

M.Phil. Botany
Scheme of Courses
Semester I
Session 2018-2019

S.No.	Code (Course No.)	Subject (Course Title)	Periods/ Week	Marks		
				Theory	Int. Ass.	Total
1	BOT-MP 101	Research Methodology	6	75	25	100
2	BOT-MP 102	Elective-I	6	75	25	100
3	BOT-MP 103	Seminar – I	3	37	13	50
4		Research work for Dissertation				
Total			15	250		

* List of Elective Courses

1. BOT-MP 102 E-1 - Plant Hormones, Biochemistry & Metabolism
2. BOT-MP 102 E-2 - Bioinformatics and Internet Resources
3. BOT-MP 102 E-3 - Advanced Wastewater Technologies
4. BOT-MP 102 E-4 - Nutraceuticals and Herbal Remedies

M.Phil. Botany
Scheme of Courses
Semester II
Session 2018-2019

S.No.	Code (Course No.)	Subject (Course Title)	Periods/ Week	Marks		
				Theory	Int. Ass.	Total
1	BOT-MP 201	Advanced Analytical Techniques	6	75	25	100
2	BOT-MP 202	Elective-II	6	75	25	100
3	BOT-MP 203	Seminar – II (Dissertation based)	3	37	13	50
4		Dissertation				
Total			15	250		
<p>* List of Elective Courses</p> <ol style="list-style-type: none"> 1. BOT-MP 202 E-5 - Organic Farming Theory and Practice 2. BOT-MP 202 E-6 - Molecular Toxicology 3. BOT-MP 202 E-7 - Function and Dynamics of Biodiversity 4. BOT-MP 202 E-8 - Advanced Environmental Ecology 5. BOT-MP 202 E-9 - Advanced Plant Tissue Culture Techniques 						

M.Phil. (BOTANY) SEMESTER-I
BOT-MP 101 - Research Methodology

Time: 3 Hours

Theory: 6 Periods/Week

Max. Marks: 100

Theory: 75; Int. Ass.: 25

1. **Basic Concepts:** Research process, problem identification, research designs, informal experimental designs. Completing randomized design, randomized block design, latin square design, factorial designs
2. **Sampling Designs:** Random sampling, complex random sampling, non-probability sampling, measurement and scaling techniques. Data collection.
3. **Processing and Analysis of Data:** Central tendency, dispersion, asymmetry, correlation, regression analysis, multiple correlation and regression, partial correlation, association, index numbers, time series.
4. **Sampling and Testing of Hypothesis:** Concept of probability, probability, normal distribution, Poisson distribution, χ -square test, t-test. Sampling distribution, central limit theorem, Sandler's A-test, standard error, population mean, population proportion, sample size, confidence intervals, null hypothesis and alternative hypothesis, level of significance, two tailed and one tailed tests, Z-test, t-test, x^2 -test, F-test, testing of correlation coefficients, One way ANOVA, two way ANOVA Tukey's HSD.
5. **Non-Parametric Tests:** Sign test, Fisher-Irwin test, Mc Nemer test, Wilcoxon Mann-Whitney test, Wilcoxon, Mann-Whitney test, Kruskal-Wallis test, one sample runs test. Spearman's rank correlation, Kendall's coefficient of concordance.
6. **Multivariate Analysis:** Multiple regression, multiple discriminant analysis, multiple analysis of variance, canonical correlation analysis, Factor analysis, cluster analysis, path analysis. Computational techniques.
7. **Survey of Literature:** The students will be required to review literature in their respective disciplines and submit an assignment for evaluation.

References:

1. Kothari, C.R.(2004). Research Methodology: Methods and Techniques, New Age International Publishers, New Delhi.
2. Arya, P.P. and Pal, Y.(2001) Research Methodology in Management: Theory and Case Studies. Deep and Deep Publishers Pvt. Ltd., New Delhi.

M.Phil. (BOTANY) SEMESTER-I

BOT-MP 102 E-4 – Nutraceuticals and Herbal Remedies

Time: 3 Hours

Max. Marks: 100

Theory: 6 Periods/Week

Theory: 75; Int. Ass.: 25

1. **Introduction to Herbs and Ayurveda:** Concept of tridosha, role of pancha karma in ayurveda, origin of Charaka samhita, comparison of ayurveda with other systems of healing like unani, siddha, homeopathy and yoga.
2. **Herbal Product Formulations** for skin and healthcare, brain tonics and anti-aging products; their manufacturers and suppliers; export market hub of herbs.
3. **Nutraceuticals:** General introduction, classification of nutraceuticals, inorganic mineral supplements, vitamin supplements, dietary fibres, antioxidants, health drinks, natural sweeteners, cereals and grains, polyunsaturated fatty acids.
4. **Herbal Cosmetics:** Formulation and manufacturer of hair dyes, face wash and soaps, skin care creams and lotions, anti-aging creams, shampoos, perfumes, mouthwash, toothpastes.
5. **Herbal medicines** for diseases like asthma, Alzheimer's disease, dengue fever, diarrhoea, epilepsy, goitre, gout, hypertension, jaundice, leukemia, obesity, and ulcer of stomach, eczema and diabetes.
6. **Herbal Pesticides:** General introduction, methods of pest control, manufacturer and exporter of eco guard crop protector - biodegradable pest control products, natural organic pesticides and insecticides and their benefits over chemical pesticides.

References:

1. Leyel, C. F. 2004. Types of Herbs. Srishti Book Distributors, New Delhi (India).
2. Singh, M. P. and Panda, Himadri 2005. Medicinal herbs with their formulations. Volume 1 & 2. Daya Publishing House, Delhi.
3. Murthy, N. A. and Pandey, D. P. 1998. Ayurvedic Cure for Common Diseases. Orient Paperbacks, Delhi.
4. Rangari., V. D. 2003. Pharmacognosy and Phytochemistry. Vol. II. Career Publications, Nashik.
5. Ojha D. and Kumar, A. 1978. Pancha Karma Therapy in Ayurveda. Chaukhamba Amarabharti Prakashan, Varanasi.

6. Sharma, S. 1983. The System of Ayurveda. Neeraj Publication House, Delhi.
7. Verma, H. K. 1998. A Comprehensive Book of Ayurvedic Medicine for General Practitioners. Kalyani Publishers, New Delhi.
8. Nadkarni, K.M. 1998. India Materia Medica Vol. II. Popular Book Depot, Bombay 7, Dhootapapeshwar Prakashan Ltd. Panvel.

BOT-MP 201: Advanced Analytical Techniques

Time: 3 Hours

Max. Marks: 100

Theory: 6 Periods/Week

Theory: 75; Int. Ass.: 25

1. **Principles of Analytical Methods:** Titrimetry, Gravimetry, Colorimetry, Spectrophotometry, Chromatography, GLC, HPLC, Atomic Absorption Spectrophotometry and Flame Photometry.
2. **Histochemical and immunotechniques:** Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH.
3. **Biophysical methods:** Molecular analysis of biomolecules using UV/visible, fluorescence, UV, circular dichroism, NMR and ESR spectroscopy, molecular structure determination using X-ray fluorescence and X-ray diffraction and NMR; Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.
4. **Molecular biology & Recombinant DNA methods:** Isolation, purification and sequencing of RNA, DNA (genomic and plasmid) and protein, different separation methods; analysis of RNA, DNA and proteins by one and two dimensional Electrophoresis and electrofocussing gels; Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; Isolation, separation and analysis of carbohydrates and lipids molecules using RFLP, RAPD and AFLP techniques.
5. **Microscopic techniques:** Visualization of cellular and sub cellular components by light microscopy, resolving power of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze fracture methods for EM image processing methods in microscopy.
6. **Radiolabeling techniques:** Detection and measurement of radioisotopes normally used in biology; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.

Books Recommended:

1. Brown TA (2001) Gene cloning and DNA analysis, An Introduction, 4th Edition, Blackwell Scientific Publication, Oxford, UK
2. Friefelder, D (1982) Physical Biochemistry, Applications to Biochemistry and Molecular Biology, WH Freeman and Company
3. Wilson K. and Walker J. (Eds.) (1995). Practical Biochemistry: Principles and Techniques, Cambridge University Press, UK.

4. Riley, T. and Tomilson, C. (1987). Principles of Electroanalytical Methods. John Wiley and Sons Ltd., Chichester, England.
5. Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.

M.Phil. (BOTANY) SEMESTER-II
BOT-MP 202 E-8 - Advanced Environmental Ecology

Time: 3 Hours

Theory: 6 Periods/Week

Max. Marks: 100

Theory: 75; Int. Ass.: 25

1. **Water Chemistry:** Chemistry of water, concept of DO, BOD, COD, sedimentation coagulation, filtration, Redox potential.
2. BOD test procedure, determination of BOD and Modelling of BOD, Calculation of BOD constants using Least square and Fujimoto methods. Interrelationship between BOD, COD and TOC.
3. Box model, point source stream pollution. Dissolved oxygen model (oxygen sag curve). Basic design of Screening, sedimentation. Filtration, Softening Break point chlorination.
4. Physico-chemical and bacteriological sampling including MPN test and analysis of water quality. Standards for water quality and wastewater discharge.
5. **Solid waste management with vermicomposting:** Resource recovery or reclamation, organic waste processing, composting, anaerobic digestion, vermiculture and vermicomposting, essential precautionary steps in vermicomposting, vermiculture and protein production, vermiwash, overall benefits, economics and marketing. Fermentation.
6. **Bioremediation:** Types of bioremediation, use of fungi, algae and bacteria in biosorption, cautions for using bioremediations, biodegradation of oil spills, TNT wastes, dye stuff wastes, pesticides and xenobiotics.
7. **Polymers and plastic degradation:** Introduction, polymer synthesis, polymer degradation, photochemical degradation, biodegradation of naturally occurring polymeric substances, disposable synthetic polymers, polymer recycling, carry bags- a menace, role of microorganisms in degradation of polymers and plastic.
8. **Biofertilizer;** Bacteria, bacterization, mass cultivation of microbial inoculants, green manuring, the blue green algae, algalization. *Azolla*. Present status and improvements.
9. **Biomass production technology:** Introduction, plant biomass, sources of biomass, forest biomass, crop residues (cereals, leguminous crops, sugar cane etc.), aquatic biomass, wastes as a source of energy, composition of plant biomass (cellulose, hemicellulose and lignins). Biomass conversion, biological and non-biological processes, useful products of biomass (ethyl alcohol, methanol, methane). Applications and future prospects.

Reference:

1. Benefield. L.D., Jenkins. J.F. Jr. and Weand. B.L. (1985). Process chemistry for Water and Wastewater Treatment. Prentice Hall Inc., New York.

2. Cornwell. D.A. and Davis. M (1999). Introduction to Environmental Engineering. McGraw-Hill. New York.
3. Eckenfelder, W.W.Jr (1989). Industrial Water Pollution Control. McGraw-Hill Book Company, New York.
4. Elangovan. R. and Saseetharan, M.K. (1995). Unit Operation in Environmental Engineering. New Age International, New Delhi.
5. Fair, G.M. Geyer.J.C. and Okum.K (1979). Water and Wastewater Engineering. Vol.2. John Wiley, New York.
6. Alexander, M.(1999). Biodegradation and Bioremediation. Academic Press, San Diego.
7. Abbasi. S.A. and Ramasami. E. (1999). Biotechnological Methods of Pollution Control. Universities Press, Hyderabad.
8. Manahan. S.E. (2009). Environmental Science and Technology. Lewis Publishers. New York.
9. Rittmann. D.E. McCarty.P.L.(2001). Environmental Biotechnology: Principles and Applications. McGraw Hill, New York.