

ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS UNDER CBCS PATTERN FOR AFFILIATED COLLEGES WITH
EFFECT FROM THE ACADEMIC YEAR 2022-2023 ONWARDS

B.Sc., Botany
PROGRAMME STRUCTURE

Sem	Part	Course Code	Courses	Title of the Paper	T/P	Credits	Hours/Week	Max. Marks		
								Int.	Ext.	Total
I	I	2211T	T/OL	Tamil/Other Languages-I	T	3	6	25	75	100
	II	712CE	E	Communicative English -I	T	3	6	25	75	100
	III	22BBO1C1	CC	Plant Diversity – I	T	5	5	25	75	100
		22BBO1P1	CC	Plant Diversity – I	P	4	4	40	60	100
		-	AL-IA	Chemistry/Zoology/Microbiology/Biotechnology	T	3	3	25	75	100
		-	AL-IA	Practical-Respective Theory Allied Course	P	2	2	40	60	100
	IV	22BVE1	SEC-I	Value Education	T	2	2	25	75	100
		-	Library	-	-	2	-	-	-	
				Total		22	30	205	495	700
II	I	2221T	T/OL	Tamil/Other Languages-II	T	3	6	25	75	100
	II	722CE	E	Communicative English - II	T	3	6	25	75	100
	III	22BBO2C1	CC	Plant Diversity – II	T	5	5	25	75	100
		22BBO2P1	CC	Plant Diversity – II	P	4	4	40	60	100
		-	AL-IB	Chemistry/Zoology/Microbiology/Biotechnology	T	3	3	25	75	100
		-	AL-IB	Practical-Respective Theory Allied	P	2	2	40	60	100
	IV	22BES2	SEC-II	Environmental Studies	T	2	2	25	75	100
		Naan Mudhalvan Course	Language Proficiency for Employability(Effective English)	-	2	2	25	75	100	
				Total		24	30	230	570	800
III	I	2211T	T/OL	Tamil/Other Languages-II	T	3	6	25	75	100
	II	712CE	E	English – III	T	3	6	25	75	100
	III	22BBO3C1	CC	Plant Anatomy, Embryology & Micro techniques.	T	3	3	25	75	100
		22BBO3C2	CC	Microbiology & Plant Pathology	T	3	3	25	75	100
		22BBO3P1	CC	Plant Anatomy, Embryology & Micro techniques, Microbiology & Plant Pathology.	P	3	3	40	60	100
		-	AL-II A	Chemistry/Zoology/Microbiology/Biotechnology	T	3	3	25	75	100
			AL-II A	Practical-Respective Theory Allied	P	2	2	40	60	100
IV	22BE3	SEC-III	Entrepreneurship	T	2	2	25	75	100	
		-	NME-I	Adipadai Tamil (or) Advance Tamil (or) IT Skills for Employment/ MOOC'S	T	2	2	25	75	100
				Total		24	30	255	645	900
	I	2231T	T/OL	Tamil/Other Languages-IV	T	3	6	25	75	100
	II	2232E	E	English for Enrichment – I	T	3	3	25	75	100
		22BBO4C1	CC	Plant Biochemistry & Instrumentation	T	4	4	25	75	100
		22BBO4C2	CC	Cytology, Genetics & Evolution	T	4	4	25	75	100

IV	III	22BBO4P1	CC	Plant Biochemistry & Instrumentation, Cytology, Genetics & Evolution	P	3	3	40	60	100	
		-	AL-II B	Chemistry/Zoology/Microbiology/Biotechnology	T	3	3	25	75	100	
		22BVE1	AL-II B	Practical-Respective Theory Allied Course	P	2	2	40	60	100	
	IV	-	NME-II	Adipadai Tamil(or) Advance Tamil(or) Small Business Management / MOOC'S	T	2	2	25	75	100	
		Naan Mudhalvan Course		Digital Skills for Employability – (Microsoft-Office Fundamentals)	-	2	3	25	75	100	
				Total		26	30	255	645	900	
V	III	22BBO5C1	CC	Taxonomy of Angiosperms & Economic Botany	T	4	4	25	75	100	
		22BBO5C2	CC	Plant Ecology	T	4	4	25	75	100	
		22BBO5C3	CC	Plant Physiology	T	4	4	25	75	100	
		22BBO5C4	CC	Plant Biotechnology	T	4	4	25	75	100	
		22BBO5P1	CC	Taxonomy of Angiosperms, Economic Botany & Plant Ecology	P	4	6	40	60	100	
		22BBO5P2	CC	Plant Physiology & Plant Biotechnology	P	4	6	40	60	100	
		-		Career development/employability skills	-	-	2	-	-	-	
				Total		24	30	180	420	600	
VI	III	22BBO6I	DSE	Internship		24	26	150	250	400	
	IV	Naan Mudhalvan Course		Medical Coding for Employability (Medical coding#)	T	2	4	25	75	100	
				Total		26	30	175	325	500	
				(Or)							
	III	22BBO6E1		Research methodology, Biostatistics & Bioinformatics	T	6	6	25	75	100	
		22BBO6E2		Medicinal Botany	T	6	6	25	75	100	
		22BBO6E3		Horticulture & Plant Breeding	T	6	6	25	75	100	
		22BBO6E4		Seaweed Technology	T	6	6	25	75	100	
	IV	-		Library/Yoga etc			2				
		Naan Mudhalvan Course		Medical Coding for Employability (Medical coding#)	-	2	4	25	75	100	
			Total		26	30	125	375	500		
III				(Or)							
		22BBO6PR	DSE	Project - I *		6	8	25	75	100	
		22BBO6E1		Research methodology, Biostatistics & Bioinformatics	T	6	6	25	75	100	
		22BBO6E3		Horticulture & Plant Breeding	T	6	6	25	75	100	
		22BBO6E5		Forestry	T	6	6	25	75	100	
IV	Naan Mudhalvan Course		Medical Coding for Employability (Medical coding#)	-	2	4	25	75	100		
			Total		26	30	125	375	500		
				(Or)							
III	22BBO6PS		Project - II **		12	14	50	150	200		
	22BBO6E1	DSE	Research methodology, Biostatistics & Bioinformatics	T	6	6	25	75	100		

	22BBO6E2	Medicinal Botany	T	6	6	25	75	100	
IV	Naan Mudhalvan Course	Medical Coding for Employability (Medical coding#)	-	2	4	25	75	100	
Total					26	30	125	375	500
Grand Total					146	--	--	-	4400

Medical Coding- Physical Training

Project - I* It is a group project which contains maximum of 4 candidates.

Project - II** It is a group project which contains maximum of 2 candidates.

Sem.	Part	Course Code	Title of the Paper	Credit	Hours/Week	Marks		
						Int.	Ext.	Total
I	III	71BEPL	Professional English for Life Science–I	4	5	25	75	100
II		72BEPL	Professional English for Life Science–II	4	5	25	75	100
III		*	Professional English for Life Science–III	4	5	25	75	100
IV			Professional English for Life Science–IV	4	5	25	75	100

*The Syllabus of Professional English for III & IV Semester will be provided after Receiving the syllabus from TANSICHE.

As per TANSICHE, the Professional English book will be taught to all four streams apart from the existing hours of teaching/additional hours of teaching (1 hour/day) as a 4 credit paper as an add on course on par with Major paper and completion of the paper is a must to continue his/her studies further.

- TOL-Tamil/Other Languages,
- E-English
- CC – Core course Core competency, critical thinking, analytical reasoning, research skill & team work
- Allied –Exposure beyond the discipline
- AECC-Ability Enhancement Compulsory Course (Professional English & Environmental Studies) -Additional academic knowledge, psychology and problem solving etc.,
- SEC-Skill Enhancement Course – Exposure beyond the discipline (Value Education, Entrepreneurship Course, Computer application for Science, etc.,
- NME -Non Major Elective – Exposure beyond the discipline
- DSE– Discipline specific elective – Student choice– either or
 - Internship
 - Internship Marks = Internal = 150 (75+75) two midterm valuation through Viva voce and External 250 marks (Report=150+VivaVoce=100) = Total 400 marks
 - Theory paper
 - Project +3 theory papers.
- MOOCs–Massive Open Online Courses
- T-Theory, P- Practical

Semester – I					
Course code: 22BBO1C1	Core Course–I		T/P	C	H/W
	Plant Diversity – I (Algae, Fungi, Lichens, and Bryophytes)		T	5	5
Objectives	<ul style="list-style-type: none"> ➤ To know the non-vascular Cryptogams. ➤ To study the structure and classification of Algae, Fungi, Lichens and Bryophytes. ➤ To familiarize the economic importance of Algae, Fungi, Lichens and Bryophytes. 				
Unit -I	<p>Algae: General characters and classification of algae by Fritsch (1935). Structure, pigmentation, food reserves and methods of reproduction and Life cycle of the following genera (Excluding developmental studies)</p> <p>Cyanophyceae – <i>Oscillatoria</i>, Bacillariophyceae–<i>Diatoms</i>. Chlorophyceae – <i>Caulerpa</i> Phaeophyceae–<i>Sargassum</i>. Rhodophyceae –<i>Gracilaria</i>.</p>				
Unit -II	<p>Fungi:General characters and classification of Fungi by C.J. Alexopoulos (1962). Occurrence, structure, mode of nutrition and life history of the following genera: (Excluding developmental studies)</p> <p>Phycomycetes – <i>Albugo</i>. Basidiomycetes – <i>Agaricus</i> Ascomycetes –<i>Peziza</i>. Deuteromycetes – <i>Cercospora</i></p>				
Unit -III	<p>Lichens: General features, Types of Lichen(Leprose,Crustose, Foliose, fruticose &Dimorphic), structure and reproduction of the following genera. (Excluding developmental studies)</p> <p>Foliose lichen - Parmotrema Dimorphic Lichen - Cladonia Fruticose lichen - <i>Usnea</i></p>				
Unit -IV	<p>Bryophytes:General characters and classification of Bryophytes byRothmaler. Occurrence, structure, reproduction and life history of the following genera (Excluding developmental studies): a. <i>Marchantia</i>&b.<i>Polytrichum</i>.</p>				
Unit -V	<p>Economic importance:</p> <p>A) Algae - Algae as food and source of phycocolloid (Agar-agar, Algin, Carrageenan), Diatomite, Algal parasites and Algal blooms. Potential of microalgae for SCP, β-carotene, Biodiesel.</p> <p>B) Fungi - Fungi as food, medicines, growth regulators (GA), industrial application (enzyme production), agriculture application of <i>Mycorrhizae</i>, decomposers, harmful effects (Food spoilage, Mycoses).</p> <p>C) Lichens - Lichens as food, Ecological importance - role in succession and indicator of pollution.</p> <p>D) Bryophytes - Bryophytes as food,medicine and Ecological importance</p>				
<p>Reference and Textbooks</p> <p>Alexopoulos, C.J. <i>Introductory Mycology</i>. John wiley& sons, New York</p> <p>Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). <i>Biology</i>, Pearson Benjamin Cummings, USA. 8th edition.</p> <p>Chapman V.J and Chapman D.J the algae. MacMillan Press</p> <p>Fritsch F.E. – <i>The structure and reproduction of the Algae</i>. Vol. I and II Vikas Publications New Delhi.</p>					

Kumar, H.D. (1999). *Introductory Phycology*. Affiliated East-West Press, Delhi.

Lee, R.E. (2008). *Phycology*, Cambridge University Press, Cambridge. 4th edition.

Pandey B.P. – College Botany – *Algae, Fungi and Bryophytes*. Vol. I S.Chand & Co., Calcutta.

Sambamurthy, A.V.S.S. 2005. *A textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. I.K. International Pvt.Ltd, New Delhi.

Smith G.M, – *Cryptogamic Botany*. Vol. I and II McGraw Hill Publication.

Vashista B.R. (2009) *Botany for degree students*. S. Chand & co., Calcutta.

Outcomes	<ul style="list-style-type: none">➤ The students gain noteworthy knowledge in identification of Algae, Fungi, Lichens and Bryophytes.➤ The students will be able to understand and utilize Algae, Fungi, Lichens and Bryophytes.➤ It will help the students to create a positive aesthetic environment.
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Semester – I				
Course code: 22BBO1P1	Core Practical–I	T/P	C	H/W
	Plant Diversity – I (Algae, Fungi, Lichens, and Bryophytes)	P	4	4
Objectives	<ul style="list-style-type: none"> ➤ To observe and identify the specimen of Algae, Fungi, Lichens, and Bryophytes. ➤ To make suitable micropreparation of Algae, Fungi, Lichens and Bryophytes. 			
	<p>Algae:</p> <ol style="list-style-type: none"> 1. Microscopic observation and identification of following algal specimens– <i>Oscillatoria</i> and <i>Diatoms</i>. 2. Micropreparations of thallus and reproductive parts of <i>Caulerpa</i>, <i>Sargassum</i> and <i>Gracilaria</i> <p>Fungi:</p> <ol style="list-style-type: none"> 1. To observe and identify. <i>Albugo</i> infected leaf, <i>Agaricus</i>, <i>Stroma</i> of <i>Cercospora</i> and <i>Peziza</i> apothecium. <p>Lichens:</p> <ol style="list-style-type: none"> 1. Microscopic observation on sectional view of <i>Usnea</i>, <i>Parmotrema</i> and <i>Cladonia</i>. 2. To observe and identify <i>Usnea</i>, <i>Parmotrema</i> and <i>Cladonia</i>- soredia, <i>Isidia</i> and apothecium – specimens/slides. <p>Bryophytes:</p> <ol style="list-style-type: none"> 1. To observe and identify the specimens of <i>Marchantia</i> and <i>Polytrichum</i>. 2. Micro-preparations of thalli, reproductive organs of <i>Marchantia</i> and <i>Polytrichum</i>. <p>Display of specimens, photographs and newspaper clippings related with economic important of algae, fungi lichens and bryophytes as spotters (SCP capsules, biofertilizer pocket, agar stripes, antibiotics vials, photographs of VAM, food spoilage, mycoses, lichens & different kinds of pollution)</p>			
Outcomes	<ul style="list-style-type: none"> ➤ Students may able to identify the various forms of Algae, Fungi, Lichens and Bryophytes. ➤ Aware the knowledge of non-vascular cryptogams. 			

Semester – I				
Course code: 22BBO1P1	Core Practical–I	T/P	C	H/W
	Plant Diversity – I (Algae, Fungi, Lichens, and Bryophytes)	P	4	4

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

- | | | |
|--------------|---|-----------|
| 1. | Take T.S of given material A, B and C . Stain, mount in Glycerine and submit the slides for valuation. Identify, draw sketches and label it. Give reasons. | 3x7 =21 |
| 2. | Identify, draw sketches and write notes on D,E,F & G | 4x5=20 |
| 3. | Identify and write the genus and group of H,I and J | 3x2=6 |
| 4. | Identify and write notes on K&L | 2x1.5=3 |
| 5. | Record Note Book | 10 |
| Total | | 60 |

Key and Scheme of Valuation

- | | | |
|--------------------|---|-----------|
| 1. | A (Algae), B (Fungi) and C (Lichen/ Bryophytes) material to be given (Section-2, Identification-1, Diagram-2, Notes-2) | 3x7 =21 |
| 2. | D (Algae), E (Fungi), F (Bryophytes), G (Lichen) to be given (Identification-1, Sketches-2, Description-2) | 4x5=20 |
| 3. | Identify and write the genus and group.
H (Algae), I (Fungi/Lichen), J (Bryophytes), (Genus – 1, Group –1) | 3x2=6 |
| 4. | K . Algae/Bryophyte, L Fungi/Lichen - Economic importance (Identification-0.5, Notes– 1) | 2x1.5=3 |
| 5. | Record Note Book | 10 |
| Total marks | | 60 |

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

- | | | |
|--------------|---|-----------|
| 1. | Take T.S of given material A, B and C . Stain, mount in Glycerine and submit the slides for valuation. Identify, draw sketches and label it. Give reasons. | 3x5=15 |
| 2. | Identify, draw sketches and write notes on D,E,F & G | 4x3.5=14 |
| 3. | Identify and write the genus and group of H,I and J | 3X1=3 |
| 4. | Identify and write notes on K&L | 2x1=2 |
| 5. | Continuous assessment | 6 |
| Total | | 40 |

Key and Scheme of Valuation

- | | | |
|--------------------|---|---------------|
| 1. | A (Algae), B (Fungi) and C (Lichen/ Bryophytes) material to be given (Section-2, Identification-1, Diagram-1, Notes-1) | 3x5=15 |
| 2. | D (Algae), E (Fungi), F (Bryophytes), G (Lichen) to be given (Identification-1, Sketches-1, Description-1.5) | 4x3.5=14
4 |
| 3. | Identify and write the genus and group.
H (Algae), I (Fungi/Lichen), J (Bryophytes), (Genus – 0.5, Group –0.5) | 3X1=3 |
| 4. | K . Algae/Bryophyte, L Fungi/Lichen - Economic importance (Identification-0.5, Notes – 1) | 2x1.5=3 |
| 5. | Continuous assessment | 05 |
| Total marks | | 40 |

Semester – II					
Course code: 22BBO2C1	Core Course–II		T/P	C	H/W
	Plant Diversity – II (Pteridophytes, Gymnosperms & Paleobotany)		T	5	5
Objectives	<ul style="list-style-type: none"> ➤ To know the morphological characters and life history of Pteridophytes and Gymnosperms. ➤ To know the methods of fossilization and geological time scale. 				
Unit -I	Pteridophyta: General characters and classification of Pteridophytes by K.R. Sporne, Stelar evolution in Pteridophytes, Heterospory and origin of seed habit. Apogamy, and apospory.Economic importance of Pteridophytes.				
Unit -II	Pteridophyta: Structure,reproductionand life history of the following genera (excluding developmental studies) a) <i>Psilotum</i> , b) <i>Selaginella</i> , c) <i>Equisetum</i> and d) <i>Marsilea</i> .				
Unit -III	Gymnosperms: General characters and classification of Gymnosperms by K.R.Sporne. The structure and life history of the following genera (excluding developmental studies) a) <i>Pinus</i> and b) <i>Gnetum</i> . Economic importance of Gymnosperms.				
Unit -IV	Paleobotany: Fossils and methods of fossilization such as compression,casts, molds, petrification, impressions and coal balls. Geological time scale. Carbon dating. Important Fossils in India;1. National Fossil Wood Park,Tiruvakkarai, Villupuram district&Sathanur,Perambalur District, Tamilnadu.2. Shivalik Fossil Park,MarkandaValley, Nahan, Sirmaur district, Himachal Pradesh.				
Unit -V	Paleobotany: Contributions of Birbal Sahni. A brief study about Birbal SahniInstiure of Palaeobotany, Lucknow.A brief study of the following fossil plants: a) <i>Rhynia</i> ,b) <i>Lepidodendron</i> and c) <i>Williamsonia</i> .				
Reference and Textbooks					
Arnold C.A. (1947) <i>An introduction to Palaeobotany</i> . McGraw Hill Book Co., New York.					
Raup,D.M. Stanley,S.M2004, <i>Principles of Paleontology</i> , CBS Publishers & Distributers, Pvt.Ltd, New Delhi					
Shuka, M.A. Sharma. M. (1992) <i>Plant fossils</i> . (a link with the past) (Abirbasahni Birth century tribute) Birbal SahniInstiure of Palaeobotany, Lucknow.					
Sporne K.R. Morphology of Pteridophytes. B.I Publications, New Delhi.					
SporneK.R.(1971) <i>The Morphology of Gymnosperms</i> Hutchinson University Library, London.					
Stewart, W.n, Rothwell,G.W 2005. <i>Paleobotany and the Evolution of Plants</i> . Cambridge University Press, Cambridge					
Vashishta,P.C.2016. <i>Botany for Degree students, Pteridophyta</i> (vascular cryptogames) S.Chand&Company Pvt,Ltd, New Delhi					
Vashista, P.C – An introduction to Pteridophyta. Vikas publishing Co					
Outcomes	<ul style="list-style-type: none"> ➤ Understand the salient features of Pteridophytes, Gymnosperms and Palaeobotany. ➤ Students learn to understand the fossilization process and evolutionary trends. 				

Semester – II					
Course code: 22BBO2P1	Core Practical–II		T/P	C	H/W
	Plant Diversity – II (Pteridophytes, Gymnosperms & Paleobotany)		P	4	4
Objectives	<ul style="list-style-type: none"> ➤ To make suitable temporary micro preparation of the types prescribed in Pteridophytes, Gymnosperms and Paleobotany. ➤ To know the methods of fossilization, geological time scale and carbon dating. 				
	<p>Pteridophyta: Photographs of different types of Stele, Heterospory and origin of seed habit, Apogamy, and apospory.</p> <p>Study of morphological and anatomical structures of the vegetative and reproductive parts and microscopic observations of the following genera: a) <i>Psilotum</i>, b) <i>Selaginella</i>, c) <i>Equisetum</i> and d) <i>Marsilea</i>.</p> <p>Gymnosperms: Study of morphological and anatomical structures of the vegetative and reproductive parts and microscopic observations of the following genera: a) <i>Pinus</i> and b) <i>Gnetum</i>.</p> <p>Palaeobotany: Observe and identify the fossil slides and photographs of <i>Rhynia</i>, <i>Lepidodendron</i>, and <i>Williamsonia</i>.</p> <p>Photographs/fossils specimens of Birbal Sahni.</p> <p>Observe and identify the fossil specimens and photographs of era period and epoch of Geological Time Scale.</p> <p>Submission of certified bonafide record Note Book is mandatory for the External Practical Examinations.</p>				
Outcomes	<ul style="list-style-type: none"> ➤ Understand the salient features of Pteridophytes, Gymnosperms and Palaeobotany. ➤ Students learn to understand the fossilization process, carbon dating and evolutionary trends. 				

Semester – II					
Course code: 22BBO2P1	Core Practical–II		T/P	C	H/W
	Plant Diversity – II (Pteridophytes, Gymnosperms & Paleobotany)		P	4	4

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

1.	Take T.S of the material A&B . Stain, mount in Glycerine and submit the slides for valuation. Identify, draw sketches and label it. Give reasons.	2x8 =16
2.	Take L.S of the given material C . Stain, mount in Glycerine and submit the slide for valuation. Identify, draw sketches and label it. Give reasons.	1x8 =08
3.	Identify, draw sketches and write notes on D,E&F	3x5=15
4.	Identify, draw sketches and write notes on G	1x5=05
5.	Identify and write the genus and group of H & I	2x2=04
6.	write the era and period of fossil specimen/photograph of J	1x2=02
7.	Record Note Book	10
	Total	60

EXTERNAL

Key and Scheme of Valuation

1.	A (Pteridophytes), B (Gymnosperms) – Vegetative part material to be given. (Section-3, Identification-1, Diagram-2, Notes-2)	2x8 =16
2.	C (Pteridophytes/Gymnosperms) Reproductive part material to be given (Section-3, Identification-1, Diagram-2, Notes-2)	1x8 =08
3.	D (Pteridophytes - Vegetative part), E (Gymnosperms - Vegetative part), F (Pteridophytes/ Gymnosperms Reproductive parts) to be given (Identification-1, Sketches-1, Description-2)	3x5=15
4.	G (Palaeobotany) to be given (Identification-1, Sketches-1, Description-2)	1x5=05
5.	Identify and write the genus and group. H (Pteridophytes), I (Gymnosperms) (Genus – 1, Group - 1)	2x2=04
6.	Identify and write the era and period of fossil specimen/photograph of J . (Era -1, Period - 1)	1x2=02
7.	Record Note Book	10
	Total marks	60

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

- | | | |
|----|--|-----------|
| 1. | Take T.S of the material A&B . Stain, mount in Glycerine and submit the slides for valuation. Identify, draw sketches and label it. Give reasons. | 2x6 =12 |
| 2. | Take L.S of the given material C . Stain, mount in Glycerine and submit the slide for valuation. Identify, draw sketches and label it. Give reasons. | 1x6 =06 |
| 3. | Identify, draw sketches and write notes on D,E&F | 3x3=09 |
| 4. | Identify, draw sketches and write notes on G | 1x3=03 |
| 5. | Identify and write the genus and group of H & I | 2x2=04 |
| 6. | write the era and period of fossil specimen/photograph of J | 1x1=01 |
| 7. | Continuous assessment | 05 |
| | Total | 40 |

INTERNAL

Key and Scheme of Valuation

- | | | |
|----|--|-----------|
| 1. | A (Pteridophytes), B (Gymnosperms) – Vegetative part material to be given.
(Section-3, Identification-1, Diagram-2, Notes-2) | 2x6 =12 |
| 2. | C (Pteridophytes/Gymnosperms) Reproductive part material to be given
(Section-3, Identification-1, Diagram-2, Notes-2) | 1x6 =06 |
| 3. | D (Pteridophytes - Vegetative part), E (Gymnosperms - Vegetative part), F (Pteridophytes/ Gymnosperms Reproductive parts) to be given (Identification-1, Sketches-1, Description-2) | 3x3=09 |
| 4. | G (Palaeobotany) to be given (Identification-1, Sketches-1, Description-2) | 1x3=03 |
| 5. | Identify and write the genus and group.
H (Pteridophytes), I (Gymnosperms)
(Genus – 1, Group - 1) | 2x2=04 |
| 6. | Identify and write the era and period of fossil specimen/photograph of J .
(Era -0.5, Period – 0.5) | 1x1=01 |
| 7. | Continuous assessment | 05 |
| | Total marks | 40 |

Semester – III					
Course code: 22BBO3C1	Core Course–III		T/P	C	H/W
	Plant Anatomy, Embryology & Micro techniques		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To learn the internal structure of higher plants ➤ To know the different types of cells, organs and developmental process of higher plants 				
Unit -I	Anatomy: Meristematic tissues: definition, structure, function & classification. Shoot and root apical organization and theories: Shoot apex: Histogen theory & Tunica – Corpus theory. Root apex: Histogen theory & Korper-Kappe theory. Structure and function of simple & complex permanent tissues				
Unit -II	Anatomy: Primary structure of dicot and monocot stem and root. Normal secondary growth in dicot stem and root. Anomalous secondary growth in <i>Boerhavia</i> and <i>Dracaena</i> stems. Structure of dorsiventral and isobilateral leaf. Wood – Structure and types – Sap wood & Heart wood, annual ring.				
Unit -III	Embryology: Structure and development of microsporangium, microsporogenesis, male gametophyte. Structure and development of megasporangium, Types of ovules, Megasporogenesis, Female gametophyte (Monosporic- <i>[Polygonum]</i>), Bisporic- <i>[Allium]</i> & Tetrasporic type- <i>[Fritillaria]</i> .				
Unit -IV	Embryology: Fertilization- major events -syngamy-double fertilization and their significance. Endosperm – types (Nuclear, cellular, helobial) and ruminant endosperm. Functions of endosperms. Structure and development of dicot (<i>Capsella/Tridax</i>) and monocot (<i>Najas/Maize</i>) embryos. A brief study about Polyembryony.				
Unit -V	Microtechniques: Principle, working mechanisms and structure and types of Microtome. Fixation, dehydration, infiltration, embedding, hand sectioning, microtome sectioning, stain types, staining and mounting. Preparation of double staining using saffranin and fast green. Whole mounts, temporary mounts, maceration and epidermal peeling.				
Reference and Textbooks Alen Peacock, H.J <i>Elementary Micro technique</i> , Em Kay Publications, New Delhi. Bhojwani, S.S and S.P Bhatnagar 2008, <i>The Embryology & Angiosperms</i> , Vikas publishing House Pvt. Ltd. New Delhi. Cutter, E.G (1969) <i>Plant Anatomy, Part I</i> Addison – Wesley Publishing Co., Eames, A.J. and MacDaniels, L.H (1972) <i>Introduction to plant Anatomy</i> . Esau K. (1953) <i>Plant Anatomy</i> Fahn. A. (1974) <i>Plant Anatomy</i> , Pergaman Press, New York. Gray. P. <i>Hand book of basic Micro technique</i> , Tata McGraw Hill Co., New Delhi.					

Maheswari, P. *Introduction to the Embryology of Angiosperms* Tata-McGraw Hill Publishing House Ltd. New Delhi.

Sass – J. E *Botanical Microtechnique*, Oxford & IBH Publishing House Co., New Delhi.

Outcomes	<ul style="list-style-type: none">➤ The students will develop the skills in identification of various plant parts of anatomy➤ The students will learn about embryo structure and Microtechniques
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Semester – III					
Course code: 22BBO3C2	Core Course–IV		T/P	C	H/W
	Microbiology& Plant pathology		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To know about Microorganisms and microbial disease ➤ To learn about microbes infected plant disease,disease control and treatments. 				
Unit -I	<p>Bacteria: Scope of Microbiology. Outline of bacterial classification-Bergey’s systemic bacteriology. Morphology of Bacteria - size, shape & arrangement. Structure and arrangement of cell wall – Capsule, Slime layer, Pili and Flagella. Structure and Chemical composition of cell wall- Gram Positive and Gram Negative.</p>				
Unit -II	<p>Bacterial nutrition- Phototrophs, Chemotrophs, Autotrophs and Heterotrophs, Obligate parasite. Growth curve, Reproduction – vegetative and asexual. Bacterial recombination - Conjugation, Transformation and Transduction.</p>				
Unit -III	<p>Viruses: Discovery, physiochemical and biological characteristics. Classification of Baltimore. General structure with special reference to viroids and prions (Slow virus). Bacteriophages – Types of T-phages, Detail study of T₄-phage (DNA virus) – lytic and lysogenic cycle. Structure and salient features of RNA virus (TMV) and Mycoplasma. Brief outline about Mycophages, Oncogenic (Tumour) virus and Cyanophages.</p>				
Unit -IV	<p>Plant microbe interaction: Microbial interaction: Plant-microbe, soil-plant-microbe interactions leading to symbiotic (rhizobial, algal, actinomycetes and mycorrhizal), associative, endophytic and pathogenic interactions.</p>				
Unit -V	<p>Plant pathology: An introduction about plant diseases. A study of the following plant diseases with special reference to the causative agents, symptoms, etiology and control measures. a) Fungal disease – Red rot of sugarcane b) Bacterial disease- Citrus canker c) Viral disease- Leaf Curl of Papaya. General Methods of Plant Protection: Cultural Methods: Tillage, sowing and planting dates, crop hygiene, crop rotation, trap crops and fertilizers. Physical Methods: Heat and soil solarizations. Chemical Methods: Brief account and uses of Bactericides, Fungicides, Insecticides and Nematicides. Biological Control: Introduction, biological control of Insect pests and diseases. Legal (Plant - quarantine): Introduction, domestic quarantine and Need of plant Quarantine in India</p>				
Reference and Textbooks					
Arumugam, N et al., 2014. Microbiology. Saras publication, Nagercoil.					
Dubey, A text book of botany , S.Chand & Company Ltd. Reprint, 2009, Ram Nagar, New Delhi					
Mehrotra, R.S., and Aggarwal, A. 2010. Plant Pathology. Tata McGraw Hill Education Private Limited, New Delhi.					
Microbiology – Pelczar, Chan and Krieg. Tata – McGraw Hill 1993					
Microbiology with CD Prescott, Harley and Klein (McGraw – Hill companies, Inc					

2002)

Nayadu , M.V. 2008. Plant Viruses. Tata McGraw Hill Education Private Limited, New Delhi.

Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

Sambamurthy A.U.S.S., A text book plant pathology, 2006. International Publishing house Pvt Ltd.

Singh R.S. (1978) – Plant Diseases. Oxford & Co., New Delhi.

Singh, R.P. 2015. Microbiology. Kalyani Publishers.

Text book of Microbiology – R.C.Dubey & D.K.Maheshwari S.Chand & Co. New Delhi.

Vashishta, B.R., Sinha, A.K. 2010. Botany for degree students Fungi. S. Chand & Company Ltd. New Delhi.

Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGrawHill International.

Outcomes	<ul style="list-style-type: none">➤ Aware the knowledge of Microorganisms and microbial interaction with plants.➤ Understand the microbes infected plant disease and disease control and treatments
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Semester – III						
Course code: 22BBO3P1	Core Practical–III			T/P	C	H/W
	Plant Anatomy, Embryology & Micro techniques, Microbiology & Plant Pathology.			P	3	3
Objectives	<ul style="list-style-type: none"> ➤ To develop skill of bacterial staining techniques. ➤ To know the association of micro-organism with soil and plants. ➤ To understand the development of anther and embryo. ➤ To learn about internal structure of root, stem and leaf. 					
	<p>Microbiology:</p> <ol style="list-style-type: none"> 1. Preparation of Nutrient Agar, Agar plates, Slants, Potato Dextrose Agar medium – PDA 2. Sterilization of Glassware and Media 3. Isolation of Bacteria, Fungi from Soil and water samples 4. Isolation of Pure Cultures of Bacteria by streak, Pour and Spread plate Techniques 5. Motility of Bacteria – Hanging Drop Technique 6. Simple (Methylene Blue) and Differential Staining (Gram Stain) of Bacteria 7. Viable count of Bacteria by serial Dilution Technique 8. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 9. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electronmicrographs of bacteria, binary fission, endospore, conjugation, root Nodule. <p>Plant pathology:</p> <ol style="list-style-type: none"> 1. Observation of crop plants infected by the pathogens included in the syllabus and study of symptoms, causative agents and Etiology. <p>Anatomy:</p> <ol style="list-style-type: none"> 1. Micropreparation of stem, root and leaf of dicot - <i>Tridox</i> and stem of monocot- <i>Cyanodon</i> 2. Micropreparation of (Anomalous Secondary growth) stem of - <i>Boerhavia</i> and <i>Dracaena</i> 3. Observation of permanent slides related with meristem - simple and complex tissues 5. Identification of wood based on either RLS or TLS <p>Embryology:</p> <ol style="list-style-type: none"> 1. To dissect out and mount Dicot embryo (<i>Tridax</i>) and Monocot embryos (Maize) 2. To prepare permanent micro preparations showing types of ovules and embryosac. 3. Micro preparations anther and Take T.S of anther (<i>Datura/Cassia</i>) <p>Micro techniques:</p> <ol style="list-style-type: none"> 1. Photograph/model of Microtome 2. Preparation and application of the following–Saffranin, Fast Green, 					

	Acetocarmine, Wax, Glycerin, Canada balsam Submission of certified bonafide record Note Book is mandatory for the External Practical Examinations.
Outcomes	<ul style="list-style-type: none">➤ Awareness about microorganism and understand its role in environment.➤ Understand the salient features of wood.➤ Gain knowledge about micro techniques.➤ Understand about the anther and embryo.

Semester – III						
Course code: 22BBO3P1	Core Practical–III			T/P	C	H/W
	Plant Anatomy, Embryology & Micro techniques, Microbiology & Plant Pathology.			P	3	3

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

1.	Demonstrate the Microbiological experiment as indicated in ' <u>A</u> '	1X5=5
2.	Perform Gram Staining using the given bacterial culture ' <u>B</u> '. Write the procedure and submit the slide for valuation.	1X5=5
3.	Identify and write notes on the given model/photograph <u>C</u>	1X4=4
4.	Comment on <u>D&E</u> .	2X4=8
5.	Take T.S of given material ' <u>F</u> '. Stain, mount in Glycerin and submit the slide for valuation. Identify, Draw sketches and label it. Give reasons.	1X7=7
6.	Identify and write notes on the given specimen <u>G&H</u>	2X3=6
7.	Dissect and display anyone stage of the dicot embryo from the given material ' <u>I</u> '. Mount in Glycerin and submit it for valuation. Write notes and draw sketch.	1X6=6
8.	Identify and write notes on the given specimen <u>J&K</u>	2X2=4
9.	Submission of two permanent slides	5
10.	Record Note Book	10
Total		60

Key and Scheme of Valuation

1.	<u>A</u> Microbiology Experiment - Plating techniques/Hanging Drop (Procedure-2, Demonstration-3)	1X5=5
2.	<u>B</u> Gram Staining (Positive/negative) (Procedure-3, Slide-2)	1X5=5
3.	<u>C</u> - Model/photograph/slides to be given from Microbiology (Identification-1, Sketches-1, Description-2)	1X4=4
4.	<u>D</u> (Disease) & <u>E</u> (Plant protection) Model/photograph/slides/ specimens to be given from Plant Pathology (Identification-1, Sketches-1, Description-2)	2X4=8
5.	<u>F</u> - Material to be given Plant Anatomy (Section-2, Identification-1, Diagram-2, Notes-2)	1X7=7
6.	<u>G&H</u> Materials (Vascular bundle/R.L.S. wood & Simple/permanent tissue) to be given (Identification-1, Sketches-1, Description-1)	2X3=6
7.	<u>I</u> Dicot embryo - <i>Tridax</i> material to be given (Slide-2, Identification -1, Sketch-1, Notes-2)	1X6=6
8.	<u>J</u> Microtome Photograph, Model & <u>K</u> – Stain to be given (Identification-1, Notes-1)	2X2=4
9.	Submission of two permanent slides	5
10.	Record Note Book	10
Total marks		60

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

1.	Demonstrate the Microbiological experiment as indicated in ' <u>A</u> '	1X4=4
2.	Perform Gram Staining using the given bacterial culture ' <u>B</u> '. Write the procedure and submit the slide for valuation.	1X4=4
3.	Identify and write notes on the given model/photograph <u>C</u>	1X3=3
4.	Comment on <u>D&E</u> .	2X3=6
5.	Take T.S of given material ' <u>F</u> '. Stain, mount in Glycerin and submit the slide for valuation. Identify, Draw sketches and label it. Give reasons.	1X4=4
6.	Identify and write notes on the given specimen <u>G&H</u>	2X3=6
7.	Dissect and display anyone stage of the dicot embryo from the given material ' <u>I</u> '. Mount in Glycerin and submit it for valuation. Write notes and draw sketch.	1X4=4
8.	Identify and write notes on the given specimen <u>J&K</u>	2X2=4
9.	Submission of two permanent slides	5
Total		40

Key and Scheme of Valuation

1.	<u>A</u> Microbiology Experiment - Plating techniques/Hanging Drop (Procedure-2, Demonstration-2)	1X4=4
2.	<u>B</u> Gram Staining (Positive/negative) (Procedure-2, Slide-2)	1X4=4
3.	<u>C</u> - Model/photograph/slides to be given from Microbiology (Identification-1, Sketches-1, Description-1)	1X3=3
4.	<u>D</u> (Disease) & <u>E</u> (Plant protection) Model/photograph/slides/specimens to be given from Plant Pathology (Identification-1, Sketches-1, Description-1)	2X3=6
5.	<u>F</u> - Material to be given Plant Anatomy (Section-1, Identification-1, Diagram-1, Notes-1)	1X4=4
6.	<u>G&H</u> Materials (Vascular bundle/R.L.S. wood & Simple/permanent tissue) to be given (Identification-1, Sketches-1, Description-1)	2X3=6
7.	<u>I</u> Dicot embryo - <i>Tridax</i> material to be given (Slide-1, Identification -1, Sketch-1, Notes-1)	1X4=4
8.	<u>J</u> Microtome Photograph, Model & <u>K</u> – Stain to be given (Identification-1, Notes-1)	2X2=4
9.	Continuous assessment	5
Total marks		40

Semester – IV				
Course code:	Core Course–V	T/P	C	H/W
22BBO4C1	Plant Biochemistry & Instrumentation	T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To study the basic concepts of biochemistry, about the atoms and bond interaction ➤ To know about Scientific instrument uses and it's working principles 			
Unit –I	Structure of atoms and bonds: Basic concepts of Biochemistry, Brief account of atoms, bonds – Ionic, Hydrogen, Covalent, Co-ordinate – Vander walls forces and Base concepts, chemical equilibrium and buffer, Molecular structure and properties of water.			
Unit –II	Enzymes: Nomenclature, Classification, Properties, Enzyme catalysis and activation energy, Mechanism of enzyme action, enzyme inhibition, factors affecting enzyme activities, Isozyme, co-enzymes and prosthetic groups.			
Unit –III	Plant Metabolites – Primary metabolites: Classification, structure and properties of the following Primary metabolites a). Carbohydrates b). Proteins c). Lipids. Secondary metabolites: Elementary account on Steroids, Alkaloids and Phenols.			
Unit –IV	Instrumentation: Principle, working mechanisms and structure of compound microscope and Electron microscope (SEM & TEM). Structure, Principles, Measurement and Uses of pH meter, colorimeter, centrifuge, micrometry and Spectrophotometer.			
Unit –V	Instrumentation: Electrophoresis – Principles and Methods (AGE & SDS-PAGE). Chromatography – Principles and types of chromatography e.g., Paper chromatography, Thin layer chromatography and its applications.			
Reference and Textbooks				
Annie & Arumugam – <i>Biochemistry & Biophysics</i> , Saras Publications. Nagercoil, Kanyakumari Dt.				
Conn E.E. and Stump – <i>Outlines of Biochemistry</i> . Wiley Eastern Ltd. Chennai.				
Fathima, D et al., 2019. <i>Biochemistry</i> . Saras Publications. Nagercoil.				
Jain J.L. <i>Fundamentals of Biochemistry</i> S. Chand & Co., New Delhi				
Jeyaraman J (1995) – <i>Laboratory manual in Biochemistry</i> , Wiley Eastern Ltd, Chennai.				
Jeyaraman J (1995)– <i>Techniques in Biology</i> –A college level study–Higgin Bothams Chennai.				
Lehninger A.L. – <i>Biochemistry</i> . Kalyani's New Delhi.				
Sathyanarayana, U. and Chakarapani, U. 2008. <i>Fundamentals of Biochemistry</i> . Books and Allied Pvt. Ltd. Kolkata.				
Scopes, R.K 2004, <i>Protein Purification, Principles and Practice</i> (3 rd Ed)Springer(India)Pvt,Ltd, NewDelhi				
Trevor Palmer and Philip L. Bunner. 2008. <i>Enzymes</i> . EWP Pvt. Ltd. New Delhi.				
Varma S.K. – <i>Plant Physiology and Biochemistry</i> . S.Chand & Co., New Delhi.				
Outcomes	<ul style="list-style-type: none"> ➤ Students will be able to Gain knowledge on fundamental biochemical principles. ➤ Students will be able to handle the scientific instruments 			

Semester – IV						
Course code: 22BBO4C2	Core Course–VI			T/P	C	H/W
	Cytology, Genetics & Evolution			T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To study about the structure and function of cell organelles and cell mechanisms. ➤ To provide knowledge on cell biology, genetics & Evolution 					
Unit –I	Cytology: Ultrastructure of plant cell and cell wall- structure chemistry and function. Structure, chemistry and functions of plasma membrane (fluid-mosaic model only) Structure and functions of nucleus, mitochondria, chloroplast, endoplasmic reticulum, ribosome and Golgi complex. Ergastic substances –Cystolith, Raphides and Starch grains Cell division – Stages of mitosis and meiosis and their significance.					
Unit –II	Genetics: Monohybrid, Dihybrid Crosses – Mendel's Laws – Test and Back Crosses, Lethal Genes and Incomplete dominance – Co-dominance. Interaction of genes – Dominant (12:3:1) and Recessive (9:3:4) Epistasis.					
Unit –III	Linkage- crossing over and recombination. Mapping of Chromosomal genes, Two point, Three point crosses– Neurospora tetrad analysis. Extra chromosomal inheritance in Plants – Male sterility in Maize, Sex determination in plants. Polygenic inheritance –Ear length of maize, Multiple allele-ABO blood groups. Population genetics: Hardy-Weinberg's Law- principles, significance and applications. Gene pool and Gene frequency.					
Unit –IV	Structure of DNA, Semi - conservative mechanisms of replication – Transcription, Central Dogma-DNA as genetic Material – Griffith's Experiment, RNA as Genetic material in TMV, Types of RNA, RNA polymerases, Ribosomes, mRNA rRNA, tRNA. Genetic code – Initiation, Elongation and Termination of Transcription and Translation.					
Unit –V	Evolution: Origin of Life, Theories Related to Origin of Life and Evolution. Evidences for Evolution -Morphology, Anatomy, Biochemical evidences. Evolutionary Theory of Lamarck, Darwin and Devries. Modern Synthetic Theory – Genetic variations, Natural selection and Isolation.					
Reference and Textbooks						
Aioy paul. 2011. <i>Textbook of cell and Molecular biology</i> (3 rd Ed.). Books and Allied Pvt. Ltd., Kolkata.						
Arumugam, N., Meyyan, R.P., Kumaresan, V. 2014. <i>Genetics, Biometrics and Bioinformatics</i> . Saras publication. Tamil Nadu.						
De Robertis, E.D.P & De Robertis, E.M.F (1980) <i>Cell and molecular biology</i> , Holt Saunders International Editions, Philadelphia, Tokyo.						
Gupta, P.K. 2000. <i>Genetics</i> . Rastogi Publications, Meerut.						
Nagini, S. 2011. <i>Genetic Engineering Principles and applications</i> . Scitech publications Pvt. Ltd, Chennai.						
Rastogi, S.C. (1992) <i>Cell biology</i> , Tata McCraw Hill Publishing Co., Ltd., New Delhi.						
Singh, M.D. and Sunil Kumar. 2009. <i>Genetics and Plant breeding</i> (Vol. II). APH Publishing Corporation, New Delhi.						
Sundararajan, S., (2000) <i>Cytology</i> , Anmol Publication (P) Ltd., New Delhi.						
Verma, P.S., <i>Cytology</i> , S. Chand & Co., Calcutta.						
Williams King et al., 2016. <i>Concepts of Genetics</i> . Pearson India Education Services Pvt. Ltd. 2016.						
Outcomes	<ul style="list-style-type: none"> ➤ The students will understand the cell divisions and the role of cell organs. ➤ Gain the knowledge about advance cell biology, genetics and evolution. 					

Semester – IV					
Course code: 22BBO4P1	Core Practical–IV		T/P	C	H/W
	Plant Biochemistry & Instrumentation, Cytology, Genetics & Evolution		P	3	3
Objectives	<ul style="list-style-type: none"> ➤ To develop skill in preparing laboratory solution. ➤ To gain knowledge about plant primary and secondary metabolites. ➤ To understand the nature of genetics and evolution. 				
	<p><u>Plant Biochemistry & Instrumentation</u></p> <p>MAJOR EXPERIMENTS</p> <ol style="list-style-type: none"> 1. Measurement of pH in different samples. 2. Preparation of Buffer and titration curves (acid and base) 3. Estimation of starch in plant tissues. (Colorimetric method) 4. Estimation of protein in plant tissues. 5. Determination of complementary colours in plant parts. 6. Verification of Beer's Law. 7. Measurement of cell size using micrometers. <p>MINOR EXPERIMENTS</p> <ol style="list-style-type: none"> 1. Qualitative test for Phytochemicals: <ol style="list-style-type: none"> a. Phenols, b. Alkaloids & c. Steroids 2. Qualitative test for Lipids. 3. Paper Chromatography <ol style="list-style-type: none"> a. Separation of pigment by ascending Chromatography. b. Separation of Dyes by Circular Chromatography. <p><u>Spotters</u></p> <p>Principle and working principles protocol of pH meter, colorimeter and centrifuge through Photograph/ models.</p> <p><u>Cytology</u></p> <ol style="list-style-type: none"> 1. Photographs of Ultra structure of plant cell, fluid-mosaic membrane model, Mitochondria, Chloroplast, Nucleolus, Golgi complex, Endoplasmic reticulum and Ribosomes. 2. Micropreparation of cystolith (Ficus leaf), Raphides (Araceae members eg. <i>Arum</i> petiole) and starch grains(Potato and Rice grains) 3. Micropreparation of Onion root tips, showing the stages of mitosis. 4. Showing permanent slides/photographs of mitosis and meiosis. <p><u>Genetics</u></p> <ol style="list-style-type: none"> 1. Observe the genetic variations among inter and intra specific plants. 2. Simple problems on monohybrid, dihybrid ratio and interaction of factors. 3. Construction of chromosome maps using three - point test cross data. 4. Photographs, Demonstrations, Setups, Instruments, materials connected with genetics and Molecular biology. DNA/RNA Model, DNA Replication. Chemical mutagens, Thyamine dimer, Nucleosome, Plasmids, Enzymes. 5. Problem related to population genetics. (Calculate the heterozygotes and frequencies of recessive and dominant genes in a population.) <p><u>Evolution</u></p> <p>Photographs and models related to evolution theory from the given syllabus.</p> <p>Submission of certified bonafide record Note Book is mandatory for the External Practical Examinations.</p>				

Outcomes	<ul style="list-style-type: none">➤ Awareness about Instrumentation and understand its role in research.➤ Understand the salient features of Evolution.➤ Gain knowledge about Plant Biochemistry.➤ Developing skill in solving genetic problems.➤ Understand about the plant cell and Genetics.
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Semester – IV				
Course code: 22BBO4P1	Core Practical–IV	T/P	C	H/W
	Plant Biochemistry & Instrumentation, Cytology, Genetics & Evolution	P	3	3

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

1.	Taking a lot from the set of the experiments 'A'. Write the procedure, complete the experiment, tabulate the data and interpret the result	1x10=10
2.	Demonstrate the given experiment 'B'.	1x5=05
3.	Write critical notes on 'C'.	1x5=05
4.	Identify, draw sketches and write notes on 'D & E'	2x5=10
5.	Dissect and find out any one mitotic stage in the given material 'F'.	1x5=05
6.	Construct a Chromosome map from given the three point cross data 'G'	1x5=05
7.	Solve the genetic problem 'H & I' and interpret it.	2x5=10
8.	Record Note Book	10
Total		60

Key and Scheme of Valuation

1.	A Major biochemistry experiments prescribed in the syllabus (Requirement-2, Procedure-3. Results & Data-3, and Interpretation-2)	1x10=10
2.	B Minor Biochemistry experiment prescribed in the syllabus (Identification- 1 Demo-2&Notes-2)	1x5=5
3.	C – Apparatus - pH meter/ colorimeter/ centrifuge (Identification-1,Protocol/ Principle-2, Diagram- 2)	1x5=5
4.	D & E Cytology- Models/Photographs/Slides to be given (Identification-1, Sketches-2, Description-2)	2x5=10
5.	F Mitotic stages - Onion root tip (Slide-2, Identification-1, Diagram-1, Notes-1)	1x5=5
6.	G Construct the Chromosome map. (Identification-1, Calculation-2, Intrepretation-2)	1x5=5
7.	H Genetic problem (Monohybrid /Dihybrid/test cross/back cross) I Population genetic problem(Derivation – 3, Interpretation 2)	2x5=10
8.	Record Note Book	10
Total marks		60

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

1.	Taking a lot from the set of the experiments 'A'. Write the procedure, complete the experiment, tabulate the data and interpret the result	1x7=07
2.	Demonstrate the given experiment 'B'.	1x4=04
3.	Write critical notes on 'C'.	1x4=04
4.	Identify, draw sketches and write notes on 'D & E'	2x3=06
5.	Dissect and find out any one mitotic stage in the given material 'F'.	1x4=04
6.	Construct a Chromosome map from given the three point cross data 'G'	1x4=04
7.	Solve the genetic problem 'H & I' and interpret it.	2x3=06
8.	Continuous assessment	5
Total		40

Key and Scheme of Valuation

1.	A Major biochemistry experiments prescribed in the syllabus (Requirement-1, Procedure-2. Results & Data-2, and Interpretation-2)	1x7=07
2.	B Minor Biochemistry experiment prescribed in the syllabus (Identification- 1 Demo-2&Notes-1)	1x4=04
3.	C – Apparatus - pH meter/ colorimeter/ centrifuge (Identification-1,Protocol/ Principle-2, Diagram- 1)	1x4=04
4.	D & E Cytology- Models/Photographs/Slides to be given (Identification-1, Sketches-1, Description-1)	2x3=06
5.	F Mitotic stages - Onion root tip (Slide-1, Identification-1, Diagram-1, Notes-1)	1x4=04
6.	G Construct the Chromosome map. (Identification-1, Calculation-2, Intrepretation-1)	1x4=04
7.	H Genetic problem (Monohybrid /Dihybrid/test cross/back cross) I Population genetic problem(Derivation -2, Interpretation-1)	2x3=06
8.	Continuous assessment	5
Total marks		40

Semester – V					
Course code: 22BBO5C1	Core Course–VII		T/P	C	H/W
	Taxonomy of Angiosperms & Economic Botany		T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To provide the knowledge about angiosperms, Binomial nomenclature and the classification of plants ➤ To study about Economic importance of plants and plant uses 				
Unit –I	<p>Aims and significance of Taxonomy: Botanical nomenclature-International Code of Nomenclature for algae, fungi, and plants (ICN) Principles and rules; Ranks and names; Typification, Author citation, valid publication, rejection of names, principle of priority and its limitations. Preparation, maintenance and significance of Herbarium. A brief note on important Indian (BSI) and world herbaria (Kew Herbaria), Virtual herbarium, E-flora.</p>				
Unit –II	<p>Outline of the following classification and their merits and limitations</p> <ul style="list-style-type: none"> a) Artificial system- Carl Linnaeus , b) Natural system -Bentham and Hooker, c) Phylogenetic system- Angiosperm Phylogeny Group (APG III) classification. <p>Taxonomic key preparation - Bracketed and Indented keys</p>				
Unit –III	<p>Basic knowledge in morphology of Angiosperms: Root: Tap root, Fibrous root, and modifications; Leaf: Phyllotaxy, simple, compound and modifications; inflorescence-types; Flower: description of floral parts; Fruits-types.</p>				
Unit –IV	<p>Brief study of the following families with special features and economic importance.</p> <ul style="list-style-type: none"> a) Nymphaeaceae, b) Caesalpiniaceae, c) Meliaceae, d) Cucurbitaceae, e) Sapotaceae f) Rubiaceae, g) Apocynaceae, h) Euphorbiaceae, i) Orchidaceae, j) Commelinaceae, k) Poaceae 				
Unit –V	<p>Brief study of the following economic products with special reference to Botanical name, Family, morphology of the useful part and uses.</p> <ul style="list-style-type: none"> a) Cereals -Paddy & Maize, b) Pulses – Green gram & Soya beans, c) Fruits – Mango & Grapes, d) Spices & Condiments-Cardamom & Garlic, e) Essential Oils - Sandalwood oil & Lemon Grass oil, f) Beverages - Coffee & Cocoa, g) Dyes–Saffron & Indigo, h) Fibres - Cotton & Sissal hemp, i) Latex - Rubber & Gutta-percha, j) Wood & Cork - Teak wood & Cork. 				
<p>Reference and Textbooks</p> <p>Gupta, R.K. 1992. <i>Text book of systematic Botany</i>. Atma Rain & Sons.</p> <p>Heslop Harrison, <i>New concept in flowering plant Taxonomy</i>.</p> <p>Hill. A.W. 1951 <i>Economic Botany</i>, McGraw Hill publishing house. New Delhi.</p> <p>Jeffrey, C. 1982. <i>An Introduction of plant taxonomy</i>, Allied publishers private limited.</p> <p>Jones, B.S. <i>Plant systematics</i>, Mc Graw Hill publications. New Delhi</p> <p>Kochhar, S.L. <i>Economic Botany in the Tropics</i>, Macmillan India. Ltd, New Delhi.</p> <p>Lawrence G.H.M.1955. <i>In Introduction to plant taxonomy</i>. Central Book Depot, Allahabad.</p> <p>Madhava Chetty, K., Sivaji, K and Tulasi Rao, K. 2008. <i>Flowering plants of</i></p>					

<p>Chittoor District, Andhra Pradesh, India. Students offset printers, Tirupathi.</p> <p>Pandey, B.P.1980. <i>Economic Botany</i>. S.Chand& Co. Ltd. New Delhi</p> <p>Vashishta P.C. 1974. <i>Taxonomy of Angiosperms</i>. S.Chand& Co. Ltd., New Delhi</p> <p>Verma, B.K. 2011. <i>Introduction to Taxonomy of Angiosperms</i>. PHE Learning Pvt. Ltd. New Delhi.</p> <p>Verma,V. <i>Text Book of Economic Botany</i>.</p>	
Outcomes	<ul style="list-style-type: none"> ➤ The students can learn Binomial nomenclature and plant systematic. ➤ The students will get knowledge about economic importance of plants.

Semester – V				
Course code: 22BBO5C2	Core Course–VIII	T/P	C	H/W
	Plant Ecology	T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To understand the ecological relationship of plants with environment. ➤ The Biotic and abiotic factors and their influence on vegetation ➤ To provide knowledge about pollution, preventive measures of pollution. 			
Unit –I	Ecosystem: Concepts of Ecosystem and its components – Biotic and abiotic factors and their influence on vegetation – a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire. Types of Ecosystem (Pond and Forest Ecosystem), Dynamics of Ecosystem – Food chain – Food web – Trophic levels – Energy flow and Ecological Pyramids of Energy, Bio mass and Numbers. Biogeochemical cycles –Nitrogen and Carbon cycle.			
Unit –II	Vegetation: Units of Vegetation, Plant Communities, Plant formation, Plant association and Plant consociation, Society – development of vegetation. Migration – ecesis, colonization. Methods of study of vegetation (Quadrat and transect).			
Unit –III	Plant Adaptations: Ecological classification of plants – Hydrophytes, Xerophytes, Mesophytes and Halophytes - Morphological and anatomical features and their correlation to the habitat factors. Plant succession - hydrosere , Xerosere, climatic community.			
Unit –IV	Biodiversity: Types and causes of Biodiversity – Genetic diversity, Species diversity and Ecosystem diversity. Conservation methods- <i>Ex-situ</i> conservation – Botanical garden and Seed bank. <i>In-situ</i> conservation – Biosphere reserve (Gulf of Mannar) and National park. Hot spots in India - IUCN threatened categories and Unknown categories. Red data Book. Bio piracy, IPR. Phytogeographical regions of India and its climatic zones. Continental drift, Endemism.			
Unit –V	Environmental deterioration: Pollution – Air pollution - causes, Particulate matter, Ozone, Acid rain and green house effect. Water Pollution - Fresh water pollution – Sewage contamination, Industrial effluents, Toxic chemicals (Pesticides and Herbicides). Marine Pollution – Thermal Pollution – Radioactive pollution – Preventive measures of pollution. Soil erosion-causes and conservation methods. Deforestation - Cause, Effects and preventive measures.			
Reference and Textbooks Gupta S.P. 2010. <i>Statistical Methods</i> . Sultan Chand and Sons, New Delhi. Gurumani, N. 2005. <i>An Introduction to Biostatistics</i> . MJP Publishers, Chennai. Kormondy E.J. 2004. <i>Concepts of Ecology</i> (4 th Ed.). Prentice-Hall of India Private Limited, New Delhi. Kulshrestha, S.K. 2005. <i>Biodiversity of Tropical Aquatic Ecosystems</i> . Anmol Publications Pvt. Ltd. New Delhi. Kumar H.D. 1992. <i>Modern concepts of Ecology</i> , Vikas publishing house, New Delhi Kumaresan, V., Arumugam, N. 2015. <i>Plant Ecology and Phytogeography</i> . Saras publication. Nagarcoil. Odum, E.P.1953. <i>Fundamental of Ecology</i> , Saunder co, London				

Odum, E.P.1970.Ecology : *The link Between the Natural and social sciences* (2nd Ed.). Amerind Publishing Pvt. Ltd. New Delhi.

Rana, S.V.S. 2013. *Essential Ecology and Environmental Science* (5 Ed.). PHI Learning Pvt. Ltd. New Delhi.

Saha, T.K. 2009. *Ecology and Environmental Biology*, Books and Allied Pvt. Ltd. Kolkata.

Sharma, P.D. 1981. *Elements of Ecology*, Rastogi Publication, Meerat.

Shukla, R.S. and Chand, P.S. Chandel. 2019. *A text book of Plant Ecology*. S. Chand and company Pvt. Ltd. New Delhi.

Sing,M.P.,Sing,B.S.,Dey,S.2004.*Conservation of Biodiversity and Natural Resources*. Daya Publishing House, New Delhi

Woodhead, T.W. 2004. *Plant Ecology*, Sonali Publications, New Delhi.

Outcomes

- Gain the knowledge on ecological relationship of plants with environment.
- The learn about Biodiversity conservation, about pollution and preventive measures.
- The understand the knowledgeon Biotic and abiotic factors and their influence on vegetation

Semester – V						
Course code: 22BBO5C3	Core Course–IX			T/P	C	H/W
	Plant Physiology			T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To understand the Nature of light and its importance of the physiology of plants. ➤ To understand the various biochemical pathways and physiological actions of plants. 					
Unit –I	Water relation: Water in relation of plants – Absorption of water – Physico-chemical processes plant cell as an Osmotic system – plasmolysis – significance and practical application. Soil water – Mechanism of water absorption & factors affecting absorption of water. Ascent of Sap-, Transpiration-types-Mechanism of stomatal movement (Stewart theory), Guttation – Translocation of organic solutes; Evidences, mechanism.					
Unit –II	Photosynthesis: Introduction-pigment systems - Light Reaction – Photosynthetic unit – PSI & PSII cyclic and noncyclic reactions–Dark reaction – C ₃ & C ₄ Cycle, CAM path way.					
Unit –III	Respiration: Aerobic and Anaerobic Respiration, R.Q – Mechanism of Respiration Glycolysis – T.C.A. Cycle – Terminal Oxidation – Electron Transport, phosphorylation, pentose phosphate pathway and photorespiration.					
Unit –IV	Plant Growth Regulators and Physiology of Flowering: Role of Auxins, Gibberellins, Cytokinins, Abscisic acid & Ethylene in plant growth, Seed dormancy- causes and method of breaking dormancy, Photoperiodism & Vernalization – phytochrome, properties and role in flowering. Biological clock-circadian rhythm.					
Unit –V	Photophysiology: Nature of light – solar radiation Electromagnetic spectrum, Absorption and emission – Biological Energy conversion – Fluorescence, phosphorescence and Bioluminescence.					
Reference and Textbooks						
Albert L. Lehniger. <i>Biophysics</i> – concepts and mechanics.						
Annie, R. 2004. <i>Biophysics & Plant Physiology</i> . Saras publication, Nagarcoil.						
Campbell, A.N and Reece, B.J. 2009. <i>Biology</i> (7 th Ed.). Dorling Kindersley Pvt. Ltd., New Delhi.						
Casey, E.J. <i>Biophysics</i> – affiliated East – West Press Pvt., Ltd. New Delhi						
Devlin and Barker – <i>photosynthesis</i> . Affiliated East - West Press Pvt. Ltd., New Delhi.						
Dr.Salilbose. <i>Elementary Biophysics</i> .						
Frank,B.Salisbury and Cleon W.Ross. <i>Plantphysiology</i> ,Publishers and Distribution,NewDelhi						
Fulleretal. <i>Biophysics</i> – concepts and mechanics.						
GILL.P.S. <i>Plant physiology</i> , S. Chand & Company Ltd., New Delhi – 1.						
Jain, V.K. <i>Fundamentals of plant physiology</i> , S. Chand & Co., New Delhi.						
Ray Noggle G and George J. Fritss. <i>Introductory plant physiology</i> . Prentice Hall of India Pvt. Ltd, New Delhi.						
Verma, V., 2007. <i>Text book of Plant Physiology</i> . Ane books Pvt. Ltd., New Delhi.						
Outcomes	<ul style="list-style-type: none"> ➤ Describe the physiological phenomena of plants in terms of mechanisms. ➤ Discuss different metabolic pathways. ➤ Understand photoperiodism and physiology of flowering. 					

Semester – V						
Course code:	Core Course–X			T/P	C	H/W
22BBO5C4	Plant Biotechnology			T	4	4
Objectives	<ul style="list-style-type: none"> ➤ To provide the knowledge on Modern Plant Biotechnology Techniques ➤ To create the knowledge on Bio-fertilizers and Fermentation technology 					
Unit –I	Recombinant DNA technology: Basic Principles, history and scope. Tools of genetic engineering. Recombination of DNA- Enzymes and vector, Cloning vectors-PBR 322, Ti plasmid, Cloning of Insulin gene, Techniques of gene manipulation and its applications.					
Unit –II	Agricultural Bio-technology: Bio-fertilizers - Mass cultivation and uses of <ul style="list-style-type: none"> a. Bacterial biofertilizers – Azospirillum b. Algal biofertilizers – Nostoc c. Fungal biofertilizer – Mycorrhiza (VAM) Biopesticides –Bioinsecticides. Transgenic plants- Bt cotton, FlavrSavor tomato.					
Unit –III	Industrial Biotechnology: <ul style="list-style-type: none"> a. Production of ethanol b. Production of Penicillin Vaccines – Types, Source, production and uses. Biofuel – Hydrogen Production and Biogas production-Methanogenesis					
Unit –IV	Plant Tissue Culture: Introduction and Importance of Plant Tissue Culture; Totipotency, Sterilization – Media Types (MS media, B5 media and WPM) – Preparation; Culture of Plant Materials. Tissue and Organ Culture; Cell Suspension Culture, Somatic Embryogenesis.					
Unit –V	Micropropagation: Methods and Application, Androgenesis and Gynogenesis for Haploid Production, Protoplast Culture and Somatic Hybridization, Soma clonal Variation and Conservation of Germplasm. Synthetic seed.					
Reference and Textbooks						
Bhojwani , S.S. and Razdan , M.K., “ <i>Plant Tissue Culture : Theory and Practice</i> ”, (revised edition) Elsevier Science Publishers, New York, USA, 1996.						
Dubey, R.C.2019. <i>Advanced Bio-Technology</i> . S.Chand& Co. Ltd. New Delhi.						
Gupta P.K. 2000. <i>Elements of Biotechnology</i> . Rastogi Publications, Meerut.						
Hartman and Kester. 2011. <i>Plant Propagation Principles and Practices</i> . PHI Learning Pvt. Ltd. New Delhi.						
Kumar, H.D.1993. <i>A Text book of Bio-Technology</i> . East West Affiliated Press Ltd., New Delhi.						
Narayanaswamy, S. 2008. <i>Plant Cell and Tissue Culture</i> . Tata McGraw-Hill Publishing Company Ltd. New Delhi.						
Sathyanarayana, U. 2005. <i>Biotechnology</i> . Books and allied Pvt. Ltd., Kolkata.						
Srivastava “H.S. <i>An Introduction to Bio-Technology</i> . Rastogi Publishing Company Meerut.						
Wiseman, A. <i>Principles of Bio-Technology</i> . Surrey University Press. U.K.						
Outcomes	<ul style="list-style-type: none"> ➤ The students will know the Advanced Plant Biotechnology Techniques ➤ Understand the value of Bio-fertilizers and Fermentation technology 					

Semester –V					
Course code: 22BBO5P1	Core Practical-V		T/P	C	H/W
	Taxonomy of Angiosperms and Economic Botany and Plant Ecology		P	4	6
Objectives	<ul style="list-style-type: none"> ➤ To develop observation technical skill in dissecting floral parts. ➤ To gain knowledge about different types of plant classification. ➤ To learn about various types economically important plants. ➤ To understand the biotic and abiotic relationship in ecosystem. 				
	<p><u>Taxonomy of angiosperms and economic Botany:</u></p> <ol style="list-style-type: none"> 1. Morphological identification of Vegetative and Reproductive parts and their modifications. 2. Dissect out the floral parts of plants come under the families prescribed in the theory syllabus. Write descriptions in technical terms, Draw diagrams of vegetative and floral parts and V.S. of flower. Draw floral diagram and write floral formula/e according to Bentham& Hooker’s system of classification. 3. Preparation of artificial keys and identification of fresh and herbarium plants using flora. 4. Submit minimum of ten herbarium sheets and proper field note book with correct identification for external valuation 5. Identify the economic products related to theory syllabus and write Botanical name, family, Morphology of the useful part and uses. <p><u>Plant ecology</u></p> <ol style="list-style-type: none"> 1. Ecological field study-Quadrates and Line transect methods of vegetation study. 2. Morphological, ecological and anatomical adaptation of hydrophytes, xerophytes, mesophytes and halophytes. 				
Outcomes	<ul style="list-style-type: none"> ➤ Develop observation and technical skill in dissecting floral parts. ➤ Apply the knowledge of economic product to the society. ➤ Understand and learn the herbarium preparation techniques. ➤ Gain knowledge about In-situ and Ex-situ conservation. 				

Field study to a floristic rich area is must for a period of three days only under supervision to observe and collect the plants in their natural habitats.

Submission of certified bonafide record Note Book is mandatory for External Practical

Semester –V				
Course code: 22BBO5P1	Core Practical-V	T/P	C	H/W
	Taxonomy of Angiosperms and Economic Botany and Plant Ecology	P	4	6

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

1.	A – Work out the specimen and identify the respective families and describe with technical term. Draw L.S. flower, floral diagram and write floral formula	1x7= 07
2.	B - Work out the specimen and identify the respective families through elimination process	1x5=05
3.	C - Analyze the vegetation in already constructed quadrat/transect. Tabulate the observed data and calculate frequency density and abundance. Express the result through the graph.	1x6=06
4.	D&E - Identify, draw sketches and write notes on morphological and ecological adaptations	2X5=10
5.	F & G - Write Genus and Family.	2x2= 04
6.	H & I - Write Botanical name, Family, Morphology of useful part and uses.	2x4= 08
7.	Submission Herbarium & Field note book	10
8.	Submission of Record note book	10
Total		60

Key and Scheme of Valuation

Time: 3 hours

Max-marks- 60

1.	A - The given plant with technical term (Identification-1, Description-3, L.S. of flower-1, flower diagram-1, floral formula-1)	1x7= 07
2.	B – Angiosperm specimen selected from families in the syllabus (Identification-1, Elimination process -2, Reason -2)	1x5=05
3.	C Analyze the vegetation in already constructed quadrat/transect. Tabulate the observed data and calculate frequency density and abundance. Express the result through the graph. (Procedure-2, Tabulation-2, Graph-1, Interpretation-1)	1x6=06
4.	D&E Ecological specimen Cladode, phyllode, phylloclade, pneumatophore & vivipary (Identification-1, Notes: Morphology-2, & Ecological-2)	2X5=10
5.	F&G – Angiosperm specimen selected from families in the syllabus (Genus-1, Family-1)	2x2= 04
6.	H & I - Economic products prescribed in the theory syllabus (Name-1, Family ½, Morphology ½, Uses-2)	2x4= 08
7.	Submission Herbarium & Field note book -	10
8.	Submission of Record note book	10
Total		60

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

1.	A – Work out the specimen and identify the respective families and describe with technical term. Draw L.S. flower, floral diagram and write floral formula	1x5= 05
2.	B - Work out the specimen and identify the respective families through elimination process	1x5=05
3.	C - Analyze the vegetation in already constructed quadrat/transect. Tabulate the observed data and calculate frequency density and abundance. Express the result through the graph.	1x5=05
4.	D&E - Identify, draw sketches and write notes on morphological and ecological adaptations	2X4=08
5.	F & G - Write Genus and Family.	2x2= 04
6.	H & I - Write Botanical name, Family, Morphology of useful part and uses.	2x4= 08
7.	Continuous assessment	05
Total		40

Key and Scheme of Valuation

Time: 3 hours
marks- 40

Max-

1.	A - The given plant with technical term (Identification-1, Description-3, L.S. of flower-1, flower diagram-1, floral formula-1)	1x5= 05
2.	B – Angiosperm specimen selected from families in the syllabus (Identification-1, Elimination process -2, Reason -2)	1x5=05
3.	C Analyze the vegetation in already constructed quadrat/transect. Tabulate the observed data and calculate frequency density and abundance. Express the result through the graph. (Procedure-2, Tabulation-2, Graph-1, Interpretation-1)	1x5=05
4.	D&E Ecological specimen Cladode, phyllode, phylloclade, pneumatophore & vivipary (Identification-1, Notes: Morphology-2, & Ecological-2)	2X4=08
5.	F&G – Angiosperm specimen selected from families in the syllabus (Genus-1, Family-1)	2x2= 04
6.	H & I - Economic products prescribed in the theory syllabus (Name-1, Family ½, Morphology ½, Uses-2)	2x4= 08
7.	Continuous assessment	05
Total		40

Semester –V				
Course code:	Core Practical-VI	T/P	C	H/W
22BBO5P2	Plant Physiology & Plant Biotechnology	P	4	6
Objectives	<ul style="list-style-type: none"> ➤ To develop technical skill in major and minor experiments in Physiology. ➤ To learn role of Phytohormones. 			
	<p><u>Plant physiology</u></p> <p>Major Experiments</p> <ol style="list-style-type: none"> 1. Determination of Osmotic Pressure – Plasmolytic method. 2. Measurement of Water Potential – Chardakov's method.[Falling drop method] 3. Determination of Suction Pressure – Weighing method. 4. Rate of Photosynthesis – <i>Hydrilla</i> Experiment of Willmont's Bubbler using different colour filters. 5. Rate of Photosynthesis using different concentrations of sodium-bicarbonate (Bubble method). 6. Determination of Chlorophyll pigments by Arnon method. 7. Determination of seed viability using tetrazolium <p>Minor Experimental Setups (Demonstrations only):</p> <ol style="list-style-type: none"> 1. Thistle funnel experiment 2. Potato Osmoscope 3. Transpiration – bell Jar experiment 4. Ganong'sRespiroscope. 5. Anaerobic Respiration 6. Fermentation (Khune's Tube) 7. Light screen experiment. 8. Mohl's half leaf Experiment 9. Lever Auxanometer 10. Clinostat <p>Photographic models of action and absorption spectra, red drop, growth regulators (Auxin, GA, cytokine & ethylene)</p> <p><u>Plant Biotechnology:</u></p> <p>Protocol and demonstration is important for all biotechnological experiments</p> <ol style="list-style-type: none"> 1. Demonstration of Structural details – rDNA, Cloning vectors - PBR 322,Ti plamid, Transgenic Plants (photographs or models) 2. Flow chart or Photographic models of production of Ethanol, Penicillin, Vaccine, algal, bacterial and fungal biofertilizers and hydrogen and biogas production. 3. Modern biogas plant/simple laboratory method / sewage degrading microbes 4. Plant tissue culture techniques, preparation of culture medium -Protocol. 5. Callus culture and embryo culture -Flow chart. 6. Production synthetic seeds-Sodium alginate method -Flow chart. 			
Outcomes	<ul style="list-style-type: none"> ➤ Understand and learn the Physiological techniques. ➤ Gain the knowledge about medium preparation and tissue culture techniques. 			

Submission of certified bonafide record Note Book is mandatory for External Practical Examination

Semester –V				
Course code: 22BBO5P2	Core Practical-VI	T/P	C	H/W
	Plant Physiology & Plant Biotechnology	P	4	6

EXTERNAL QUESTION

Time: 3hrs **Max. Marks: 60**

1.	A Taking a lot, ask for requirement, write the procedure, setup and perform the experiment as indicated, collect data/measurements, present them and interpret the results	1x10=10
2.	B Setup and demonstrate minor experiment	1X5=5
3.	C & D Write notes on given physiological spotters	2x5=10
4.	E & F & G Write notes on given biotechnology spotters	3x5=15
5.	H&I - Write critical notes on tissue cultural protocol.	2x5=10
6.	Record Note	10
Total		60

EXTERNAL

Key and Scheme of Valuation

Time: 3 hours

Max-marks- 60

1.	A – From physiology Major experiments (Requirements-2, Procedure-3, Setup-3, and Result-1, Interpretation-1)	1x10=10
2.	B - Minor Experiment (Procedure-3, Demo-2)	1X5=5
3.	Physiology spotters C & D - Photographic models of action and absorption, spectra, red drop, growth regulators (Identification-1, Sketch -2, Procedure/Notes-2)	2x5=10
4.	E, F&G Biotechnological spotters (photos/models/protocols) E - Algal, bacterial and fungal biofertilizers and hydrogen and biogas production-flow chart. F – rDNA, Cloning vectors - PBR 322, Ti plasmid, Transgenic Plants (Identification -1, Diagram – 2, Notes - 2) G - Ethanol, Penicillin, Vaccine Production- flow chart	3x5=15
5.	H&I Protocol-tissue culture (photograph/model/Protocol) H - Protocol of Callus culture and embryo culture -Flow chart. I -Protoplast culture, Production of synthetic seed -Flow chart. (Identification-1, Protocol/ Principle-2, Diagram- 2)	2x5=10
6.	Record Note	10
Total		60

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

1.	A Taking a lot, ask for requirement, write the procedure, setup and perform the experiment as indicated, collect data/measurements, present them and interpret the results	1x6=06
2.	B Setup and demonstrate minor experiment	1X5=05
3.	C & D Write notes on given physiological spotters	2x3=06
4.	E & F & G Write notes on given biotechnology spotters	3x4=12
5.	H&I - Write critical notes on tissue cultural protocol.	2x3=06
6.	Continuous assessment	5
Total		40

EXTERNAL

Key and Scheme of Valuation

Time: 3 hours

Max-marks- 40

1.	A – From physiology Major experiments (Requirements-1, Procedure-2, Setup-2, and Result & Interpretation-1)	1x6=06
2.	B - Minor Experiment (Procedure-3, Demo-2)	1X5=05
3.	Physiology spotters C & D - Photographic models of action and absorption, spectra, red drop, growth regulators (Identification-1, Sketch -1, Procedure/Notes-1)	2x3=06
4.	E, F&G Biotechnological spotters (photos/models/protocols) E - Algal, bacterial and fungal biofertilizers and hydrogen and biogas production-flow chart. F – rDNA, Cloning vectors - PBR 322, Ti plasmid, Transgenic Plants G - Ethanol, Penicillin, Vaccine Production- flow chart (Identification -1, Diagram – 1, Notes - 2)	3x4=12
5.	H&I Protocol-tissue culture (photograph/model/Protocol) H - Protocol of Callus culture and embryo culture -Flow chart. I -Protoplast culture, Production of synthetic seed -Flow chart. (Identification-1, Protocol/ Principle/Notes-1, Diagram- 1)	2x3=06
6.	Continuous assessment	5
Total		40

Semester – VI				
Course code:	DSE- I	T/P	C	H/W
22BBO6E1	Research methodology, Biostatistics & Bioinformatics	T	6	6
Objectives	<ul style="list-style-type: none"> ➤ To know the Basic knowledge on Research, Data collection and validation ➤ To learn the skill of General laboratory practices ➤ To know the application of Bioinformatics for Research. 			
Unit -I	Basic concepts of research: Research-definition and types of research (Descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs empirical). Research methods vs methodology. Literature-review and its consolidation; Library research; field research; laboratory research.			
Unit - II	General laboratory practices: Common calculations in botany laboratories. Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases. Preparation of solutions. Dilutions. Percentage solutions. Molar, molal and normal solutions. Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.			
Unit -III	Data collection and documentation of observations: Maintaining a laboratory record; Tabulation and generation of graphs. Imaging of tissue, specimens and application of scale bars. The art of field photography.			
Unit -IV	Biostatistics: Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation. Simple correlation and regressions. Test of significance: based on normal, t and X^2 test. Sampling techniques: Simple, random, stratified and systematic sampling.			
Unit -V	Bioinformatics – Definition – Bioinformatics servers – Bibliographic resources and literature databases – PUBMED, MEDLINE, AGRICOLA – Database Searching techniques – ENTREZ – Data Mining – techniques & tools – Data Warehousing – Biological & Specialized Databases — Genome Databases at NCBI, EBI, TIGR, SANGER – Virtual Library. Application of Bioinformatics			
Reference and Textbooks Arora, P.N. and Mathan, P.K. 2016. Biostatistics. Himalaya Publishing Home, Mumbai. Astogi, S.C., Mamita Menderatta, Parag Rastogi, 2004. Bioinformatics – concepts, skills and applications. CBS Publishers & Distributors, New Delhi. Attwood, Introduction to Bio-Informatics. Fundamentals of Biostatistics I.A.Khan and A.KhanurnUkaaz Pub. Hyderabad. Gurumani, N. 2006. Research Methodology for Biological Sciences. MJP Publishers, Chennai. Introductory Practical Biostatistics B.N.Misra and M.K.Misra. Darbari Prokashan, Kolkata 1992. Kothari C.R. 2005. Research Methodlogy; Methods & Techniques. New Age International Pvt. Ltd. New Delhi.				

Misener, Bio-Informatics, Methods and protocols.

Mishra, Bio-Informatics and human genome.

Westhead, D. R. and J. H. Parish and R.M. Twyman, 2003. Bioinformatics. Viva Books Private Ltd., New Delhi.

Outcomes	<ul style="list-style-type: none">➤ Students can understand the Basic knowledge on Research, Data collection and validation➤ Gain the skills of General laboratory practices➤ Gain the knowledge on about Bioinformatics applications in Research
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Semester – VI					
Course code:	DSE–II		T/P	C	H/W
22BBO6E2	Medicinal Botany		T	6	6
Objectives	<ul style="list-style-type: none"> ➤ To provide the knowledge on Indian systems of Medicine, about Medicinal plants and Cultivation and Conservation of Medicinal plants ➤ To provide the information about Pharmacology, Phytochemistry and Folk medicines 				
Unit –I	Ethnobotany: Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany. Medicinal plant cultivation. Medicinal Plants of different climatic zones. <i>In-situ</i> and <i>ex-situ</i> conservation of medicinal of plants.				
Unit –II	Indian systems of medicine: Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, Ayurveda – Definition and Scope. History, origin, panchamahabhutas, saptadhatu and tridosha. Concepts, Rasayana, , Unani: History, concept & treatments. Plants used in Siddha, Ayurvedic and Unani treatments				
Unit –III	Pharmacology: Definition – Pharmacognosy – Pharmacology–Drug adulteration – types, methods of drug evaluation – Biological testing of herbal drugs medicinal uses of the following herbs Tulsi, Ginger, Garlic, Turmeric and Fenugreek.				
Unit –IV	Phytochemistry: Phytochemicals –Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds) Principles and methods of their testing – identification and utilization of the medicinal herbs; <i>Catharanthus roseus</i> (cardiotonic), <i>Withaniasomnifera</i> (drugs acting on nervous system) and <i>Bacopa monnieri</i> (memory booster).				
Unit –V	Folk medicines: Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.Traditional/indigenous knowledge and utility of some medicinal plants– <i>Solanum trilobatum</i> , <i>Cardiospermum halicacabum</i> , <i>Eclipta alba</i> , <i>Adathodavasica</i> , <i>Solanum nigrum</i> , <i>Cassia auriculata</i> and <i>Aloe vera</i> .				
Reference and Textbooks Abdul Kader, S. 2014. <i>A Text book of Medicinal Botany</i> . Shamsudheen Publications, Chennai. Anonymous – 1982 – <i>Useful Plants of India</i> – CSIR – New Delhi. Anonymous – 2001 – CSIR – <i>The Wealth of India</i> Vol.1 – 20.CSIR, New Delhi. Arya Vaidya Sala. 2010. <i>Indian Medicinal Plants; A Compendium of 500 species</i> (Vol.1-5). Universities Press Pvt. Ltd. Hyderabad. Chopra – 1980 – <i>Glossary Indian Medicinal Plants</i> – CSIR – New Delhi. Gamble J.S. – 1935 – <i>Flora of the Presidency of Median</i> vols. I, II & III. Govt. Press Calcutta, India. Mathew K.M. – 1989 – <i>Flora and Tamil Nadu</i> carnatic reprint herbarium, St.Joseph’s College, Tiruchirappalli. Miller, L.G. Murray, W.J. 2005. <i>Herbal Medicinals; A clinicians guide</i> . Viva books Pvt. Ltd., New Delhi. Moshrafuddin Ahmed. 2010. <i>Medicinal Plants</i> . MJP Publishers, Chennai.					

Natkarni K.M.–1998–*Indian Materia Medica*, Vols. I, II & III. Popular Prakashan, New Delhi.

Dhiman, A.K. 2003. *Sacred plants and their medicinal uses*. Daya Publishing House, Daya Publishing House, New Delhi.

Shukla, R.S. and Chand, P.S. Chandel. 2019. *Plant Ecology Including Ethnobotany and plant science*. S. Chand and company Pvt. Ltd. New Delhi.

Outcomes	<ul style="list-style-type: none">➤ Improved the knowledge on Indian systems of Medicine, about Medicinal plants and Cultivation and Conservation of Medicinal plants➤ Gain the information about Modern Pharmacology, Phytochemistry and Folk Medicines.
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Semester –VI					
Course code: 22BBO6E3	DSE–III		T/P	C	H/W
	Horticulture & Plant Breeding		T	6	6
Objectives	<ul style="list-style-type: none"> ➤ To create the Knowledge on Horticulture techniques and Garden designs ➤ To know the Plant Propagation techniques, about Plant breeding and It's scope 				
Unit -I	Horticulture: Importance of Horticulture, Classification of horticultural crops – fruits, vegetables, crops, climate, soil, water and nutrition needs of horticultural crops, Pruning methods.				
Unit -II	Garden designs: types of gardens – formal, informal and kitchen garden & lawn maintenance – floriculture, cultivation of commercial flowers –Rose and Jasmine, nursery maintenance. Cultivation of important fruit trees (eg) Mango, Banana,				
Unit -III	Plant propagation methods: cutting, layering, grafting, budding,-- stock-scion relationship. Use of plant regulators in horticulture – induction of rooting, flowering, fruit set and development, flower thinning control of fruit crop.				
Unit -IV	Plant breeding and its scope: Methods; plant introduction, Selection: Mass selection, Pure line selection, Clonal selection, Hybridization; procedure and achievements.				
Unit -V	Genetic basis and application in plant breeding, Role of polyploidy and Mutation in plant breeding, Heterosis –theories and Inbreeding depression.				
Reference and Textbooks					
Bose, T.K. & Mukherjee, D. (1972) <i>Gardening in India</i> , Oxford & IBH publishing Co., Kolkatta, Mumbai, New Delhi – 385pp.					
Edmond Musser & Andres, <i>Fundamentals of horticulture</i> , McGraw hill Book Co., Gardener, Basic horticulture, Mac millan, N.Y.					
Lex Lauries& Victor H. Rice (1950) <i>Floriculture – Fundamental and Practices</i> . McGraw Hill Publishers, N.Y.					
Naik, <i>South Indian fruits and their culture</i> , Vardhachary& co., Chennai.					
Randhawa, <i>Ornamental horticulture in India</i> , Today & Tomorrow Publishers, New Delhi.					
Sandhu, M.K. (1989) <i>Plant propagation</i> , Wiley Eastern Ltd., New Delhi, Bangalore, Bombay, Calcutta, Chennai, Hyderabad, Pune – 287pp.					
Sundararajan, J.S. Muthuswamy, J. Shanmugavelu, K.G. balakrishnan, <i>A guide to horticulture</i> , Thiruvenkadam Printers, Coimbatore.					
Outcomes	<ul style="list-style-type: none"> ➤ Improved the Knowledge on Horticulture techniques and Garden designs ➤ To become a entrepreneur through Horticulture and Plant Propagation techniques 				

Semester –VI					
Course code: 22BBO6E4	DSE–IV		T/P	C	H/W
	Seaweed Technology		T	6	6
Objectives	<ul style="list-style-type: none"> ➤ To provide knowledge on seaweed resources and It's uses ➤ To know the Cultivation of sea weeds and seaweed technology 				
Unit -I	Seaweed resources in India and abroad. General features and life history of Rhodophyta (<i>Gracilaria</i>) and Chlorophyta(<i>Ulva</i>).				
Unit -II	Chemical structure and their uses of various industrial phycocolloids – Agar, Carrageenan, Alginate and fucoidan				
Unit -III	Method for extraction of Agar, Carrageenan, Algin and fucoidan (any one method).				
Unit -IV	Methods of commercial cultivation of Seaweeds. Objectives – Site selection, Installation of test plants, Kinds of test planting, Introduction of test plants. Preparation of the farm site and –construction of farm – Line method, Rope & Raft methods, Net method – Floating bamboo method – Mangrove stakes and nets-method.				
Unit -V	Seaweeds– Seed selection and preparation, Tying of seedings, Planting, Harvesting, Pre-harvest activities, Harvesting procedures, Drying. Maintenance of the farm. Marking of seaweeds.				
Reference and Textbooks					
Biology of Algae – Bold and Wynne.					
Elements of Marine Ecology – Tait.					
Algae – Vashista.					
Outcomes	<ul style="list-style-type: none"> ➤ Improve the skills on Cultivation of sea weeds and seaweed technology ➤ To become a entrepreneur through commercial cultivation of Seaweeds 				

Semester –VI					
Course code: 22BBO6E5	DSE–V		T/P	C	H/W
	Forestry		T	6	6
Objectives	<ul style="list-style-type: none"> ➤ To enable the students to understand the importance of forest and it's products ➤ To know about the Nursery Technology, Wood Science and Remote sensing 				
Unit -I	History of Forestry - divisions and interrelationships. Classification of forests - High forests, coppice forests, virgin forest and second growth forests, pure and mixed forests - even and uneven aged stands. Forest Mensuration - Measurements of diameter, girth (circumference) of trees and standard rules of breast height measurement. Age of trees: object and methods of determination of age of standing and felled trees. Remote sensing and GIS in forestry: Systems for data collection and analysis. GIS- basic concept and GIS tools and components.				
Unit -II	Silviculture - Objectives and scope - Site factors - climatic, edaphic, physiographic, biotic interaction - C sequestration potential of forests. Silvicultural systems- Origin, distribution, general description, phenology, silvicultural characters, regeneration methods and economic importance of the following tree species of India. <i>Tectona grandis</i> , <i>Dalbergia sissoo</i> , <i>Terminalia arjuna</i> , <i>Santalum album</i> , <i>Swietenia macrophylla</i> , <i>Pterocarpus marsupium</i> , <i>Azadirachta indica</i> , <i>Bamboos</i> , <i>Pinus roxburghii</i> and <i>Casuarina equisetifolia</i> .				
Unit -III	Wood Science and Technology - Wood structure-gross structure of wood, bark, sap wood, heartwood and pith, early wood, late wood, growth rings, grain, texture and identification of wood. Physical & mechanical properties of wood, defects of wood during processing, manufacturing, seasoning; wood destroying agents, wood preservation-causes and methods.				
Unit -IV	Forest Management - Basic concepts on Forest types of India. - Important acts and policies related to Indian forests, factors influencing global/ Indian forests distribution. Forest Protection - Introduction, kinds of forest protection measures, Protection against injuries by man, deforestation, illicit felling, encroachment, mining, shifting cultivation and forest fire. Commercial Forestry - Non-Timber Forest Products - methods of collection, management and importance of Non-Timber Forest Products (NTFP).				
Unit -V	Social forestry – fodder, fuel wood, leaf manure, and timber production, Urban forestry – uses of urban forests, Arboriculture and its importance in urban forestry. Agroforestry - Agroforestry - definition, concept and objectives. Classification of agroforestry systems - primary systems and subsystems - inheritance effects. Silvopastoral systems – protein banks, Agroforestry practices for wasteland reclamation- agroforestry practices for salt affected soils, wetlands and waterlogged areas. Participatory forest management - concept, types, Joint Forest Management (JFM), Van panchayat, community forestry, user groups and NGO's. Participatory rural appraisal (PRA).				
Reference and Textbooks Reddy & Nagamani, 2017. Introductory Forestry Divya, M. P. Divya; K. T. Parthiban, 2014. A Textbook on Social Forestry and Agroforestry Alok Kumar Patra, 2020. Introductory Forestry					
Outcomes	<ul style="list-style-type: none"> ➤ Improve the knowledge on Importance of Forest and It's products ➤ Gain the knowledge on Nursery Technology, Wood Science and Remote sensing ➤ Understand the Different types of Natural resources and It's sustainable management 				