

DEPARTMENT OF BOTANY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. BOTANY

Semester - II

SESSION : 2024-25



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

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SYLLABUS AND MARKING SCHEME FOR M. Sc. (BOTANY)

SECOND SEMESTER

Session 2024-2025

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I CC- MBO201	Genetics	80	16	20	04	05
II CC- MBO202	Taxonomy of Angiosperm	80	16	20	04	05
III CC- MBO203	Molecular Biology	80	16	20	04	05
IV CC- MBO204	Plant Metabolism	80	16	20	04	05
V	Lab Course I - based on paper I and II	100	33			04
VI	Lab Course II - based on paper III and IV	100	33			04
	Total	520		80		28

*CC – Course Code

04 Theory papers - 320

04 Internal Assessments - 80

02 Practical - 200

Total Marks - 600

Note: 1. 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical/Project work

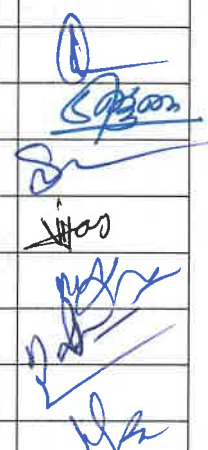
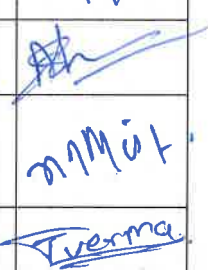






**M.Sc. (BOTANY) SCHEME 2024-2025
SEMESTER – II, LAB COURSE**

LAB COURSE-1 (4 Hrs)	100
Part – I Exercise based on Genetics	20
Part - II Exercise based on Taxonomy of Angiosperm	30
Part – III Spotting	15
Part – IV Field Study	15
Part – V Viva- Voce	10
Part – VI Sessional	10

LAB COURSE-2 (4 Hrs)	100
Part – I Exercise based on Molecular Biology	30
Part – II Exercise based on Plant Metabolism	30
Part – III Spotting/ field study	20
Part – IV Viva- Voce	10
Part – V Sessional	10

Name and Signatures of Members Board of Studies

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	
		3. Dr. Satish Kumar Sen	
		4. Dr. Vijay Laxmi Naidu	
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M.Sc. – BOTANY SEMESTER – II

SESSION - 2024-2025

PAPER – I (Course Code- MBO201)

GENETICS

Max. M. - 80

Min. M. - 16

UNIT-I

- **Chromatin Organization:** Chromosome structure and packaging of DNA, molecular organization of centromere and telomere, chromatin and heterochromatin, banding pattern, Karyotype. Ribosomal RNA genes.
- **Special types of chromosomes:** Polytene, lamp brush, B chromosomes and sex chromosomes & Sex determination in plants.
- **Cytoplasmic inheritance:** Mitochondrial DNA & Cytoplasmic male sterility in plants.

UNIT-II

- **Structural alterations in chromosomes:** origin, meiosis and breeding behaviour of duplication, deficiency, inversion and translocation heterozygotes;
- **Numerical alterations in chromosomes:** Aneuploids - monosomic, nullisomic, trisomic and tetrasomic; Euploids - haploids and polyploids; origin & production of autopolyploids, allopolyploids.
- **Genetics of prokaryotes and eukaryotic organelles:** Phage phenotype, genetic recombination in virus & bacteria (transformation, conjugation and transduction in bacteria).

UNIT-III

- **Genetic recombination-** Mechanism of crossing over, molecular mechanism of genetic recombination.
- Role of Rec-A, Rec-B, Rec- C and Rec-D enzymes.
- Homologous & Site specific recombination,
- Linkage - theories, types mechanism & linkage group.

UNIT-IV –

- **Chromosome inheritance:** Chromosome theories, mendelian laws, gene interaction.
- **Transposones:** transposable elements in prokaryotes and eukaryotes.
- **DNA damages & Repair:** mechanisms, inherited human diseases and defects in DNA repair.


3





Laboratory Exercise

- Problems on genetics: based on inheritance / interaction / crossing over / linkage.
- Karyotype analysis (Slide/ Photograph).
- To study the salivary gland chromosomes from Chironomous larva.

Recommended Books:-

- Ahluwalia K.B 2005 (First Edition). Genetics. New Age International Private Ltd. Publishers, New Delhi.
- Gardner and Simmons Snustad 2005 (Eighth Edition). Principles of Genetics, John Wiley and Sons, Singapore.
- Gupta P.K Genetics , Rastogi Publications.
- Karp, G. 1999. Cell and Molecular Biology : Concept and Experiments. John Wiley and Sons, Inc., USA.
- Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
- Lewis, R. 1997. Human Genetics: Concepts and Application (Second Edition). WCB McGraw Hill, USA.
- Pawar C.B 2003 (First Edition). Genetics Vol. I and II. Himalaya Publishing House, Mumbai.
- Russel, P.J. 1998. Genetics (Fifth Edition). The Benjamin/Cummings Publishing Company IND., USA.
- Sariau C 2004 (Sixth Edition) Genetics. TATA McGraw-Hill Publishing Company Ltd., New Delhi.
- Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc., USA.
- Strickberger 2005. (Third Edition). Genetics. Prentice Hall of India Pvt. Ltd., New Delhi.
- Verma and Agarwal, Genetics, S. Chand Co, New Delhi.. 20. Singh B.D 2004. Genetics. Kalyani Publication, Ludhiana.

Outcome:-

- Analyzing the structure of chromosomes and how the packaging of DNA occurs. Students can differentiate Euchromatin and Heterochromatin region of chromosome on the basis of staining properties.
- Students can draw a good karyotype and Idiograms of Karyotype, and also how the evolution of Karyotype takes place.
- Evaluating the different structural and numerical changes why? And how? It occurs in the chromosome students, can able to use the trisomic and monosomic for the chromosomes mapping.
- Categorizing the role and process of mutation and different mutagenic agent which brings about mutation in the organism.
- Students will also understand the role of mutation in crops improvement and permutation.
- Understanding of the history of gene from 'something', 'factor'; and gene and one gene one enzyme one character hypothesis.
- Students will also know the interaction of gene, genetic recombination producing the characters differently.

4



Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:



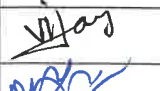


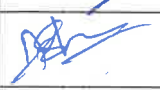
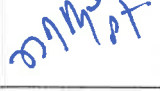





1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :
 - Q.1 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
 - Q.2 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
 - Q.3 Short answer type question (Answer in 200-250 words) **(04 Marks)**
 - Q.4 Long answer type questions (Answer in 400-450 words) **(12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
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Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
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 - i. Internal Test in each paper (20 marks)
 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar.(20 marks)
 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

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M.Sc. – BOTANY SEMESTER – II

SESSION - 2024-2025

PAPER – II (Course Code- MBO202)

TAXONOMY OF ANGIOSPERMS

M.M. - 80

Min. - 16

UNIT-I

- **Taxonomy Tools-** Herbarium, Floras.
- **The species Concepts-** Taxonomic, hierarchy, species, Genus, family and other categories. Principles used in assessing relationship.
- Delimitation of taxa and attribution of rank. Salient features of international code of Botanical nomenclature.

UNIT- II

- **System of Angiosperm classification:** - Phenetic versus Phylogenetic Systems, cladistics in Taxonomy.
- Salient Features of the systems Proposed by Bantham and Hooker, Hutchinson, Takhtajan and Cronquist.
- **Taxonomic evidence** - Morphology, Anatomy, Palynology, Embryology-Cytology and Phytochemistry.

UNIT – III

- **Diversity of flowering plants:** General account of following families -
 - Dicotyledons – Polypetalae.
 - Ranales – Ranunculaceae, Magnoliaceae, Annonaceae, Nymphaeaceae.
 - Geraniales – Rutaceae, Meliaceae.
 - Myrtales – Myrtaceae, Lythraceae.

UNIT – IV

- **Diversity of flowering plants:** General account of following families -
 - Dicotyledons – Gamopetalae –
 - Asterales – Compositae,
 - Lamiales –Lamiaceae, Verbenaceae.
 - Monochlamydeae – Polygonaceae, Euphorbiaceae.
 - Monocotyledons – Musaceae, Liliaceae, Palmaceae, Cyperaceae.

Laboratory Exercise

❖ Description and classification of the following plants.

Dicot:

1. Polypetalae –

a. *Delphinium*

b. *Annona sp.*

c. *Polyalthia*

longifolia

d. *Nymphaea sp.*

e. *Azadirachta indica*

f. *Melia azadirach*

g. *Callistemon sp.*

h. *Lagerstromia sp.*

2. Gamopetalae –

a. Members of

Astereceae

b. *Oscimum sp.*

c. *Hyptis*

d. *Lippianodiflora*

e. *Vitex negundo*

f. *Duranta sp.*

3. Monochlamydae –

a. *Polygonum sp.*

b. *Antigonanleptopus*

c. *Croton sp.*

4. Monocot:

a. *Musaceae – Musa sp.*

b. *Liliaceae – Allium*

cepa

c. *Cyperaceae – Cyperus*

rotandus

Recommended Books

- Mathur, R.C., Systematic Botany of Angiosperms.
- Rajkumar, Systematic Botany.
- Tyagi, Y.D. and Kchhetrapal, An Introduction to the Taxonomy of Angiosperms.
- Sumbhamusthi, v.S.S., Taxonomy of Angiosperms.
- Singh and Pandey, Jain, A Text book of Botany- Angiosperms.
- Chopra, G.L., Angiosperms.

Outcome :-

1. Student will able to get knowledge about taxonomic tools, species concept, ICBN, systems of classification and taxonomic evidences.
2. They will understand the diversity of flowering plants including dicots and monocots, their economic importance.
3. Student willable to identify scientifically the plants up to species level around their locality.

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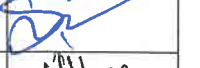
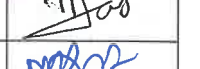





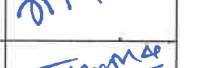


Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
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M.Sc. – BOTANY SEMESTER – II

SESSION - 2024-2025

PAPER – III (Course Code- MBO203)

MOLECULAR BIOLOGY

Max. M. 80

Min. M. 16

UNIT – I

- **DNA:** structure - A, B and Z forms, replication, RNA editing, RNA Splicing
- **tRNA:** Structure and function.
- **Protein Synthesis:** mechanism of protein synthesis, transcription in prokaryotes & eukaryotes, translation.

UNIT – II

- **Proteins sorting:** targeting of proteins to organelles.
- **Mutations:**
 - spontaneous and induced mutations, physical and chemical mutagens,
 - Molecular basis of gene mutations.
- Site directed mutagenesis.
- Robertsonian translocation, B-A translocation.

UNIT – III

- **Gene structure and expression:** fine structure of gene, Cis-trans test, fine structure analysis of eukaryotes, introns and their significance.
- Regulation of gene expression in prokaryotes (operon circuit) and eukaryotes (Britten-Davidson model).
- **Molecular Genetic mapping:** Genetic markers: RFLP, RAPD, AFLP, VNTRs.

UNIT – IV

- **Molecular Cytogenetics:**
 - Nuclear DNA content;
 - C - value paradox, cot curve and its significations,
 - Restrictions mapping, concept and techniques
- **Alien genes transfer through chromosomes manipulations:** transfer of whole genomes from Wheat, Brassica, Arachis; transfer of individual chromosomes and chromosomes segments; Inbreeding and heterosis.

Laboratory Exercise:

- Separation of proteins by SDS PAGE.
- Separation of plant DNA by Agarose Gel Electrophoresis.
- Isolation of DNA by CTAB Method.
- Isolation of plant DNA and quantification by UV spectrophoretic method.

- Restriction digestion of plant DNA, its separation by Agarose Gel Electrophoresis and visualization by ethidium bromide staining.
- Isolation of plant DNA from Onion (house hold method)

Recommended Books:-

- Albert Etal 2002 (Fourth Edition). Molecular Biology of the cell, Garland Science (Iaylor and Francis) New York Group (wt)
- Buchanan B.B, Gruissm W. and Jones R.L 2000. Biochemistry and Molecular Biology of Plant. American Society of Plant Physiologist, Maryland, USA.
- Cooper G.M and Hausman R.E 2007 (Fourth Edition). The Cell molecular approach Sinauer associate, Inc, Suderland (USA).
- De Robertis and De Robertis 2005 (Eight edition) (Indian) Cell and Molecular Biology, Lippincott Williams, Philadelphia. [B.I Publications Pvt. Ltd. New Delhi].
- Gerald Karp 1999 Cell and Molecular Biology- Concept and Expts. John Wiley and ScneIne., USA.
- Gupta P.K Cell and Molecular biology Rastogi Publications.
- Gupta P.K, Cytogenetics Rastogi Publications.
- Krishnamurthy, K.V 2000. Methods in Cell Wall Cytochemistry. CRC Press, Boca Raton, Florida.
- Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
- LodishEtal 2004 (Fifth Edition). Molecular Cell Biology, W H Freeman and company, New York.
- Powar C.B 2005 (Third Edition). Cell Biology, Himalaya Publishing, Mumbai.

Outcome:-

- To learn the biochemical nature and types of nucleic acids, their functions in living systems.
- To understand the process of proteins synthesis in prokaryotes and eukaryotes.
- To know the protein targeting to organelles.
- To obtain knowledge about mutation
- To know gene regulation in prokaryotes and eukaryotes.
- To construct the molecular map of genome (RFLP, RAPD, AFLP, VNTRs).
- To construct restriction mapping of DNA and measure DNA content of a cell.
- To study of chromosomal manipulation for obtaining a desire characters and improve quality in crops.




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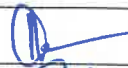

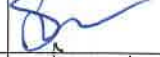
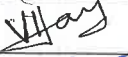





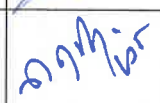


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M.Sc. – BOTANY SEMESTER – II

SESSION - 2024-2025

PAPER – IV (Course Code- MBO204)

PLANT METABOLISM

M.M. – 80

Min. - 16

UNIT - I

- **Photochemistry & photosynthesis:**
 - General concepts & historical background.
 - Evolution of photosynthetic apparatus, photosynthetic pigments & light harvesting complexes.
 - Photooxidation of water, mechanism of electron & proton transport (Hill reaction).
 - Carbon assimilation- the Calvin cycle, C4 cycle, CAM pathway.
 - Photorespiration & its significance.
 - Biosynthesis of Starch & Sucrose.

UNIT – II

- **Respiration & Lipid Metabolism:**
 - Overview of Plant respiration, Glycolysis, TCA cycle, electron transport & ATP synthesis, Pentose Phosphate pathway,
 - Glyoxalate pathway,
 - Alternative Oxidase system,
 - Structure & function of lipids fatty acid biosynthesis, synthesis of membrane lipids, structure lipids & storage lipids & their catabolism.

UNIT– III

- **Nitrogen & Sulphur Metabolisms:-**
 - Biological Nitrogen fixation. Nodule formation & Nod factors.
 - Mechanism of Nitrate uptake & reduction, ammonium assimilation. Nitrate and ammonium assimilation; amino acid biosynthesis. Sulphur uptake, transport & assimilation.
 - Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

UNIT – IV

- **Sensory Photo-Biology :-**
 - Sensory photobiology - Structure, function and mechanisms of action of Phytochromes, Cryptochromes and Phototropins. Photophysiology of light induced responses.
 - The flowering process: Photoperiodism & its significance, vernalization - floral induction & development genetic & molecular analysis. Flowering as a multi-organ function, floral induction, evocation and development. Regulation of flowering by light and temperature.



Role of circadian rhythm. Involvement of hormones. Genetic, molecular and biotechnological aspects, manipulation of flowering and floriculture.

- Endogenous clock & its regulation.

Laboratory Exercise

- Extraction and separation of chloroplast pigments by chemical method by Separating funnels.
- Separation of chloroplast pigments by Paper chromatography.
- Separation of plant pigments by Column chromatography.
- To demonstrate Hill's reaction.
- Separation of amino acids by Paper chromatography.
- To determine the rate of photosynthesis under different concentration of CO₂ / different light intensity / different colours of light.
- Demonstration of fermentation by Kuhne's vessel.
- To determine RQ by Ganong's respiroscope/ Hare's respiroscope.
- Protein test by Xanthoproteic reactions / Million's reaction.
- Demonstration of Catalase activity / Peroxidase activity / Dehydrogenase activity / Amylase activity.

Recommended Books

- Cell Physiology by Giese.
- Plant Physiology by Bidwell.
- Plant Physiology by Subhash Chandra Dutta.
- Plant Physiology by Noggle and Frutz.
- Plant Physiology by Devlin.
- Plant Physiology by Taiz and Zeiger.
- Photosynthesis by Robinowitch and Govindjee.

Outcome:-

- Students understand the the rate of photosynthesis influence the productivity of agricultural crops. It ensures that all living species have access to oxygen in the atmosphere and their effects in global concerns.
- Through this units Nitrogen and Sulfur are essential nutrients for plants, and their metabolism is crucial for various physiological processes and overall plant growth and development.
- Students understand the phytochrome system to sense the change of season. Photoperiodism is a biological response to the timing and duration of day and night. It controls flowering, setting of winter buds, and vegetative growth. Detection of seasonal



changes is crucial to plant survival.

- With the help of plant respiration units' students understand, the metabolism in plants of organic molecules using enzymes to generate usable energy in the form of adenosine triphosphate (ATP). Through these units students understand importance of respiration in plants is crucial for their survival, growth, and overall metabolism. Respiration in plants refers to the process by which cells break down organic molecules (such as sugars) to release energy in the form of ATP (adenosine triphosphate).
- Outcome of the flowering process in plants is the production of flowers, which are the reproductive structures of angiosperms (flowering plants). Flowering plants undergo a series of developmental stages to produce flowers, which are crucial for sexual reproduction. Students understand this chapter flowering process is fundamental to the reproductive success and survival of flowering plants, contributing to biodiversity and ecosystem stability.
- Plants require an endogenous regulatory network and mechanism to cope with diurnal environmental changes and compensate for their sessile nature. Plants use the circadian clock to anticipate diurnal changes.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :


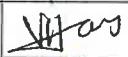
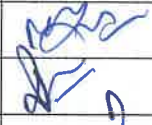
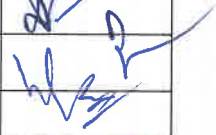
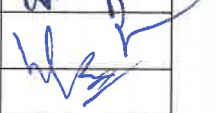



- Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.
Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
4. Internal Assessment Examination will be as follows:
 - i. Internal Test in each paper (20 marks)
 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

Name and Signatures of Members Board of Studies

S. No.	Category	Name of Nominated Members	Signature	
1.	Chairperson	Dr. Ranjana Shrivastava		
2.	Members	1. Dr. G. S. Thakur		
		2. Dr. Shriram Kunjam		
		3. Dr. Satish Kumar Sen		
		4. Dr. Vijay Laxmi Naidu		
		5. Mr. Motiram Sahu		
		6. Dr. Rajeshwari Prabha Lahare		
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)		
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)		
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)		
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)		
6.	Ex Meritorious Student PG	Tanu Verma		
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	