M. Phil. BOTANY

SYLLABUS

(WITH EFFECTIVE FROM 2018-2019)

M. Phil., BOTANY PROGRAMME – Course Structure under CBCS Pattern

(For the candidates admitted from the academic year 2018-2019 onwards)

S. No.	Sem	Paper	Hrs/ Week	Credit	Exam Hrs.	Marks		
						Internal	External	Total
1	I	Core course I – Research Methodology	6	4	3	40	60	100
2	I	Core course II - Nanotechnology	6	4	3	40	60	100
3	I	Core Course III - Molecular Systematics	6	4	3	40	60	100
4	I	Elective paper – Teaching and Learning Techniques	6	4	3	40	60	100
5	II	Dissertation	-	8	-	50 *(Viva – Voce)*	150 Dissertation	200
			24	24				600

Program outcome:

- Students can grasp the knowledge on diversity and their role in environment. They can understand internal organization of cells, tissues and functions of life forms.
- Students can also acquire knowledge on the applied sciences like horticulture and gardening and microbes.
- Students can pursue either an academic career in institutions as lecturers and professors or a scientific career in various scientific positions such as Plant Scientists, Weed Scientists etc.
- They can also go and work as researchers and as administrators.
- They have also the potion in Botanical Survey of India and other Government departments by competitive examinations such as UPSC, TNPSC etc.

Program Specific Outcome:

- Students will have the capability to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for botany.
- Students will be able to explain how organisms function at that level of the gene, genome, cell, tissue, organ and organ –system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life.
- Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae and fungi that differentiate them from each other and from other forms of life.
- Students will have excellent research skills (field, laboratory, plant growth facilities and library.
- Students can be able to know Communications skills to discuss and analyze problems using oral and written communication skills.
- Students will acquire the knowledge about the cultivation of medicinal and aromatic plants

Semester I

CORE COURSE I – RESEARCH METHODOLOGY

Course Code : 18MPT1 ◈ Hrs / week : 7 ◈ Credit : 5 ◈ Marks : 25 + 75 = 100

Objectives:

- To initiate the students into research activities.
- To handle various instruments, principles and applications.

Course outcomes:

- Students are able to know the basic laboratory techniques
- They can expertise in handling electrophoresis
- Acquiring knowledge on principles and applications of spectrophotometer
- Imparting knowledge on statistical analysis
- They will be Expert in preparation of manuscripts

Unit-I

Buffers: Characteristics and preparation. pH meter – principles, measurement of pH and pKa.. Centrifuges – principle, types and operation. Microscopy – Fluorescence, confocal and flow cytometry, Electron Microscopy (TEM, SEM). Chromatography - basic principle – Detailed study of HPLC, principle of ion exchange; molecular sieve and affinity chromatography of TLC

Unit-II

Electrophoresis – basic principle – its types, electrophoretic mobility and factors influencing electrophoretic mobility, isoelectric foucusing, application, PAGE. Tracer techniques - nature of radioactivity, pattern of decay, half life autoradiography – detection of radiation and measurements by GM counter, Scintillation counter and applications of isotope in Biology.

Unit-III

Principles and applications – Spectrophotometer UV/Vis. Flame photometer, atomic absorption spectrophotometer Fluorimeter, NMR and ESR. Biosensors. Techniques in plant tissue culture- preparation of culture media and methods of culturing plant tissues- Micropropagation, somatic embryogenesis and somoclonal variations. Protoplast isolation and fusion. GM foods.

Unit-IV

Measures of Central Values and Dispersion – Probability, Binomial, Poisson and Normal – Correlation and Regression for simple and linear data – Testing of significance – large sample test, t-test and chi-square test. Analysis of variance; One and Two way ANOVA. Principles of experimental design; CRD, RBS.

Unit-V

Research – Scope, objectives and approaches. Sample – types; Sampling Techniques Hypothesis: Definition, characteristics, types, significance. Literature collection, Web Browsing. Writing review of Literature and Journal article. Structure of thesis. Manuscript for publication and proof correction.

Text Books:

- Gupta S P., 1990, Statistical Methods, Sultan Chand & Sons.
- Kothari C R., 1992, Research Methodology – Methods & Techniques, Wishwa Prakashan.

References:

- Block R J., Durrm E L., Zweign G., 1958, A manual of Paper Chromatography
- and Paper Electrophoresis, Academic Press Inc., New York.
- David T. Plummer, 1988, An Introduction to Practical Biochemistry, Tata McCraw-Hill Publishing Co. Ltd., New Delhi.
- Harborne J B., 1973, Phytochemical methods – A guide to Modern Techniques of Plant Analysis, Chapman and Hall Ltd., London.
- Jayaraman J., 1972, Techniques in Biology, Higginbothoms P Ltd., Chennai.
- Heith Wilson & John Walker, Practical Biochemistry – Principles and Techniques, 2000 (5th Edn.), Cambridge University Press.
- Ragava Rao D., 1983, Statistical Techniques in Agricultural and Biological Research, Oxford & IBH Publishing Co., New Delhi.
- Ralph R., 1975, Methods in Experimental Biology, Blackie Publ., London.
- Stock R., & Rice C B E., 1977, Chromatographic Methods, Chapman and Hall Ltd., London.
- Umbreit W W., 1972, Manometric and Biochemical Techniques Burgess Publishing Co., Minnesota.

Mapping with programme outcomes					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	M	S	S	S	S
CO4	M	S	S	S	S
CO5	M	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I

CORE COURSE II – NANOTECHNOLOGY

Course Code : 18MPT2 ◈ Hrs / week : 7 ◈ Credit : 5 ◈ Marks : 25 + 75 = 100

Objectives:

- To comprehend the advantages and applications of nanoparticles generated through mediation by plants.

Course outcomes:

- Students are able to know how to prepare crude drugs
- Acquiring knowledge in synthesis of nanomaterials
- They will know how nanoparticles interact with living organisms
- Imparting knowledge on toxicity effect of nanoparticles
- Experiencing in characterization and applications of nanoparticles

Unit I

Crude drugs: Processing – Powdering, extraction – cold and hot extraction. Purification of drug- partial and complete. Drug adulteration. Evaluation of crude drugs - Biological testing of herbal drugs. Nanoparticles – definition and historical background. Principles and properties of nanoparticles and nanomaterials: quantization effects – inverse relationship between size and reactive surface area.

Unit II

Biogenic synthesis of nanomaterials - the essentials of Nanostructure Generation: Top-Down vs. Bottom-Up Chemical and Physical Self Assembly. Biological synthesis – biomimetics, green plants, and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates.

Unit III

Interactions between nanoparticles and living systems, interaction with cells, exposure of living systems to nanomaterials - the surface effects, the effects of size, shape, surface and bulk composition, and solubility and persistence. Particle characteristics: Distribution, organ system effects, including effects on immune and inflammatory systems.

Unit IV

Toxicity effects of nanomaterials. Mediators of the Toxicity of Particles. Factors influencing the interaction of nanomaterials over mammalian cells: uptake, transport and biodistribution of nanoparticles in living system, toxicity on cellular processes. Strategies that can mitigate nanoparticle toxicity in biological systems. Risk Assessment Methodologies. EU regulatory aspects related to risk assessment

Unit V

Detection and Measurement of Nanoparticles – physical characterization by UV, FTIR, SEM, FESEM, DLS, X-ray diffraction, Zeta potential. Nanomaterials and their applications. Engineering safer and more biocompatible nanoparticles.

References:

- European Commission, SCENIHR, 2006. Modified opinion on the appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies, European Union.
- Barbara Panessa-Warren, 2006 Understanding cell-nanoparticle interactions - making nanoparticles more biocompatible. Brookhaven National Laboratory
- Volker Mailänder and Katharina Landfester 2009 Interaction of Nanoparticles with Cells Biomacromolecules, 10 (9): 2379 – 2400 DOI: 10.1021/bm900266r Iseult Lynch, Anna Salvati & Kenneth A. Dawson, 2009 Protein-nanoparticle interactions: What does the cell see? Nature Nanotechnology 4, 546 - 547 doi:10.1038/nnano.2009.248
- Orr GA, et al. 2010. Cellular recognition and trafficking of amorphous silica nanoparticles by macrophage scavenger receptor a. Nanotoxicology. Published online September 17, 2010. DOI:10.3109/17435390.2010.513836
- Gysell Mortimer (2011). The Interaction of Synthetic Nanoparticles with Biological Systems PhD Thesis, School of Biomedical Sciences, University of Queensland.

Mapping with programme outcomes					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	M	S	S	S
CO2	M	S	S	S	S
CO3	M	S	S	S	S
CO4	M	S	S	S	S
CO5	M	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I

CORE COURSE III – MOLECULAR SYSTEMATICS

Course Code : 18MPT3 ◈ Hrs / week : 7 ◈ Credit : 5 ◈ Marks : 25 + 75 = 100

Objectives:

- To impart new outlook in Plant Systematics.
- To understand the Plant Systematics at Molecular level.

Course outcomes:

- Students are able to know the genetic materials and phylogenetic tools
- Acquiring knowledge on plant genome
- They will know taxonomic characters
- Imparting knowledge on phylogenetic methods
- They can able to know about chemosystematics

Unit-I

Chloroplast DNA – Mitochondrial DNA in Plant Systemtatics – Ribsomal RNA as a phylogenetic tool – Polymorphism – Hybridization and variable evolutionary rate in molecular phylogenies – Molecular systematics and crop evolution – Applications of molecular systematics.

Unit-II

Plant Genomes: Generating Molecular Data – Gene Mapping and Gene Sequencing; Types of Molecular Data, Analysis of Molecular Data – Alignment of Sequences, Homoplasy, Phylogeny Reconstruction, Gene Trees and Species Trees; Molecular characters – Genome size variations – Plant genome statistics.

Unit-III

Phenetic methods: Principles of Taxometrics, Operational Taxonomic units, Taxonomic characters, Measuring Resemblance – simple matching coefficient. Yulein coefficient, coefficient of association, Taxonomic distance; Cluster Analysis – Agglomerative methods, Divisive methods, Hierarchical classifications; Ordination technique Application of Numerical Taxonomy in Angiosperms.

Unit-IV

Phylogenetic methods: Cladistics-Pleiomorphic and apomorphic characters, Homology and analogy, Parallelism and convergence, Monophyly, Paraphyly and polyphyly; Cladistic Methodology – operational evolutionary units, characters and coding, Measure of similarity and construction of trees.

Unit-V

Chemosystematics: Secondary metabolites, Polysaccharides, Sugars and their derivatives, Hydrocarbons, Fatty acids and lipids. Applications of chemistry at intraspecific. Specific, Generic, Intergeneric and Familial levels. Current trends in biosystematics.

References:

- Michael G. Simpson, Plant Systematics, 2006, Elsevier Academic Press, Burlington.

- Hills D.M., Mortiz C & Mable B K. (eds.), 1996, Molecular Systematics, Sinaver Associates, Sunderland, USA.
- Gurucharan Singh, Plant Systematics (II Edn), 2004, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Harborne J. B. & Turner B. L., 1984, Plant Chemosystematics, Academic Press, London.

Mapping with programme outcomes					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	M	S	S	S
CO2	M	M	S	S	S
CO3	M	M	S	S	S
CO4	M	M	S	S	S
CO5	S	M	S	S	S

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Semester I

CORE COURSE IV – TEACHING AND LEARNING TECHNIQUES

Course Code : 18MPT4 ◇ Hrs / week : 7 ◇ Credit : 5 ◇ Marks : 25 + 75 = 100

Objectives:

- To empower scholars with soft skills.
- To introduce the teaching and dynamics of teaching – learning
- To facilitate e- learning/ e-teaching with the ICT tools
- To acquire practical skills (in subject) aiming at gaining confidence to handle practical classes
- To develop teaching skills and gain confidence in teaching.

Course outcomes:

- Students are able to know the computer applications
- Acquiring knowledge on class room communications
- They can able to know how to teach with advanced technology
- Imparting knowledge on teaching and learning techniques
- Develop the teaching skills and gain confidence in teaching

Unit I - Computer Application

Computer system: Characteristics, parts and their functions – Different generations of computer – Operation of computer: Switching on/off/restart/ Mouse control, Use of key board and some functions of key – Information and communication technology (ICT): Definition, Meaning Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for research: on-line journals.

Unit II - Communication

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal Communication. Skills of Communication: Listening , Speaking, Reading and Diction and Vocabulary – Classroom communication and dynamics.

Unit III – Communication Technology

Communication Technology: Bases, Trends and Development – skills of using Communication Technology – Computer Mediated Teaching, Multimedia, E-content – Satellite based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web.

Unit IV – Pedagogy

Instructional Technology: Definition, Objectives and Types. Lecture with power point presentation – versatility of lecture technique – Demonstration: Characteristics, Principles, Planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, seminar, workshop, symposium and panel discussion – modes of teaching: CAI, CMI and WBI.

Unit V – Teaching Techniques

Teaching Techniques: Definition, Meaning and Nature - Types of Teaching skills: Skill of set induction, Skill of stimulus variation, Explaining, probing Questions, Black Board Writing and Closure – Integration of Teaching – Evaluation of Teaching.

REFERENCES:

- Bala Rani Sharma (2007) Curriculum Reforms and Teaching Methods, Sarup and Sons, New Delhi.
- Don Skinner (2005) Teacher Training, Edinburgh University Press Ltd., Edinburgh.
- Information and Communication Technology in Education: A Curriculum for schools and programme for Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
- Kumar KL (2008) Educational Technology, New Age International Publishers, New Delhi.
- Mangal SK (2002) Essential of Teaching - Learning and Information Technology, Tandon publications, Ludhiana.
- Michael D and William (2000) Integrated Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York.
- Pandey Sk (2005) Teaching Communication, Commonwealth Publishers, New Delhi.
- Singh VK and Sudarshan KN (1996) Computer Education, Discovery Publishing Company, New York.
- Ram Babu A and Dandapani S (2006) Microteaching, Vol. I and II, Neelkammal Publications, Hyderabad.
- Sharma RA (2006) Fundamentals of Educational Technology, Surya Publications, Meerut.
- Vanaje M and Rajasekar S (2006) Computer Education, Neelkammal Publications, Hyderabad.

Mapping with programme outcomes					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	L	M	S	S	S
CO2	L	L	S	S	S
CO3	L	L	S	S	S
CO4	L	L	S	S	S
CO5	L	L	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester II

CORE COURSE – PROJECT (Dissertation and Viva - Voce)

Course Code : 18MBT5 ◈ Hrs / week : 7 ◈ Credit : 5 ◈ Marks : 25 + 75 = 100

Course outcomes:

- Students are able to get practical knowledge and they can able to expert in their field.
- They can get their job opportunities in various biological industries and research stations.