BODOLAND UNIVERSITY

Ph.D. course work Syllabus in Botany under Faculty of Science, BU

Dept. of Botany
Bodoland University
Kokrajhar-7833 70
BTAD, Assam

Course work syllabus for Ph.D. (Botany), *w.e.f.* 2021

COURSE CONTENT

Department of Botany, Bodoland University

Paper	Code	Title	Credit	Seminar/ Assignment	Internal exam	Final exam
Paper-I	BOT CP-I	Research Methodology	3	20	20	60
Paper-II	BOT CP-II	Computer Application	3	20	20	60
Paper-III	BOT CP-III	Plant and Environment	3	20	20	60
Paper-IV	BOT OP-I	Plant Taxonomy	3	20	20	60
	BOT OP-II	Ecology	3	20	20	60
	BOT OP-III	Plant Physiology and Biochemistry	3	20	20	60
Paper-V	BOT CP-IV	Research and Publication Ethics	2	0	0	50
		Total	14 credits	80	80	290

NB:-Course contains five papers, four Compulsory Papers and one from Optional Papers

Paper Code: BOT CP-I

Paper Title: Research methodology

Total Marks=100 (20+20+60)

Credit-3

UNIT I

Research methodology, research concept, identification of research gap, understanding the scientific questions. Novelty in research in support of existing literatures, setting hypothesis and objectives, writing research proposal/synopsis.

UNIT II

Scientific writings: Forms of scientific writing i.e. research articles, notes, report, review, monograph, dissertation/thesis, popular article etc, components of research articles, writing strategy for a research article.

UNIT III

Introduction to Patent laws: Patents Laws, process of patenting research findings, copy right, cyber laws.

UNIT IV

Field techniques: Collection and preservation techniques of specimens (Algae, Fungi, Lichen and higher plants).

Suggested readings

1. Kothari, CR. *Research Methodology Methods and Techniques*. New Age International Publishers, New Delhi, 2009.
2. Ackoff, Russell L. *The Design of social Research*, Chicago Press, 1961.
3. Ackoff, Russell L. *Scientific Method*, New work: John Wiley & Sons, 1962.
4. Jain, S.K. and R.R. Rao. *A hand book of Field and Herbarium Technique*. Today & Tomorrow Publication, New Delhi, 1977.

Paper Code: BOT CP-II

Paper Title: Computer Application

Total Marks: 100 (20+20+60)

Credit-3

Unit I

Operating system, System Software, Application Software

Use of Microsoft office word in word processing, graphical presentation and preparation of documents.

Power Point in graphical presentation and preparation of documents, Creating and printing a presentation, producing a slide show

Excel in data analysis, Editing and formatting worksheets, performing basic calculations, working with charts.

Browsing internet for related literature and Inter Groups for sharing of data and result.

Unit II

Exercises in Adobe Photoshop: Preparation of at least one plate containing 5-6 photograph complete with legends and title.

Use of Paint/Draw programs.

Unit III

Preparation of scientific posters for presentations. Use of various presentation techniques.

Unit IV

Applications exploring various websites and search engines for collecting quality literature and secondary data related to research work.

Botanical websites: International Plant Names Index (IPNI); The Plant List (http://www.theplantlist.org); Tropicos (http://www.tropicos.org); Biodiversity Heritage Library (BHL); Index Fungorum (http://www.indexfungorum.org.); Algaebase (http://www.algaebase.org.).

Suggested Readings

1. https://www.tutorialspoint.com/word/word_tutorial.pdf
2. https://onlinecourses.swayam2.ac.in/cec20_cs05/preview
3. Computer Fundamentals by P.K. Singha, Priti Singha
4. Peter Norton “Introduction to Computers” , 6th International Edition (McGraw Hill)

Paper Code: BOT-CP-III

Paper Title: Plant and Environment

Marks=100 (20+20+60)

Credit-3

UNIT I

Definition of Biodiversity; levels- microbial, genetic, species, ecosystem, landscape; drivers, magnitude and distribution of biodiversity; evolution of biodiversity; change in biodiversity over time in different regions of the world; concept of diversity hotspots; biodiversity in India.

UNIT II

Sustainable use of biodiversity; biodiversity loss and its consequences; estimates of extinction rates worldwide and in India; biodiversity and food security; biodiversity and legal issues; analysing and discussion of causes and consequences of extinction/changes in biodiversity, North-East scenario.

UNIT III

Conservation strategies; conservation genetics; wildlife biology; ex-situ conservation; facilities establishment of new population, captive breeding, reintroduction, discussion on advantages and disadvantages; in-situ conservation.

UNIT IV

Protected areas of NE India: Problems of protected areas in India, connectivity and corridors; population biology of endangered species of NE India.

Suggested Readings

1. Dwivedi, O.P. India's Environmental Policies, Programmes and Stewardship
2. Chopra K. R. Development and Environmental Policy in India: The Last few decades.
3. Freeman, B. (ed.), 1995. - Environmental Ecology- The ecological effects of pollution, disturbance, and other stresses. Academic press.
4. Krishnamurthy K.V. A textbook of Biodiversity, Science Publishers Inc., Enfield, New Hampshire, USA.
5. Odum, E. P. and Barrett, G. W. (2005). Fundamentals of Ecology, 5th Edition, Cengage Learning, New Delhi, India

Paper Code: BOT OP-I

Paper Title: Plant taxonomy

Marks=100 (20+20+60)

Credit-3

UNIT I

Taxonomy and Systematics- Basic components of taxonomy, advancement levels of taxonomy; digital databases of Plant Taxonomy; Post –Darwinian and APG system of classification

UNIT II

Phenetic Taxonomy- Principles, OTUs, taxonomic characters and their coding, Measuring resemblance (Simple matching coefficient, coefficient of association, Yule coefficient, taxonomic distance), Cluster analysis**;** Cladistic Taxonomy- Cladistic Concepts; Construction of cladograms, evaluating consensus tree.

UNIT III

Major problems of Taxonomy teaching and research in India and some remedies, Role of plant; Taxonomy in difference branches of plant research, including medicinal plants research, Taxonomic literature and websites, Population concept in taxonomy.

UNIT IV

Process of Identifications: Herbarium techniques: Methods of Collection, Identification and Documentation; Digital herbarium; Roles and importance of herbaria, Botanical Gardens and Museums in taxonomic studies, major Herbaria and Botanic Gardens in World and India.

Suggested readings

1. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
2. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford& IBH Pvt. Ltd., New Delhi. 3rdedition.
3. Lawrence: Taxonomy of Vascular Plants
4. Sivarajan, V.V. (Ed. Robson). Introduction to Principles of Plant Taxonomy
5. Heywood, V.H. Plant Taxonomy
5. Naik, V.N. Taxonomy of Angiosperms (1988)
6. Stace, C.R. Plant Taxonomy and biosystematics (2nd Ed.)

Paper Code: BOT OP-II

Paper Title: Ecology

Marks=100 (20+20+60)

Credit-3

UNIT I

Field Survey, Field sampling (Soil, Plant and Water samples) and Physiochemical analysis, Overview of phytosociological methods used in ecological study, Vegetation and Community analysis methods, ethics in ecological research, Finding out research problem and gaps.

UNIT II

Principles of ecology, population ecology, key concept, attributes, population growth and regulations, life history strategies- r and k selection, Species richness, diversity and its measurement, Population and community ecology research in India- Past, current status and future direction. Algal ecology- Present Scenario.

UNIT III

Ecosystem functioning, definition of ecosystem services (ES); methods of valuation, Ecologic al niche and its types, habitat analysis, resource partitioning and character displacement- case studies; case studies on ecosystem studies- global, regional and local; Role of algae in ecosystem maintenance.

UNIT IV

Degraded ecosystem research in NE India- current status and future direction, Use of algae, microbes and plant for remediation and degraded ecosystem, Ecological engineering and Eco- toxicology associated with degraded systems, Stress ecology- biotic and abiotic, plant-animal and plant microbe interaction – key concept and method of study. Biological methods for treatment of waste water.

Suggested readings

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.
6. General Ecology. HD. Kumar. Vikass Publ. House Pvt. Ltd. 1995. Global Biodiversity. Trivedi.

Paper Code: BOT OP-III

Paper Title: Plant Physiology and Biochemistry

Marks=100 (20+20+60)

Credit-3

Unit I

Stress physiology: Abiotic stress: Physiological and biochemical responses of plants to environmental stress. Biotic stress: Effect of fungal infection on plant metabolism. Oxidative stress: Generation of reactive oxygen species, effect of ROS on plant metabolism, mechanism of ROS detoxification in plants.

Unit II

Secondary Metabolites: Biosynthesis and applications of secondary metabolites in plants and lichens.

Unit III:

Instrumentation and Analytical Techniques: Chromatographic techniques, Centrifugation Techniques, Electrophoresis and Spectroscopic Technique.

General protocol for extraction, separation, purification and identification of some photochemical from lichens and higher plants.

Modern techniques for qualitative and quantitative analysis of hormones, secondary metabolites, proteins, pathogen related protein and amino acids.

Unit IV:

Microbial Culture techniques: Preparation of culture media: complex and defined media; Selective and differential growth media; establishing pure culture: streak plate; pour plate; Preservation of cultures: establishment of stock culture; subculturing.

Suggested Readings

1. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons. U.S.A.

4th edition.
2. Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A. (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.
3. Bajracharya D. (1999). Experiments in Plant Physiology-A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology. S.Chand.
5. Singh R.P. Microbiology. Kalyani Publishers.
6. Tortora G.J. Berdell R.F. & Case C.L. Microbiology: An Introduction. (13th Edition). Pearson.

Paper Code: BOT CP-IV

Paper Title: Research and Publication Ethics

Total Marks: 50

Credit-2

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

References

Bird, A. (2006). *Philosophy of Science.* Routledge.

MacIntyre, Alasdair (1967) *A Short History of Ethics.* London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865

National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition.* National Academies Press.

Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1–10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179–179. https://doi.org/10.1038/489179a

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