

Minutes of the 14th MEETING OF BOARD OF STUDIES (BOS) OF DEPARTMENT OF BOTANY

Minutes of the 14th meeting of the board of Studies of the Department of Botany held on 4th August 2023 in the office of Head, Department of Botany, Central University of Jammu.

The following members attended the meeting:

Name	Affiliation
Professor Brijmohan Singh Bhau (Chair and HOD)	Head, Department of Botany, CUJ
Professor Namrata Sharma (External expert)	Department of Botany, Jammu University
Dr Deepak Bhardwaj (Member)	Assistant Professor, Department of Botany, CUJ
Dr Shweta Yadav (External Member)	Assistant Professor, Department of Environmental Studies, CUJ
Dr Yogesh Kumar (Special invitee)	Associate Professor, Department of Botany, CUJ
Dr. Samantha Vaishnavi (Special invitee)	Assistant Professor, Department of Botany, CUJ
Dr. Ashok Kumar (Special invitee)	Assistant Professor, Department of Botany, CUJ

1) Opening remarks by the chair

The Chairman welcomed all the members and thanked them for making it convenient to attend the meeting.

2) To consider and approve draft course contents for core, elective, and skill enhancement courses under New Education Policy for the 3rd semester of Integrated B.Sc. (Honours) and M.Sc. Botany programme.

The board considered and approved the core and skill enhancement courses and their contents with the modifications, and the modified course contents are placed in Annexures- I, II, and III.

3) To consider and approve course content for Open elective courses under New Education Policy to be offered by the Department of Botany.

The board considered and approved the Open elective courses and their contents with the modifications. Modified course contents are in Annexures- IV, V, VI, VII, and VIII.



4) To consider the case of the Ph.D. scholar Ms Shreya Proach, who recently joined Kashmir Administrative Service (KAS).

The board considered the case of Ms Shreya Proach's application and the recommendation of the RAC meeting (Annexure IX) held on 22nd July 2023 and approved the conversion of her full-time PhD programme to a part-time course.

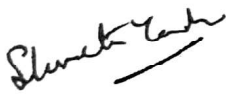
5) To consider and approve the names of external examiners for setting the End semester examination question paper and conducting the practical examination.

The board considered and approved the names of external examiners for setting the End semester examination question paper and conducting the practical examination. The approved list of examiners is placed in Annexure- X.

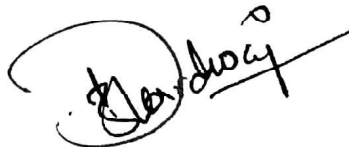
6) To allow students to opt for MOOC/online courses in subsequent semesters.

The board considered the case regarding the discrepancies that arose due to the delay in conducting the exam by the MOOC/online course coordinators and allowed students to opt for other MOOC/Online courses in subsequent semesters to complete their credit requirements for the previous semester/s.

7) The meeting concluded with a vote of thanks to the Chair.



Dr Shweta Yadav
(Member)



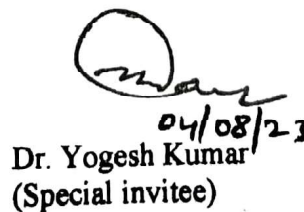
Dr Deepak Bhardwaj,
(Member)



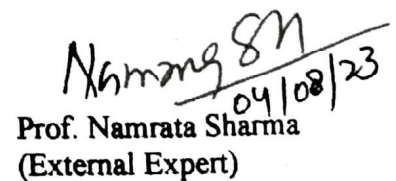
Dr. Ashok Kumar
(Special invitee)



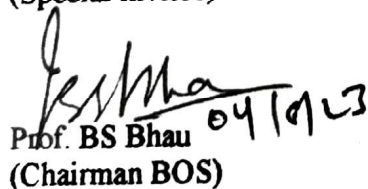
Dr. Samantha Vaishnavi
(Special invitee)



Dr. Yogesh Kumar
(Special invitee)



Prof. Namrata Sharma
(External Expert)



Prof. BS Bhau
(Chairman BOS)

Annexure-I

Course Title: Fungi, Cryptogams and Phanerogams

Credits: 3-0-1

Course objectives:

The objective of this course is to have an in-depth study of Fungi, Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms, and to appreciate and understand the differences in morphology, anatomy and types of reproduction in these groups.

Course outcomes:

On successful completion of the course, the students will be able to:

- 1) differentiate among various fungi genera, algae, bryophytes, pteridophytes, gymnosperms and angiosperms.
- 2) identify various groups of fungi, algae, bryophytes, pteridophytes, Gymnosperms and Angiosperms based on their morphology.
- 3) Learn about the evolution of various vegetative and reproductive structures from algae to angiosperms.
- 4) acquire and refine their skills in section cutting and double staining techniques for identifying distinctive characteristic anatomical features

Theory

Unit 1: Hidden Mycological World

General characteristics, Classification – Alexopoulos and Mims, 1996 and Hibbett et al., (2007), Life cycle of Chytridiomycete (*Synchytrium*), Oomycetes (*Phytophthora*), Zygomycetes (*Rhizopus*) Ascomycetes (*Saccharomyces*, *Aspergillus*, *Neurospora*), Basidiomycetes (*Puccinia*, *Agaricus*).

Allied Fungi - General characteristics, occurrence and status of slime Molds, types of plasmodia and fruiting bodies.

Ecological significance of Fungi: Mycorrhiza, sugar fungi; cellulose and lignin-degrading fungi.

Unit 2: Mesmerising Algal World

General characteristics; Classification (Fritsch, 1935, 1945 and Lee, 1999, 2008)

Range of thallus organisation and details of reproduction* in Cyanobacteria (*Oscillatoria*, *Nostoc*), Chlorophyta (*Chlamydomonas* and *Volvox*), Charophyta (*Chara*), Xanthophyta (*Vaucheria*), Phaeophyta (*Ectocarpus* and *Fucus*) and Rhodophyta (*Polysiphonia*).

Ecological significance of algae.

Unit 3: Wonders of Archegoniates:

Transition in plants to land habit (Theories and postulates); evolution of alternation of generations.

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Phytoplankton: General characteristics; classification, range of thallus organisation and reproduction* (comparative) in Liverworts (*Riccia*, *Marchantia*), Leafy liverwort (*Porella*), Hornworts (*Anthoceros*) and Mosses (*Funaria*).
Ecological significance of bryophytes with special reference to *Sphagnum*.

Early land plants (*Rhynia*), fossil pteridophytes and extinct Pteridophytes: General characteristics, classification, morphology and reproduction* (comparative) of Psilopsida (*Psilotum*), Lycopsida (*Selaginella*), Sphenopsida (*Equisetum*), Pteropsida (*Pteris*, *Marsilea*).

Ecological importance of Pteridophytes.

Unit 4: Diverse spermatophytes

Palaeobotany: Geological time scale, fossils, and fossilization process. Morphology, anatomy and affinities of fossil plants (Pteridospermales and Bennettitales). Gymnosperms: General characteristics, classification, morphology, and reproduction* (comparative) of Cycadales (*Cycas*), Coniferales (*Pinus*) and Ephedrales (*Ephedra*). Ecological significance of Gymnosperms. Angiosperms: General characteristics, range of habitat, adaptation, morphology and reproduction of dicotyledons (*Ranunculaceae* and *Brassicaceae*) and monocotyledons (*Liliaceae* and *Poaceae*).

* Developmental details not to be included

Practicals

- 1) To study the vegetative and reproductive structures of *Perenospora*, *Albugo*, *Rhizopus*, *Penicillium*, *Aspergillus*, *Puccinia*, *Agaricus*, *Alternaria* with the help of temporary mounts, permanent slides and photographs.
- 2) Study of ectomycorrhiza. Endomycorrhiza and slime molds with the help of temporary mounts and photographs.
- 3) To study the morphology of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas*, *Volvox*, *Chara*, *Sargassum*, *Ectocarpus* and *Polysiphonia* with the help of temporary mounts, permanent slides and photographs.
- 4) To study the morphology, anatomy and reproductive structures of *Riccia*, *Marchantia*, *Anthoceros* and *Funaria* with the help of a temporary mounts, permanent slides and photographs.
- 5) To study the morphology, anatomy and reproductive structures of *Psilotum*, *Selaginella*, *Equisetum*, *Pteris* and *Marsilea* with the help of a temporary mounts, permanent slides and photographs.
- 6) To study the morphology, anatomy and reproductive structures of Fossil Gymnosperms *Cycas*, *Pinus*, *Gingko* and *Ephedra* with the help of temporary mounts, permanent slides and photographs.
- 7) To study the morphology, anatomy and reproductive structures of *Ranunculus*, *Brassica*, *Allium cepa* and *Zea mays*.

Suggested Readings:

- 1) Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
- 2) Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
- 3) Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
- 4) Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

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- 5) Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A., Minorsky P.V., Jackson R.B. (2008). *Biology*, Pearson Benjamin Cummings, USA. 8th edition.
- 6) Pelczar, M.J. (2001) *Microbiology*, 5th edition, Tata McGraw-Hill Co, New Delhi.
- 7) Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). *Pteridophyta*. S. Chand. Delhi, India.
- 8) Bhatnagar, S.P. & Moitra, A. (1996). *Gymnosperms*. New Age International (P) Ltd Publishers, New Delhi, India.
- 9) Parihar, N.S. (1991). *An introduction to Embryophyta: Vol. I. Bryophyta*. Central Book Depot. Allahabad
- 10) Gifford, E.M. (1989). *Morphology and evolution of vascular plants* (No. 04, QK641, G5 1989).
- 11) Kumar, H.D. (1999). *Introductory Phycology*, 2nd edition. New Delhi, Delhi: Affiliated East-West Press.
- 12) Lee, R.E. (2008). *Phycology*, 4th edition. Cambridge, Cambridge: Cambridge University Press.
- 13) Pelczar, M.J. (2001). *Microbiology*, 5th edition. New Delhi, Delhi: Tata McGraw-Hill Co.
- 14) Talaro, KP, Talaro A. 2006. *Foundations in Microbiology*. New Delhi, Delhi: McGraw-Hill
- 15) Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. (2008). *Biology*, 8th edition. San Francisco, California: Pearson Benjamin Cummings.
- 16) Prescott, L.M., Harley J.P., Klein D. A. (2005). *Microbiology*, 6th edition. New Delhi, Delhi: McGraw Hill.
- 17) Sethi, I.K. and Walia, S.K. (2018). *Text book of Fungi and Their Allies*. (2nd Edition), Medtech Publishers Delhi.
- 18) Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). *Introductory Mycology*, 4th edition. Singapore, Singapore: John Wiley & Sons.
- 19) Agrios, G.N. (2005). *Plant Pathology*, 5th edition. Cambridge, U.K.: Academic Press.
- 20) Burchett, Stephen and Burchett, Sarah. (2018). *Plant Pathology*. New York: Garland Science.
- 21) Sharma, P.D. (2011). *Plant Pathology*. Meerut, U.P.: Rastogi Publication.
- 22) Webster, J., Weber, R. (2007). *Introduction to Fungi*, 3rd edition. Cambridge, U.K.: Cambridge University Press.
- 23) Raven, F.H., Evert, R.F., Eichhorn, S.E. (1992). *Biology of Plants*. New York, NY: W.H. Freeman and Company.
- 24) Tortora, G.J., Funke, B.R., Case. C.L. (2007). *Microbiology*. San Francisco, U.S.A: Pearson Benjamin Cummings.
- 25) Kaur I., Uniyal P.L. (2019). *Textbook of Gymnosperms*. New Delhi, Delhi: Daya Publishing House.
- 26) Kaur I., Uniyal P.L. *Textbook of Bryophytes*. New Delhi, Delhi: Daya Publishing House (in Press).
- 27) Parihar, N.S. (1972). *An Introduction to Embryophyta. Vol. II: Pteridophyta*. Allahabad, UP: Central Book Depot.
- 28) Parihar, N.S. (1991). *An Introduction to Embryophyta. Vol. I: Bryophyta*. Allahabad, UP: Central Book Depot.
- 29) Bhatnagar, S.P., Moitra, A. (1996). *Gymnosperms*. New Delhi, Delhi: New Age International (P) Ltd Publishers.
- 30) Coulter, J.M., Chamberlain, C.J. (1910). *Morphology of Gymnosperms*. Chicago, University of Chicago Press.
- 31) Schofield, W.B. (1985). *Introduction to bryology*. New York, USA. Macmillan, (Reference book for Unit 2) S. Chand Publication.
- 32) Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). *Botany For Degree Students Pteridophyta*. New Delhi, Delhi: S. Chand Publication. Delhi, India.

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Annexure-II

Course Title: Fundamentals of Cell Biology

Credits: 3-0-1

Course objectives:

The purpose of this course is to give a firm foundation to the students in the fundamentals of Cell Biology so that they would be able to describe and discuss the structure and functioning of cells in the forms of their envelopes and internal components. Intricacies of cell division are also included.

Course outcomes:

Upon the successful completion of this course, students should be able to:

- 1) Recall and compare structures of prokaryotic and eukaryotic cells and apply this knowledge to their functions.
- 2) Describe the structure and composition of cell membranes and plant cell wall and correlate the same with their functions.
- 3) Describe the components of the cell's cytoskeleton and correlate them with cell movements.
- 4) Describe various sub-cellular structures and understand their interrelationship between form and function at the cellular level.
- 5) Identify different parts of a chromosome and explain chromatin packaging into chromosomes.
- 6) Identify the events that occur during each phase of the cell cycle. Illustrate the major cellular events occurring during mitosis and meiosis and appreciate the cell cycle.
- 7) Appreciate various Model systems in Cell biology and their unique features.

Syllabus

Unit 1: Introduction to cell and cell envelopes

Cell as a unit of life – discovery, structure, properties and function; Cell theory; Characteristics of prokaryotic cells (Archaea and Eubacteria); Characteristics of eukaryotic cells (plant, animal and fungal); Plant cell types.

Plasma membrane structure – Brief history; Chemical composition of plasma membranes, Fluid mosaic model; Function of plasma membrane; Membrane transport – passive (diffusion and facilitated diffusion), active transport (brief account of carriers, channels and pumps), endocytosis and exocytosis.

Plant cell wall – Types and chemical composition; important functions.

Unit 2: Plasmodesmata and cell organelles

Plasmodesmata- Structure and function.

Nucleus: nuclear envelope, nuclear pore complex, nuclear lamina; Nucleolus – structure and function.

Structural organization and functions of mitochondria and chloroplast; organelles DNA- Structure and function.

Unit 3: Endomembrane system and associated organelles

Endoplasmic reticulum – types (RER and SER) and structure; RER as sites for protein synthesis, targeting and insertion of proteins, protein folding, processing and quality control; Smooth ER and lipid synthesis, export of proteins and lipids.

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Golgi apparatus – organization, protein glycosylation, protein sorting and export from Golgi apparatus.

Structure and function of lysosomes, peroxisomes, glyoxysomes.

Plant vacuoles: structure and function.

Unit 4: Cytoskeleton and Cell Division

Chromosome - gross morphology, fine structure of chromosome in prokaryotes and eukaryotes; Nucleosome model, Cell cycle, interphase (G1, S and G2 phases), Mitosis and Meiosis- Details and significance; Preliminary view of Cell cycle regulation; Experimental model systems in Cell biology- *Neurospora crassa*, *Caenorhabditis elegans*, *Drosophila* and *Arabidopsis*.

Cytoskeleton - structure of microtubules, microfilaments and intermediate filaments.

Practicals

- 1) Study of plant cell structure with the help of epidermal peel mount of *Allium/Rhoeo/ Crinum*.
- 2) Demonstration of the phenomenon of protoplasmic streaming in *Hydrilla* leaf.
- 3) Measurement of cell size by the technique of micrometry.
- 4) Counting the cells per unit volume with the help of haemocytometer in Yeast / pollen grains
- 5) Study of cell and its organelles with the help of electron micrographs.
- 6) Cytochemical staining of DNA using Feulgen stain.
- 7) Cytochemical staining of cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.
- 8) Study the effect of organic solvents and temperature on membrane permeability.
- 9) Study of different stages of mitosis through acetocarmine squash preparation and permanent slides
- 10) Study of different stages of meiosis through acetocarmine squash and permanent slides

Suggested Readings:

- 1) Cooper, G.M. and Hausman, R.E. (2018) *The Cell: A Molecular Approach*. 7th edition. Oxford University Press, USA
- 2) Albert B et al. (2015) *Molecular Biology of the Cell*, New York, Garland Sciences, 6th edition.
- 3) Karp G. and Iwasa J (2015). *Cell and Molecular Biology: Concepts and Experiments*, John Wiley & Sons, U.S.A. 8th edition.
- 4) Lodish, H. F., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H. L., ... & Amon, A. (2021). *Molecular Cell Biology*. New York: WH Freeman. 9th edition.
- 5) Hardin, J., Becker, G., Skliensmith, L.J. (2012). *Becker's World of the Cell*, Pearson Education Inc. U.S.A. 8th edition.
- 6) DeRobertis E.D.P and DeRobertis E.M.F. (2010) *Cell and Molecular Biology*, 8th edition, Lippincott, Williams & Wilkins.
- 7) Gupta PK, *Cytology Genetics and Evolution*, 8th edition (2017) Rastogi Publications.
- 8) Cohn, N.S. *Elements of Cytology*, 2nd edition (1969) Harcourt, Brace and World USA.
- 9) David E. Sadava, *Cell Biology: Organelle Structure and Function* 1st Edition, Jones & Bartlett Pub.
- 10) Taiz, L., Zeiger, P. E. E., Mller, P. E. I. M., & Murphy, P. A. C. A. (2018). *Fundamentals of plant physiology*. Sinauer Associates.

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Annexure-III

Course Title: Techniques in Floriculture and Horticulture

Credits:2-0-0

Course objectives:

This course aims to acquaint students with the fundamentals of floriculture and horticulture, flower and fruit production and its trade. It will help students to understand the various grades of cut flowers, fruit types and post-harvest handling, packing, storage and transportation mechanisms. A brief outline of the production technology of selected ornamental and horticultural plants and value addition of flowers will also be given. Students will also learn the techniques of production of seedlings and nursery management. This course will also deal with using fertilisers, growth regulators and irrigation to increase productivity.

Course outcomes:

On successful completion of this course, the students should be able to:

- 1) gain the basic knowledge on importance and propagation techniques, varieties and cultivation practices and processing techniques of different types of flowers, fruits, medicinal and aromatic plants.
- 2) gain knowledge on pre and post-harvest physiology and management technologies of fruits and vegetables.
- 3) gain an edge on conventional and modern packaging and preservation technology of fruits, vegetables and ornamental crops.
- 4) learn about identifying plants and garden tools, propagation of plants and value-added flower products.
- 5) understand the concepts of genetic variations and mechanisms for the improvement and domestication of ornamental plants.
- 6) identify the different plant varieties, their nutritional/soil type requirement, and their management in nurseries and greenhouses.

Syllabus

Unit 1: Floriculture practices

Importance and scope of floriculture and horticulture in the World and India. Classification of floriculture: according to environment and growth habit-tree, shrubs, climbers, herbs and their uses. Scope of cut and loose flowers in national and global trade, Global Scenario of cut flower Production, area under cut flowers and production problems in India. Nursery, establishment, care and management of nursery, selection of site and layout, propagation of ornamental plants, lifting, potting, repotting, packaging of ornamental plants, Cultivation practices of important annuals, seasonal and perennials flowers and foliage plants. Principles and styles of flower arrangement, production of flowers for exhibition. Drying of flowers and dry flower arrangement. Storage & transportation, marketing of *Rosa*, *Chrysanthemum*, *Dianthus*, *Gerbera*, *Gladiolus*, *Polianthes*, orchids, *Anthurium*, *Lilium*, *Alstroemeria*, *Dahlia* and *Tagetes*.

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Production technology, post-harvest handling, distillation methods, value addition, aroma chemicals, quality standards and regulations for *Cymbopogon*, *Citronella*, *Chrysopogon*, *Geranium*, *Mentha*, *Ocimum*, *Eucalyptus*, *Pogostemon* and *Lavandula*.

Unit 2: Horticulture practices

Importance of horticulture in nutritional security and national economy; Horticultural geography (regions and zones); Orchard establishment and orchard floor management; Present status and prospects of important horticultural crops. Classification of fruit crops; Propagation technique; nursery management; training and pruning; rootstock and scion; causes of unfruitfulness and control.

Organic horticulture – definition, components principles, methods, merits and demerits. Different organic inputs play their role on organic horticulture. Sustainable soil fertility management, weed management practices in organic farming, biological/natural control of pests and diseases, post-harvest management of organic produce, Certification, and export. International Federation of Organic Agriculture Movement (IFOAM) and global scenario of organic movement.

Unit 3: Technical aspects and challenges

Special horticultural practices, use of growth regulators, physiological disorders and remedies, Integrated Pest Management (IPM) and Integrated Disease Management (IDM), production for exhibition purposes. Methods of delaying flower opening, Pre-cooling, pulsing, packing, Principles and structures used in protected cultivation include hotbed, cold frame, glasshouse polyhouse, shade net, low tunnels, rain shelters etc. Interaction of light, temperature, humidity, CO₂, water on crop regulation. Greenhouse heating, cooling, ventilation, and shading. Containers and substrates, soil decontamination. Water and nutrient management. Automated greenhouses.

Various schemes & funding opportunities for setting up of commercial floriculture and horticulture units. Protection of plant varieties, farmer's rights and intellectual property rights.

Suggested readings:

- 1) S.K. Bhattacharjee and Lakshman Chandran De. 2010. Advanced Commercial Floriculture, Vols. I and II Aavishkar Pub., Second Revised and Enlarged Edition, 798. 2.
- 2) D. Ravinath. 2007. Floriculture: A Viable Business. Excel Books.
- 3) S.Prasad, U. Kumar. 2010. A Handbook of Floriculture). Agrobios (India).
- 4) John M. Dole and Harold F. Wilkins. 2004. Floriculture: Principles and Species: Prentice Hall; 2 edition (2nd Edition).
- 5) Paul V. Nelson (Author). 2002. Greenhouse Operation and Management. Prentice Hall; 6 edition (6th Edition).
- 6) J.S. Arora. 2007, Introductory Ornamental Horticulture. Kalyani Publications.
- 7) Allan M. Armitage and Judy M. Laushman. 2008 Speciality Cut Flowers: The Production of Annuals, Perennials, Bulbs and Woody Plants for Fresh and Dried Cut Flowers. Timber Press; REV.

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Annexure-IV

Course Title: Biostatistics

Credits: 4-0-0

Course objectives:

This course is designed to acquaint a student with various statistical tools that can be used in experimental biology setup for better analysis and conclusions.

Course outcomes:

On successful completion of this course, the students should be able to:

- 1) handle and present massive field and experimental data in a proper form.
- 2) Analyse the results of their experiment for significance.
- 3) Compare and contrast different observations/ data of their experimental setups.
- 4) Present their results in logical form and impress upon their practicality.

Syllabus

Unit 1: Data Collection and Sampling

Statistical Data, Types of Data: attributes and variables, discrete & continuous data, Primary and Secondary data, Different types of scales- nominal, ordinal, ratio and interval. Presentation of data: Sampling methods.

Unit 2: Measures of Central Tendency

Frequency distributions, cumulative frequency distribution and their representation, histogram, frequency polygon and ogives. Stem and leaf chart. Box Plot, Univariate Data-Concepts of central tendency, standard deviation and standard error, dispersion and relative dispersion, moments, measures of skewness and kurtosis.

Unit 3: Correlation and Regression

Bivariate Data: Scatter diagram. Correlation coefficient and its properties, Correlation ratio. Rank – Spearman's and Kendall's measures of correlation. Principle of least squares, linear regression, fitting of curves reducible to polynomials by transformation. Multiple regression, Multiple and partial correlation coefficients.

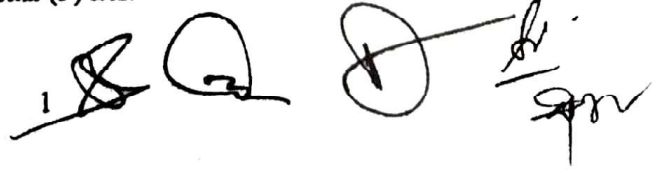
Unit 4: Data Analysis and Test of Significance

Sampling distribution for discrete data. Analyses of contingency tables; hypothesis of homogeneity and independence. Measures of association, relative risk, odds ratio and confidence interval. Computation and importance of student 't-test, chi-square test, F-test and one-way ANOVA

Suggested Readings:

1. Alan Agresti: *Categorical Data analysis*; John Wiley and Sons, New York, USA.
2. Bhatt B.R, Srivenkatramana T and Rao Madhva K S (1996): *Statistics: A Beginner's Text*, Vol 1, and New Age International (P) Ltd.





3. Goon A M, Gupta M K, Das Gupta B (1991): Fundamentals of Statistics, Vol 1, World Press, Calcutta
4. Anderson T W and Sclove S L (1978): An Introduction to Statistical Analysis of Data, Houghton Mifflin Co
5. Snedecor G W and Cochran W G (1967): Statistical Methods, Iowa State University Press
6. Spiegel, M R (1967): Theory and Problems of Statistics, Schaum's Publishing Series

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Annexure- V

Course Title: Basics of Plant Virology

Credits:4-0-0

Course objectives:

The course aims to give an introduction to the origin, evolution, taxonomy, structure, transmission, replication, diagnostics and control strategies of plant viruses. Viruses evolve very fast, cause serious diseases in economically important plants, and pose serious threat to agriculture and food security. Knowledge about plant viruses would prepare the graduates for addressing these issues.

Course outcomes:

On successful completion of this course, the students should be able to:

- 1) understand the origin and evolution of viruses, the history of virology, taxonomy of viruses, and differentiate between viruses and virus-like infectious agents.
- 2) describe structures and genome organisations of plant viruses and various events involved in virus replication.
- 3) describe various methods to study and diagnose plant viruses.
- 4) strategise control measures, and devise applications of plant viruses.

Syllabus

Unit 1: Introduction to plant viruses and virus-like infectious agents

Introduction to plant viruses, history of virology, origin and evolution of viruses, virus taxonomy. Defective particles, satellite nucleic acids and satellite viruses, viroids, prions, bacteriophages and virophages.

Unit 2: Virus structure and replication

Structure of viruses, genome organization and expression of viral genomes. Replication of RNA and DNA Viruses: entry, genome replication, transcription, translation, assembly and exit with emphasis on TMV, Caulimo virus, Tobacco Mosaic Virus, Tomato leaf curl virus.

Unit 3: Methods to study plant viruses

Host range, transmission, movement and symptomatology of plant viruses. Propagation, purification and characterization of plant viruses. Physical, biochemical, serological and molecular methods of virus detection, diagnosis and assay.

Unit 4: Plant virus control and applications

Conventional control of plant viruses, quarantine, conventional resistance to plant viruses, transgenic approach of virus control, antiviral compounds. Applications of plant viruses in biotechnology, nanotechnology, medicine and human health.

Suggested Readings:

- 1) Roger Hull. Comparative Plant Virology. Academic Press. 2009. ISBN: 978-0123741547

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- 2) Alan J. Cann. Principles of Molecular Virology. 6th Edition. Academic Press. 2015. ISBN: 978-0128019467
- 3) J. Carter and V. Saunders. Virology: Principles and Applications. John Wiley & Sons Ltd. 2013. ISBN: 978-1119991427
- 4) S.J. Flint, L.W. Enquist, V.R. Racaniello, A.M. Skalka. 2009. Principles of Virology. American Society for Microbiology. ISBN: 978-1555814434
- 5) D.M. Knipe and P.M. Howley. Fields Virology. 2013. Lippincott Williams and Wilkins. ISBN: 978-1451105636

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Annexure- VI

Course Title: Plants in the Indian Traditional System of Knowledge Credits 2=0-0

Course objectives:

The purpose of this course is to explore the intricate relationship between plants and humans such that the students should be able to understand the concept of the Indian system of traditional medicines, cultural significance and conservation of traditional knowledge of plants in different Indian societies.

Course outcomes:

Upon the successful completion of this course, students should be able to:

- 1) Learn about the relationships between people and plants, including how plants are used in traditional cultures.
- 2) Explore the traditional use of plants for healing ailments.
- 3) Understand the cultural significance of plants by learning how plants play a vital role in cultural rituals, ceremonies, and folklore.
- 4) Learn about the traditional culinary uses of plants and their importance in local cuisines.
- 5) Explore plants' spiritual and religious significance in traditional belief systems and shamanic practices.
- 6) Explore the traditional harvesting, cultivation, and conservation methods to ensure the sustainable use of plant resources.

Syllabus

Unit 1: Traditional Systems of Knowledge in Plants

Overview of indigenous cultures and their relationship with plants; Importance of traditional plant knowledge in indigenous cultures of India; Traditional System of Medicine (TSM) in India and its importance.

Introduction, Concept and Principles of Ayurveda, Some important plants of Ayurveda and their utilisation (*Aconitum heterophyllum*, *Cinnamomum tamala*, *Emblica officinalis*, *Elettaria cardamomum*, *Glycyrrhiza glabra*, *Picrorhiza kurroa*).

Unit 2: Ethnobotany and Cultural Significance of Plants

Concept of herbalism and its significance. Traditional medicinal plant knowledge and its role in healthcare; Symbolism and mythology associated with plants; Indigenous perspectives on plant-human relationships, Local health traditions.

Ethno medicines; Ethnobotanical plants of Jammu & Kashmir (*Acacia catechu*, *Achyranthes aspera*, *Acorus calamus*, *Azadirachta indica*, *Butea monosperma*, *Cannabis sativa*, *Centella asiatica*, *Justicia adhatoda*).

Unit 3: Traditional Plant Conservation and Protection

Threats to traditional plant knowledge and ways to mitigate them; Sacred Groves; Protection of traditional knowledge bill, 2016. Intellectual property rights about traditional knowledge and culture.

Bio-piracy; Strategies to protect the indigenous knowledge system; Geographical Indicators (GI); Access and benefit sharing


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Suggested Readings:

- 1) Kunwar, R.M., Sher, H., & Bussmann, R.W. (Eds.) (2021) Ethnobotany of the Himalayas. Springer Nature
- 2) Sharma, S and Kumar, R.J. (2021). Sacred groves of India. repositories of a rich heritage and tools for biodiversity conservation. For. Res. 32, 899-916 <https://doi.org/10.1007/s11676-020-01183-x>.
- 3) Oommen, O.V., Laladhas, K. P., Nellyat, P., & Pisupati, B. (Eds.) (2023) Biodiversity Conservation Through Access and Benefit Sharing (ABS). Himalayas and Indian Sub-Continent. Springer Nature.
- 4) Singh, M.P., Srivastava, J., and Pandey, S.N. (2003). Indigenous Medicinal Plants, Social Forestry, and Tribals. Daya Books.
- 5) Indian Medicinal Plants (Vol 1- 4) by K.R. Kirtikar and B.D. Basu (2006)
- 6) Handbook of Ayurvedic Medicinal Plants by L.D. Kapoor (2005).
- 7) Godagama (2004). The Handbook of Ayurveda Shantha, Bishen Singh Mahendrapal Singh, Dehradun.
- 8) Jain, S.K. (1989). Methods and approaches in Ethno-botany. Society of Ethnobotanists CDRI, Lucknow. Pp.127-128.
- 9) V.V. Sivarajan and I. Balachandran (1994). Ayurvedic Drugs and their Plant Sources by Oxford & IBH.
- 10) A.K. Sharma (2006). Globalization of Herbal Health. Recent Progress in Medicinal Plants Vol.12.

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Annexure- VII

Course Title: Basics of Herbal Drug Technology

Credits: 2-0-0

Course objectives: The objective of the course is to make the students understand the use of plants as a source of herbal drugs from cultivation to final drug product, WHO and ICH guidelines for the evaluation of herbal drugs, herbal cosmetics, natural sweeteners, nutraceuticals, and appreciate patenting of herbal products will also be highlighted

Course outcomes:

On successful completion of this course, the students should be able to:

- 1) develop conceptual skills about traditional Indian medicinal system, herbal medicines, their processing, storage and marketing.
- 2) gain knowledge about developing commercial enterprises of herbal medicines
- 3) learn the basic tools and techniques for propagation and phytochemical analysis of medicinal plants.
- 4) gain knowledge of the latest guidelines issued by the regulating authorities for manufacturing herbal drugs.

Syllabus

Unit 1: Raw material for herbal drugs

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material. Good agricultural practices in the cultivation of medicinal plants, including Organic farming.

Phytochemistry - active principles and methods of their testing - identification and utilisation of the medicinal herbs, *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on the nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

Unit 2: Evaluation and regulation of herbal drugs

WHO & ICH guidelines for assessing herbal drugs Stability testing of herbal drugs. Regulations in India (ASU DTAB, ASU DCC).

Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

Unit 3: Herbal Industry and Good manufacturing of herbal drugs

Herbal drugs industry: Present scope and future prospects. A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India. Components of GMP (Schedule - T) and its objectives.

Infrastructural requirements, working space, storage area, machinery and types of equipment, standard operating procedures, health and hygiene, documentation and records.

Suggested readings:

- 1) Chopra, R.N., Nayar S.L. and Chopra, I.C. (1956). Glossary of Indian Medicinal Plants, C.S.I.R., New Delhi.

- 2) Arber, A. (1999). Herbal plants and Drugs. Mangal Deep Publications.
- 3) Sivarajan V.V. and Balachandran I. (1994). Ayurvedic drugs and their plant source Oxford IBH publishing Co.
- 4) Miller, L. and Miller, B. (1998). Ayurveda and Aromatherapy. Banarsidass, Delhi.
- 5) Green, A. (2000). Principles of Ayurveda, Thomsons, London.
- 6) Kokate, C.K. (1999). Pharmacognosy, Nirali Prakashan.
- 7) Textbook of Pharmacognosy by Trease & Evans.
- 8) Textbook of Pharmacognosy by Tyler, Brady & Robber.
- 9) Pharmacognosy by Kokate, Purohit and Gokhale
- 10) Essential of Pharmacognosy by Dr.S.H Ansari 5. Pharmacognosy & Phytochemistry by V.D Rangari
- 11) Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy).
- 12) Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

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Annexure-VIII

Course title: History of Science and Technology in India

Credits: 2-0-0

Course objectives:

This course will expose the students to the contribution of Indian knowledge to the development of science and technology and make them understand the Importance of the roots of the knowledge system. Further, students will understand the contributions of different civilisations of India in science & technology development and, analyse it and apply it to their day-to-day life.

Course outcomes:

At the end of the Course, Students will be able to:

- 1) Identify the importance of Traditional knowledge of India in developing science & technology.
- 2) Explain the need for and importance of traditional knowledge in developing agriculture and other scientific areas.
- 3) Illustrate the various colonial rules in India, relating them to developing different research organisations.
- 4) Understand the contribution of different scientists from ancient & modern India.

Syllabus

Unit-1. Science and Technology- The Beginning and later development

Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. Development of Geography: Geography in Ancient Indian Literature. Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas, and karkhanas set up. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. Innovations in the field of agriculture - new crops and new techniques of irrigation.

Unit-2. Developments in Science and Technology in Colonial India

Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service. Indian Response to New Scientific Knowledge. Science and Technology in Modern India: Development of research organisations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.

Unit-3. Prominent scientists of India since the beginning and their achievement

Mathematics and Astronomy: Baudhayana, Aryabhata, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charaka, Yoga & Patanjali. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha and Dr Vikram Sarabhai.

Suggested Readings:

- 1) Arnold, D. (2013) Nehruvian science and postcolonial India. Isis, 104(2), 360-370.



- 2) Bagla, P., & Menon, S. (2008). Destination Moon. India's quest for the Moon, Mars, and beyond. HarperCollin
- 3) Kumar, D. (2001) Reconstructing India: Disunity in the science and technology for development discourse, 1900-1947. Osiris, 15(1), 241-258.

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Anx IX

From: Dinesh Kumar Dinesh.Kumar@icar.gov.in Subject: Re: DRC Minutes of meeting 22-7-23

Date: 24 July 2023 at 2:13 PM

To: office bot office_bot@cuajammu.ac.in, bs bhau bsbhau@cuajammu.ac.in

Cc: dineshkumarbhu@gmail.com

Dear Sir,

I have gone through the report of Ms. Shreya Proach and found the work satisfactory. As per her request, I recommend that her request can be accepted as most of the laboratory work is completed

Please let me know if anything else is needed.

With thanks and kind regards,

Sincerely

Dinesh Kumar

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Dr Dinesh Kumar,

M.Sc. Biotechnology (BHU) & Ph.D. Biotechnology (BHU), D.Y.Sc. (BHU), PDF (USA),

LL.B. (Professional with Spl Cyber and Patent Law), LL.M. (Spl IP Law)

PG Diploma in IPR (IGNOU & WIPO Geneva), IPCAP (Confederation of Indian Industries)

PG Diploma Technology Management in Agri. (Gold Medalist, NAARM & University of Hyderabad-Central University), ARS, Principal Scientist (Biotechnology)

Room No: 106 (First Floor), Computer Building,

Centre for Agricultural Bioinformatics (CABIN)

ICAR-Indian Agricultural Statistics Research Institute (IASRI)

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<https://iasri.icar.gov.in/>

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Most of the biological investigations in 21st century will be in silico. Walter Gilbert

(Nobel Laureate) इक्कीसवें सदी में जैवविज्ञान के अधिकतर खोज कंप्यूटर से / में होंगे . वाल्टर

गिल्बर्ट (नोबेल पुरस्कार विजेता)

Walter Gilbert

