List of New Course(s) Introduced

Department : Botany

Programme Name : *Ph. D. Course work*

Academic Year : 2018-19

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	LS/BOT/PPC3/REC1	Bio-resource Utilization & Herbal Technology
02.	LS/BOT/PPC3/REC2	Bio-atmospheric Interactions and Green Remediation
03.	LS/BOT/PPC3/REC3	Environmental Ecology
04.	LS/BOT/PPC3/REC4	Advance Bacterial Genetics
05.	LS/BOT/PPC3/REC5	Medical Botany

Scheme and Syllabus Attached

04.07.22

Signature & Seal of HoD

विभागाध्यक्ष
Head
वनस्पति शास्त्र विभाग
Department of Botany
गुरु घासीदास विश्वविद्यालय (केन्द्रीय वि.वि.), बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.)

GURU GHASIDAS VISHWAVIDYALAYA

(A central University)

Bilaspur (CG)

SYLLABUS

(Pre Ph.D Course)

Department of Botany
School of Life Science

Ph.D. Programme in Botany
(2018-19)

ABOUT THE PROGRAM

The Ph.D course work course comprises compulsory course (04 credits; A), discipline-specific courses (04 credits; B) and research theme-specific courses (04 credits; C). Since PhD students come from different educational backgrounds, relevant courses will be chosen in consultation with the concerned DRC/RAC to compliment the previous education, improve specific skills required for thesis and subsequent career. The compulsory Courses (CC), and Discipline-Specific Courses are compulsory for all students registered in the Ph.D program in botany. Whereas, a research scholar will select elective courses (i.e., Research Specific Courses as suggested by the concerned DRC/RAC.

Common course

Course code	Title (credit)	Credit/Marks
LS/BOT/PPC-1	Research Methodology and Computer Application (04)	04/100

Discipline-specific courses

Course code	Title (credit)	Credit
LS/BOT/PPC-2	Instrumentation and techniques in Plant Sciences (04)	04/100

Research Specific Courses (students select any one of these)

Course code	Title (credit)	Credit/Marks
LS/BOT/PPC3/REC-1	Bio-resource application & Herbal technology (03) Review of literature and Seminar presentation (01)	03+01/75+25
LS/BOT/PPC3/REC-2	Bio-atmospheric Interactions and Green remediation (03) Review of literature and Seminar presentation (01)	
LS/BOT/PPC3/REC-3	Environmental Ecology (03) Review of literature/Seminar presentation (01)	
LS/BOT/PPC3/REC-4	Advance Bacterial Genetics (03) Review of literature and Seminar presentation (01)	
LS/BOT/PPC3/REC-5	Medical Botany (03) Review of literature and Seminar presentation (01)	

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Bio-resource application & Herbal technology — New course

LS/BOT/PPC3/RSC-1

(Credits- 03; contact hour-45h; maximum marks – 75)

Unit I:

Microbes: their isolation, purification & maintenance. Screening of useful strain, Strain improvement through random mutation (random & rational selection), strain improvement. Fermentation technology, fermentation media and Downstream Processing. Application of microbes in various fields. New course

Unit II:

Bioremediation: biodegradability of Petroleum hydrocarbons, Halocarbons, Chlorophenols, Nitroaromatics; Solid waste and solid waste management. Microorganisms as biofertilizers and biopesticides: Principles and mechanism of biological control, Commercial production of biofertilizers and biopesticides. Biofuels: From organic residue (ethanol), fuel from algae and cyanobacteria. Single cell proteins and mushroom based protein. New course

UNIT III:

Steps, solvents & equipments used for phytochemical analyses; Techniques used for extraction, separation, purification and *in vitro* and *in vivo* analyses of phytochemicals; Herbal extract preparations and storage methods. Application of bioactive phytochemicals in industry and healthcare.

Unit IV:

Intellectual Property Rights (IPR), Patents, Trademarks, Copyrights. Introduction to Patenting of Microbiological materials and GMO, implication of patenting, current issues, patenting of genes and DNA sequences.

Suggested Reading:

1. Reed G (1997). Industrial Microbiology. CBS Publishers (AVI Publishing Co.)
2. Stanbury PF, Whitekar A. and Hall (1995). Principles of Fermentation Technology. Pergaman. McNeul and Harvey.
3. Rehm and Reed (1983). Biotechnology. Verlag Chemie.
4. Bhosh, Fiecht er and Blakebrough (1999). Advances in Biochemical Engineering. Springer Verlag Publications.
5. Creuger and Creuger (2001). Biotechnology- A textbook of Industrial Microbiology. Sinaeur Associates.

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6. Casida LE (1997). Industrial Microbiology, Wiley Eastern.
7. Agrios, GN (1997).Plant Pathology. Academic Press, San Diego.
8. Cook RJ and Baker KF (1983). The Nature and practice of Biological Control of plant pathogens. Amereca Phytopathological Society Press, St. Paul, MN.
9. Butt, TM, Jackson CW and Magan N (2001). Fungi as Biocontrol agent. CABI Publishing, UK
10. Maier RM, Pepper IL and Gerba CP (2000). Environmental Microbiology. Academic Press. USA
11. Pepper IL,Gerba CP and Brusseau ML (2006). Environmental and Pollution Science. Academic Press. USA
12. Baker KH and Herson DS (1994). Bioremediation. MacGraw Hill Inc. N.Y.

Review of literature and Seminar presentation

(Credits- 01; contact hour-15h; maximum marks – 25)

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गुरु घासीदास वि
Guru Ghasidas Vi

Bio-atmospheric Interactions and Green remediation — New course

(LS/BOT/PPC3/RSC-2)

(Credits- 03; contact hour-45h; maximum marks – 75)

UNIT I:

Mass and energy exchange between the biosphere and atmosphere: Exchange of carbon (CO_2) between the biosphere and atmosphere, deposition of nutrients and heavy metals to the plants and their fate

UNIT II:

Plant-atmosphere exchange of trace gases: Biogenic Volatile organic compounds (BVOCs) and climate change. Impact of eco-physiological factors on the exchange of trace gases.

UNIT III:

Green remediation: Core elements, strategies for environmental (air, water, and soil) clean-up, waste management, effects of remedy implementation, sustainability of site remediation, case studies

UNIT IV:

Biochar: Biochar for environmental management, Biochar for agricultural soil amendment, Biochar for atmospheric carbon sequestration, Biochar's Potential and Pitfalls

Suggested Readings

1. Adger, W. N. 2005. Adapting to climate change. Wiley Publication. UK.
2. Biosphere-Atmosphere Exchange of Pollutants and Trace Substances, Publisher: Springer-Verlag Berlin and Heidelberg GmbH & Co. KG, ISBN: 9783540617112
3. Lehmann, J. 2009. Biochar for Environmental Management: Science and Technology. Earthscan Publishers, UK
4. Bell and Treshow 2002. Air Pollution and Plant Life. Willey Publication. UK
5. Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites, US EPA, 2008.
6. Pepper, Ian. 2003. Environmental chemistry. Wiley Publication. UK
7. Koppmann, R. 2007. Volatile Organic Compounds in the Atmosphere. Blackwell Publishing Ltd, Print ISBN:9781405131155.

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Review of literature and Seminar presentation

(Credits- 01; contact hour-15h; maximum marks – 25)

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Head

Environmental Ecology — NEW course

LS/BOT/PPC3/RSC-3

(Credits- 03; contact hour-45h; maximum marks – 75)

UNIT I:

Metal Contamination (of Air, Water and Soil) - Assessment of Metals Toxicity; Various Bioassay for Metal Contaminations; Ground Water Pollution-Fluoride and Arsenic Contamination.

UNIT II:

Problems of Mining Industries (Aluminium Toxicity and Acid Mine Drainage); Bioremediation of Pollutants (metals), Reclamation of Degraded Wastelands (mine sites)

UNIT III:

Global Climate Change- Global Warming; Ozone Pollution and its Impact on Plants; Ocean Acidification- Causes and Implications; Light Pollution and its Ecological Impact.

UNIT IV:

Forest - Structure and Regeneration; Sacred Groves and Biodiversity Conservation; Natural Resources - Management and Sustainable Development

Suggested Readings:

1. Larcher, W. 2003. Physiological Plant Ecology. Springer-Verlag Berlin Heidelberg.
2. Adger, W. N. 2005. Adapting to climate change. Wiley Publication. UK.
3. Bell and Treshow 2002. Air Pollution and Plant Life. Willey Publication. UK
4. Pepper, Ian. 2003. Environmental chemistry. Wiley Publication. UK.
5. Gerrish G.A, Morin J.G., Rivers T.J., Patrawala Z. 2009. Darkness as an ecological resource: the role of light in partitioning the nocturnal niche. Oecologia. 160:525–536.
6. Rich C., Longcore T. 2006a. Introduction. In: Rich C, Longcore T, editors. Ecological consequences of artificial night lighting. Washington: Island Press; p. 1–13.

Review of literature and Seminar presentation

(Credits- 01; contact hour-15h; maximum marks – 25)

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Advanced Bacterial Genetics
LS/BOT/PPC3/RSC-4

(Credits- 03; contact hour-45h; maximum marks – 75)

Unit I:

Extra-chromosomal and moveable elements

Plasmids, Role of plasmids (in genetic engineering, pathogenesis, environmental cleaning etc), Genetic recombination in bacteria (Conjugation, Transformation and Transduction), Transposons] New course

Unit II:

Transcription, Translation, Regulation of gene expression (Operons and regulons, repression and activation of Lac operon, feedback inhibition and regulation of virulence genes in pathogenic bacteria), DNA/gene manipulating enzymes: Endonuclease, Exonuclease, Ligase, polymerase, phosphatase, transcriptase, transferase, topoisomerase] New course

Unit III:

Recombinant DNA Technology and Microbes

Application of microbe in recombinant DNA Technology, Cloning vectors, Transformation, Construction of genomic and cDNA libraries, Screening and characterization of clones, Recombineering with single and double stranded DNA; detection of gene expression changes using various reporter genes

Unit IV:

Mutagenesis (site directed, Transposon), construction of Knock-out mutants. modern approaches to the generation and analysis of targeted gene disruptions and fusions using PCR and cloning methods, Signal transduction in microbes.

Host-microbe interaction, good and bad microbes] New course

Suggested Readings:

Snyder, L., Peters, L., Henkin, T.M. and Champness, W. 2013. Molecular Genetics of Bacteria, 4th edition, American Society for Microbiology, Washington, D. C.

Miller, J.R. 1992. A Short Course in Bacterial Genetics: Lab Manual, Cold Spring Harbor Laboratory Press.

Sambrook and Russell. 2001. Molecular Cloning. 3rd Edn. CSHL Press. USA

Brown, T. A. 2016. *Gene cloning and DNA analysis: an introduction* —7th ed. Wiley-Blackwell Publishing. UK.

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Primrose and Twyman. 2010. Principles of Gene manipulation and Genomics, Wiley-Blackwell Publishing. UK.

Krebs, J. E., Goldstein, E. S., Kilpatrick, S.T. 2011. Lewin's Gene X. Jones and Bartlett Publisher. USA.

Review of literature and Seminar presentation

(Credits- 01; contact hour-15h; maximum marks – 25)

Medical Botany — New course

LS/BOT/PPC3/RSC-5

(Credits- 03; contact hour-45h; maximum marks – 75)

Unit I:

Botanicals as a source of drugs: Introduction to Medicinally important Plant parts: Fruits, Leaves, Stem and its modifications (underground and aerial), Roots, Study of some medicinally important families with reference to systematic position. Diagnostic features and medicinal uses only: Meliaceae, Myrtaceae, Apiaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Zingiberaceae, Musaceae and Poaceae.

Unit II:

Pharmacognosy: Definition, history and scope of pharmacognosy including indigenous system of medicine. Various system of classification of drugs of natural origin.

significance of pharmacopoeial standards. Occurrence, distribution, Organoleptic evaluation, Microscopical evaluation,chemical constituents including tests and therapeutic efficacy of drugs (Some examples).

Unit III:

Herbal Formulations: Principle, methods, single herb formulation, poly-herbal formulation & their merits and demerits. Standardization of various herbal formulations. Drug Research (Laboratory-based)- Basic knowledge of the following: Drug sources: plant, Microbes, animal and mineral. Methods of drug identification.

Unit IV:

Natural products as markers for new drug discovery: The Role of natural products as potential new drug discovery.The Role of natural products chemistry in drug discovery. Selection and optimization of lead compounds for further development. Contribution of national research laboratories (CDRI, CIMAP, RRC and NBRI) in medicinal plants Research, A general account of IBPGR and NBPGR.

Suggested readings:

1. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Businesshorizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
2. W.C.Evans & Trease, Pharmacognosy, 15th edn.2008, W.B. Saunders & Co.Ltd., London.
3. Guidelines for the Assessment of herbal medicines, 1991,WHO Report, Geneva.

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4. Quality Control Methods for Medicinal Plant material, 1992, WHO Guidelines.
5. Indian Pharmacopoeia, 1996, Govt. of India, Ministry of Health and family welfare, Delhi.
6. Dr.C.K. Kokate, Practical Pharmacognosy, 1988, Vallabh Prakashan, Delhi.
7. Dr.P.Mukherjee, Quality control herbal drugs, 2005, Business Horizons, New Delhi
8. Trease and Evans Pharmacognosy, W.C. Evans.
9. Harborne - Comparative Biochemistry of Flavonoids.
10. Advances in Natural Product Chemistry, extraction and isolation of biologically active compounds. S. Natori et al., Wiley, New York.
11. Standardization of Botanicals by V. Rajpal, Vol. I and Vol II, Eastern Publishers, New Delhi.
12. Practical Evaluation of Phytopharmaceuticals by K.R. Brain and T.D. Turner, Wright-Scientechnica, Bristol.
13. Houghton P, Mukherjee PK. Evaluation of Herbal Medicinal Product, Pharmaceutical Press, London, 2009.
14. Henry, R. J. 1997. Practical Applications of Plant Molecular Biology. Chapman &Hall, London, UK.
15. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge UniversityPress, New York, USA.
16. Plant molecular biology, Grierson and S.N. Convey, 1988. Blackie
17. Methods in Plant molecular biology. A laboratory course manual by (Ed.) Oak Nakuga, 1995. Cold Spring Harbour Laboratory Press.
18. Pharmacognosy Vol I & II by Mohammed Ali CBS Publications, New Delhi.
19. Nakanishi -Natural Products Chemistry, Vol. 1 & Vol. 2
20. Practical Evaluation of Phyto pharmaceuticals by K. r. Brain, T.D. Turner.
21. The Chemistry of Natural Products, Edited by R.H. Thomson, Springer
22. International Edn. 1994.
23. Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New
24. York, 1998.
25. Cutler, Stephen J.; Cutler, Horace G. (2000). *Biologically active natural products: pharmaceuticals*. CRC Press.
26. Newman DJ, Cragg GM (2007) Natural products as sources of new drugs over the last 25 years. Journal of Natural Products 70, 461-477.

27. Quality control of herbal drugs: an approach to evaluation of botanicals by P. K. Mukherjee.

28. Herbal Drug Technology by S.S. Agrawal & M. Paridhavi.

Review of literature and Seminar presentation

(Credits- 01; contact hour-15h; maximum marks – 25)

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