M. Phil.
BOTANY
SYLLABUS - 2018

St. JOSEPH'S COLLEGE (Autonomous)

Special Heritage Status Awarded by UGC

Accredited at 'A' Grade (3rd cycle) by NAAC

College with Potential for Excellence Conferred by UGC

DBT-STAR & DST-FIST Sponsored College

TIRUCHIRAPPALLI - 620 002, INDIA

GUIDELINES FOR M.PHIL. PROGRAMME

1. Duration

The programme runs for one year 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	4	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Course	4			
C4	Guide Paper	4			
Total		**16**	**Total**		**8**

A) Each Course should contain 5 units, covering the subject requirements of the courses offered. **Marks for CIA and SE are in the ratio 25: 75**.

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

A candidate shall be declared to have passed Course I, II, III and IV, if he / she secures not less than 40% of the marks in both CIA and the University Examination and 50% of the marks in the aggregate (i.e. continuous internal assessment and the written Examination taken together.

B) In course C1 on **'Professional Skills for Teaching– Learning'** the first three units are common to all the Departments of the College. The first three unit titles are **Soft Skills, E-teaching, E-learning, Elements of Technology ofTeaching and Learning.** The remaining two units are department specific tomake use of the above mentioned skills & techniques to teach the Core Course.

The C1 Course is (to be) designed to explore 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 Sector.

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.

C) **Evaluation:**

C.1:

For CIA and 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 (15) and Practical Component(15). The total mark 100 will be converted into **25** marks.

C.2, C.3 & C.4:

The CIA components for C-2, C-3 and C-4 are Mid Semester Test (25), End Semester Test (25), Seminar (30), Objective Type test /Assignment (20). *(The marks of Mid semester test (75), End semester test (75) will be converted into 25 each.)*

The total mark 100 will be converted into 25 marks. The tests and Semester Examination are centrally conducted by COE for 3 hours.

a) Question papers for C1, C2 & C3 are set by External Examiners.
b) Question paper for C4 will be set and valued by the Research Advisor only.
c) The evaluation method will be the same for both C2 and C3 Courses.

3. Credits

	Courses	Title		Contact hours	Library hours	Total hours	Credit	CIA marks	SE marks	Total marks
Semester-I	C1	Professional Skills for Teaching-Learning	T	3	2	5	3	25	50	100
			P	2	2	4	1		25	
	C2	Research Methodology		5	4	9	4	25	75	100
	C3	Core Paper		5	5	10	4	25	75	100
	C4	Guide Paper		5	5	10	4	25	75	100
Total				**20**	**18**	**38**	**16**	**100**	**300**	**400**

		Internal	Cr	Mk	External	Cr	Mk
Semester-II	C5	Seminar & Review of Related Literature	1	15	Dissertation Evaluation	6	75
		Mid-term Review Presentation	1	15	Viva-voce	2	25
		Dissertation Work	4	50			
		Publication of Research Articles	1	10			
		Viva-voce	1	10			
Total			**8**	**100**		**8**	**100**

4. Question Pattern

Course	Mid & End Semester Tests		
	SCIENCE		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×7 = 21
C2	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
C3	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
C4	Open Choice: Comprehensive Type	5/8	5×15 = 75
	ARTS		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×7 = 21
C2	Open Choice: Comprehensive Type	5/8	5×15 = 75
C3	Open Choice: Comprehensive Type	5/8	5×15 = 75
C4	Open Choice: Comprehensive Type	5/8	5×15 = 75

Course	Semester Examination		
	SCIENCE		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×12 = 36
C2	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
C3	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
C4	Open Choice: Comprehensive Type	5/8	5×15 = 75
	ARTS		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×12 = 36
C2	Open Choice: Comprehensive Type	5/8	5×15 = 75
C3	Open Choice: Comprehensive Type	5/8	5×15 = 75
C4	Open Choice: Comprehensive Type	5/8	5×15 = 75

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 theSemester –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 to the CoE through HOD in a sealed cover

5.3 Publications

All the M.Phil. Scholars should publish atleast one Research article in the reputed Journals before the submission of their dissertation. Publication of research article will be considered as CIA component. According to the type of Journals marks will be distributed to each article as follows.

UGC approved Journals	-	10 marks
Other Journals with ISSN number	-	8 marks
ReTeLL or Seminar /Conference Proceedings	-	6 marks

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 Curbing Plagiarism

According to The draft of University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Education Institutions) Regulations, 2017. Before submitting the thesis every students should submit the draft and get the certificate from the college library which will be issued after the verification of plagiarism. The certificate should be enclosed along with the thesis.

Plagiarism would be quantified into following levels in ascending order of severity for the purpose of its definition:

Level-0: Similarities upto 10% Excluded
Level-1: Similarities above 10% to 40%
Level-2: Similarities above 40% to 60%
Level-3: Similarities above 60%

Penalties for Students Plagiarism Disciplinary Authority (PDA) of the HEI, based onrecommendations of the Academic Misconduct Panel (AMP), shall impose penalty considering the severity of the Plagiarism.

i. Level 0: Similarities upto 10% - Minor Similarities, no penalty.
ii. Level 1: Similarities above 10% to 40% - Such student shall be asked to submit a revised script within a stipulated time period not exceeding 6 months.
iii. Level 2: Similarities above 40% to 60% - Such student shall be debarred from submitting a revised script for a period of one year.
iv. Level 3: Similarities above 60% -Such student registration for that programme shall be cancelled.

5.6 Viva-Voce

An open Viva-Voce examination shall be conducted by both the external examiner and the supervisor **and shall be attended by members of Department Research Committee members, all faculty members of the departments, other research scholars and other interested experts / researchers** and evaluated jointly by the Examiner and the Supervisor. The valuation of M.Phil. Dissertations and the viva-voce examination shall be carried out on the same day at the place of the Research Supervisor (viva is to be conducted only if the student passes in the valuation of the dissertation). The mark should be sent to the Controller of Examinations by the Research supervisor. A candidate shall be declared to have passed Part-II Examination if he secures not less than **55%** of the marks both in internal and external.

6. Classification of Final Results

i. The classification of final results shall be based on the CGPA, as indicated in Table 2.
ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as “Outstanding”. Similarly, the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99, and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective Programmes as “Excellent”, “Very Good”, “Good”, and “Above Average” respectively..
iii. Absence from an examination shall not be taken as an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
Below 50	NA	RA

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Results
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re-Appearance

6.1 Credit based weighted Mark System is to be adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

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 the guide concerned should be recorded in the 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

Programme outcomes (POs)

1. Scholars are to be adopted with a new paradigm of self-learning in the form of review of earlier knowledge acquired.
2. Scholars are brought to light from the previous investigation completed to the newer thrusts of knowledge and implementation in research.
3. Scholars are trained to design, implement and evaluate secured information (hard and soft) systems with assured quality and efficiency.
4. Scholars are to be oriented towards becoming globally competent.

Programme Specific Outcomes (PSOs)

1. Post Graduates will acquire basic knowledge on statistics and learn its application in biological studies.
2. Post Graduates will acquire knowledge on the production of GMOs which play a significant role in field of agriculture and medicine.
3. Post Graduates will learn the principle and methodology of thesis writing and research publications.
4. Post Graduates will acquire knowledge on bioinformatics and nanotechnology.
5. Post Graduates will learn the popular tools in bioinformatics for sequence analysis and molecular visualization.

Course Pattern - 2018 Set

Sem	Code	Title of the Paper
I	18MBO101	Course – C1: Professional Skills for Teaching – Learning
	18MBO102	Course – C2: Research Methodology
	18MBO103	Course – C3: Biotechnology (Open online course)
	18MBO104A	Course – C4: Soil Microbiology
	18MBO104B	Course – C4: Molecular Systematics
	18MBO104C	Course – C4: Advanced Bryology
	18MBO104D	Course – C4: Plant-Pest Control Strategies
	18MBO104E	Course – C4: Mycorrhizal Symbiosis
	18MBO104F	Course – C4: Angiosperms Taxonomy
II	18MBO205	Course – C5: Dissertation

18MBO101

PROFESSIONAL SKILLS FOR TEACHING-LEARNING

Course Outcomes

1. To empower scholars with soft skills.
2. To introduce the teaching and dynamics of teaching – learning
3. To facilitate e- learning/ e-teaching with the ICT tools
4. To acquire practical skills (in subject) aiming at gaining confidence to handle practical classes.
5. To develop teaching skills and gain confidence in teaching.
6. To acquire knowledge on the preparation of teaching aids

Unit I: Soft Skills

1. Introduction to Soft Skills, Soft Skills Vs Hard Skills, types of Soft Skills
2. 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
3. Behavioral Skills- Leadership skills, Time Management, Creativity and Lateral thinking
4. Interview Skills- Resume Writing, Different types of interviews, Etiquettes in interviews, Mock interviews
5. 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

1. Emerging trends in Educational Psychology- Meaning, Scope and Methods
2. Learning- Different Theories of learning, Approaches to learning(Classical Conditioning- Ivan Pavlov; Operant conditioning- B.F.Skinner); kinds of learning, factors affecting learning
3. 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 18 hours theory both for UG & PG .classes and assisting 18 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.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18MBO101				Title of the Paper PROFESSIONAL SKILLS FOR TEACHING-LEARNING					Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	4	3	5	3	1	4	5	3	4	3.5	
CO2	5	3	5	3	3	4	4	2	3	3.5	
CO3	4	3	2	5	3	2	3	2	2	2.8	
CO4	5	4	3	3	2	5	3	3	5	3.3	
CO5	4	3	5	2	2	2	3	3	3	3.0	
CO6	5	3	5	4	4	3	2	4	3	3.6	
					Overall Mean Score for COs					3.3	

Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

18MBO102

RESEARCH METHODOLOGY

Course Outcomes:

1. To initiate the students into research activities.
2. To handle various instruments, principles and applications
3. To acquire knowledge on different types of microscope
4. To learn the principle and methodology of chromatography
5. To learn the principle and methodology of tracer technique
6. To acquire knowledge on statistics and its application in research .

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, Course outcomes 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 nd Techniques, 2000 (5th 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.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18MBO102	Title of the Paper RESEARCH METHODOLOGY							Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	5	3	1	4	5	3	4	3.5
CO2	5	3	5	3	3	4	4	3	3	3.6
CO3	4	3	3	5	3	3	3	3	3	3.3
CO4	5	4	3	3	3	5	3	3	5	3.7
CO5	4	3	5	3	3	3	3	3	3	3.3
CO6	5	3	5	4	4	3	3	4	3	3.7
Overall Mean Score for COs										3.5

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$$

$$\text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

18MBO103

BIOTECHNOLOGY
(Open Online Course)

Course Outcomes:

1. To study the techniques used in Genetic Engineering
2. To explore the possible applications and future potentiality of Biotechnology.
3. To understand cloning strategies
4. To learn the techniques in tissue culture
5. To acquire knowledge in gene transfer methodology
6. To develop a protocol for plantibodies production

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.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18MBO103				Title of the Paper BIOTECHNOLOGY (Open Online Course)					Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	4	3	5	3	2	4	5	3	4	3.5	
CO2	5	3	5	3	3	4	4	3	3	3.7	
CO3	4	3	3	5	3	3	3	3	3	3.2	
CO4	5	4	3	3	3	5	3	3	5	3.6	
CO5	4	3	5	3	3	3	3	3	3	3.3	
CO6	5	3	5	4	4	3	3	4	3	3.6	
							Overall Mean Score for COs			3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

18MBO104A

SOIL MICROBIOLOGY

Course Outcomes:

1. To learn the diversity of microbes in soils
2. To understand the various biochemical transformation occur in soil
3. To understand the factors affecting decomposition of organic matter
4. To acquire knowledge on Bio geo chemical cycling
5. To understand the mechanism of phosphate solubilization by microbes
6. To get knowledge on soil as a habitat for 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.

18MBT104B

MOLECULAR SYSTEMATICS

Course Outcomes:

1. To get a new out look on plant systematics.
2. To understand the structure of chloroplast DNA
3. To acquire knowledge on plant genome mapping
4. To acquire knowledge on Principles of Taxometrics
5. To learn the phylogenetic methods in systematics
6. To acquire knowledge on chemosystematics:.

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.

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1. Michael G. Simpson, Plant Systematics, 2006, Elsevier Academic Press, Burlington.
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18MBT104C

ADVANCED BRYOLOGY

Course Outcomes:

1. To acquire knowledge and characteristics to identify the Bryoflora.
2. To be familiar with the ecology and distribution pattern of bryophytes in India and other regions of the world.
3. To inculcate the techniques of antimicrobial, phytochemical and nanosynthesis in Bryoflora.
4. To learn the Evolutionary Trends in gametophyte and Sporophyte diversity
5. To acquire knowledge on Antimicrobial studies of bryophytes
6. To study the nanoparticles and Tissue culture techniques in bryophytes

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

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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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6. Kashyap, S. R. (1932). Liverworts of Western Himalayas and the Punjab plains (Vol.I & II). Research Co. Publications. Delhi, India.
7. Manju, C. N., Rajesh, K. P. and Madhusoodanan, P. V. (2005). Bryophytes of Wayanad in Western Ghats, Malabar. Natural History Society, Kerala.
8. Pandey, B. P. (1994). Bryophyta. S Chand & Co. Ltd, New Delhi.
9. Parihar, N.S. 1965. An introduction of Embryophyta: Bryophyta, General Book Central Book Depot, Allahabad.
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11. Vashishta, B. R., A. K. Sinha, and A. Kumar (2003). Bryophyta, New Delhi.

18MBT104D

PLANT PEST CONTROL STRATEGIES

Course Outcomes:

1. To understand the nature of pest damage and their control.
2. To understand the interactions between the insects and plants.
3. To understand the Allelochemical interaction among plants
4. To study the influence allelochemical on the host/pest selection
5. To understand the methodology for the production of pest rasistent plants
6. To understand the role of plant disease control

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

1. Pedro Barbosa and Debrorah K. Letourneau (Eds.) 1988. Novel aspects of insect-plant interactions. A Wiley-interscience Publication, New York.

2. Ananthakrishnan, TN. 2002. Insects, Plants and Molecular interactions. Madras Science Foundation, Chennai.
3. Vasantharaj David B and Kumarasami T., 1998. Elements of Economic Entomology. Popular Book Depot, Chennai.
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18MBT104E

MYCORRHIZAL SYMBIOSIS

Course Outcomes:

1. To study the diversity of mycorrhiza and their associations
2. To learn the types of host - mycorrhizal association
3. To study the structural diversity of mycorrhizae
4. To acquire knowledge on Orchid mycorrhizae
5. To understand the functions of mycorrhizae
6. To understand the role of VAM in agriculture and horticulture

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.
3. Allen, M.F. 1991. The Ecology of Mycorrhizae, Cambridge University Press, New York, USA.

18MBT104F

ANGIOSPERMS TAXONOMY

Course Outcomes:

1. To study the classical taxonomy with reference to different parameters.
2. To understand the relevance of techniques in plant systematics.
3. To study the comprehensive view of various approaches to plant classification
4. To study the various evidences in taxonomy
5. To study the. application of PCR, RFLP, RAPD in plant systematics
6. To understand secondary metabolites as sources of taxonomic evidence

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.

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