K.V.R.Govt. COLLEGE FOR WOMEN (A), KURNOOL

(Under the Jurisdiction of Rayalaseema University)

Accredited with "A" Grade by NAAC

BOARD OF STUDIES MEETING

2019-20

Subject: M.Sc BOTANY

7-8-2019

K.V.R. Govt. COLLEGE FOR WOMEN (AUTONOMOU), KURNOOL

ACCREDITATED BY NAAC WITH 'A' GRADE

PG DEPARTMENT OF BOTANY

2019-2020

MINUTES OF THE BOARD OF STUDIES MEETING

Board of Studies meeting was conducted in the department of Botany
On 7-08-2019 at 10.00 am with the following members.

S.NO	Name	Designation and Address	Signature
		MEMBERS FROM THE DEPARTMENT	
1	**Dr.R.VINOLYA KUMARI**	**CHAIRMAN**	
2	**Dr.S.SUNITHA**	Member	
3	**Dr. Y.RAGUNATH REDDY**	Member	
4	**Dr. R.VENKATA RATHNAM**	Member	
5	**Dr. BINDU PRASUNA**	MEMBER	
		UNIVERSITY NOMINEE	
6	**PROF. C.SUDHAKAR**	Prof. of Botany Sri Krishna Devaraya University Anathapure	
		SUBJECT EXPERTS	
7	**Dr. A. M. REDDY**	Assistant Professor in Botany Yogivemana University Kadapa	
8	**Dr. G. S.RANGANAYAKULU**	Assistant Professor in Rayalaseema University Kurnool	
		ALUMNAE	
9	**Dr. M. SUSEELAMMA**	SML Govt Degree College Yemmiganor,Kurnool	
		INDUSTRIALIST	
10	**SRI. R.VINOD KUMAR**	The Area Manager National Seed Corporation Kurnool	
		STUDENT REPRESENTATIVES	
11	**CH.LIKITHA**	M.Sc	
12	**P. KRISHNA VENI**	M.Sc	

K.V.R. Govt. COLLEGE FOR WOMEN (AUTONOMOU), KURNOOL

ACCREDITED BY NAAC WITH 'A' GRADE,

Established in 1958 under G.O.Ms.No.197 Edn. Dt.27-01-1958

DEPARTMENT OF BOTANY

CURRICULUM(CBCS)- M.Sc (Botany)

(syllabus W.e.f Academis Year 2019-20)

SEMESTER -1

S.NO	PAPER CODE	TITLE OF THE PAPER	NO OF CREDITS	SEMESTER END EXAM DURATION	TOTAL MARKS IAE	SEE
THEORY						
1	1111	**BIOLOGY AND DIVERSITY OF BACTERIA, FUNGI, VIRUSES &PLANT PATHOLOGY**	4	3	20	80
2	1121	**BIOLOGY AND DIVERSITY OF ALGAE,BRYOPHYTA AND PTERIDOPHYTA AND GYMNOSPERMS**	4	3	20	80
3	1131	**PLANT TAXONOMY**	4	3	20	80
4	1141	**PLANT PHYSIOLOGY**	4	3	20	80
PRACTICALS						
1	1111& 1121	**BIOLOGY AND DIVERSITY OF BACTERIA, FUNGI, VIRUSES &PLANT PATHOLOGY& BIOLOGY AND DIVERSITY OF ALGAE,BRYOPHYTA AND PTERIDOPHYTA AND GYMNOSPERMS**	4	3		100
2	1131& 1141	**PLANT TAXONOMY& PLANT PHYSIOLOGY**	4	3		100

Total credits: 24

SEMESTER -II

S.NO	PAPER CODE	TITLE OF THE PAPER	NO OF CREDITS	SEMESTER END EXAM DURATION	TOTAL MARKS IAE	SEE
THEORY						
1	2111	**CELLBIOLOGY AND PLANT DEVELOPMENT**	4	3	20	80
2	2121	**MOLECULAR GENECTICS AND TECHNIQUES IN BIOLOGY**	4	3	20	80
3	2131	**PLANT BIOCHEMISTRY**	4	3	20	80
4	2141	**OPEN ELECTIVE- PLANT AND HUMAN WELFARE**	4	3	20	80
PRACTICALS						
1	2111& 2121	**CELLBIOLOGY AND PLANT DEVELOPMENT & MOLECULAR GENECTICS AND TECHNIQUES IN BIOLOGY**	4	3		100
2	2131	**PLANT BIOCHEMISTRY**	2	3		50

Total credits : 22

RESOLUTIONS

The members of BOS in Botany met on 7-08-2019 in the Department of Botany, KVR Govt. Degree College for Women(A), Kurnool under the chairmanship of **Dr.R. Vinolya Kumari** Incharge of M.Sc. Botany Course, discussed the proposals on the curriculum for the I year PG Botanty course and passed the following resolutions applicable to the academic year 2019-20.

- Resolved to follow the Rayalaseema university revised syllabus in Botany for I M.Sc., Semester-I and Semester-II as decided by the expert members and members of the Board of Studies (PG) Botany.

- It is unanimously resolved that there is 20% change in theory syllabus for First year M.Sc., The question paper pattern for theory shall have two sections . Section - A for 20 marks and Section - B for 40 marks. IAE: Internal assessment marks -20Marks(Internal examination 15, Seminar5) and extracurricular activity : NSS,YOUTHRED CROSS,NCC.

- The BOS chairman is authorized to give the panel of Internal and external examiners to the controller of Examination

- Resolved to approve the new syllabus in Botany for I M.Sc., Semester-I and Semester-II

- The new syllabus will come into effect from the academic year 2019-20 for I M.Sc. Semester-I and Semester-II.

- Resolved to conduct the practical examinations at the end of Semester-II for I M.Sc. students.

1. In each Semester there will be four papers i.e. four Core papers for Semester-I, for Semester-II There are three paper and one open Elective paper These Semester End Examinations will be for 80 Marks .

2. Internal Assessment Examination will be for 20 Marks.
   There will be two Internal Assessment Examinations in each semester.
   (Average of two to be taken).

   Seminar/Assignment/Project is given the weight age of 5 Marks.

   Total Internal Assessment Marks =15 + 5 = 20 Marks

3. Model Question Paper for Semester End Examination :

   i) The Semester End Examination Question Paper consists of
   Part A with four questions to be answered out of eight questions of five marks each (64x 5 = 20) and

   Part B with four questions of internal choice carrying 15 marks each (4 x 15 = 60)

   ii) Duration is 3 Hours

   iii) Maximum marks are 80 and Minimum Passing marks are 30.

4. Model question paper for IAE.

   i) Internal Assessment Examination will be for 20 marks.
   ii) One big question and one short answers
   iii) Duration of Internal Assessment Examination is 45 minutes.
   iv) The above pattern stands for Semester-I and Semester-II.

5. Practical Examination:-

i) There will be **one** Practical Examination at the end of Semester-II.

ii) Maximum marks for Practical Examination is 100.

iii) Minimum passing marks for Practicals are 20.

iv) Duration of Practical Examination is 3 hours.

v) There will be no Internal Assessment Examination in Practical Examination.

Scheme of valuation for each suject paper Practical Examination:

Practical-I

i)	Major Experiment	20 Marks
ii)	Minor Experiment	10 Marks
iii)	Spotters	10 Marks
iv)	Record	05 Marks
v)	Viva	05 Marks
	Total =	50 Marks

6. Resolved to approve the syllabus (Theory Semesters I, II) as prescribed below

7. Resolved to approve the Model Papers for I-M.Sc. Semester-Iand Semester-II as per

8. Resolved to follow the CBCS Semester pattern with a total of 96 Credits for 2400 marks. In each semester :
   - Four instructional hours per week has been given four Credits for Theory and
   - Three instructional hours per week considered as two credits for Practicals.
   - Each open Elective has been given four credits
   - Dissertation of Project work in last semester along with Viva and Seminar has been given four credits.

SEMESTER -1

BOT1111- BIOLOGY AND DIVERSITY OF BACTERIA, FUNGI, VIRUSES &PLANT PATHOLOGY

Unit-I: Bacteria and Phytoplasma

General account; classification, ultrastructure, cell wall of bacteria, nutrition, reproduction: fission and genetic recombination (transformation, transduction and conjugation), economic importance (useful and harmful aspects) , symbiotic and asymbiotic nitogen fixation by bacteria. Phytoplasma; general characteristics and economic importance.

Unit- II: Fungi

General characteristics of fungi, cell wall composition, nutrition: (Saprobic, biotrophic, symbiotic); reproduction: (vegetative, asexual, sexual), heterothallism, Heterokaryosis; Para sexuality, recent trends in classification and Ainsworth's classification of fungi. economic importance of fungi (in industry, as medicine and food, biocontrol agents). Lichens: structure and reproduction, mycorrhizae. Mushroom cultivation methods

Unit-III: Viruses

General characters, virus genetic material, ultrastructure of virions, isolation and purification of viruses; chemical nature, replication and transmission of viruses (by grafting, seeds,contact, water, air, soil, agricultural tools, insects). Economic importance of virus. viral diseases in plants. Viroids and Prions.

Unit –IV: Plant Pathology

Classification of plant diseases and symptomology. Mechanism (s) of pathogenesis and resistanc and disease control measures (physical, chemical and biological control). Case studies of economically important causative agents with special reference to crop plants. Plant-virus interaction with emphasis on-TMV & BYMV, Plant-bacterial interaction with emphasis on blight of paddy & citrus canker; Plant-fungus interaction with emphasis on-downy mildew of bajra, club root of crucifers, red rot of sugarcane, leaf spot and tikka diseases of groundnut. Beneficial interactions of mycorrhizae.

Practicals:

1. Gram staining of Bacteria
2. Demonstration of motility in Bacteria.
3. Determination of microbial counts by using Heamocytometer.
4. Morphological study of fungi belonging to Myxomycota, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina
5. Observation of properties and fixatives of various viruses
6. Study of symptomology of locally available diseased specimens.
7. Isolation of fungi from soil: media preparation, dilution plate technique.

8. Study of Crustose and Foliose lichens
9. Mushroom cultivation

Suggested Readings:

1. Ainsworth G.C., E.K.Sparrow & A.S.Sussman, 1973.The Fungi-An advanced treatise. Academic Press.
2. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. 1996. Introductory Mycology. John Wiley & Sons Inc.
3. Bilgrami, K.S. & H.C. Dube (1990) : A Text Book of Plant Pathology, Vikas publishing House Pvt., Ltd.,New Delhi, India.
4. Burnett, J.H. (1968) : Fundamentals of Mycology. Edward Arnold (Publishers) Ltd., London. 5.

Dube, H.C . (1992) : A Text Book of fungi, Bacteria & Virus, Vikas Publishing House (P) Ltd., New Delhi.
5. Mandahar, C.L. 1978. Introduction to Plant viruses. Chand & Co., Ltd., Delhi.
6. Mehrotra, R.S. and Aneja, K. R. 1998. An Introduction to Mycology. New Age International Press.
7. Mehrothra, R.S (1994) : Plant Pathology, Tata McGraw Hill Publishing Co., Ltd., New Delhi 9. Pandey, B.P. (1999) : Plant pathology-Pathogens & Plant Diseases, S. Chand & Co., New Delhi-492 pp.,
8. Pelczar, M.J., E.C.S.Chan & N.R.Krieg. 1986. Microbiology. Tata McGraw Hill, New Delhi. 11. Rangaswamy, G. and Mahadevan, A. 1999. Diseases of Crop Plants in India (4th Ed.) Prentice Hall of India Pvt. Ltd., New Delhi.
9. Sharma, P.D. 2000. Plant Pathology. Narosa Publishing House, India.
10. Singh, R.S. (2000) : Introduction to Principles of Plant pathology (3rd Edition), Oxford & IBH Publishers, New Delhi.
11. Sullia, S.B. and Shantharam, S. 2000. General Microbiology. Oxford & IBH Publ. , New Delhi.
12. Webster, J. (1999) : Introduction to Fungi (2nd edition), Cambridge University Press 16. R. Hall (2005). Plant Virology. Printice Hall

BOT 1121: BIOLOGY AND DIVERSITY OF ALGAE, BRYOPHYTA, PTERIDOPHYTA &GYMANOSPERMS

UNIT – 1: ALGAE

General characters of algae -thallus diversity, pigmentation . Recent trends in classification of algae - a general account. Salient features and classification of Cyanophyta , Rhodophyta, Phaeophyta, Bacillariophyta and Chlorophyta. Economic importance of algae: Algae as food, biofertilizers; industrial products; biofuels; harmful algae-algal blooms.

UNIT II: BRYOPHYTES

General characters and classification of Marchantiophyta; Anthoceratophyta and Bryophyta. Salient features of the orders and representatives: Marchantiales (Marchantia), Jungermanniales (Porella), Anthoceratales (Anthoceros) and Polytrichales (Polytrichum). Diversity and evolution of gametophyte and sporophyte. Ecology and Conservation of bryophytes.

UNIT III: PTERIDOPHYTES

General characters and classification of pteridophytes. salient features of representatives: Psilotopsida (Psilotum), Lycopsida (Lycopodium), Equisitopsida (Equisetum), Marratiopsida (Angiopteris) and Polypodoppsida (Pteris). Origin and phylogeny of pteridophytes- telome theory , stelar theory. Heterospory and Seed habit.

UNIT IV: GYMNOSPERMS AND PLANT FOSSILS

General characters and classification of divisions and salient features of representatives: Cycadophyta (Cycas), Pinophyta (Pinus), Ginkgophyta (Ginkgo) and Gnetophyta (Gnetum). Economic importance of gymnosperms. Principles of Paleobotany - process of fossilization; types of fossils. Salient features and evolutionary significance of fossil gymnosperms - Pteridospermales and Bennititales.

PRACTICALS

1. Observation of representatives of all groups in the natural habitat.
2. Morphological study of representative members of all groups using whole mount preparations and sections.
3. Study of morphology and anatomy of vegetative structures of Algae, Bryophytes, Pteridophytes and Gymnosperms
4. Each student has to submit herbarium specimens and a report on field study.

5.Study of fossils from Pteridophytes andGymnosperms.

SUGGESTED READINGS:

Agashe S.N. 1995. *Paleobotany*. Oxford & IBH, NewDelhi

Bernard Goffinet & Jonathan Shaw. 2008. *Bryophte Biology*. 2nd ed. Cambridge University Press.

Bhatnagar, S.P. & Alok Mitra. 1997. *Gymnosperms*. New Age Int. (P) Ltd.

Charles C. Beck and Charles B. Beck. (Ed). 1988. *Origin and Evolution of Gymnosperms.* CUP.

Chopra, R.N. & P.K. Kumar. 1988. *Biology of Bryophytes*. Wiley Eastern.

Graham, J.E., Lee, W. Wilox & L.E. Graham. 2008. *Algae*. 2nd ed. Benjamin Cummings

Sambamurthy AVSS. 2005. *A Text Book of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany.* IK International Pvt. Ltd.

Sporne, K.R. 1965. *Morphology of Gymnosperms.* HUP, London

Sporne, K.R. 1976. *Morphology of Pteridophytes.* HUP, London

Van den Hoek , Christian D. Mann & H.M. Jahns *et al*. 1995. *Algae, An introduction to phycology.* Cambridge University Press.

Vashista, P.C. 2005. *Gymnosperms.* S.Chand & Co., New Delhi

Vashista, P.C. 2005. *Pteridophyta.* Revised ed., By Sinha and Anil. S. Chand & Co, New Delhi.

Vashishta, B.R., V.P.Singh & A.P. Sinha. 2012. *Botany for Degree Students: Algae*. 34th ed. S. Chand & Co, New Delhi.

Vashishta, B.R., A.K. Sinha & Adarsh Kumar . 2011. *Botany for Degree Students Part III Bryophyta..* 3rd ed. S. Chand & Co, New Delhi

PAPER BOT 1131: PLANT TAXONOMY

UNIT – 1: ANGIOSPERMIC CLASSIFICATION AND PHYLOGENY

Plant taxonomy- scope and significance. History of plant classifications: Artificial, Natural and Phylogenetic classifications. Natural system- Bentham and Hooker's classification. Principles of phylogenetic classifications–data sources; Plesiomorphy, apomorphy; monophylly and polyphylly. Cladograms and Phylogenetic trees. Angiospermic Phylogeny Group classification (APG-III). Clades, Orders and Families. A Comprehensive account on origin, phylogeny and diversification of angiosperms.

UNIT –II: FLORISTIC STUDIES AND HERBARIUM METHODOLOGY

Plant explorations around the world – a general account. Floristic inventories in India – a general account. Botanical Survey of India - organisation and activities. Flora of Andhra Pradesh – a general account; endemic plants and threatened taxa. Herbarium methodology- methods of collection, processing and preservation of plant specimens. Significant herbaria of the world and India.

UNIT – III: PLANT IDENTIFICATION AND NOMENCLATURE

Process of identification- conventional and modern approaches; Preparation of taxonomic keys. Taxonomic literature- floras, journals and databases. International Code of Nomenclature(ICN)- Principles, Rules and Recommendations; taxonomic hierarchy-species, genera and families; typification , rule of priority; concept of names and author citation; effective and valid publication. Describing a new species.

UNIT – IV: STUDY OF SELECTED ANGIOSPERMIC CLADES-ORDERS

Salient features , distribution and diversity of the following groups (based on APG –III); ANITA Grade; Magnolids (Magnoliales- Annonaceae); Monocots (Asparagales- Orchidaceae); Commelinids (Poales- Poaceae); Fabids (Fabales- Fabaceae, Malphigiales- Euphorbiaceae); Malvids (Malvales- Malvaceae, Caryophyllales-Amaranthaceae); Lamids (Gentianales- Apocyanaceae, Solanales- Solanaceae, Lamiales- Lamiaceae); Campanulids (Asterales- Asteraceae).

PRACTICALS

1. Study of about 25 wild taxa representing different families and identification to species level
2. Study of flora of the college campus
3. As a part of Botanical Tour, student should observe and record the flora and vegetation types of the study area and submit a report at the time of practical examination
4. Part of practical, student should submit 50 herbarium specimens of common wild plant taxa
5. Construction of Taxonomic Keys
6. Nomenclatural exercise

SUGGESTED READINGS:

Angiosperm Phylogeny Group website. 2015. Consult www.apgweb.

Gamble & Fischer1915-35. *Flora of Presidency of Madras.* 3 Vols. BSMS, Dehradun

Heywood, V.H., RK Burmmitt, A. Culham, O. Seberg. 2007. *Flowering plant Families of the World.* Firefly books Ltd. New York.

Judd, W.S., Christopher, S. Campbell,Elizabeth A. Kellogg, Peter F. Stevens and Michael J. Donoghue. 2007. *Plant Systematics: A Phylogenetic Approach*, 3rd ed. Sinauer.

Lawrence, G.H.M. 1951. *Taxonomy of vascular plants.* McMillan , New York.

Naik, V.N. 1992. Taxonomy of Angiosperms. 2nd Edn. Tata Mc Graw Hill Publications.

Pullaiah, T. 2005. *Taxonomy of Angiosperms.* Regency publications, New Delhi.

Pullaiah, T. *et al*. 1997. *Flora of Andhra Pradesh.* 4 Vols.Scientific Publishers, Jodhpur

Radford, A.E. *et. al. Vascular plant systematic.* Harper & Row. New York.

Ravi Prasad Rao,B. 2014. *The Plant Directory*. Anusha Publishers, Hyderabad.

Simpson, Michael G.2006. *Plant Systematics.* Elseiver & Academic Press.

Singh, Gurucharan. 2005. *Plant Systematics.* Oxford & IBH. New Delhi.

Sivarajan, V.V. 1991. *Introduction to Principles of Plant Taxonomy.* Oxford & IBH. New Delhi.

BOT1141 : PLANT PHYSIOLOGY

UNIT I: PLANT AND SOIL WATER RELATIONS

Thermodynamic concept of plant cell and water relations. Water Potential, Osmotic potential and Pressure potential. Dynamics of SPAC. Active and Passive absorption of Ions. Essential elements- functions and deficiency symptoms. Stomatal structural features; mechanism of stomatal movements and stomatal Index. Stomatal responses to environmental factors, antitranspirants and their importance in drought resistance.

UNIT II: PHOTOSYNTHESIS

Current knowledge on mechanism of photosynthesis- LHCs, photochemical reactions, electron transport in chloroplasts. photophosphorylation. Carbon fixation pathways- Reductive PPP and its regulation by light and metabolites; C4 pathway; CAM Pathway; C-3, C-4 Intermediates. Photosynthesis vs. Plant productivity. Photorespiration- Glycolate pathway, Significance of photorespiration.

UNIT III: RESPIRATION AND PLANT GROWTH REGULATORS

Significance of Plant Respiration; Glycolysis, TCA Cycle, ETS and ATP synthesis. Pentose Phosphate Pathway. Glyoxylate cycle, Alternate oxidase system. Biosynthesis and mechanism of action of plant growth regulators- Auxins, Gibberellins, Cytokinins, Brassinosteroids, Abscissic acid, Jasmonic acid and salicylic acid. Role of hormones in agriculture. Physiology of flowering-Kinetics of phytochrome; Photoperiodism

UNIT IV: STRESS pHYSIOLOGY: Concept of stress and strain; Kinds of stress; Abiotic stress-Water stress; Salt stress; Temperature stress; Heavy metal stress; Biotic stress factors-Stress avoidance and tolerance mechanisms; structural, physiological, biochemical and molecular responses of plants to environmental stress; Reclamation of saline soils and heavy metal contaminated soils.

PRACTICALS

1.Determination of total chlorophyll content and a/b ratio in leaves.

2.Extraction and Estimation of Chlorophyll pigments.(Arnan method).

3.Separation of chloroplast pigments into two or four groups. Record of their absorption spectra

4. Determination of cell permeability by using Beet Root tissues.
5. Determination of stomatal index and frequency in leaves
6. Determination of water potential of the tissue
7. Comparative anatomy of C3, C4 and CAM plants
8. Determination of Titrable acidity (TAN) in leaves of CAM plants
9. Determination of viability of different seed material.
10. Estimation of IAA by Solkowski rection
11. Determination of membrane stability and chlorophyll stability index
12. Determination of membrane stability and chlorophyll stability index of stressed plants 8. Estimation of free Proline in stressed plants sample.

SUGGESTED READINGS

Buchannan *et al*., 2001. *Biochemistry and Molecular Biology of plants.*

Delvin ,RM. 1969. *Plant Physiology*. Affiliated East West Newyork Ltd.

Dennis, DT., DB. Layzell, DD. Lefebyre & D. Turpin. 1997. *Plant Metabolism* . 2nd Ed.Addison WeselyPub Co. New York

Govindjee, ed. 1982-83. *Photosynthesis.* Vol I & II. Academic Press Inc. New York.

Hopkins, W. 1998. *Introduction to Plant Physiology*. ELBS & Longman, Essex., England.

Kocchar and Gujral. 2012. *Comprehensive Plant Physiology*. Mac Milan Pub.

Raghavendra, S. 1998. *Photosynthesis: A Comprehensive Treatise*. Cambridge University Press, Cambridge, UK

Salisbury, F.B. and C. S.Ross. 1992. *Plant Physiology.* 4th Ed. Worsworth Publishing & Co. , Belmout , California.

Taiz and E.Zeiger. 1998. *Plant Physiology.* 2nd Edition. Sinauer Assosiates Inc Publishers, Massachuessets, USA

Thomas C. Moore. 1992. *Biochemistry and Physiology of Hormones.* Narosa .

Wilmer, C.M. & M. Fricker.1996. *Stomata.* 2nd Ed, Chapman Hall.

SEMESTER –II

BOT 2111- CELLBIOLOGY AND PLANT DEVELOPMENT

UNIT- I: Cell Communication:

Over view of cell organells: General principles: Cell surface receptors and Intracellular receptors; Forms of Intracellular signaling - Autocrine, Paracrine, Contact dependent, Synaptic and Endocrine signaling; Response of cell to signals; Cell surface receptors - Ion channel linked, G- protein linked and Enzyme linked receptors; Intracellular signaling proteins - Different types and their role; Second messengers; cAMP pathway and role of calcium; Cellular interactions:i) Microvilli, Tight junctions, Belt and Spot Desmosomes. ii) Gap junctions - Electrical coupling, the connexon. iii) Permeability to ions and small molecules. iv) Factor mediating cell-self recognition (aggregation factor), Cellular interaction and Cyclic AMP.

UNIT I1: Cell cycle

- Overview of eukaryotic cell cycle; Regulation of cell cycle by cell growth and extra cellular signals; Cell cycle check points; Regulation of cell cycle progression - Protein kinases; MPF; Cyclins and Cyclin dependent kinases.; Events of M Phase; Cell Death:i) Apoptosis - Definition, Morphological and Biochemical differences between Apoptosis and Necrosis; Mechanism (Intrinsic pathway and Extrinsic pathway), Inhibitors of Apoptosis and Significance. ii) Cancer Development and causes of Cancer; Properties of Cancer cells; Approaches to Cancer treatment.

UNIT I -Tissue types and Tissue systems in Plants:

Root growth and Development: Root apical meristem; Cell division, Cell expansion and elongation. Differentiation of root; vascular tissue, root hair and Lateral roots formation. Stem growth and development: organization of the shoot apex; cytological and molecular analysis of shoot apical meristems. Tissue differentiation in the shoot; xylem regeneration and Phloem differentiation.

UNIT II Leaf and flower development:

Development of leaf, History, Specialized cells and tissue differentiation. Development and Anatomy of flower, including transition to Flowering and reproductive shoot apex.

Practicals:

1. Preparation of Cytological slides for Mitosis using Root tips.
2. Preparation of Cytological slides for Meiosis-I using Flower buds; Chiasma Frequency.
3. Identification of different stages of Mitosis and Meiosis.
4. Study of tissues and Tissue systems.
5. Study of internal organization of different types of stems
6 of internal organization of roots.
7. Study of internal organization of plants showing anomalous secondary growth.

8. Microscopic examination of vertical sections of leaves such as Polyalthia, Ficus, NeriumNymphaea, maize and Wheat to understand the internal structure of leaf tissues and trichomes, glands etc. =
9. Study epidermal peals of leaves to study the development and structure of stomata and prepare stomatal index.
10. Wood maceration.
11. Preparation of permanent slides -5 slides to be submitted at the time of Examination.

Suggested Readings:

1.Cooper Geoffrey, M. - The Cell-A Molecular Approach, ASM Press, Washington.
2.Sharma, A.K & A. Sharma. - Chromosome Techniques: Theory & Practice, Batter Worth.
3.Albert's, A. et al. - Molecular Biology of the Cell, Garland Publishing House, New York.
4.De Robertis, E.D.P. & E.M.F. DeRobertis. - Cell and Molecular Biology, Lippincott Williams & Wilkins, Bombay.
5.Freifelder, D. - Molecular Biology, Narosa Publishing House, New Delhi.
6.Gardener, E. J. & D. P. Snustad - Principles of Genetics, John Willey, New York .
7.Powar, C.B. - Cell Biology.
8.Sambamurthy, A.V.S.S. – Genetics, Narosa Publications, New Delhi
9.Sinnot, E.W., L.C. Dunn & T. Dobzhansky - Principles of Genetics, V Edn, McGraw Hill,

1.Atwell, B.J. Kriedermann, P. E. and Jumbull, C.G.N. (Ed.) 1999. Plants in Action. Adaptation in Nature, performance in cultivation. MacMilan Education, Sydney, Australia.
2.Burgess, J. 1985. An introduction to Plant Cell development. Cambridge Univ. Press, Cambridge.
3.Fahn, A. 1982. Plant Anatomy (3rdEd.), Pergamon Press, Oxford.
4.Fosket, D.E. 1994. Plant growth and Development. A molecular approach, Academic Press, San Diego, USA.
5.Howell, S.H. 1998. Molecular Genetics of Plant Development, Cambridge Univ. Press, Cambridge.
6.Jane, F.W. 1970. The structure of wood. Black, London.
7.Lyndon, R.F. 1990. Plant Development. The Cellular Basis, Unnin Hyman, London.
8.Murphy, T.M. and Thompson, W.F. 1988. Molecular Plant Development, Prentice Hall, New Jersey.
9.Pullaih, T., Naidu, K. C., Lakshminarayana, K. & Hanumantha Rao, B. 2007. Plant Development. Regency Publications, New Delhi.
10.Raghavan, V. 1999. Developmental Biology of Flowering Plants, Springer-Verlag, New York.
11. Steeves, T.A. and Sussex, TM. 1989. Patterns in Plant Development (2ndEd.). Cambridge Univ Press, Cambridge.
11.Waisel, Y., Esnel, A, and Kafkaki U. (Eds.). 1996. Plant Roots. The Hiden Hall (2nd Ed.), New York, USA.

PAPER 2121: MOLECULAR GENETICS AND TECHNIQUES IN BIOLOGY

UNIT I: INHERITANCE, RECOMBINATION AND MAPPING

Mendelian laws of inheritance- an overview.Linkage , Chromosome as a linkage unit , factors affecting linkage; Genetic recombination: types and molecular mechanism of recombination. Factors affecting recombination. Chromosomal mapping; Two factor and Three factor mapping , Mapping by recombinational frequencies. Coefficient of coincidence of double crosses, Interference –types and significance.

UNIT II: MUTATION AND POPULATION GENETICS

Modern concept of gene, Mutations–types. Chromosomal structural aberrations: deficiencies, duplications, translocations, inversions and their significance in evolution. Numerical changes in chromosomes: aneuploidy and euploidy, polyploidy and their significance in evolution; molecular mechanism of mutagenesis.

UNIT III: pH, MICROSCOPY, CENTIFUGATION AND CHROMATOGRAPHY

pH- Measurement of pH, biochemical buffers, Principles and applications of Microscopy- Light microscope, Phase contrast and Electron microscope. Fixation and staining methods. Centrifugation – basic principles of sedimentation, Types of centrifuges. Preparative ultracentrifugation- differential centrifugation, density gradient, analytical ultracentrifugation and applications. General principles, definitions and applications of chromatography. Paper chromatography, thin-layer chromatography, gas-liquid chromatography.

UNIT IV:ELECTROPHORESIS, SPECTROSCOPY AND RADIO ISOTOPE TECHNIQUES

Principles, definition and applications of SDS-PAGE, Agarose gel electrophoresis. Laws of light absorption, Instrumentation and applications of UV-Visible spectrophotometer. Radioisotope Techniques –types of isotopes, radioactive decay. Detection and measurement of radioactivity. Autoradiography, Isotopes used in biology.

PRACTICALS

1. Problems related to Genetics
2. Seperation and identification of aminoacids by paper chromatography
3. Seperation and identification of sugars by TLC
4. Seperation and identification of Lipids by TLC
5. Seperation of aminoacids by Ion –exchange chromatography
6. Seperation of proteins by PAGE
7. Seperation of Pigments by paper chromatography
8. Isolation and spectrophotometric characterization of plant pigments.

SUGGESTED READINGS

Alberts A *et al.* 1994.*Molecular Biology of cell.* Garland publ.New York.

Cantor,C.R. and P.R. Schimmel. *Biophysical Chemistry* by , W.H. Freeman & Co.
Copper Geoffrey, M. 2000. *The Cell - a Molecular approach*. 2nd Edn. ASM Press, Washington.
De Robertis EDP & EMF De Robertis . 2001. *Cell and Molecular biology.* Lippincott Williams & Wilkins.
Freifelder D.1990. *Molecular biology.* Narosa publication house, New Delhi.
Gardner E J & D P Snustad 1996. *Principles of Genetics.* John Willey, New York.
Glasel A. and M.P. Deutscher. 1995. *Introduction to Biophysical Methods for Protein and Nucleic Acid Research.* Academic Press.
John M. Wrigglesworth. 1983. *Biochemical research technique* (*A Practical Introduction*)
Strickberger MW 1996. *Genetics* III edn.McMillan,New York.
Cooper,T.G. *The tools of Biochemistry.* Wiley Eastern.
Vanholdem, K.E. and W.C. Johnson. 1988. *Principles of Physical Biochemistry*. Wilson & Walker. 1986. *Practical Biochemistry: Principles & Techniques.* Cambridge University Press.

PAPER 2131 : PLANT BIOCHEMISTRY

UNIT I: BIOENERGETICS

Energy transformation in living systems, Laws of thermodynamics, free energy and standard free energy changes, Phosphate group transfer and ATP, free energy from hydrolysis of ATP, High energy phosphates as currency of cell. Biological oxidation-reduction reactions and their half reactions.

UNIT II: ENZYMES

Nomenclature and classification- Isoenzymes, structure; Ribonuclease, Lysozyme, Chymotrypsin. Mode of action of enzymes; enzyme-substrate complex Inhibition: Competitive, Non competitive and Feed back inhibition. Regulation of enzyme activity. Enzyme Kinetics: Michaelis- Menten equation and Reversible reactions.

UNIT III: CARBOHYDRATES AND PROTEINS

Classification and properties of carbohydrates of Mono (Glucose, Galactose, Fructose), Oligo (Lactose, Maltose, Sucrose) and Polysaccharides: Homopolysaccharides (Starch, Glycogen,

Cellulose and Heteropolysaccharides. Gluconeogenesis. Amino acids: Non standard protein and aminoacids, peptides structure and reactions. Proteins: Primary structure and its sequence determination, Secondary, Tertiary and Quarternary structural features of proteins (Ramachandran plot).

UNIT IV: LIPID METABOLISM

Chemical composition of plant lipids. α- Oxidation and β- Oxidation of fatty acids.
Biosynthesis of fatty acids - malonyl CoA and long chain saturated and unsaturated fatty acids.

PRACTICALS

1. Estimation of proteins in plant samples by Biuret or Lowry's method
2. Estimation of Reducing sugars in plant samples by Nelson's method.
3. Determination of Amylase activity in germinating seeds
4. Estimation of Amino acids by Ninhydrin method
5. Determination of Catalase activity in germinating seeds
6. Reaction of amino acids and sugars
7. Aminoacid titrations
8. Iodine no and Sophonificatiob number
9. Estimation of Starch.

SUGGESTED READINGS

Buchnan, Gruissen & Jones. 2001. *Biochemistry and Molecular Biology of Plants*.
Dennis, D.T., D.B. Layzell, D.D. Lefebrye & D. Turpin. 1997. *Plant Metabolism*. 2nd ed. Addison Wesely Pub. Co. New York.
Dey and Horborne. 1998. *Plant Biochemistry*. Academic Press.
Heldt, H.W. 1997. *Plant Biochemistry and Molecular Biology.* OUP.
Horton, HR, MoranLA, Ochs RS *et al.,* 2001. *Principles of Biochemistry,* III edn. Prentice Hall.
Lehninger, A.L. 2001. *Biochemistry.* Kalyani Publishers. Ludhiana.
Mathews CK, Van Holde KE and Ahem KG. 2000. *Biochemistry* III edn. Sanfransico. Benjamin Cummings.
Thomas C. Moore. 1992. *Biochemistry and Physiology of Plant Hormones*. II Eds. Narosa Publishers.
Wilkins, M.B. (ed) 1987. *Advanced Plant Physiology.* ELBS & Longman. Essex., England.

UNIT II: PLANT RESOURCES

Brief account of the following plant Resources(examples limited to 10 under each category)-local,common and botanical names; morphology and utility Edible Resources- Cereals, Millets, Pulses, Spices and Condiments; Vegetables; Starch and Sugar Yielding Plants; Oil yielding plants. Dye yielding plants. Plants as sources of timber and biofuels. Transgenic plants. Herbal medicine.

UNIT III: MUSHROOM CULTIVATION

Introduction, history.Types of mushrooms. Mushrooms available in India- *Volvariella volvacea, Pleurotus citrinopileatus,Agaricus bisporus,* Mushroom Research Centres; Mushroom cultivation Procedure steps; Storage: Short term and Long term storage; Nutritional and medicinal value of mushrooms; Food Preparation: Types of food prepared from mushrooms; Cost-benefit ratio: Market in India and abroad, export value

UNIT IV: ORGANIC FARMING

Concept of Organic farming, history, objectives. Need of Organic farming in the present scenario. Types and methods of Organic farming. Advantages(benefits to environment and health benefits) and disadvantages of organic farming. Organic manure- types(green manure, vermicompost and vermiwash). Economic potential of Organic farming in India. Production and export of some certified organic products in India.

SUGGESTED READINGS:

Alan beebay & anne- Maria Brennan. 2008. First Ecology. 3rd ed. Oxford University press.
Cotton CM. 1996. Ethnobotany: Principles and Applications
Cunningham, W.P. & M.A. Cunningham. 2007. Principles of Environmental Science- Inquiry and Applications. Tata Mc Graw Hill Publications. New Delhi.
Hill, Albertt, F. 1952. A Text Book of useful plants and plant products. Tata Mc Graw Hill Publications. New Delhi.
Kokate , C.K. AP. Purohit & SB .Gokhale. 2000. Pharmacognosy. Nirali Prakasan Publications.
Rao, RaviPrasad B. 2005. Biodiversity. In Pullaiah.T. (ed) Taxonomy of Angiosperms. Regency Publications. New Delhi. Pp: 287-317.
Sambamurthy, A.V.V. S. & N.S. Subbramaniyam 2000. Economic Botany of Crop Plants. Asiatech Publishers Inc.