M.PHIL. SYLLABUS – 2015

BOTANY

DEPARTMENT OF BOTANY
ST. JOSEPH'S COLLEGE (Autonomous)
Accredited at A Grade (3rd cycle) by NAAC
College with Potential for Excellence by UGC
Tiruchirappalli – 620 002

GUIDELINES FOR FULL TIME M.PHIL.

1. **Duration :** The programme runs for one year consisting of two semesters. The Semester- I is from August to February and the Semester- II runs from March to August, of the following year.

2. **Course Work:**

Semester - I			Semester - II		
Course	**Title**	**Cr**	**Course**	**Title**	**Cr**
C1	Professional Skills for Teaching – Learning	3	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Course	5			
C4	Guide Paper	5			
	Total	17		Total	8

2. a) Each Course should contain 5 units, covering the subject requirements of the courses offered.

Marks for CIA and SE are in the ratio 40 : 60.
The CIA components are **Mid Semester Test (25), End Semester Test (25), Seminar (15), Objective Type Assignment Test (15)**. The total mark 80 will be converted into 40 marks. **The tests and Semester Examination are centrally conducted by COE for 3 hours.**

CIA & SE	Tentatively on
Mid Semester Test	December 2nd Week
End Semester Test	February 2nd Week
Semester Examinations	February 4th Week

Scholar should acquire **a minimum of 20 marks from CIA to appear for SE.** The Scholar should acquire a minimum of 30 marks in Semester Examination. He / She will be declared to have passed in the various courses in Semester I, provided he/she secures not less than 50 marks on an aggregate (CIA+SE).

2. b) (i) In course C1 on **'Professional Skills for Teaching – Learning'** the first three units are common to all the Departments of the College. The Academic Council has granted permission to incorporate some modifications in the C1 Course by Physics, Computer Science and Mathematics Departments. The first three unit titles are **Soft Skills, E-teaching, E-learning, Elements of Technology of Teaching and Learning.** The remaining two units are department specific to make use of the above mentioned skills & techniques to teach the Core Course.

The C1 Course is (to be) designed to exploit the various Teaching – Learning – Research Skills to be imbibed / cultivated to make the research scholars to be fit for the profession they are likely to acquire in the Education Industry. Thus only for the course (C1) the written component is 60% and Practical component is 40% both in CIA and SE.

b) (ii) **Evaluation for C1:**

Theory Component: For both CIA & SE, there will be a 2 hour test only from the first THREE units. The CIA components are Mid Semester Test (35), End Semester Test (35) and Assignment (30). The total 100 will be converted into 25 marks.

Practical Component: The last TWO units are department specific. There is no Mid and End Semester Tests. But the CIA for the same are assessed continuously by the teacher(s) concerned totaling 15 marks. For SE, the Practical evaluation is done by an external examiner.

c) Question papers for C1, C2 & C3 are set by External Examiners.

d) Question paper for C4 will be set and valued by the Research Advisor only.

e) Departments will be permitted to offer either paper 2 or paper 3 as Open Online Course to the M.Phil. students. The evaluation method will be the same for both C2 and C3 Courses.

3. Credits:

	Courses	Title		Contact Hrs.	Library Hrs.	Total Hrs.	Cr	CIA Mk.	SE Mk.	Total Mk.
SEMESTER – I	C1	Professional Skills for Teaching – Learning	T	3	2	5	2	25	35	60
			P	2	2	4	1	15	25	40
	C2	Research Methodology		5	4	9	4	40	60	100
	C3	Core Course		5	5	10	5	40	60	100
	C4	Guide Paper		5	5	10	5	40	60	100
	Total			**20**	**18**	**38**	**17**	**160**	**240**	**400**

		INTERNAL			EXTERNAL		
			Cr	**Mk**		**Cr**	**Mk**
SEMESTER – II	**C5 – DISSERTATION**	Seminar & Review of Related Literature	2	15	Dissertation Evaluation	6	75
		Mid Term Review Presentation	2	15	*Viva-voce*	2	25
		Dissertation Work	3	60			
		Viva-Voce	1	10			
Total			**8**	**100**		**8**	**100**

4. Question Pattern:

Science	**Course**	**Mid & End Semester Tests and Semester Examinations**		
	C1	Section A : Short Answers Section B : Either / Or – Essay Type	7/9 3	7 x 2 = 14 3 x 7 = 21
	C2	Section A : Short Answers Section B : Either / Or – Essay Type	10 5	10 x 2 = 20 5 x 8 = 40
	C3	Section A : Short Answers Section B : Either / Or – Essay Type	10 5	10 x 2 = 20 5 x 8 = 40
	C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
Arts	**Course**	**Mid & End Semester Tests and Semester Examinations**		
	C1	Section A : Short Answers Section B : Either / Or – Essay Type	7/9 3	7 x 2 = 14 3 x 7 = 21
	C2	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C3	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60

5. Dissertation

For carrying out the dissertation, it is mandatory to strictly adhering to the rules of the college as given below:

5.1. Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis/Result/Mid Term Review just before the submission of the final draft of the dissertation

5.2. Submission

Candidates shall submit the Dissertations to the Controller of Examinations **not earlier than five months but within six months** from the date of the start of the Semester –II. The above said time limit shall start from the 1st of the month which follows the month in which Semester - I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of **four** months in the first instance and another **four** months in the second instance with penalty fees. If a candidate does not submit his/her Dissertation even after the two extensions, his/her registration shall be treated as cancelled and he/she has to re-register for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he/she has already passed these papers.

At the time of Submission of Dissertation, the guide concerned should forward the marks for 90% as stated above to the COE in a sealed cover

5.3. All the M.Phil. Scholars (along with their Guides) have to submit at least one Research articles for publication, at the time of submitting the dissertation.

Departments (with the constituted Expert Committee) will scrutinize; select and recommend the best articles for a publication either in RETELL or in School-based Journals.

5.4. Requirement

For the valuation of dissertation it is mandatory to have passed in all the four courses. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university/colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the *viva-voce* will be done by both of them. The average marks will be considered.

5.5. *Viva-Voce*

The external examiner who valued the Dissertation and the Research Adviser shall conduct the *Viva-Voce* for the candidate for a maximum of 100 marks. A Candidate shall be declared to have passed in *viva-voce* if he/she secures not less than 50% of the marks prescribed for Dissertation and 50% of the marks in the aggregate of the marks secured in *viva-voce* and Dissertation valuation. A student can undertake dissertation in the second semester whether or not he/she has passed the first semester.

6. Classification of Successful Candidates

6.1. The candidates who pass the Semester– I and Semester – II examinations in their first attempt shall be classified as follows:

S. No.	Total Marks secured in Semester – I and Semester–II Examinations	Classification
1.	80% and above in the case of Science Subjects & 75% and above in the case of Arts and Social Science Subjects	I Class with Distinction
2.	60% to 79% in the case of Science Subjects & 60 % to 74% in the case of Arts and Social Science Subjects	I Class
3.	50% to 59% in all the subjects	II Class

Note: Mathematics, Statistics and Computer Science/Application shall be treated as Science Subjects

6.2. Candidates who have failed in the courses may take the supplementary exams conducted by the COE immediately. Even then if they could not complete the course(s), they will be given two more chances only to appear for those courses along with the next batch scholars. The maximum duration for the completion of the M.Phil. Programme is 2 Years.

7. Attendance:

Daily attendance for 90 working days should be enforced for the students. Periodical report of a student to he guide concerned should be recorded in he register kept by the guide.

8. The Scholar must obtain 80% of attendance per semester in order to appear for the Semester Examinations/*Viva-Voce.*

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M.Phil. Botany Course Pattern – 2015

Semester	Subject Code	Title of the Paper
I	**15MBO 101**	Course – C1: Professional Skills for Teaching–Learning
	15MBO 102	Course – C2: Research Methodology
	15MBO 103	Course – C3: Biotechnology (Open Online Course)
	15MBO 104A	Course – C4: Biogenic Nanoparticles
	15MBO 104B	Course – C4: Plant Tissue Culture
	15MBO 104C	Course – C4: Soil Microbiology
	15MBO 104D	Course – C4: Molecular Systematics
	15MBO 104E	Course – C4: Advanced Bryology
	15MBO 104F	Course – C4: Plant-Pest Control Strategies
	15MBO 104G	Course – C4: Mycorrhizal Symbiosis
	15MBO 104H	Course – C4: Floristic Studies of Angiosperms
II	**15MBO 205**	Course – C5: Dissertation

M.PHIL. BOTANY

Sem-I **Hours / Week: 5**

15MBO101 **Credit: 2**

CI: PROFESSIONAL SKILLS FOR TEACHING – LEARNING

Objectives

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

Unit I: Soft Skills

a. Introduction to Soft Skills, Soft Skills Vs Hard Skills, types of Soft Skills
b. Communication skills- Basics in communication, structure of written and oral sentences, Verbal, non-verbal, body language, JOHARI Window, Intrapersonal and Interpersonal Communications, Activities in Effective Communication
c. Behavioral Skills- Leadership skills, Time Management, Creativity and Lateral thinking
d. Interview Skills- Resume Writing, Different types of interviews, Etiquettes in interviews, Mock interviews
e. Team Building and Group Discussion- Progressive stages of Team Building, Parameters of GD (special reference to attending, listening, responding skills), Mock Group GDs

Unit II: Techniques and Dynamics of Teaching- Learning

a. Emerging trends in Educational Psychology- Meaning, Scope and Methods
b. Learning- Different Theories of learning, Approaches to learning(Classical Conditioning-Ivan Pavlov; Operant conditioning-B.F.Skinner); kinds of learning, factors affecting learning
c. Motivation: Intrinsic and extrinsic motivation, Development of memory and intelligence

Unit III: e-Learning and e-Teaching

An overview of Microsoft office-2007: MS WORDS-2007- MS Excel-2007- MS Powerpoint-2007, Concepts in e-Resources and e-design: World Wide Web Concepts - Making use of Web Resources- Web site creation concepts – Creating Web Page Editors- Creating Web graphics – Creating Web Audio files.

Unit IV: Experimental Techniques

Acetate and Phosphate buffer preparation. Preparation of standard curves-glycine, glucose and absorption spectra of plant pigments – Electrophoresis: PAGE – Chromatography: Separation and identification of amino acids. Double staining and permanent slide preparation – submission of 10 slides for evaluation. Biostatistics: Random Sampling (50 samples) using Random number table, Data collection, classification and presentation. Measures of central values and dispersion to the classified data, t-test and chi-square test. Bibliometry.

Unit V: **Teaching Methods**

Preparation of teaching aids – preparation of Power point, animated and text lecture materials for teaching the lessons – Teaching 15 hours theory both for UG & PG .classes and assisting 15 hours practical classes both for UG & PG.

References

UNIT I

1. JASS (2013). Winners in the making. Introduction to soft skills. St. Joseph's college, Trichy
2. Murphy, Raymond. (1998). Essential English grammer. 2nd ed. Cambridge university press
3. Trishna (2004). Knowledge system how to do well in GDs and interviews. Reprographic and printing services, secunderabad

UNIT II

1. Covey, Stephen. (2004). 7 habits of highly effective people, free press
2. Driscoll, M P (1994). Psychology of learning for instruction, needham, ma: allyn and bacon
3. Gardner, Howard (1983; 1993). Frames of mind: the theory of multiple intelligences, new York; basic books

UNIT III

1. Joyce cox, curtisfrye etc (2007), step by 2007 microsoft office system, prentice hall of india pvt Ltd, new delhi

UNIT IV& V

1. Jayaraman J., 1972, Techniques in Biology, Higginbothoms Pvt.Ltd., Chennai.
2. Ralph R., 1975, Methods in Experimental Biology, Blackie Publ., London.
3. Educational Psychology in class room – Lindaren Henry – Asia Publishing Home.
4. Psychology of class room learning – Holt Richard.
5. Gupta,S.C.2013. Fundamentals of statistics, Himalaya Publishers, Mumbai.

Sem-I **Hours / Week: 4**

15MBO102 **Credit: 4**

C2 : RESEARCH METHODOLOGY

Objectives

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

Unit-I

Buffers: Characteristics and preparation. pH meter – principles, measurement of pH and pKa. Electrometric determination- glass and reference electrodes. Gas-measuring electrodes – basic principle, applications of Clark electrode. Centrifuges – principle, types and operation. Microscopy – Fluorescence, confocal and flow cytometry, Electron Microscopy (TEM, SEM).

Unit-II

Chromatography - basic principle – Detailed study of HPLC, principle of ion exchange; molecular sieve and affinity chromatography of TLC. Electrophoresis – basic principle – its types, electrophoretic mobility and factors influencing electrophoretic mobility, isoelectric foucusing, application, PAGE.

Unit-III

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 – principles, instrumentation – Spectrophotometer UV/Vis. Flame photometer, atomic absorption spectrophotometer Fluorimeter, NMR and ESR. Biosensors.

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

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

References

1. Block R J., Durrm E L., Zweign G., 1958, A manual of Paper Chromatography and Paper Electrophoresis, Academic Press Inc., New York.

2. David T. Plummer, 1988, An Introduction to Practical Biochemistry, Tata McCraw-Hill Publishing Co. Ltd., New Delhi.

3. Harborne J B., 1973, Phytochemical methods – A guide to Modern Techniques of Plant Analysis, Chapman and Hall Ltd., London.

4. Jayaraman J., 1972, Techniques in Biology, Higginbothoms P Ltd., Chennai.

5. Heith Wilson & John Walker, Practical Biochemistry – Principles and Techniques, 2000 (5^{th} Edn.), Cambridge University Press.

6. Ragava Rao D., 1983, Statistical Techniques in Agricultural and Biological Research, Oxford & IBH Publishing Co., New Delhi.

7. Ralph R., 1975, Methods in Experimental Biology, Blackie Publ., London.

8. Stock R., & Rice C B E., 1977, Chromatographic Methods, Chapman and Hall Ltd., London.

9. Umbreit W W., 1972, Manometric and Biochemical Techniques Burgess Publishing Co., Minnesota.

Sem-I **Hours / Week: 12**

15MBO103 **Credit: 4**

C3 : BIOTECHNOLOGY (Open Online Course)

Objectives

- To study the techniques used in Genetic Engineering.
- To explore the possible applications and future potentiality of Biotechnology

Unit I

Basic principles – mechanism of natural gene transfer by *Agrobacterium*, Ti plasmids. Generation of foreign DNA molecules – Enzymes used in Genetic Engineering – restriction enzymes – their types and target sites; cutting and joining of DNA molecules – linkers, adapters, homopolymers; cloning vehicles and their properties – natural plasmids, *in vitro* vectors, phages, Cosmids and T-DNA based hybrid vectors. Cloning with sstr. DNA vectors.

Unit II

Cloning strategies – cDNA and genomic libraries; recombinant selection and screening methods. Expression of cloned genes – problems and solutions, shuttle vectors; DNA sequencing – Sanger's and automated sequencing. Applications of PCR and DNA hybridization – Southern, Northern and Western blotting.

Unit III

Techniques in tissue culture : culturing explants and haploids, protoplasts fusion and embryoids. Methods of gene transfer mechanism: Ca transfection, electroporation, shot gun, micro injection, biolistics and lipofection. Gene knockouts and transgenic animals – animal pharming and xenografting. Biodegradation stimulation and its applications. Bioleaching.

Unit IV

GMOs and biosafety – Genetic use Restriction Technology (GURT); patenting of genes, cell and life forms; TRIP rights; Genomics – Arabidopsis, E. coli, Human. Gene therapy – types, principles and applications. Gene drain – the tangled genes – uniformity and genetic loss; directed recombination and recombinant DNA technology.

Unit V

Methodology and protocol in the development and production of plantibodies, plantigens, food vaccines and Bioplastics. Production of transgenic plants for herbicides, drought, salt and disease resistance. Anti-sense RNA technology – its mechanism and application. Golden rice technology and biotransformation of high value metabolites through cell culture. RNA interference and silencing of selective genes – their application in gene regulation.

References

1. Freifeider D., 1993, Molecular Biology, Jones and Bartiett Publishers, London.
2. Glick BR and Pasternak JJ. 1998. Molecular biotechnology: Principles and applications of recombinant DNA, 2en Ed. ASM Press, Washington, USA.
3. Old RW and Primrose SB, 1989, Principles of Gene Manipulation, Blackwell Scientific Publication, London.
4. Primrose SB, 1993, Animal Biotechnology, Blackwell Scientific Publication, London.
5. Watson JD et al., 2007. Recombinant DNA: Genes and Genomes – a short course. 3rd Ed. Cold Spring Harbor Laboratory Press, CSHL, New York, USA.
6. Websource: Open Online Course (e-content, ppt, you tube lectures).

    a) http://www.sjctni.edu/Department/BO/OOC/unit1.jsp
    b) http://www.sjctni.edu/Department/BO/OOC/unit2.jsp
    c) http://www.sjctni.edu/Department/BO/OOC/unit3.jsp
    d) http://www.sjctni.edu/Department/BO/OOC/unit4.jsp
    e) http://www.sjctni.edu/Department/BO/OOC/unit5.jsp

For Units

Sl. No	Topics	Type of content	Locations
1	Unit I- Basic Principles	PPT	http://www.sjctni.edu/Department/BO/OOC/Basic Principles.ppt
2	Unit II-Cloning strategies	PPT	http://www.sjctni.edu/Department/BO/OOC/ Cloning strategies.ppt
3	Unit III- Techniques of tissue culture	PPT	http://www.sjctni.edu/Department/BO/OOC/ tissue culture. ppt
4	Unit IV- Recombinant DNA Technology	PPT	http://www.sjctni.edu/Department/BO/OOC/ Recombinant DNA.ppt
5	Unit V- Genetic Engineering	PPT	http://www.sjctni.edu/Department/BO/OOC/ Genetic Engineering.ppt

Sem-I **Hours / Week: 6**

15MBO104A **Credit: 5**

C4 : BIOGENIC NANOPARTICLES

Dr G Melchias.

Objectives: *To comprehend the advantages and applications of nanoparticles generated through mediation by plants.*

Unit I

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

1. 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.
2. Barbara Panessa-Warren, 2006 Understanding cell-nanoparticle interactions - making nanoparticles more biocompatible. Brookhaven National Laboratory
3. 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**
4. 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
5. Gysell Mortimer (2011). The Interaction of Synthetic Nanoparticles with Biological Systems PhD Thesis, School of Biomedical Sciences, University of Queensland.

Sem-I **Hours / Week: 6**
15MBO104B **Credit: 5**

C4 : PLANT TISSUE CULTURE

Dr R Jeyachandran

Objectives

- To know the basic techniques for *in vitro* culture of plants.
- To study the latest techniques in tissue culture of plants.

Unit-I

Laboratory organization and Techniques in Plant Tissue Culture. Methods of sterilization. Organ culture, root, shoot tip or meristem, ovary, flower and ovule culture and their importance. Integration of plant tissue culture into plant transformation protocols.

Unit-II

Callus and multiple shoot induction – principle, protocol and significance. Cell suspension cultures – Principle, protocol and its importance. Totipotency, cytodifferentiation and organogenesis – Principle, factors influencing organogenesis and applications.

Unit-III

Plant regeneration – Somatic embryogenesis and synthetic seeds – Principle, protocol and importance. Single cell culture, embryo culture – Principle, protocol and applications. Somaclonal variations – Basis and applications.

Unit-IV

Anther and Pollen cultures – Principle, protocol and its significance. Protoplast, isolation, fusion and culture somatic hybridization, chemofusion, electrofusion important properties of protoplast, somatic hybrids, Cybrids – Principles, protocol and importance.

Unit-V

Hairy root culture – Role of plant tissue culture in forestry, micropropagation, clonal propagation, production of useful biochemicals – Gene conservation bank – Role of plant tissue culture in biotechnology.

References

1. Edwin F, George and Paul Sherington D., 1984, Plant Propagation by Tissue Culture, Exegetics Ltd., Edington, Westbury England.
2. Indra K. Vasil, 1980, Cell Culture and Somatic Cell Genetics of Plants Academic Press inc., New Yourk.
3. Kalyanakumar D, 1997, An Introduction to Plant Tissue Culture, New Central Book Agency, Calcutta.
4. R.L.M. Pierik, 1987, *In vitro* culture in higher plants. Martinus Nijhoff Publishers, Boston.

Sem–I **Hours / Week: 6**

15MBO104C **Credit: 5**

C4 : SOIL MICROBIOLOGY

Dr J John

Objectives

- To learn the diversity of microbes in soils.
- To understand the various biochemical transformation occur in soil environment mediated by soil microbes.

Unit-I

Soil as a habitat for micro organisms, physio-chemical properties of soil-soil organic matter, soil water, soil air and soil microbes.

Unit-II

Microbial decomposition of soil organic matter – Cellulose, hemi cellulose, lignin. Water soluble components and proteins.

Unit-III

Factors affecting organic matter decomposition, litter quality, temperature, aeration, soil pH, soil moisture and inorganic chemicals.

Unit-IV

Bio geo chemical cycling – Carbon, Nitrogen, Phosphorus and Sulphur – Role of soil microbes in bio geo chemical cycling.

Unit-V

Phosphate Solubilizing Microbes (PSM) isolation and characterization mass production of phosphate solubilizing microbes – Mechanism of phosphate solubilization.

References

1. Debey R. C and Maheswari D.K., 2000, Text book of Microbiology, S. Chand & Co., Ltd., New Delhi.
2. Martin Alexander, 1969, Introduction to Soil Microbiology. Wiley International Edition, New York.
3. Peiczar *et al*., 1998, Microbiology, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Sem-I **Hours / Week: 6**
15MBO104D **Credit: 5**

C4 : MOLECULAR SYSTEMATICS

Dr S R Senthilkumar

Objectives

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

Unit-I

*Chloroplast DN*A – 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

1. Michael G. Simpson, Plant Systematics, 2006, Elsevier Academic Press, Burlington.
2. Hills D.M., Mortiz C & Mable B K. (eds.), 1996, Molecular Systematics, Sinaver Associates, Sunderland, USA.
3. Gurucharan Singh, Plant Systematics (II Edn), 2004, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Harborne J. B. & Turner B. L., 1984, Plant Chemosystematics, Academic Press, London.

Sem-I **Hours / Week: 6**
15MBO104E **Credit: 5**

C4: ADVANCED BRYOLOGY

Dr S Sahaya Sathish

Objectives:

- To acquire knowledge and characteristics to identify the Bryoflora.
- To be familiar with the ecology and distribution pattern of bryophytes in India and other regions of the world.
- To inculcate the techniques of antimicrobial, phytochemical and nanosynthesis in Bryoflora.

Unit-I

General characteristic of Bryophytes, Classification of Bryophytes (Rothmaler 1951), Thallus organization of gametophytes and range of structure and evolution of sporophytes; distribution of bryophytes; Alternation of generation, Economic importance of Bryophytes.

Unit-II

Bryophyte Water relations - absorption and conduction, Xerophytes adaptations, drought tolerance, desiccation and rehydration, ectohydric, endohydric and myxohydric bryophytes. Methods of vegetative, asexual and sexual reproduction of bryophytes.

Unit-III

Ecological significance of Bryophytes - role as pollution indicators. Ecology of the bryophytes, Bryophytes in India, phylogeny of the bryophytes. A general account of fossil bryophytes, origin and evolution of bryophytes.

Unit-IV

Evolutionary Trends in gametophyte and Sporophyte diversity among bryophytes. Comparative structural organization of gametophytes and sporophytes spore-elaters, Dehiscence and spore dispersal mechanisms and germination of Bryophytes. Cytology of Moss. Bryogeography distribution of Polyploidy and Aneuploidy. Cytological technics, Cytotaxonomy; use of Cytological data of various groups of bryophytes**.**

Unit-V

Antimicrobial studies of bryophytes, Bryophytes as the source of bioactive compounds-phytochemistry of bryophytes- Selection and Purification of Solvents for Extraction-Methods of isolation,(including industrial methods) purification and characterization of Bryophytes. Nanoparticles and Tissue culture techniques.

References

1. Alain Vanderpoorten and Bernard Goffinet, 2009. Introduction to Bryophytes, Cambridge University Press, New York.
2. Campbell, Ditt (1940). The evolution of land plants. Stanford University Press. California.
3. Dye. AF, J.G. Duckett (Eds) (1984). The experimental Biology of Bryophytes. *Chronica Botanical*. Academic Press, London.
4. Gangulee, H. C. (1969-1980). Mosses of Eastern India and adjacent regions.Vol. I-III. (Fasc. 1-8), BSI, Calcutta.

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Sem-I **Hours / Week: 6**

15MBO104F **Credit: 5**

C4 : PLANT PESTS CONTROL STRATEGIES

D*r K Rajan*

Objectives:

- To understand the nature of pest damage and their control.
- To understand the interactions between the insects and plants.

Unit-I

Type of pests and their damages: Pests of paddy, groundnut, cotton, potato and sugarcane. Methods of pest controls – biological, chemical and hormonal. Use of genetic manipulation in insect control.

Unit-II

Allelochemical interaction among plants. Herbivores and their predators. Allomones, kairomones and Synomones: plant origin and predator released. Antimones as precursors of semiochemicals.

Unit-III

Influence of plant produced allelochemical on the host/pest selection behavior of entomophagous insects. Plant produced allelochemicals and host/prey habitat location. The role of allelochemicals synomones. The role of allelochemicals resistance. Implications for the use of entomophagous insects in applied biological control.

Unit-IV

Development of insect resistant plants through application of phytochemicals/genes. Phytochemicals as pesticides. Principles of hormones involved in insect resistance. Insect attractants and repellents. Plant protection methods.

Unit-V

Role of enzyme in plant disease – general toxins (tab toxin, cercosporin) – host specific toxins – HV toxin, T-toxin, HC toxin. Insect antifeedants in plants. Growth regulators in plant diseases.

References

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Sem–I **Hours / Week: 6**
15MBO104G **Credit: 5**

C4 : MYCORRHIZAL SYMBIOSIS

Dr A Egbert Selwin Rose

Objectives: *To study the diversity of mycorrhiza and their associations*

UNIT I
Introduction: Association types, Host plants, Mycorrhizal fungi. Structure and development of mycorrhizal roots -Root systems, Tissues, Cells , Fungal reactions to plants prior to mycorrhizal formation, influence of the plant root on mycorrhizal formation, cellular basis of plant-fungus interchanges in mycorrhizal associations, mycorrhizal mycelium.

UNIT II
Types of mycorrhizal association – Endomycorrhiza, Ectomycorrhiza and Ericoid mycorrhizal.Vasicular Arbuscular Mycorrhizas: The symbionts forming VA mycorrhizas-colonization of roots and anatomy of VA mycorrhizas – genetic, cellular and molecular interaction in the establishment of VA mycorrhizas.

UNIT III
Ectomycorrhizas: Structural diversity and development of ectomycorrhizal roots – nitrogen and phosphorus nutrition of ectomycorrhizal plants. Ectendomycorrhizas- characteristics and functions.

UNIT IV
Mycorrhizas in Ericales: Arbutoid and Monotropoid mycorrhizas – Ericoid mycorrhizas. Orchid mycorrhizas- Biology of orchids, fungi forming orchid mycorrhizas, mycorrhizal interactions, pathogenic and symbiotic considerations, rationale and significance.

UNIT V
Functions of mycorrhzas: Uptake, translocation and transfer of nutrients in mycorrhizal symbiosis – the roles of mycorrhizas in ecosystems – VA mycorrhizas in agriculture and horticulture – mycorrhizas in managed environments.

References:

1. Smith, S.E. and Read, D.J. 2008 Mycorrhizal Symbiosis (Third Edition) Academic Press, London, UK.
2. Allen, M.F. 1992. Mycorrhizal Functioning: An Integrative Plant Fungal Process, Chapman and Hall, New York.
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Sem-I **Hours / Week: 6**
15MBO104H **Credit: 5**

C4 : FLORISTIC STUDIES OF ANGIOSPERMS

Dr S Soosairaj

Objectives

- To study the classical taxonomy with reference to different parameters.
- To understand the relevance of techniques in plant systematics.

Unit-I

Concept of taxonomic characters and various character states. Taxonomic hierarchy. Plant nomenclature – basis, ICBN rules and typification. Taxonomic key. Taxonomic literature – flora, monograph and revisions.

Unit-II

Comprehensive view of various approaches to plant classification – natural, artificial, phylogenetic, general and special purpose, their advantages and disadvantages. Phenetic and numerical taxonomy – OTU, weighting, cluster analysis. Digital taxonomy – need and application, various data base in taxonomy.

Unit-III

Taxonomic evidences from morphology, anatomy, karyology, embryology, palynology, paleobotany, ecology and physiology. Phytogeography – definition, various geographic regions proposed by Grisebuch, Drude and Good. Speciation.

Unit-IV

Plant genome as source of taxonomic evidence – gene mapping, sequencing, base ratio, hybridization. Application of PCR, RFLP, RAPD in plant systematics. Proteins – amino acids sequencing, storage proteins, serology and isoenzymes.

Unit-V

Application of secondary metabolites as sources of taxonomic evidence – alkaloids, flavonoids, terpenoids, sugars, polysaccharides. Hydrocarbons, Fatty acids, lipids and pigments – betalains, anthocyanins and betacyanin.

References

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