Minutes of the
9th Meeting of the Board of Studies
of
Department of Botany
Central University of Jammu

Venue : Office of Head, Department of Botany, CUJ, Bagla
Date : Thursday, 9th January, 2020
Time : 10:30 am

Department of Botany
Central University of Jammu

No.CUJ/BOT/2020/ Date: 9th January, 2020

MINUTES OF THE 9th MEETING OF BOARD OF STUDIES (BOS) OF DEPARTMENT OF BOTANY

9.1 Minutes of the meeting of the 9th Board of Studies of Department of Botany held on 9th Jan, 2020 at 10.30 am in Committee Room, Temporary Academic Block, Central University of Jammu.

9.2 The following members attended the meeting:

Name		Affiliation
Prof. B. S. Bhau	- Chairman	Department of Botany, Central University of Jammu
Prof. A. K. Wakhlu (retd.)	- External Expert Member	Department of Botany, University of Jammu, Jammu
Prof. Namrata Sharma	- External Expert Member	Head, Dept. of Botany, University of Jammu, Jammu
Prof. Veenu Koul	- External Expert Member	Department of Botany, University of Jammu, Jammu
Dr. S. Vaishnavi	- Member Secretary	Asst. Prof., Dept. of Botany, Central Univ. of Jammu
Dr. V. Srivastava	- Special invitee	Asst. Prof., Dept. of Botany, Central Univ. of Jammu
Dr. D. Bhardwaj	- Special invitee	Asst. Prof., Dept. of Botany, Central Univ. of Jammu
Dr. D. Kumar	- Special invitee	Asst. Prof., Dept. of Botany, Central Univ. of Jammu
Dr. B. L. Bhellum	- Special invitee	Assoc. Prof. (retd.), GCW Parade, Jammu

Dr. A. Bhat, Assistant Professor, Centre for Molecular Biology, CUJ could not attend the meeting.

9.3 Opening remarks by the Chair

The Chairman welcomed all the members, especially experts from outside the University, Retd. Prof. A. K. Wakhlu, Prof. Namrata Sharma and Prof. Veenu Koul, and thanked them for making it convenient to attend this meeting and providing invaluable inputs.

9.4 To consider and approve the course structure for semesters VIII - X of the Integrated M. Sc. Botany programme.

The courses pertaining to semesters VIII and IX were discussed in great detail. The courses of semester VIII were finalized and it was decided that the remaining courses shall be taken up in due course.

The approved course scheme and contents for semester VIII are placed on record as Annexure-1.

.5 **To consider and approve inclusion of the course 'Research and Publication Ethics' in Ph.D. coursework.**

The course on 'Research and Publication Ethics (RPE)' was approved to be included in coursework for Ph.D. in Botany. The mode of evaluation would conform to University norms. Further, the modifications in core course 'Techniques in Biological Research (TBR)' were also approved.

The approved courses, RPE and TBR are placed on record as Annexure - 2 and 3, respectively.

.6 **The Meeting ended with a vote of thanks to the Chair.**

Prof. B. S. Bhau 9/1/2020

Retd. Prof. A. K. Wakhlu

Prof. Namrata Sharma

Prof. Veenu Kaul 09/01/20

Dr. S. Vaishnavi

Dr. V. Srivastava

Dr. D. Bhardwaj

Dr. D. Kumar

Dr. B. L. Bhellum

Department of Botany
Central University of Jammu

Course structure of Integrated M. Sc. Botany VIIIth Semester (2020-21)

SEMESTER 1/ 4 PAPERS (All Core)	Credits	Hours/week
Core – 4 credits		
Applied Ecology	4	4-0-0
Genetics and Cytogenetics	4	4-0-0
Molecular Plant Physiology	4	4-0-0
Applied Pteridology and Gymnospermology	4	4-0-0
Applied Ecology Lab	2	0-0-4
Genetics and Cytogenetics Lab	2	0-0-4
Molecular Plant Physiology Lab	2	0-0-4
Applied Pteridology and Gymnospermology Lab	2	0-0-4
	24	16-0-16 = 32

Semester VIII

Course Title: Applied Ecology

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course Objectives

The course provides student with a thorough understanding and appreciation of ecosystems. The biotic and abiotic components; interactions; physical drivers and remote sensing that define major ecosystem types are described. It is imperative to have a firm grasp on the applicability of general ecological concepts (already dealt in IV sem).

Theory

Unit 1: Concept and Components of Applied Ecology

Introduction; utilization of ecological principles in relation to biotic and abiotic factors; natural systems versus anthropogenically influenced systems; effects of different land use changes on hydrological, chemical and biological processes in air, soil and water; Anthropogenic threats to aquatic ecosystems and associated hydro-morphological changes (construction of dams and dikes; drainage of land); current environmental issues; global carbon budget and cycling; waste and climate change.

Unit 2: Ecotoxicology and Ecological Restoration

Basics of ecotoxicology- sources and fate of toxicants; their routes of exposure, bioavailability, dose-response, biomarkers, risk assessment and biomagnifications; regulation, and monitoring of pollutants; recent developments in bioremediation, their advantages and disadvantages; ecological restoration of degraded ecosystems- methods and strategies for terrestrial and aquatic ecosystems; restoration of biological diversity- Augmentation by reintroduction and introduction of species.

t 3: Remote Sensing and Geographic Information System

ciples and concepts; spectral characteristic and reflectance of earth's surface features ks, soil, vegetation, water) in different wavelength regions of electromagnetic spectrum; plication of remote sensing and GIS in ecology- monitoring and natural resource nagement (vegetation mapping and forest resources management).

it 4: Ecological modelling

ndamentals of modelling, different models, statistical computing; skills and resources, ocess of formulating models of natural systems and confronting them with data; troduction to modelling platforms- R modelling platform; case studies using current pproaches for building, fitting and application of models.

nit 5: Society and Ecology

Sustainable development- goals, targets and challenges (energy, carbon and climate); Ecological literacy for the development of sustainable society with emphasis on population policy, carrying capacity and eco-footprint; Sustainable and organic agriculture; farm as an ecosystem- pest control, integrated crop and livestock production, and marketing systems; Fundamental concepts and strategies of industrial ecology– Material substitution and De-materialization (reuse and recycling).

Applied Ecology Lab

Assessment	
Max. Marks	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

Practicals

1. Study of forest vegetation and structure by applying suitable sampling methods and vegetation indices.
2. Quantification of the soil carbon content using titration methods.
3. Quantification of major nutrients (Nitrogen and Phosphorus) of soil by titration.

4. To determine the soil moisture content on a dry weight basis. To measure the compactness and porosity of different soils (agricultural land, barren land or degraded compact soils).
5. To analyze the inorganic and organic contaminants from soil or water system for toxicity study.
6. To study and calculate of exposure risk of pollutants (air/water/soil) to human health using data from clinical centres.
7. To study the enrichment and isolation of bacteria that degrade 2,4-Dichlorophenoxyacetic acid.
8. To demonstrate the ability of a soil bacterial community to adapt to imposed metal stress.
9. To detect *E. coli* in water by the most probable number (MPN) method.
10. To determine the biodegradation rate of a synthetic phenol or other phenolic compounds.
11. To demonstrate, introduction and installation of R software platform.
12. To demonstrate hands on R software, data entry, basic plotting and basic calculation.
13. Practical modelling exercises as per theory classes.
14. Demonstration and hand on remote sensing sensors; data extraction and data processing.
15. Remote sensing imagery resources and image processing and interpretation.
16. Analysis of RS and GIS data and interpreting the data for modelling applications.

SUGGESTED READINGS:

1. Singh JS, Singh SP, Gupta SR (2014) Ecology Environmental Science and Conservation, S Chand & Co. New Delhi.
2. Barbour MG, Burk JH, Pitts WD (1987) 2nd Edition Terrestrial Plant Ecology, The Benzamin/Cummings Publishing Company, San Francisco.
3. Omasa K, Nouchi I, De Kok LJ (2005) Plant responses to air pollution and global change, Springer Japan, Tokyo.
4. Gurjar BR, Molina T, Ojha CSP (2010) Air Pollution Health and Environmental Impacts, CRC Press, Boca Raton, U.S.A.

5. Singh JS (1993) Restoration of degraded land: concepts & strategies. Rastogi Publications, Meerut.

6. Smith RL (2001) Ecology and Field Biology, 6th edition. Benjamin Cummings.

7. Soetaert K and Herman PMJ (2009) A Practical Guide to Ecological Modelling. Springer Publication.

8. Sven Erik Jorgensen and Brian D Fath (2011) Fundamentals of Ecological Modelling Academic Press. Elsevier.

9. Michael H, PhD, Dong (2014) An Introduction to Environmental Toxicology, 3rd Edition, Create space Independent Pub.

10. Basudeb Bhatta (2011) Remote Sensing and GIS, Oxford University Press, 2nd edition.

11. Lillesand, Kiefer and Chipman (2011) Remote Sensing and Image Interpretation, Wiley, Sixth edition.

Semester – VIII

Course: Genetics and Cytogenetics

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course objectives

The course intends to provide the students with the detailed knowledge of applications of genetics and cytogenetics in fields like plant breeding, population genetics, evolutionary genetics and taxonomy.

Unit 1: Fungal Genetics

Introduction; Mutants and wild types- Isolation and characterisation of different mutants (complementation and functional allelism); functional mutants (auxotrophs, conditional lethals, resistance mutants, reverse mutants); Parasexual cycle - ~~Parasexual cycle~~, heterokaryosis, haploidisation, mitotic crossover and recombination, genetic analysis; Meiotic recombination - methods of analysis, linkage and tetrad analysis, gene mapping, gene conversion; Extra-chromosomal elements - Mitochondrial genome and plasmids, 2-micron plasmid, killer plasmid and linear plasmid;. Epigenetic gene silencing in filamentous fungi - RIP, MIP, Quelling, Heterothallism and mating type switch

Unit II: Eukaryotic Genome

Structure, organization evolution of plant genome; recombination- Molecular mechanism, linkage and crossing over; genetic and molecular markers, construction of linkage maps; Physical mapping of genes; correlation of genetic and physical maps; QTL mapping; concept of GWAS. Plant Genome Projects-History, organization and goals; case studies (*Arabidopsis thaliana*, *Oryza sativa* and *Cicer arietinum*); Indian scenario.

Unit III: Transposable Genetic Elements

Discovery; transposable elements in bacteria (IS, composite and non-composite Tn), transposable elements in Yeast and maize; host cell interaction in the regulation of

transposition. Role of transposons in plant genetic and epigenetic regulation, and speciation; gene creation; evolutionary significance of transposable elements.

Unit IV: Chromosome- physical structure, numerical and structural changes

Chromosome architecture – Linear differentiation; structure and role of centromere and telomere; unique and repetitive DNA; euchromatin and heterochromatin; banding patterns; karyotype evolution; DNA content and C-value paradox; transmission and characterization of mono-and trisomics and their use in chromosome mapping of diploid and polyploid species; breeding behaviour and genetics of complex translocation heterozygotes, translocation tester sets, Robertsonian translocations; breeding behaviour and genetics of inversion heterozygotes; production, characterization and utility of alien addition and substitution lines.

Unit V: Modern techniques in genetics and cytogenetics

Brief idea about application of- Chromosome banding; fluorescence in-situ hybridization (FISH); Genomic in-situ Hybridization (GISH); multicolor genomic in-situ hybridization (McGISH); primed in-situ (PRINS) DNA labeling; fiber-FISH; flow cytometry (Determination of nuclear DNA content, ploidy and genome size); chromosome microdissection and utilization of micro-isolated DNA; three-dimensional, live-cell imaging of chromatin dynamics in plant nuclei using chromatin tagging systems; chromatin immunoprecipitation for detecting epigenetic marks on plant nucleosomes; image analysis of DNA fiber and nucleus in plants.

SUGGESTED READINGS:

1. Swanson CP, Merz T, and Young WJ, (1967), Cytogenetics, Prentice Hall of India, Pvt. Ltd.
2. Russel PJ, (1998), Genetics, Benjamin/Cummings Publishing Co, Inc.
3. Sinnott EW, Dunn LC and Dobzhansky T (1958); Principles of Genetics, Kugakusha Co; Ltd.
4. Snustad DP and Simmons MJ (2000); Principles of Genetics. John Wiley & Sons. NY.
5. Klug and Cummings (2012) Concept of Genetics, 10th Edn; Pearson publications.
6. Acquaah G (2007) Principles of Plant Genetics and Breeding; Blackwell Publishing Ltd; USA.
7. Allard RW (1999) Principles of Plant Breeding (2nd Edition); John Wiley and Sons.
8. Hartl DL and Jones EW (2007) Genetics – Analysis of Genes and Genomes: 7th edition; Jones and Barlett publishers.

9. Hartwell LH, Hood L, Goldberg ML, Reynolds AE, Silver LM, Veres RC (2006) Genetics – From Genes to Genomes; 3rd edition; McGraw Hill.
10. Lewin B (2008) Genes IX; Jones and Barlett Publishers.
11. Singh RJ (2002) Plant Cytogenetics; 2nd edition; CRC Press.
12. Smartt J and Simmonds NW (1995); Evolution of Crop Plants (2nd Edition) Longman.
13. Strickberger MW (2008) Genetics; 3rd Edition; Pearson (Prentice Hall).
14. Weising K, Nybom H, Wolff K and Kahl G (2005) DNA Fingerprinting in Plants: Principles; Methods and Applications; 2nd ed; Taylor and Francis Group; Boca Raton.
15. JRS Fincham. (1979). Fungal Genetics. Botanical Monographs Vol 4. University of California Press.

Genetics and Cytogenetics Lab

Practicals

Assessment	
Max; Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

1. To study of mitotic chromosomes of *Allium cepa*, ~~*Avena*~~ *sativum*, *Hordeum vulgare* by squash technique - Pre-treatment; Fixation and Staining of Chromosomes
2. To study meiotic chromosomes of *Phlox drummondii*/ *Allium cepa*/ *Tradescantia* sp., *Delphinium* sp., *Aloe* sp.
3. Karyotype analysis and preparation of idiograms.
4. Analysis of molecular polymorphism in parental lines and derived mapping population using different types of molecular markers.
5. Construction of a linkage map using available data.
6. To demonstrate the effect of polyploidy on plant phenotype, meiosis, pollen and seed fertility and fruit set.
7. To study the effect of mono and trisomy on fertility and meiotic behaviour.
8. To study the effect of translocation heterozygosity on chromosome behaviour, pollen and seed fertility.
9. To study the meiosis of complex translocation heterozygotes.
10. Experiments based on the chapter 5.

Semester – VIII

Course: Molecular Plant Physiology

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course objectives

The course deals with details of plant developmental, sensory and stress physiology and secondary metabolism, signal transduction; programmed cell death and defense.

Theory

Unit 1: Developmental Physiology

Stages of fruit development and their regulation; biochemical and related events during fruit ripening in climacteric and non-climacteric fruits; physiology and biochemistry of fruit abscission; post-harvest changes; production of transgenic fruits; hormonal regulation of seed development; events associated with seed maturation- factors regulating seed dormancy; mechanisms of mobilization of food reserves during seed germination.

Unit 2: Sensory physiology and Secondary metabolism

Biochemical and biophysical mechanisms of thigmotropism- electric self-defence, taste, light; explosion, sleeping and rhythms; stimuli that trigger rapid movements- movements based on mechanical forces, mobility triggered by sense of touch, taste and electricity; motors driving movements in the living world, actin-myosin motors; photosensing- chemistry of excitability; neurotransmitters in plants; natural products (secondary metabolites)- their range and eco-physiological functions; overview of terpenoidal, alkaloidal, and phenolic metabolites and their biosynthesis.

Unit 3: Sensory Photobiology and Signal Transduction

Cryptochromes and phototropins- Structure, function and mechanisms of action; stomatal movement- scotomorphogenesis and photomorphogenesis; specific signalling mechanisms and their regulation- simple and hybrid type of two-component sensor-regulator system in

bacteria and plants (examples of chemotaxis, osmosensing, ethylene and cytokinin signaling); quorum sensing; gasotransmitters.

Unit 4: Stress Physiology

Introduction to stress; plant responses to biotic and abiotic stresses; mechanisms of stress tolerance- drought, salinity, metal toxicity, freezing and heat stress; nitrosative and oxidative stress – effects and causes; reactive oxygen species metabolism; nitric oxide (NO) biosynthesis and metabolism; NO-mediated signalling; markers; antioxidant mechanisms.

Unit 5: Programmed cell death (PCD) and defense

Concept of PCD and its types in plants during vegetative and reproductive stages; developmental and stress-induced PCD; Plant, leaf and flower senescence and their characteristics; altered metabolism during senescence and its regulation; hormonal modulations; biochemical mechanisms of plants chemical war against other plants and animals; plant responses to herbivory; defense mechanisms; induced phytochemical responses.

Molecular Plant Physiology Lab

Assessment	
Max; Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

Practicals

1. To study the effect on different chemicals/phytohormone/stress on seed germination.
2. To study the effect of light on seed germination.
3. Demonstration of fruit ripening in climacteric and non-climacteric fruits.
4. Chlorophyll estimation of leaves (of different age) using spectrophotometric methods.
5. Demonstration of plant movements.
6. Extraction of metabolites from plant tissue and their qualitative analysis using TLC.
7. Demonstration of chemicals/phytohormone on stress alleviation.

8. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.
9. Demonstration of cell membrane damage during stress conditions.
10. To study ROS generation during development and stress conditions.
11. To study the effect of different concentrations of IAA on coleoptile elongation (IAA Bioassay).

SUGGESTED READINGS:

1. Ainsworth C (2006) Flowering and its Manipulation Annual Plant Reviews, Vol. 20 Blackwell Publishing. Oxford. U.K.
2. Davies P J. (2004) Plant Hormones: Biosynthesis. Signal Transduction, Action. 3rd Edition. Kluwer Academic Publisher. Dordrecht. The Netherlands.
3. Hopkins. G.W and Huner. N.P.A. (2008) Introduction to Plant Physiology. 4thEdn Wiley and Sons. Inc. New York. U.S.A.
4. Jordan BR. (2006) The Molecular Biology and Biotechnology of Flowering. 2nd Edition. CAB International, Oxfordshire. U.K.
5. Nelson D.L. and Cox. MM (2013). Lehninger-Principles of Biochemistry. Worth Publishers Inc. New York. U.S.A.
6. Salisbury FB and Ross CW (1992). Plant Physiology, 4thEdn. Wadsworth Publishing Co. California. U.S.A.
7. Taiz L and Zeiger E. (2006) Plant Physiology, 4th Edition, Sinauer Associates Inc. Publishers, Massachusetts, U.S.A.
8. Taiz. L. Zeiger. E. Moller IM and Murphy A (2015). Plant Physiology and Development, Sinauer Associates Inc. U.S.A. 6th edition.

Semester – VIII

Course Title: Applied Pteridology and Gymnospermology

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course objectives: The objective of the course is to give detailed knowledge of distribution, morphology, anatomy, cytology and reproductive biology of some important families of Pteridophytes and Gymnosperms. Students will also be acquainted with experimental studies in ferns and gymnosperms.

Theory

Unit 1 Pteridophytes

Diversity and distribution of Pteridophytes in India, their Phenology and habitat specificity in eastern and western Himalaya. Important concepts and their significance in plant evolution. Range of structure and reproduction in Lepidodendrales, Calamitales, Ophioglossales, Marattiales, Osmundales, Filicales and Salviniales.

Unit 2 Advances studies in Pteridophytes

Gametophyte as a model for biotechnological studies; methods of mass multiplication— *in vitro* gametophyte development, gametophyte explant culture, regeneration in clone gametophytes; propagation of sporophytes *in-vitro* conditions, acclimatization and transplantation; traditional uses of ferns in pharmaceuticals— Secondary metabolites of ferns, types, composition and their therapeutically/medicinal role; fern conservation- ex situ storage of spore, gametophyte and sporophyte, *in-vitro* culture, and cryopreservation; genetic marker for fern diversity research; non-specific markers and microsatellites; *Ceratopteris richardii* as a model system of physiological control of sex expression.

Unit 3 Gymnosperms

Diversity and distribution of living gymnosperms in India; range of structure and reproduction in Cordiatales, Coniferales, Taxales, Ginkgoales, Podocarpales and Welwitschiales.

Unit 4 Advanced studies in Gymnosperms

In vitro studies on gymnosperms using vegetative tissues, organs, microspores and male gametophytes and their significance in conservation and silviculture. Biotechnological approaches—somatic embryogenesis, genetic transformation, protoplast culture and micropropagation; phytochemistry of gymnosperms— secondary metabolites, medicinal value and drugs.

Unit 5 Applied aspects of Pteridophytes and Gymnosperms

Role of ferns in environmental clean-up; removal of contaminants by ferns in soil and water; organic and inorganic contaminants. Environmental biotechnology: role in ecotoxicology and bioremediation in ferns. Ferns in horticulture- significance and different practices; role of climatic and other factors. Ecological role of gymnosperms on regional climate, soil, and vegetation; gymnosperms in horticulture— significance and different practices; role of climatic and other factors. Genetic marker for gymnosperms diversity; research non-specific markers and microsatellites.

Practicals

Assessment	
Max; Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

1. Study of external morphology of vegetative and reproductive structures of *Ophioglossum*, *Dryopteris*, *Adiantum*, *Asplenium*, *Cheilanthes*, *Salvinia*, *Azolla* etc.
2. Study of soral structure, spores' types, their viability and germination.
3. Field visits to local areas to study the pteridophyte diversity, habitat specificity and economic importance.
4. Study of secondary metabolites of ferns and their use in medicines.
5. In vitro study of pteridophyte spores or plant to propagate the plant.

6. Study of external and internal morphology of vegetative and reproductive structures of living gymnosperms (*Gingko*, *Podocarpus*, *Taxodium*, *Araucaria*).
7. Study of pollen grains of gymnosperms, their viability and attempt germination in different media.
8. Field visits to study the diversity and habitat specificity of gymnosperms.
9. Practical based on in vitro studies of gymnosperms.
10. Study of nutritional and medicinal value of gymnosperms.
11. Study of phytochemical analysis of gymnosperms.

SUGGESTED READINGS:

Pteridophyte

1. Gifford E. M, Foster A.S. (1989). *Morphology and evolution of Vascular plants*, (3rd Edn). W H. Freeman & Co.
2. Rashid A. (1976). *An Introduction to Pteridophytes*. Vikas Publishing House.
3. Sporne K.R. (1986). *Morphology of Pteridophytes*. Hutchinson University Library, London.
4. Surange K.R. (1966). Indian Fossil Pteridophytes. Council of Scientific and Industrial Research.
5. Chandra S. &Srivastava M. (2003). Pteridology in the New Millennium. Khuwar Acad. Publishers
6. Stewart W.N. &Rothwell G.W. (2005). Palaeobotany and the Evolution of Plants, (2nd Edn.) Cambridge University Press.
7. Sharma O.P. (2006). Text book of Pteridophyta. Macmillan India Ltd., New Delhi.
8. The Morphology of Gymnosperms. K.R. Sporne. 1965. London. Hutchinson University Library; ed. H. Munro Fx. Hutchinson & Co. (Publishers).
9. John M. Coulter and Charles J. Chambrlain, 2018, Morphology of Gymnosperms. CreateSpace Independent Publishing Platform.
10. S.P. Bhatnagar and Alok Moitra, 1996, Gymnosperms. New Age International.
11. C. Biswas and B.M. Johri. 1997. The Gymnosperms. Springer-Verlag Berlin Heidelberg.
12. H. Fernández (ed.), 2018, Current Advances in Fern Research, Springer International Publishing.

ज्ञान–विज्ञान विमुक्तये

प्रो. रजनीश जैन
सचिव
Prof. Rajnish Jain
Secretary

सत्यमेव जयते

विश्वविद्यालय अनुदान आयोग
University Grants Commission
(मानव संसाधन विकास मंत्रालय, भारत सरकार)
(Ministry of Human Resource Development, Govt. of India)
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D.O.No.F.1-1/2018(Journal/CARE)

December, 2019

Respected Sir/Madam,

University Grants Commission in its 543rd meeting held on 9th August, 2019 approved two Credit Courses for awareness about publication ethics and publication misconducts entitled **"Research and Publication Ethics (RPE)"** to be made compulsory for all Ph.D. students for pre-registration course work (**attached as Annexure**).

In view of the above, you are requested to ensure that the above two Credit courses may be made compulsory for all Ph.D. students for pre-registration course work undertaken in your University from the forthcoming academic session.

With regards,

Yours sincerely,

(Rajnish Jain)

TO THE VICE-CHANCELLORS OF ALL UNIVERSITIES

ANNEXURE

Course Title:

- **Research and Publication Ethics (RPE)**-Course for awareness about the publication ethics and publication misconducts.

Course Level:

- 2 Credit course (30 hrs.)

Eligibility:

- M.Phil., Ph.D. students and interested faculty members (It will be made available to post graduate students at later date)

Fees:

- As per University Rules

Faculty:

- Interdisciplinary Studies

Qualifications of faculty members of the course:

- Ph.D. in relevant subject areas having more than 10 years' of teaching experience

About the course

Course Code: CPE- RPE

Overview

- This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

- Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation

- Continuous assessment will be done through tutorials, assignments, quizzes, and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

Course structure

- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit title	Teaching hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Databases and Research Metrics	7
	Total	**30**

Syllabus in detail

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

- **RPE 02: SCIENTIFICCONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

- **RPE 04: OPEN ACCESS PUBLISHING(4 hrs.)**

1. Open access publications and initiatives

2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

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Anx 3

Paper I

Course No. : **Course Title: Techniques in Biological Research**

Marks: 100

UNIT-I Microscopy, Chromatography and Electrophoresis

Principles and applications of light, phase contrast and fluorescence microscopy, Principles, working and applications of scanning and transmission electron microscopy, limitations of electron microscopy. Types of Chromatography, principles and applications of gel filtration, ion exchange and affinity chromatography. Factors affecting electrophoresis, electro-focussing. Principles of spectroscopy, instrumentation and application of Nuclear Magnetic Resonance (NMR) and Electron Spin Resonance (ESR). Principles, working and applications of absorption and Plasma Emission Spectroscopy. Flow Cytometry: Applications and instrumentation.

UNIT-III Proteomics, Genomics and Radiology

Proteomics & Genomics

Proteomics (2D gels, mass spectrometry), methodologies for protein purification, stabilization, and characterization Methods to study Protein–protein interaction (yeast two hybrid, BiFC), gel shift assay, kinase assay, Phage display. Co-immunoprecipitaion. Genome databases of various plants. Genome analysis: Next Generation Sequencing (NGS), Genome Sequencing, Gene Annotation and prediction, tools and resources Genomes and transcriptomes of model organisms Functional genomics: Strategies to find important genes in the genome and their functional analysis, Differential gene expression profiling methods (differential display, subtractive analysis, Microarrays, comparative transcriptomics) Comparative genomics and synteny, Principles and applications of tracer techniques in biology, radioisotopes, half life of isotopes. commonly used isotopes, safety and precautions. Effect of radiation on biological system: Mutagenic, Carcinogenic, Teratogenic Effects. Autoradiography, Principles of radiation dosimetry, Cerenkov radiation.

UNIT-IV Bioinformatics and Biostatics

Sequence Analysis – Methods of sequence alignment: Scoring matrices, Block Substitution Matrices (BLOSUM). Database searching (BLAST and FASTA). Multiple Sequence alignment (MSA) – significance; softwares (PIMA, Clustal, Pileup, ClustalW, Meme, MACAW); Phylogenetics: Phylogenetic analysis, Phylogenetic representations – graphs, trees and cladograms; Steps in phylogenetic analysis; Methods of phylogenetic analysis – similarity and distance tables, distance matrix method; Method of calculation of distance matrix (UPGMA, WPGMA); The Neighbour Joining Method; The Fitch/Margoliash method; Character-based Methods – maximum parsimony, maximum likelihood: Limitations of phylogenetic algorithms; Phylogenetic softwares – PAUP, PHYLIP, MacClade. Databases; Protein sequence and structure databases, nucleotide sequence database. Descriptive Statistics of the distribution of any variable; Mean, Mode, Median, Variance, Standard Deviation, Coefficient of Variation. Descriptive Statistics of Averages, Dispersion, Skewness and Kurtosis. Applications of Probability Distributions, Binomial and Normal Distributions. Poisson Distribution; Method and its Applications.