RANI CHANNAMMA UNIVERSITY, BELAGAVI

DEPARTMENT OF STUDIES IN BOTANY
UNDER THE SCHOOL OF BASIC SCIENCES

M.Sc. in BOTANY
CHOICE BASED CREDIT SYSTEM

III SEMESTER SYLLABUS

w.e.f.

Academic Year 2016-17 and onwards

RANI CHANNAMMA UNIVERSITY PG – SYLLABUS FOR IIIrd SEMESTER	
NAME AND COURSE: M.Sc. - Botany	
Course Code:	**Teaching HRS: 04 hrs/Week**

3.1 PLANT PHYSIOLOGY

UNIT-I. Bioenergetics - First and second law of thermodynamics. Relation between free energy change and equilibrium constant. Reduction potential. Relation between reduction potential and free energy change.

Hexose catabolism – Study of Glycolysis and citric acid cycle.

UNIT-II. Oxidative phosphorylation and photophosphorylation. Electron transfer reaction in mitochondria.

Light absorption by chloroplast pigments. Light harvesting complexes. Macromolecular organization of chloroplast membranes. Carbohydrate biosynthesis and inter conversions. Photosynthetic carbon reduction cycle and its regulation. C4 pathways and photorespiration. Biosynthesis of sucrose, starch and cellulose.

UNIT-III. Lipid metabolism – fatty acid biosynthesis and oxidation. Biosynthesis and catabolism of storage lipids. Biosynthesis and functions of membrane lipids.

Membrane transport – organization of transport at plasma membrane and Tonoplast pumps, carriers and ion channels, P-type and V- type, ATPases, ABC transporters. Regulation of membrane transport in guard cells.

UNIT-IV. Nitrogen metabolism – uptake of nitrate and its reduction; catalytic and genetic regulation of nitrate reductase. Symbiotic nitrogen fixation, mechanism of action of nitrogenase. Plant growth regulators, mechanism of action of auxins, gibberlins, cytokinins, ethylene, abscisic acid.

REFERENCES:

Fundamentals of Biochemistry. D. Vote, J.G. Vote, and C.W. Pratt, John Wiley an Sons 1999.

Physical Biochemistry, K.E Van Holde, W.C. Johnson and P. Shing Ho, Prenta Hall International IN. 1998.

Essential of Biophysics, P. Naryanan. New Agri International publisher, 2000.

Plant Biochemistry, P.M dey and J.B. Harborne, Harcourt Asia Ltd. Academic press, 1997.

Signal and Signal transduction pathways in plants. K. Palme (Ed.) Kluwer Academic publishers 1994. Annual review of Plant Physiology and Plant Molecular Biology.

Practical-V

Practicals based on 3.1

1. Effect of time and enzyme concentration on the rate of enzyme action.

2. Effect of substrate concentration and pH on enzyme action.

3. Extraction of total lipids from plant tissue purification by column chromatography analysis by TLC 4. Determination of lipase activity in germinating seeds.

5. Determination of chlorophyll a/b ratio in C3 and C4 plants.

6. Crassulacean acid metabolism.

7. Estimation of proline from stressed plants.

8. Gibberellin induction of amylase activity in cereal grains.

9. Effect of light, K, Ca and some inhibitions and against stomatal opening.

10. Determination of Photosynthesis rates in C3 and C4 plants using IRGA.

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3.2 CELL AND MOLECULAR BIOLOGY

UNIT-I

Microscopy: Concepts and applications of Light, Phase contrast, Fluorescent and Electron microscopy. Autoradiography, Cell fractination and Centrifugation technology

Chromosome: Organization of chromatin – Euchromatin and heterochromatin, constitutive and facultative heterochromatin, rearrangement, repetitive and non-repetitive DNA, C-value paradox, nucleosome model, structure and organization of telomere, centromere and kinetochore. Structural and numerical abnormalities.

Central dogma of molecular biology, Fine structure of gene, Concept of split gene, introns. Gene families, Overlapping gene, Pseudo gene and cryptic gene.

Unit – II

Cell cycle- Regulation of CDK-cyclin activities, cellular check points, DNA damage and repair-Excision repair, Post replication repair, SOS response and mutagenesis, transcription repair coupling and mechanism that prevent DNA Damage.

Mutation: Chemical and radiation mutagenes, molecular basis of mutations and their role in evolution and cancer development. Oncogenes, Proto-oncogenes, P^{53} gene, Tumor suppressor genes, RB gene, E2F gene, RAS genes.

Unit – III

Transposable elements: Retro-elements. Transposable elements in man, Prokaryotic transposons: Insertion and composite sequences, Applications of transposons in research and health care system.

Unit – IV

Expression of Genome: Transcription - RNA polymerase-types, structure and function, mechanism of transcription-initiation, elongation and termination in prokaryotes and eukaryotes. Post transcriptional modifications-RNA processing, capping, polyadenylation, splicing, alternate splicing, exon, shuffling, structural

organization of m-RNA, t-RNA and r-RNA, m-RNA transport; **Translation:** t-RNA identity, amino acylation of t-RNA, amino acyl synthetase, mechanism of translation-initiation, elongation and termination, proof reading, translational inhibitors, post translational modifications of proteins;. **Gene regulation in prokaryotes:** Concept -Lac operon-positive and negative control, tryp – operon ; A detailed study of Gene regulation in eukaryotes**.**

References:

1. Gamer, E.J. and Sherstal. D.P. Principles of Genetics, 6th Ed. John Wiley and Sons, New York
2. Herkwitz, I.W. 1977, Principles of Genetics, 2nd Ed. Macmillon Publ. Co., New York.
3. Lewin B. 2004. Genes 8th Ed. John willey and sons. New York.
4. Prescott, D.M.1988 Cells: Principles of Molecular structure and function. Johes and Bortlet pub. Boston.
5. Syenga. I. 1972, General cytogenetics, North Hapland Pub. Co.
6. Strickberg, M.W.1985. Genetics 3rd Ed.Macmillan Pub. Co., New York.
7. Waston, I.D. Et. Al. 1965. Molecular, Biology of the gene. 4th Ed. The Benjamin/Cunnings Pub. Co.,
8. H.S.Bhamrah, 1990. Molecular cell Biology, Anmol Publications, New Delhi.
9. S.C. Rastogi, 1995, Concepts, in Molecular Biology. Reeta Area, 1998, Cell biology, Anmol Publications, New Delhi.
10. G. Shanmugam, 1988, Cell Biology Lab Manual, Mac. Millan, India Ltd., Madras.
11. James Jorwell, Honey Ladish, 1986. Molecular cell biology scientific American Books. New York.
12. P.S. Verma and V.K. Agarwal, 1999. Cell Biology and Genetics S. Chand and company Ltd., New Delhi.
13. George, M. Malacinski, 1986, Macmillan publishing co., New York. Molecular Genetics of Mammalian cells.
14. A.K. Tobin, 1992, Plant organelles compartmentation of Metabolism in Photosynthetic tissue, Cambridge University, Press.
15. H.S. Bhamaah, 1990, Molecular cell Biology, Anmol Publication New Delhi.
16. Roerl Miesfeld, 1999, Applied Molecular Genetics, Wiley's Liss Publication.
17. S.C.Rastogi, 1995. Concepts in Molecular Biology.
18. Reeta Arora, 1988. Cell Biology,Anmol Publications New Delhi
19. G.Shanmugam, 1998. Cell Biology Lab Manual, Macmillan India Ltd., Madras.

20. Sharad Srivastava, 1997, Molecular Genetics, Anmol Publication, New Delhi
21. Geoffrey & W.H. Potler. 1995, Analysis of Biological Molecular, Chapman & Hall Pub. London
22. James Darwell, Honey Lodish, 1986, Molecular Cell Biology, Scientific American Books, New York.
23. Vinceeta Singhal & C.K Arora, 1995, Techniques in Molecular Biology, Anmol Publishers, New Del
24. Thorpe, N.O. (1989) Cell Biology, John Willey and sons New York.
25. Benjamin Levin (2002). Gene 8. Oxford University press.
26. Cullis C A (2001), Plant genomics and proteomics, Willey- VCH.
27. Hughes MA, (1996), Plant molecular genetics, Addison Wesley Longman. Ltd.m UK.
28. Grierson D and Covey S N, (1998), plant molecular biology. Blackle Academic and professional, London.
29. Evolution By Strickberger, M.W.Genes & Evolution, By Jha A.P. 1993.
30. Organic Evolution By lull R.C. 1976.
31. Organic Evolution By Arumugam .N. 1992.
32. Diversity & Evolutionary biology Of Tropical flowers, By Endress, P.K. 1994.
33. Cell Biology: Smith and Wood
34. Cell and Molecular Biology: Lewin J Klein smith and Valerie M Kish
35. Cell and Molecular Biology- Concept and Experiments 2nd Ed: Gerald Karp
36. Genetics: Denial J Fairbanks
37. Concept of Genetics 4th Ed: William S Klung and M R Cummings
38. Cell and Molecular Biology: P K Gupta
39. Understanding GENETICS- A molecular approach. Norman V Rothwell
40. Molecular Genetics: G S Stent
41. Genetics- Analysis and Principles: Robert J Brooker
42. Genetics 4th Ed: Susan Elrod and William Stan field
43. The Human Genome: R Scott Hawley and Catherine and Mori
44. Genetics: Daniel L Hartl.
45. Genomes: T A Brown
46. Cell Biology: D Robertis
47. Molecular Biology of Gene: J P Watson

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3.3 MEDICINAL PLANTS AND HERBAL DRUG TECHNOLOGY

UNIT-I.

History, scope and importance of medicinal plants. A brief account of Indigenous medicinal sciences- Ayurveda, Siddha and Unani. Brief account of herbal formulations and preparations.

UNIT-II

Plant identification- authentication and deposition in recognised herbaria, Ethnic communities of India. Ethnobotany and folk medicine, Applications of ethnobotany.

Study of some important medicinal plants with reference to their systematic position, diagnostic features, methods of propagation and medicinal uses of Solanum trilobatum, Cardiospermum halicacabum, Vitex negundo, Adathoda vasica, Azadirachta indica, Gloriosa superba, Eclipta alba, Aristolochia indica, Phyllanthus amarus, Boerhaavia diffusa, Curcuma longa, Ocimum sanctum, Centella asiatica, Aloe vera, Coleus forskohlii and Costus speciosus.

UNIT-III.

Database of medicinal plants, Methods of preparation of herbal extracts and phytochemical analysis. Antibacterial and antifungal activity assay of herbal extracts, Medicinal plants and plant products used in the treatment of Jaundice, cardiac problems, infertility, cancer and diabetes. Conservation of medicinal plants- In situ and Ex situ. IPR and Patenting, threatened medicinal plants.

UNIT-IV

Herbal drug technology:

Identification and authentication of phytoconstituents, Alkaloids, Coumarins, , Lignans, phenols, terpenes, sterols,

Method of isolation and estimation of the following drugs;

Forskolina from *Coleus forskaoli*

L-Dopa from *Mucuna pruriens*

Alicin- *alliun sativa*

Piperine from *piper nigram*

Catechines from *camellia sinensis (green tea)*

Organization and institutes: national medicinal plant board (NMPB) foundation for revitalization of local health tradition (FRLHT) national botanical research institute (NBRI) central institute for medicinal[and aromatic plants (CIMAP) AYUSH

References:

1. Trivedi, P. C. (2006). Medicinal Plants: Ethnobotanical Approach, Agrobios, India.

2. Purohit and Vyas, (2008). Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.

3. Yoganarasimhan, S. N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt.

4. Gokhale, S. S., Kokate, C. K. and Purohit, A. P. (1994). Pharmacognosy. Nirali Prakashan. Pune.

5. Tyagi and Dinesh Kumar (2005). Pharma Forestry. Field Guide to Medicinal Plants. Atlantic Publishers and Distributors, New Delhi.

6. Singh and Jain (1985). Taxonomy of Angiosperms. Rastogi Publications, Meerut.

7. Sinha R. K. and Shweta Sinha (2001). Ethnobiology. Surabhe Publications – Jaipur.

8. Pal, D. C. and Jain, S. K. (1998). Tribal medicine. Naya Prakash, Bidhan Sarani, Calcutta.

9. Jain, S. K. (1995). Contribution to Indian ethnobotany. 3rd edition, Scientific publishers, Jodhpur, India.

10. Jain, S. K. (1995). A Manual of Ethnobotany , 2nd edition.

11. John R. Dean. (2010). Extraction Techniques in Analytical Sciences John Wiley & Sons, Ltd. UK.

12. Surhone, L. M., Tennoe, M. T. and Henssonow, S. F. (2011). Soxhlet Extractor. Betascript Publishing. Germany.

13. Schwalbe, R., Moore, L. S. and Goodwin, A. C. (2007). Antimicrobial susceptibility testing protocols. CRC Press, Taylor and Francis Group, Boca Raton, London, New York.

14. Horborne J.B. (1973) phytochemical methods a guide to modern techniques of plant analysis, Chapman and Hall Ltd, London.

Practical-VI

Practicals based on 3.2

1. Methods of fixing and staining (Acetocarmine, Acetoorceine and feulgen)
2. Study of mitosis (*Allium/Maize*)
3. Study of meiosis (*Tredescantia/Chlorophytum/Allium*)
4. Determination of chromosome number at mitotic metaphase and diakinesis/metaphase I of meiosis.
5. Karyotype analysis in *Allium*
6. Polytene chromosome in Chironomos larvae/Fruit fly.
7. Isolation and separation of plasmid DNA
8. Isolation of plant DNA by CTAB method
9. Estimation of DNA by Diphenyl method
10. Estimation of RNA by Orcinol method
11. Agarose gel electrophoresis for separation of DNA

Charts/models and photographs.

Practicals based on 3.3

1. Identification and medicinal value of locally available medicinal plants.

2. Morphology of the useful parts of important medicinal plants.

3. Methods of propagation of important medicinal plants.

4. Demonstration of solvent/s extract/s preparation using Soxhlet apparatus.

5. Demonstration of antibacterial/ antifungal activity using medicinal plant extracts.

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3.4 OPEN ELECTIVE

PLANT PROPAGATION TECHNIQUES (THEORY)

Unit-I

History, scope and importance of plant propagation, propagation structures, green house equipments and media, seed propagation, structure of seeds, techniques of seed production types of seeds –recalcitrant, orthodox, post harvest handling of seeds.

Unit-II

Vegetative propagation: techniques of propagation by cutting, stem cuttings- hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings , root cuttings. Biology and techniques of grafting: Whip and tongue, wedge and cleft, bark, side grafting approach.

Unit-III

Techniques of budding: T- budding, patch budding chip budding ring budding. Layering and its natural modifications: simple layering tip layering, mound and stool layering air layering, compound and serpentine layering and trench layering. Propagation by specialized stem and roots

Unit-IV

Micro propagation techniques: cell and tissue culture techniques, media, growth regulators, micro and macro nutrients, sterilization techniques, MS media, root, bud.Advantage, limitations and applications of vegetative propagation, clones , genetic variation in asexually propagated plants, different methods. Propagation methods of some selected plants – citrus, grape, mango, mulberry, hibiscus, rose, croton, eucalyptus, banana, orchids, papaya, watermelon, potato, tomato, chilly, coconut, pepper, anthurium.Nursery techniques: composting, green house, planting mixture, vermicompost.

References:

1. Abbottt, A.J. and atkin R.K. 9eds (1987) improving vegetatively propagated crops, academic press ,London.
2. Bose, T.K. , Sadhu M.K. & Das, P. (1986) propagation of tropical and subtropical horticultural crops, Nowya Prakash, culcutta.
3. Hartmann and Kester (1983) plant propagation.
4. Hartmann H.T. , kester e.D. davis, f.T. and geneve R.L. 1997 plant principle s and practices prentile hall of india private limited ,new delhi.
5. Krishnamurthy H.M. (1981) plant growth substances including application in agriculture.
6. Pierik L.M. (1987) invitro culture of higher plantsmurtinus Nijhoff pub. Dordrecht.
7. Razdan, M.K. (1994) an introduction to plant tissue culture, oxford and IBH pub.co. PVT Ltd. Bombay and Calcutta.
8. Mac Donald, B. (1987) practical woody plant propagation for nursery growers Portland OR timber press.
9. Sadhu, M.K. (1989) plant propagation Wiley eastern Ltd. New Delhi.

Practicals for open elective

1. Vegetative propagation: types of cuttings
2. Vegetative propagation: tapes of grafting
3. Vegetative propagation: types of budding
4. Vegetative propagation: types of layering
5. Propagation by modified stems and
6. Propagation by modifies roots.
7. Micro propagation: preparation of media, preparation of explants, culture, initiation of shoot. Multiplication (demon starvation)
8. Pot and green house implants (demonstration)