CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

Proceedings of the meeting of Board of Studies in Botany held on 06–07-2023

A meeting of Board of Studies (University Campus and Affiliated Colleges) in the subject of Botany in Chaudhary Charan Singh University, Meerut was held on July 06, 2023 at 10.30 AM in hybrid mode through Zoom App. The following members were present:

1. Prof. Hare Krishna	Dean, Science faculty
2. Prof. Vijai Malik	Convener-I
3. Prof. Rup Narayan	Member
4. Dr. Ramesh C. Arya	Convener-II
5. Dr. Ramakant	Member
6. Dr. Mrs. Poonam Paliwal	Member
7. Prof. Ashok Kumar	Member
8. Prof. Sundip Kumar	External Expert
9. Prof. Upendra Kumar	External Expert
10. Prof. Navneet	External Expert
11. Prof. Ashwani Goel (Retd.)	Principal
12. Prof. Narendra Singh	Professor/Director of Research Institute

The Board met for the formulation of the syllabus of the subject Botany for Pre Ph.D. courses. The Board unanimously prepared and approved the syllabus for the same after thorough discussions.The revised courses are applicable to the university campus and affiliated colleges of the University. A copy of the finalized syllabus is enclosed herewith. The research methodology course will be common for all faculties and will be developed at the University level.

(Prof. Sundip Kumar)
External Expert

(Prof. Upendra Kumar)
External Expert

(*Prof. Navneet)
External Expert

(Prof. Rup Narayan)
Member

(Dr. Ramakant)
Member

(*Dr. Mrs. Poonam Paliwal)
Member

(*Prof. Ashok Kumar)
Member

(Prof. Ashwani Goel (Retd.)
Principal

(*Prof. Narendra Singh)
Prof./Director of Research Institute

(*Prof. Hare Krishna)
Dean, Science faculty

(Prof. Vijai Malik)
Convener-I

(Dr. Ramesh C. Arya)
Convener-II

Hon'ble Vice Chancellor

Kindly allow the enclosed syllabus to put in Academic Council for approval and to implement from the session 2023-2024.

(Hon'ble Vice Chancellor)

Members from the Board of Studies for Botany

S. No.	Name	Designation	College/ University	Signature
1.	*Prof. Hare Krishna	Dean, Science Faculty	C.C.S. University Campus, Meerut	
2.	Prof. Vijai Malik	Convener-I	C.C.S. University Campus, Meerut	
3.	Prof. Rup Narayan	Member	C.C.S. University Campus, Meerut	
4.	Prof. Ramesh C. Arya	Convener-II	Meerut College, Meerut	
5.	Dr. Ramakant	Member	C.C.S. University Campus, Meerut	
6.	*Dr. Mrs. Poonam Paliwal	Member	IP College, Bulandshahr	
7.	*Prof. Ashok Kumar	Member	MMH College, Ghaziabad	
8.	Prof. Sundip Kumar	External Subject Expert	GB Pant University Agriculture & Technology, Pantnagar	
9.	Prof. Upendra Kumar	External Subject Expert	MJP Rohilkhand University, Barielly	
10.	*Prof. Navneet	External Subject Expert	Gurukul Kangri University, Haridwar, Uttrakhand	
11.	Prof. Ashwani Goel (Retd.)	Principal	Shahed Mangal Pandey Degree College, Madhavpuram, Meerut	
12.	*Prof. Narendra Singh	Prof./Director of Research Institute	Kurukshetra University, Kurukshetra	

***Attended meeting online**

SUBJECT : Botany

Titles of the Papers for Core Compulsory Pre Ph.D.courses in Botany

Year	Course Code	Paper Title	Core Compulsory/ Elective/ Value added	Credits
2023-2024	BOT-101	Advances in Plant Sciences	Core Compulsory	04
	BOT-102	Tools and Techniques in Plant Sciences	Core Compulsory	04
	BOT-103	Research Methodology	Core Compulsory	04
	BOT-104	Dissertation/Term Paper/ Project	Core Compulsory	04

Note: There will fifteen hrs per credit for theory course.

Courses of Pre PhD (Botany): In Pre PhD there shall be three compulsory Theory papers (12 credits=4+4+4) and one project work/ Dissertation (Credit=4). The three papers will be as

1. Two papers will be related to Botany. Each paper will be of 4 credits (4+4 credits =12 credits).
2. One paper will be of Research Methodology and computer application. This paper will be of 4 credits.

A minimum 55% marks or its equivalent CGPA will be the passing marks.

6/7/23

VMalik

Subject: Botany		
Course Code: BOT-101	**Course Title: Advances in Plant Sciences**	Theory paper I

Course Objectives: The main objectives of this paper are to study:

1. Virus & Phytomicrobiome
2. Diversity & Evolution of plants.
3. Taxonomy & Nomenclature of plants
4. To study Medicinal plants and Molecular docking

Course Outcomes: At the end of this course, the students would be able to understand:

CO1. Virus genome
CO2. Identification of Bacteria
CO3. . Phylogeny of plants and Phylocode
CO4. Traditional nomenclature and how to carry out taxonomic studies
CO5. how to determine IUCN status
CO6. and identify medicinal plants and can perform *in-silico* drug designing

Credits: 4	**Core Compulsory**
Max. Marks: 100	Min. PassMarks:55

Total No. of Lectures-Tutorial (in hours per week): L-T-P: 4-0-0

Unit	Topics	No. of Lectures (Total sum = 60)
I	**Interaction of Plants with Viruses**: Organization, functions and dynamics of viral gene & genome; Viral promoters; Gene regulation in Virus RNA-interference and viral infections; Virus-induced gene silencing; Development of virus resistance transgenic crops. **Identification & Application of Microbes:** Identification and characterization of microbes using molecular techniques for sustainable agriculture and food security.	12
II	**Diversity and Phylogeny of Plants** Diversity of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms in India **Phylocode**: Principles, definitions, Specifiers & Naming of clades. **Phylogeny and Interrelationship** of Viridophytes, Embryophytes, Tracheophytes, Monilophytes and Spermatophytes.	12
III	**Taxonomy & Nomenclature** **Taxonomic & Nomenclatural products**: Botanical Congress and Plant nomenclature; **Taxonomic products**: Floras, Revisions, Keys, Monographs synopses and Conspectus. **Taxonomic website for**: Names & Nomenclature, Literature and Herbarium Specimens. Circumscription of genus & species.	

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IV	**Biodiversity Conservation** In-situ and Ex-situ conservation, Biodiversity in India, Valuing biodiversity, Extinction & De-extinction, Vulnerability to extinction, Diversity indices; Endemism. RET & IUCN criteria & Subcriteria, Concept of Rarity & NatureServe Conservation status assessment. Hot & cold spots; Biodiversity Act. Plant Invasion & Restoration Ecology	12
V	**Botanicals as a source of drugs & Drug Designing**: Green medicines and their on the spot identification; Herbal Formulations; Methods of drug identification. The drug development process, plant secondary metabolites as a potential source in drug development, In-silico drug designing, Evaluation of drug-like behaviour and ADME properties of molecules, , Molecular docking, and Molecular dynamics simulations	12

Teaching Learning Process: Class discussions/ demonstrations, Power point presentations, Class activities/ assignments, Field visits., Internship, etc.

Suggested Readings:

1. Chapman, V.J. and Chapman D.J., (1975). The algae. 2nd Edition, Mac. Millan Publ. Inc. New York.
2. Desikachary, T.V., (1959). Cyanophyta. ICAR, New Delhi.
3. Hoek, C. van den, Mann, D. G. and Jahns, H. M., (1995). Algae: An introduction to Phycology.CambridgeUniversity Press, UK.
4. Prescott, G. W., (1969). The algae: A review. Nelson, London.
5. Barry G. Hall. (2007). Phylogenetic Trees Made Easy: A How-To Manual, Third Edition. Sinauer Associates, Inc., Publishers, Sunderland, USA.
6. de Queiroz, K. & Philip Cantino P.D. (2020). International Code of Phylogenetic Nomenclature (PhyloCode). CRC Press: ISBN 9781138332829
7. de Queiroz, K., Philip Cantino P.D. & Jacques Gauthier, J. (2020). Phylonym: A Companion to the PhyloCode, CRC Press: ISBN 9780429446276
8. Turland, N. J., Wiersema, J. H., Barrie, F. R., Greuter, W., Hawksworth, D. L., Herendeen, P. S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T. W., McNeill, J., Monro, A. M., Prado, J., Price, M. J. & Smith, G. F. (eds.) 2018: International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017 Regnum Vegetabile 159 Glashütten, Koeltz Botanical Books DOI https://doi.org/10.12705/Code.2018
9. Angiosperm Phylogeny Group, (2016). An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnaean Society, 181: 1-20.
10. Davis, P.H., & Heywood V. H. (1965). Principles of Angiosperm Taxonomy. Oliver & Boyd. Edinburgh.
11. Jain, S.K. & Rao R. R. (1977). A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi.

12. Jones, S.B., &Luchsinger, A.E. (1987). Plant Systematics. 2nd Edition. McGraw-Hill Book Company. New York.
13. Alexopoulos, C.J., Mims, C.W. and Blaclwell, M., (2007). Introductory Mycology. Fourth Edition,Wiley India Pvt. Limited.
14. Okafor, N. and Okeke, B.C., (2018). Modern Industrial Microbiology and Biotechnology. 2nd Edition, CRC Press, Boca Raton
15. Ethi, I.K. and Walia, S.K., (2018). Text book of Fungi & Their Allies, Second Edition. MacMillan Publishers Pvt. Ltd., Delhi, India
16. Webster, J. and Weber, R., (2007). Introduction to Fungi. Third Edition, Cambridge University Press,Cambridge and New York.
17. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Businesshorizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
18. W.C.Evans & Trease, Pharmacognosy, 15th edn.2008, W.B. Saunders & Co. Ltd., London.
19. Guidelines for the Assessment of herbal medicines, 1991, WHO Report, Geneva.
20. Jones. S.B, LuchsingerA.E, 1987. Plant Systematic, 2nd edition, McGraw- Hill, Inc. NY.
21. Judd, W. S., C. S. Campbell, E. A. Kellogg, P. F. Stevens and M. J. Donoghue. (2008).
22. *PlantSystematics: A Phylogenetic Approach.* 2nd ed.Sinauer Associates, Inc., USA.
23. Radford,A.E.(1986). Fundamental of Plant Systeamtics. Harper and Row, Publisher, Inc.
24. Stace, C. A. (1989). Plant Taxonomy and Biosystematics (2nd ed.) Edward Arnold, London.
25. Simpson, M. G. (2019). Plant Systematics Elsevier Inc.
26. Soltis, D. E., Soltis, P. S., Endress, P. K., Chase, M. W. (2005). Phylogeny and evolution of the angiosperms. Sinauer, Sunderland, Massachusetts, USA.
27. Winston, J. E. (1999). Describing species: practical taxonomic procedure for biologists. Columbia University Press, New York.
28. IUCN, (2020). International Union for Conservation of Nature and Natural Resources. Prepared and published by: IUCN Science and Economic Knowledge Unit, Gland, Switzerland

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VMalik

Subject: Botany		
Course Code: **BOT 102**	**Course Title:** Tools & Techniques in Plant Sciences	Theory paper II

Course Objectives: The main objectives of this paper are to study-

1. Principles of Microscopy and Microtomy
2. Staining technique
3. Spectroscopy
4. Separation & sequencing technique
5. Bioinformatic databases and online tool used in biological studies

Course Outcomes: At the end of this course, the students would be able to understand:

CO1: Microscopy & Microtomy
CO2: Staining technique
CO3: Principles and application of spectroscopy
CO4: Electrophoresis
CO5: Sequencing technique
CO6: Database and online Bioinformatic tool

Credits: 4	Core Compulsory
Max. Marks: 100	Min. Passing Marks:55

Total No. of Lectures-Tutorial (in hours per week): L-T-P: 4-0-0

Unit	Topics	No. of Lectures (Total sum = 60)
I	**Microscopy**: Principles of Microscopy, Confocal microscopy, Fluorescnce Microscopy, Electron Microscopy, Phase Contrast microscopy; Atomic Force Microscopy. **Microtomy**: Microtomy/Microtome & it types: dehydration, clearing and embedding of material, section cutting, dewaxing of samples. **Staining Techniques**: Different types of stains (fluorescence and non fluorescence), their preparation and uses.	12
II	**Spectroscopy**: General principles; Basic laws of light absorption; Types of spectra and their biological usefulness. Working and instrumentation of UV-VIS spectrophotometry; FTIR, Atomic Absorption spectrophotometry; NIR, Raman Spectroscopy, GCMS, LCMS and ICPMS.	12
III	**Separation Techniques** **Types of Centrifuges and Application;** Chromatographic Technique: Paper chromatography, Thin Layer Chromatography (TLC), **Gel filtration, Ion exchange and**	12

	Affinity column chromatography, High Performance Liquid Chromatography (HPLC), HPTLC, Isoelectric Focussing. Gel Electrophoresis and staining technique: Native, SDS and Urea PAGE, 2-D gel electrophoresis, Pulse-field electrophoresis, DIGE (Differential in Gel Electrophoresis).	
IV	**Sequencing Technique** Gene cloning, PCR techniques, Whole genome sequencing using Whole genome shotgun sequencing; clone-by-clone or 'hierarchical shotgun' sequencing; 454 Pyrosequencing. Reversible Terminator Sequencing, Single-Molecule Real-Time (SMRT) Sequencing and Nanopore Sequencing; microbial genomes (including yeast); plant genomes (Arabidopsis, rice). Application of NGS. Genome editing tools ZFN, TALEN and CRISPR-cas and its types.	12
V	**Computational Tools and Techniques**: Techniques and tools for Sequence Alignment Phylogenetic analysis. **Homology:**Orthology & paralogy. **Databases of Protiens and DNA**, Gene bank, Protein bank, Ensembl, Phytozomeetc Online tools - ORF finder, Primer designing tools, protein motif and structure prediction tools etc.	12

Teaching Learning Process: Class discussions/ demonstrations, Power point presentations, Class activities/ assignments, Field visits., Internship, etc.

Suggested Readings:

1. Primrose, SB. 1995. Principles of Genome Analysis. Blackwell Science Ltd.Oxford, UK..
2. E.J. Gardner and D.P. Snustad. PRINCIPAL OF GENETICS (1984), John Wiley & Sons, Ney York.
3. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 Molecular Biology of the Gene 6th edition. Cold Spring Harbour Lab. Press, Pearson Pub.
4. Freifelder - Molecular Biology.
5. P.K. Gupta. BIOTECHNOLOGY AND GENOMICS. Rastogi Publications, 7th Reprint (1st Edition): 2016-2017.
6. Ghosh, Z., Mallick, B. (2008). Bioinformatics – Principles and Applications, 1st edition. New Delhi, Delhi: Oxford University Press.
7. Baxevanis, A.D. and Ouellette, B.F., John (2005). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, 3rd edition. New Jersey, U.S.: Wiley & Sons, Inc.
8. Roy, D. (2009). Bioinformatics, 1st edition. New Delhi, Delhi: Narosa Publishing House.
9. Andreas, D., Baxevanis, B.F., Francis, Ouellette. (2004). Bioinformatics: A practical guide to the analysis of genes and proteins, 3rd edition. New Jersey, U.S.: John Wiley and Sons.
10. Pevsner J. (2009). Bioinformatics and Functional Genomics, 2nd edition. New Jersey,U.S.: Wiley Blackwell.
11. Xiong J. (2006). Essential Bioinformatics,1st edition. Cambridge, U.K.: Cambridge University Press

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