causal organism of the specimen 1-5. 05
8. Comment upon the spots 1-5. 10
9. Practical records, Chart, Model etc. 16
10. Viva-voce. 08

R. S. Mehta  
27/9/16

Abhinav  
27/9/16

H. P. Sharma  
27/9/16

K. S. D. S.  
27.9.16

K. S. D. S.  
27/9/2016

Jyoti Kumar  
27/9/16

K. S. D. S.  
27/9/16

Kamini Kumar  
27.9.16

## Semester IV

## Paper 15

EC BOT(P)415 - C

**Special Practical Paper –Cytogenetics, Plant Breeding,  
Molecular Biology & Plant Biotechnology**

Full Marks: 80

Credits 10

Time : 06 Hrs.

Three questions are compulsory carrying following marks: Spotting-10; Practical record Chart and Model- 16 and Viva voce-10. Questions of 46 marks are to be set covering entire syllabus as mention below.

1. Mitotic chromosome in plant material : Karyotype study of *Allium cepa*, *A. sativum* and *Vicia faba*.
2. Study of meiotic chromosomes : *Allium cepa*, *Rheo discolor*, *Tradescantia*.
3. Pollen study : Pollen fertility and sterility of *Allium cepa*, *Rheo discolor*, *Pisum sativum*.
4. Schedule for Plant Breeding experiment :
  - (a). Floral morphology and Emasculation.
  - (b). Bagging.
  - (c). Records and labelling.
5. Biostatistics : Chi square test, t-test, Standard deviation and Standard Error.
6. Preparation of culture media.
7. Inoculation : Culture of plant tissue or organs on a suitable media.
8. Techniques : Isolation of DNA.
9. Study of mitotic and meiotic abnormalities from permanent slides and photographs
10. Comment upon spots 1-5.
11. Class records, charts, models etc.
12. Viva-voce.

*Rajni*  
27/9/16

*Akhindara*  
27/9/16

*Kandir*  
27.9.16

*H.P. Sharma*  
27/9/16

*Arjun* 27/9/2016  
*Jyoti Kumar*  
27/9/16

*27.9.2016*

*Kamini Kumar*  
27.9.16

## Semester IV

## Paper 15

Course-code: ECBOT (P) 415 – D

## Special Practical paper – Plant Physiology, Biotechnology &amp; Molecular Biology

Full Marks: 80

Credits 10

Time : 06 Hrs.

Practicals are to be based on theory paper 12 & 14. Questions in the practical paper may be asked as per model given below:

1. Preparation of 250 cc of MS medium supplemented with 2mg/L of 2,4-D and dispensing into 25 cc tubes containing 10 cc each. 08
2. Inoculation of seeds/ embryo/ apical meristem/axillary buds. 05
3. Identify Auxin through proper Bioassay. 10
4. Isolation of bacterial culture by streaking method. 05
5. Separation of chlorophyll pigments by paper chromatography. 06
6. Electrophoretic system for separation of DNA. 06
7. Preparation of synthetic seeds. 06
8. Comment upon spots 1-5. 10
9. Practical records, Model and Chart etc. 16
10. Viva – voce 08

R. S. Mehta  
27/9/16

A. K. Mishra  
27/9/16

H. P. Sharma  
27/9/16

K. S. Singh  
27/9/2016

P. S. Singh  
27/9/2016

K. S. Singh  
27-9-16

Jyoti Kumar  
27/9/16

Kamini Keshri  
27.5.16

## Semester IV

## Paper 15

Course-code: ECBOT (P) 15- E

408-E

## Special Practical Paper – Plant Taxonomy, Ethnobotany and Medicinal Plants

Full Marks: 80

Credits 10

Time: 03 Hrs.

Practicals are to be based on special theory paper 12 & 14. Questions in the practical paper may be asked as per the given model.

1. Workout Specimen **A** and identify the family and find out the botanical name of the specimen with the help of any flora. 10
2. Prepare suitable preparation of specimen **B** and find out *stomatal index*. Draw suitable diagram and comment on your observation. 10
3. Prepare a key with suitable diagram for identification of specimen **C, D and E**. 06
4. Identify at least two different cell tissue from macerated material **F** supplied to you. Comment on your observation. 04
5. Comment on active principles of specimen **G, H and I**. 06
6. Spotting Identify herbarium 1-5 (Plants of medicinal value). 05
7. Identify the angiospermic plants on spots 6-10 (only botanical names & family). 05
8. Spotting – Give botanical name family and uses of Specimens 11-15 (Plants of Ethnomedicinal Values). 10
9. Practical record. Chart Model Specimen. Field report etc. 16
10. Viva – voce. 08

Ric Me  
27/9/16

Abhinav  
27/9/16

H.P. Sharma  
28/9/16

Kaushik  
27.9.16

Kamini Kumar  
27.9.16

Jyoti Kumar  
27/9/16

Arjun  
27/9/2016

27.9.2016



## Semester IV

## Paper 16

Course-code: PWBOT416 (A,B,C,D,E) 4124

## Project Work

Full Marks: 100

Credits 10

Time : 06 Hrs.

## A. PROJECT THESIS- FORMAT

A project should be completed on a given topic from the concerned special paper.

The topic of project should be completed under following heads:

1. Introduction
2. Review literature
3. Materials and Methods
4. Results
5. Discussion
6. Reference

The practical of project should be completed either in the Departmental laboratory/ Institution.

## B. EXAMINATION

The practical examination of the Project will be conducted in the Department of Botany, Ranchi University, Ranchi. The distribution of marks will be as follows:

- |  |    |
|--|----|
| 1. Assessment of Project Thesis.   | 70 |
| 2. Describe in brief your work on project with its significance.                                     | 10 |
| 3. Eminent Scientists related to your project work Scientific Journals related to your project work. | 10 |
| 4. Viva voce.  | 10 |

Rishi  
27/9/16

Ashwini  
27/9/16

H.P. Sharma  
28/9/16

Kendur  
27.9.16

Kamini Kumar  
27/9/16  
27.9.16

Kidm  
27/9/2016

27.9.2016