

ALAGAPPA UNIVERSITY, KARAIKUDI.
NEW SYLLABUS UNDER CBCS PATTERN (w.e.f.2014-15)

B.Sc., BOTANY PROGRAMME STRUCTURE

Sem	Course			Cr.	Hrs./ Week	Marks		Total	
	Part	Subject code	Name			Int.	Ext.		
I	I	411T	Tamil / Other Languages – I	3	6	25	75	100	
	II	412E	English – I	3	6	25	75	100	
	III		4BBO1C1	Core – I – Plant Diversity – I (Algae, fungi, Lichens, Plant Protection & Bryophytes,)	4	5	25	75	100
			----	Core – II – Plant Diversity – II (Pteridophytes, Gymnosperms & Paleobotany)	-	4*	--	--	---
			----	Core – III – Practical – I (covering the Core I ,II & IV)	-	3*	--	--	---
				Allied – I(Theory cum practical)	4	3	15	60	75
			Allied Practical - I	-	2*	--	--	--	
IV	4NME1A / 4NME1B / 4NME1C	(1) Non-Major Elective – I – (a)தமிழ் மொழியின் அடிப்படைகள்/ (b) இக்கால இலக்கியம் / (c) Communicative English	2	1	25	75	100		
Total				16	30	--	--	475	
II	I	421T	Tamil / Other Languages – II	3	6	25	75	100	
	II	422E	English – II	3	6	25	75	100	
	III		4BBO2C1	Core – II – Plant Diversity – II (Pteridophytes, Gymnosperms & Paleobotany)	4	2	25	75	100
			4BBO2P1	Core – III – Practical (covering the Core I ,II & IV)	4	3	40	60	100
			4BBO2C2	Core – IV – Cytology, Anatomy and Micro techniques.	4	6	25	75	100
				Allied – II(Theory cum practical)	4	3	15	60	75
			Allied Practical – I (Covering the Allied courses I & II)	2	2	20	30	50	
IV	4BES2	(3) Environmental Studies	2	2	25	75	100		
Total				26	30	--	--	725	
III	I	431T	Tamil /Other languages – III	3	6	25	75	100	
	II	432E	English – III	3	6	25	75	100	
	III	4BBO3C1	Core – V – Embryology of Angiosperms and Plants tissue culture	4	5	25	75	100	

		----	Core – VI – Biochemistry, Molecular Biology and Instrumentation	-	3*	--	--	---	
		----	Core – VII – Practical – II (Covering the core courses V & VI)	-	2*	--	--	---	
			Allied– III(Theory cum practical)	4	3	15	60	75	
			Allied Practical - II	-	2*	--	--	--	
	IV	4NME3A/ 4NME3B/ 4NME3C	(1) Non-major Elective – II – (a) இலக்கியமும் மொழிப் பயன்பாடும் / (b) பழந்தமிழ் இலக்கியங்களும் இலக்கிய வரலாறும் / (c) Effective Employability Skills	2	1	25	75	100	
		4SBS3A1/ 4SBS3A2	(2) Skill Based Subjects – I	2	2	25	75	100	
	V	4BEA3	Extension activities	1	--	100	--	100	
			Total	21	30	--	--	675	
	I	441T	Tamil /other language – IV	3	6	25	75	100	
	II	442E	English – IV	3	6	25	75	100	
	IV	III	4BBO4C1	Core – VI – Biochemistry, Molecular Biology and Instrumentation	4	4	25	75	100
4BBO4P1			Core – VII – Practical (Covering the core courses V & VI)	4	4	40	60	100	
		Allied– IV(Theory cum practical)	4	4	15	60	75		
		Allied Practical – II(Covering the Allied courses III & IV)	2	2	20	30	50		
	IV	4SBS4B1/ 4SBS4B2	(2) Skill Based Subjects – II	2	2	25	75	100	
		4BVE4/ 4BMY4/ 4BWS4	(4) Value Education / Manavalakalai Yoga / Women’s Studies	2	2	25	75	100	
			Total	24	30	--	--	725	
	V	III	4BBO5C1	Core – VIII –Taxonomy of Angiosperms & Economic Botany	4	6	25	75	100
			4BBO5C2	Core – IX – Genetics and Plant Breeding	4	4	25	75	100
			4BBO5C3	Core – X –Plant Ecology and Biostatistics	4	4	25	75	100
			4BBO5P1	Core – XI – Practical – III (Covering the core courses VIII, IX & X)	4	4	40	60	100
			4BBOE1/ 4BBOE1B	Elective – I – Medical Botany (or) Mushroom cultivation	5	4	25	75	100
			4BBOE2A /4BBOE2B	Elective – II – Seaweed Technology (or) Horticulture	5	4	25	75	100

	IV	4SBS5A3/ 4SBS5A4/ 4SBS5A5	(2) Skill Based Subjects – I	2	2	25	75	100
			(2) Skill Based Subjects – I	2	2	25	75	100
	Total			26	30	--	--	700
VI	III	4BBO6C1	Core – XII – Plant Physiology & Biophysics	4	6	25	75	100
		4BBO6C2	Core – XIII – Micro Biology	4	5	25	75	100
		4BBO6C3	Core – XIV – Biotechnology	4	5	25	75	100
		4BBO6P1	Core – XV – Practical – IV (Covering the core courses XII, XIII & XIV)	4	5	40	60	100
		4BBOE3A /4BBOE3B	Elective – III – Biofertilizers & Biopesticides (or) Bioinformatics	5	5	25	75	100
	IV	4SBS6B3/ 4SBS6B4/ 4SBS6B5	(2) Skill Based Subjects – II	2	2	25	75	100
			(2) Skill Based Subjects – II	2	2	25	75	100
	Total			25	30	--	--	700
	Grand Total			140	180	--	--	4000

*** University Examinations will be held in the Even semesters.**

**I YEAR – I SEMESTER
COURSE CODE: 4BBO1C1**

**CORE COURSE I – PLANT DIVERSITY – I
(Algae, fungi, Lichens, Plant Protection and Bryophytes)**

Unit I: Algae

General Characters and classification of algae by Chapman. Structure, pigmentation, food reserves and Methods of reproduction of the following Genera (Excluding developmental studies)

- a. Cyanophyceae – *Oscillatoria*,
- b. Chlorophyceae – *Oedogonium*.
- c. Xanthophyceae – *Vaucheria*.
- d. Bacillariophyceae – *Diatoms*.
- e. Phaeophyceae – *Sargassum*.
- f. Rhodophyceae – *Polysiphonia*.

Unit II: Fungi

General characters, mode of nutrition and classification of Fungi, by C.J. Alexopoulos (1962). Occurrence, structure and life history of the following genera: (excluding developmental studies)

- a. Phycomycetes – *Albugo*.
- b. Ascomycetes – *Claviceps*.
- c. Basidiomycetes – *Puccinia*.
- d. Deuteromycetes – *Fusarium*.
- e. General features, structure and reproduction of fruticose lichen example *Usnea*

Unit III: Economic importance of algae, Fungi and lichen

- a) **Algae**-SCP-Biofertilizer-industrial uses of agar-carrageenan-alginate-diatamaceous earth-Algal parasites and Algal blooms
- b) **Fungi**-decomposers-food(edible mushrooms,SCP)-Medicines-growth regulators(GA)-industries(enzyme production)- Agriculture(mycorrhizae)-Harmful effects(Food spoilage, Mycoses).
- c) **Lichens**-Role in Succession, Food&indicator of pollution.

Unit IV: Plant protection

a) 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 – Tikka disease.
- b. Mycoplasma disease – Little leaf of Brinjal
- c. Bacterial disease – Citrus canker.
- d. Viral disease – Bunchy top of Banana.

b) Plant protection: Cultural practices, physical, chemical and biological controls and quarantine methods.

Unit V: Bryophytes

General characters and classification by Rothmaler. Study of the thallus structure, reproduction and life history of the following genera (excluding developmental studies):

a. *Marchantia* b. *Polytrichum*.

Text books:

1. Pandey B.P. – College Botany – Algae, Fungi and Bryophytes. Vol. I S.Chand & Co., Calcutta.
2. Vashista B.R. Botany for degree students. S. Chand & co., Calcutta.

References

1. Fritsch F.E. – The structure and reproduction of the Algae. Vol. I and II Vikas Publications New Delhi.
2. Smith G.M, – Cryptogamic Botany. Vol. I and II McGraw Hill Publication.
3. Chapman V.J and Chapman D.J the algae. MacMillan Press
4. Alexopoulos, C.J. Introductory Mycology. John wiley & sons, New York.
5. Parihar N.S. – An introduction to Embryophyta – Pteridophyta Central Book depot, Allahabad.
6. Gangulee and Kar – College Botany. Vol. II.
7. Singh R.S. (1978) – Plant Diseases. Oxford & Co., New Delhi.
8. Kumar H.D and Singh H.N. – Text Book of Algae, Prentice Hall of India.



**I YEAR – I / II SEMESTER
COURSE CODE: 4BBO2C1**

**CORE COURSE II – PLANT DIVERSITY – II
(PTERIDOPHYTES, GYMNOSPERMS & PALEOBOTANY)
(University Examinations will be held at the end of the Second Semester only)**

Unit I Pteridophyta

General characters and classification by K.R. Sporne, stelar evolution in Pteridophytes, heterospory and origin of seed habit.

Structure and life history: *Psilotum* and *Selaginella* (excluding developmental studies)

Unit II

Structure and life history: *Equisetum* and *Marsilea* (excluding developmental studies)

Unit III Gymnosperms

General characters and classification by K.R. sporne. The structure and life history of the following – *Pinus* and *Gnetum* (excluding developmental studies). Economic importance of Gymnosperms.

Unit IV Palaeobotany

Fossils and methods of fossilization – Geological time scale –carbon dating–Evaluation theories (Darwin, Lamarck and Hugh deveries)

Unit V

A brief study of the following fossil plants: *Rhynia*, *Lepidodendron*, *Pentoxylon* and *Williamsonia*. Contributions of Birbal sahani

Text books

1. Vashista, P.C (1997) – An introduction to Pteridophyta. Vikas publishing Co
2. Vashsta, P.C (1996) - Botany for Degree students. S. Chand & Co., New Delhi.

Reference Books

1. Smith G.M. – Cryptogamic Botany. Vol. II McGraw hill, New Delhi
2. Sporne K.R. Morphology of Pteridophytes. B.I Publications, New Delhi.
3. Parihar, N.S (1967). An introduction to Embryophyta Pteridophyta. Vol. II Central Book Depot. Allahabad.
4. Rashid A. (1999). An introduction to Pteridophyta. Vikas Publishing Co., New Delhi.
5. Coulter J.M Chamberlain (1964).Morphology of Gymnosperms. Central Book Depot. Allahabad.
6. Sporne K.R.(1971)The Morphology of Gymnosperms Hutchinson University Library, London.
7. Chopra, G.W and Verma, Peritials (1988) Gymnosperms. Hutchinson University Library, London.
8. Srivastava N. (1998) Gymnosperms. Pradeep Publication, Jalandhar,
9. Arnold C.A.(1947) An introduction to Palaeobotany. McGraw Hill Book Co., New York.
10. Shuka, M.A. Sharma. M. (1992) Plant fossils. (a link with the past) (Abirba sahani Birth century tribute) Birbal Sahnii Institute of Palaeobotany Lucknow.
11. Andrews H.N. Studies of Palaeobotany.



**I YEAR – I/II SEMESTER
COURSE CODE: 4BBO2P1**

**CORE COURSE III – PRACTICAL – I
(Covering Core I, II and IV)
(University Examinations will be held at the end of Second Semester only)**

Practical related to core course -I

Unit I

Algae

1. Microscopic observation and identification of following algal specimens– *Oscillatoria*, *Oedogonium*, *Vaucheria*, *Diatoms* and *Polysiphonia*.
2. Micropreparations of *Sargassum* axis, leaf and receptacles.
2. Identification of algal specimen from the algal mixture (only microscopic specimens to be given)

Fungi

1. To observe and identify the genera included in the syllabus
2. Micropreparations of *Albugo* infected leaf, *Puccinia* infected leaf, Stroma of *Claviceps*.

Lichens

1. To observe and identify *Usnea*- soredia, *Isidia* and apothecium slides.
2. Microscopic observation on sectional view of *Usnea* thallus.

Unit II

Display of Photographs and news paper clippings related with economic important of algae, fungi and lichens as spotters (SCP capsules, biofertilizer pocket, agar stripes, antibiotics vials, photographs of VAM, food spoilage, mycoeces, lichen specimens and photographs, photos of different kinds of pollution & its indicators)

Unit III

Plant protection

1. Observation of crop plants infected by the pathogens included in the syllabus and study of symptoms, causative agents and etiology.
2. Chemical fungicides – Bordeaux mixture-spot at site.

Bryophytes

1. To observe and identify the specimens of *Marchantia* and *Polytrichum*.
2. Micropreparations of thalli of *Marchantia* and *Polytrichum* – axis & leaf.

Practical related to core course -II

Unit IV

Pteridophyta and Gymnosperms

Study of morphological and anatomical structures of the vegetative and reproductive parts and microscopic observations of the followings

Psilotum, Selaginella, Equisetum, Marsilea and Getum

Palaeobotany

Observe and identify the fossil slides and photographs of *Rhynia, Lepidodendron, Pentoxylon* and *Williamsonia*.

Photographs of Birbal sahani and his fossils specimens & his institute.

Practical related to core course -IV

Unit V

Cytology

1. Photographs of Ultrastructure of plant cell, fluid-mosaic membrane model, mitochondria, chloroplast, ER, Nucleous, Golgi complex, endoplasmic reticulum and ribosomes.
2. Micropreparation of cystolith(Ficus leaf), Raphides(Araceae members eg *Arum* petiole) and starch grains(Potato and Rice grains)
3. Training students to prepare micropreparation and showing the stages of mitosis (Onion root tips) and showing permanent slides/photographs of mitosis and meiosis .

Anatomy

1. Microeparation of stems,roots and leaf of dicot[*TridoxI*]and monocot[*Chloris&Canna*]
2. Micropreparation of *Boerhavia* and *Draccaena*
3. Nodal anatomy (Uni-*Justicea*, Tri-*Azhadirecta* and Multi-*Aralea*).
4. Observation of permanent slides related with meristem- simple and complex tissues

Submission of bonafide record Note Book is mandatory for the External Practical Examinations.



ALAGAPPA UNIVERSITY, KARAIKUDI.
I B.SC., MAJOR PRACTICAL BOTANY – 4BBO2P1
Core Course – III – Practical (covering the I, II and IV)
THALLOPHYTA, BRYOPHYTES, PLANT PROTECTION, PTERIDOPHYTES,
GYMNOSPERMS, PALEOBOTANY, CYTOLOGY, ANATOMY AND MICRO –
TECHNIQUES

EXTERNAL QUESTION

Time: 3hrs

Max. Marks: 60

1. Take T.S of **A, B and C**. Stain and mount in Glycerin. Draw labeled sketches and identify given reasons. Submit the slides for valuation. **(3x8 =24)**
(Section-3, Identification-1, Diagram-2, Notes-2)
2. Identify draw sketches and write notes on **D,E,F,G** **(4x4=16)**
(Identification-1, Sketches-1, Description-2)
3. Draw sketches, identify and write notes on the given specimen **'H'** **(1x3=3)**
(Identification-1, Sketches-1, Description-1)
4. Comment on **'I'**. (Identification-1, Sketches-1, Description-1) **(1x3=3)**
5. Identify and write the genus and group of **'J'** and **'K'** **(2x2=4)**
(Genus – 1, Group - 1)
6. Record Note Book **_____ 10**

Total 60

**EXTERNAL
KEY AND SCHEME OF VALUATION**

1. **A,B and C** – Pteridophyta ,Gymnosperm, and anatomy material to be given
(Section-3, Identification-1, Diagram-2, Notes-2) **(3x8=24)**
2. **D,E,F,G** – Algae, Fungi, bryophytes, lichen and Pteridophytes to be given
(Identification-1, Sketches-1, Description-2) **(4x4=16)**
3. Materials to be given from fossils (**H**)
(Identification-1, Sketches-1, Description-1) **(1x3=3)**
4. Materials to be given from 'Etiology' (**I**)
(Identification-1, Sketches-1, Description-1) **(1x3=3)**
5. Identify and write the genus and group of **'J'and 'K'**
(Genus – 1, Group - 1)(from lichen, Pteridophyta ,Gymnosperm) **(2x2=4)**
6. Record Note Book **_____ (10)**

Total = 60



ALAGAPPA UNIVERSITY, KARAIKUDI.
I B.SC., MAJOR PRACTICAL BOTANY – 4BBO2P1

**THALLOPHYTA, BRYOPHYTES, PLANT PROTECTION, PTERIDOPHYTES,
GYMNOSPERMS, PALEOBOTANY, CYTOLOGY, ANATOMY AND MICRO –
TECHNIQUES**

INTERNAL QUESTION

Time: 3hrs

Max. Marks: 40

- | | |
|--|-----------------|
| 1. Prepare transverse sections of A and B . Mount in Glycerin. Identify and submit the slides for valuation. (Section-4, Identification-1) | (2x5=10) |
| 2. Identify, Draw sketches and write critical notes on C
(Identification-2, Diagram-2, Reasons-1) | (1x5= 5) |
| 3. (Identify, Draw sketches and write critical notes on D, E, F
(Identification-1, Diagram-2, Reasons-2) | (3x5=15) |
| 4. Continuous assessment | 10 |
| <hr/> | |
| Total = 40 | |

INTERNAL

KEY AND SCHEME OF VALUATION

Time: 3hrs

Max. Marks: 40

- | | |
|--|-----------------|
| 1. Prepare transverse sections of A and B . Mount in Glycerin. Identify and submit the slides for valuation. (from Algae, Fungi , Bryophyte & Lichen)
(Section-4, Identification-1) | (2x5=10) |
| 2. Identify, Draw sketches and write critical notes on C
(Identification-2, Diagram-2, Reasons-1)
(Identify any two from three algae mixture) | (1x5= 5) |
| 3. Identify, Draw sketches and write critical notes on D, E, F
(Identification-1, Diagram-2, Reasons-2)
(from Economic importance of algae, fungi and lichen and cytology) | (3x5=15) |
| 4. Continuous assessment by practical in-charge based on the performance in the practical, attendance, record submission etc. | 10 |
| <hr/> | |

Total = **40**



**I YEAR – II SEMESTER
COURSE CODE: 4BBO2C2**

CORE COURSE IV – CYTOLOGY, ANATOMY AND MICRO TECHNIQUES

Unit I: Microscopy

3. Principles, working mechanisms and structure of compound and electron microscopes.
4. Differences between electron microscope (EM) and compound microscope (CM)

Unit II: Cytology

1. Ultrastructure of plant cell and cell wall(chemistry and function).
2. Structure, chemistry and functions of plasma membrane (fluid-mosaic model only)
3. Structure and functions of nucleus, mitochondria, chloroplast, endoplasmic reticulum, ribosome and Gogi complexes.
4. Eragastic substances –Cystolith, Raphides and starch grains
5. Cell division – Stages of mitosis and meiosis and their significances.

Unit III: Anatomy

Meristems: Shoot and root apical meristems-Theories on meristems- classification and structure of simples and permanent tissues.

Unit IV: Internal anatomy

1. Primary structure of dicot and monocot stem and dicot and monocot root.
2. Normal secondary growth in dicot stem and root.
3. Anomalous secondary growth in *Boerhaavia* and *Dracaena* stems.
4. Structure of dorsiventral and isobilateral leaf.
5. Nodal anatomy – uni – tri– multi lacunar nodes.

Unit V: Microtechniques

Fixation, dehydration, 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.

Text books

1. Pandey B.P (1978) Plant Anatomy, S. Chand & Co., Calcutta
2. Vashista, P.C. (1968) A Text book of Plant Anatomy, S. Negin & Co.,
3. Prasad & Prasad. Outlines of Micro technique, Em Kay Publications, New Delhi.

References

Cytology

4. De Robertis, E.D.P & De Robertis, E.M.F (1980) Cell and molecular biology, Holt Saunders International Editions, Philadelphia, Tokyo.
5. Rastogi, S.C. (1992) Cell biology, Tata McCraw Hill Publishing Co., Ltd., New Delhi.
6. Sundararajan, S., (2000) Cytology, Anmol Publication (P) Ltd., New Delhi.
7. Verma, P.S., Cytology, S. Chand & Co., Calcutta.

Anatomy

8. Cutter, E.G (1969) Plant Anatomy, Part 1 Addison – Wesley Publishing Co.,
9. Eames, A.J. and MacDaniels, L.H (1972) Introduction to plant Anatomy.
10. Esau K. (1953) Plant Anatomy
11. Fahn. A. (1974) Plant Anatomy, Pergaman Press, New York.
12. Tayal M.S (1979) Plant Anatomy, Rastogi Publications, New Delhi.

Microtechniques

13. Gray. P. Hand book of basic Micro technique, Tata McGraw Hill Co., New Delhi.
14. Alen Peacock, H.J Elementary Micro technique, Em Kay Publications, New Delhi.
15. Sass – J. E Botanical Microtechnique, Oxford & IBH Publishing House Co., New Delhi.



**II YEAR – III SEMESTER
COURSE CODE: 4BBO3C1**

**CORE COURSE V – EMBRYOLOGY OF ANGIOSPERMS AND PLANT TISSUE
CULTURE**

Embryology of Angiosperms

Unit I

1. Structure and development of microsporangium, microsporogenesis, male gametophyte.
2. Structure and development of megasporangium, Types of ovules, Megasporogenesis, Female gametophyte (Monosporic-[*Polygonum*], Bisporic-[*Allium*] & Tetrasporic type-[*Fritillaria*]).

Unit II

1. Fertilization- major events -syngamy-double fertilization and their significance
2. Endosperm – types (Nuclear, cellular, helobial) and ruminant endosperm
3. Functions of endosperms,
4. Structure and development of dicot(*Capsella*) and monocot (*Najas*) embryos.

Unit III

1. Polyembryony-Types , causes and practical values
2. Apomixis- Vegetative reproduction and Agamospermy
3. Parthenocarpy-chemical method of induction and practical applications

Plant Tissue Culture

Unit IV

Historical background.

Basic knowledge about tissue culture tools, medium, sterilization and techniques of tissue culture.

1. Micropropagation: techniques and applications
2. Callus induction and role of plant growth regulators in tissue culture
3. Protoplast culture: method of isolation, purification and culture of protoplast, hybrids.

Unit V

1. Anther culture. Production of haploids – Significance of haploids.
2. Production of Synthetic seeds & significance
3. Role of tissue culture in crop improvement.

Text books

1. Bhojwani, S.S and S.P Bhatnagar 2008, The Embryology & Angiosperms, Vikas publishing House Pvt. Ltd. New Delhi.
2. Reinert, J. Plant Cell, Tissue and Organ Culture. Satish Book Enterprises. Agra.

References

1. Johri, B.M 1982. Experimental embryology of Vascular Plants. Narosa Publishing house. New Delhi.
2. Maheswari, P. Introduction to the Embryology of Angiosperms Tata-McGraw Hill Publishing House Ltd. New Delhi.
3. Maheswari, P. Recent advances in Embryology.
4. Dodds, J.H Roberts, L.W Experiments in Plant tissue culture. Cambridge University Press. Cambridge
5. Ignacimuthu, S. 1996. Basic-Technology. Tata McGraw Hill Publishing Co. Ltd., New Delhi
6. Dubey, R.C 1993. A Text book of Bio-Technology, S.Chand & Co. Ltd., NewDelhi.
7. Trehan, K. 1991. Bio-Technology, Wiley Eastern Publishers. New Delhi.
8. Narayanaswamy, S. 1994. Plant Cell and Tissue Culture, Tata McGraw Hill Publishing Co., Ltd., New Delhi.



**II YEAR – III / IV SEMESTER
COURSE CODE: 4BBO4P1**

**CORE COURSE VII – PRACTICAL – II
(Covering the Core courses V & VI)**

(University Examinations will be held at the end of fourth semester only)

Embryology of Angiosperms and plant tissue culture

1. To dissect out and mount Dicot embryo (*Tridax*)
2. To study and write critical notes on permanent Micro preparations showing development of anther, types of ovules, Embryosac, Dicot embryo and Monocot embryos.
3. Take T.S of anther (*Datura/Cassia*)
4. Plant tissue culture techniques, preparation of culture medium (Protocol and demo).
5. Callus culture and embryo culture (Protocol and demo).
6. Production synthetic seeds-Sodium alginate method (Protocol and demo)

Biochemistry and Instrumentation

MAJOR EXPERIMENTS

1. Measurement of pH of a solution.
2. Preparation of Buffer and titration curves (acid and base)
3. Estimation of starch in plant tissues. (Colorimetric method)
4. Estimation of starch in plant tissues. (Gravimetric method)
5. Determination of complementary colours
6. Verification of Beer's Law.
7. Estimation of sugars in plant tissues by colorimetry

MINOR EXPERIMENTS

1. Qualitative test for carbohydrates:
 - a) Starch.
 - b) Glucose.
2. Qualitative test for Proteins.
3. Qualitative test for Lipids.
4. Paper Chromatography: (Any one)
 - c) Separation of Amino acids by ascending Chromatography.
 - d) Separation of Amino acids by Circular Chromatography.
 - e) Separation of pigment by ascending Chromatography.
 - f) Separation of Dyes by Circular Chromatography.

Principle and working principles protocol of pH meter, colorimeter and centrifuge through Photograph/ models.

Submission of bonafide record Note Book is mandatory for External Practical



II YEAR – III / IV SEMESTER
COURSE CODE: 4BBO4P1

CORE COURSE VII – PRACTICAL – II
(Covering the Core courses V & VI)
(University Examination will be held at the end of fourth semester)

EXTERNAL QUESTION

Time: 3 hours

Max-marks- 60

- | | |
|---|-----------|
| 1. Taking a lot from the set of the experiments, write the procedure, complete the experiment, tabulate the data and interpret the result | 1x20=20 |
| 2. Dissect and display anyone stage of the dicot embryo from the given material “A”, mount in Glycerine and submit it for valuation, draw sketch and write notes on “A” | 1x15=15 |
| 3. Dissect and display anyone stage of the anther from the given material “B”, mount in Glycerine and submit it for valuation, draw sketch and write notes on “B” | 1x5=10 |
| 4. Write critical notes on C | 1x5=5 |
| 5. Submission of Record note book | 10 |
| Total | 60 |

EXTERNAL
KEY AND SCHEME FOR VALUATION

Time: 3 hours

Max-marks- 60

1. Major biochemistry experiments prescribed in the syllabus
Requirement- 3
Procedure-7
Results & Data-6
Interpretation-4
2. Dicot embryo from *Tridax* to be given for material A
Slide-5
Sketch -5
Notes-5
3. Anther from *Datura/Cassia* B
Slide -5
Sketch-2 ½
Notes-2 ½
4. Protocol from tissue culture (photograph/model etc.)
Identification - 1
Protocol- 3
Diagram- 1
5. Submission of Record note book-10



**II YEAR – III SEMESTER
COURSE CODE: 4BBO4P1**

**CORE COURSE VII – PRACTICAL – II
(Covering the Core courses V & VI)**

(University Examination will be held at the end of fourth semester)

INTERNAL QUESTION

Time: 3 hours

Max. Marks- 40

- | | |
|---|-----------------|
| 1. Taking a lot from the set of the experiments, write & submit the procedure, complete the experiments, tabulate the data and interpret the result
(Requirement - 2, Procedure-3, Data-3, Interpretation-2) | 1x10 = 10 |
| 2. Write critical notes on A, B, C and D
(Identification-1, Sketch-1, Notes-2) | 4x4 = 16 |
| 3. Write critical notes on E
(Identification-1, Principle-1, Sketch-1, Notes-1) | 1x4 = 4 |
| 4. Continuous assessment | 10 |
| | Total 40 |

INTERNAL

KEY AND SCHEME FOR VALUATION

Time: 3 hours

Max-marks- 40

- | | |
|--|-------------------|
| 1. Minor biochemistry experiments prescribed in the syllabus
Requirement - 2
Procedure-3
Data-3
Interpretation-2 | 1x10=10 |
| 2. A – Any micro preparation/permanent slide from embryology
B – Any photograph or diagram from embryology
C & D – Demo/sketch micropreparation from tissue culture
(Identification-1, Sketch-1, Notes-2) | 4x4 =16 |
| 3. E –Apparatus from pH meter/ colorimeter/ centrifuge
Identification-1
Principle-1
Sketch-1
Notes -1 | 1x4 =4 |
| 4. Continuous assessment
(by practical in-charge based on the performance in the practical class, attendance, record submission etc). | 10 |
| | Total = 40 |



**III YEAR – V SEMESTER
COURSE CODE: 4BBO5C1**

CORE COURSE VIII – TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Taxonomy

Unit I

1. Aims and significance of Taxonomy
2. ICBN principles.
 - a. Author citation.
 - b. Type concept.
 - c. Effective and valid publications
3. Brief knowledge about Botanical Survey of India (BSI).
4. Brief study on herbarium techniques.

Unit II

1. Types of classifications- artificial, Natural and phylogenetic.
2. Outline the classification of Bentham and Hooker, Engler and Prantl (Merits and demerits)
3. Taxonomic evidences from molecular, numerical and chemicals.

Unit III

1. Basic knowledge in morphology of Angiosperms.
2. Brief study of the following families with special features and economic importance.
 - a. Annonaceae
 - b. Brassicaceae
 - c. Tiliaceae
 - d. Rutaceae
 - e. Anacardiaceae
 - f. Ceasalpinaceae
 - g. Cucurbitaceae
 - h. Apiaceae

Unit IV

- a. Rubiaceae
- b. Asclepiadaceae
- c. Solanaceae
- d. Euphorbiaceae
- e. Liliaceae
- f. Orchidaceae
- g. Araceae
- h. Poaceae

Economic Botany

Unit V

Brief study of the following economic products with special reference to the Botanical name, family, morphology of useful part and the uses of the following commercial products.

1. Cereals –Wheat & maize.
2. Pulses – Green gram & Soya beans.
3. Fruits – Apple & Grapes.
4. Spices & Condiments–Cardamom & Garlic.
5. Essential Oils – Sandalwood oil & Olive oil
6. Beverages – Coffee, Cocoa
7. Dyes – Saffron, Indigo
8. Fibres – Cotton & Sissalhemp
9. Latex – Rubber & Gutta-percha
10. Resins & Gum– Canada balsam & Turpentine.
11. Wood & Cork – Rose wood & Teak wood.

Text books

1. Vashishta P.C. 1974. Taxonomy of Angiosperms. S.Chand & Co. Ltd., New Delhi
2. Kochhar, S.L. Economic Botany in the Tropics, Macmillan India. Ltd, New Delhi.
3. Verma, V. Text Book of Economic Botany.
4. Pandey, B.P.1980. Economic Botany. S.Chand & Co. Ltd. New Delhi

References

1. Gupta, R.K. 1992. Text book of systematic Botany. Atma Rain & Sons.
2. Heslop Harrison, New concept in flowering plant Taxonomy.
3. Jeffrey, C. 1982. An Introduction of plant taxonomy, Allied publishers private limited.
4. Jones, B.S. Plant systematics, Mc Graw Hill publications. New Delhi
5. Lawrence G.H.M.1955. In Introduction to plant taxonomy. Central Book Depot, Allahabad.
6. Rendle, A.B. 1930. The Classification of flowering plants, Vol. I and II cup vikas students Edn.
7. Hill. A.W. 1951 Economic Botany, McGraw Hill publishing house. New Delhi



**III YEAR – V SEMESTER
COURSE CODE: 4BBO5C2**

CORE COURSE IX – GENETICS AND PLANT BREEDING

A. Genetics

Unit I

Mendelian 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, Duplicate Dominant Genes (15:1) and Duplicate Recessive Genes (9:7)

Unit II

Linkage, crossing over and 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

Unit III

Molecular Biology - Central Dogma-DNA as genetic Material – Griffith's Experiment, RNA as Genetic material in TMV. Structure of DNA, Semi - conservative mechanisms of replication – Transcription, Types of RNA, RNA polymerases, Ribosomes, rRNA, tRNA, Genetic code – Initiation, Elongation and Termination of Transcription and Translation.

B. Plant Breeding

Unit IV

Plant Breeding Organizations(ICAR,IARI, CRRI, IRRI), Plant introduction-merits and demerits, Methods of plant breeding-pure line selection, Mass selection, Clonal selections with examples.

Unit V

Hybridization –procedure and achievements, Heterosis-theories on heterosis, Role of mutation and polyploidy in crop improvements with suitable examples.

Text books

1. Genetics – P.K.Gupta Rastogi Pub. Co. Meerut 1999
2. Chaudhary, R.C. (1991) Introduction to plant breeding, Oxford IBH Publishing Co.,(p) Ltd., New Delhi, Bombay, Calcutta – 261 pp.,
3. Breeding of Asian field crops by Borlough et al.,

References

Genetics

1. Principles of Genetics – R.H.Tamarin (McGraw-Hill Company Inc. 2002)
2. Concepts of Genetics VI edn. W.S.Klug and Cummings M.R.Prentice Hall 2000.
3. Schaurms Genetics IV edition S.Elrod, W.Stans Field.
4. Genetics – A Molecular approach T.A.Brown
5. Principles of Genetics – Snustand et al.
6. Essentials of Molecular Biology – Malacinski.
7. Principles and Practice of Plant Breeding – J.R.Shanna Tata McGraw-Hill Pub. Com. Ltd. 1994
8. Molecular Biology – II edition – D’Ffeifelder, Narosa Publishing House, New Delhi

Plant breeding

1. Allard (1960) Principles of Plant breeding, John Wiley Publications, N.Y.
2. Hayes,H.K., Immer, F.R. & Smith, D.C. (1967) Methods of Plant breeding, Reinholt Publication, N.Y.
3. Baudai, M.M. (1974) Practical plant breeding, Oxford IBH publication, New Delhi.
4. Chandrasekaran, S.N. & Parthasarathy, S. (1975) Cytogenetics and Plant breeding, Vradhachary & Co., Chennai.
5. Hari Har Ram (1998) Vegetable breeding – Principles and practices, Kalyani Publishers, Ludhiyana, New Delhi, Noida (UP) Hyderabad.
6. Chopra, V.L. (1998) Plant breeding theory & Practices (2nd edition), Oxford & IBH Publishing Co.,(p) Ltd., New Delhi & Calcutta – pp.,
7. Vijendra Das, L.D. (1998) Plant breeding, New Age International (p) Ltd., Publishers, New Delhi, Bangalore, Calcutta, Chennai, Guwahati, Hyderabad, Lucknow, Mumbai, Pune – 334 pp.
8. Singh, B.D. (1999) Plant breeding – Principles & Methods, Kalyani Publishers – 702pp.



**III YEAR – V SEMESTER
COURSE CODE: 4BBO5C3**

CORE COURSE X – PLANT ECOLOGY AND BIOSTATISTICS

Plant Ecology

Unit I

Ecosystem: Concepts of Ecosystem and its components – Biotic and abiotic, Ecosystem types, Dynamics of Ecosystem – Food chain – Food web – Trophic levels – Energy flow and Ecological Pyramids.

Unit II

Types of ecosystems-pod ecosystem(biotic and abiotic components), Units of Vegetation: Plant Communities Plant formation, Plant association and Plant consociation. Plant succession-stages of plant succession-hydroxere, zeroxere, climatic community, soil erosion-causes and conservation methods.

Unit III

Phytogeographical regions of India and its climatic zones.. Biodiversity-Definition-types-hot spots in India- Endemism- IUCN- red data book, causes of loss of biodiversity, conservation methods- ex situ and in situ conservations-Biosphere reserves [eg Gulf of Mannar.]

Unit IV

Environmental deterioration – Pollution – Air pollution: Gaseous, 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 – Radio active pollution – Preventive measures of pollution. Deforestation: Cause, Effects and preventive measures – Special reference to land misuse (Indiscriminate tree felling, Raising of plantations etc).

Biostatistics

Unit V

Data collection – Formation of frequency distribution Mean, Median and Mode – Variance and Standard deviation. Chi-square test to test the goodness of Fit with Mendelian ratios

Text books

1. Sharma P.D. – Elements of Ecology, Rastogi Publication, Meerat
2. Fundamentals of Biostatistics I.A.Khan and A.Khanurn Ukaaz Pub. Hyderabad.

References

1. Introductory Practical Biostatistics B.N.Misra and M.K.Misra. Darbari Prokashan, Kolkata 1992.
2. Biostatistics – Zar
3. Odum, E.P. – Fundamental of Ecology, Saunder co, London
4. Kumar H.D. – Modern concepts of Ecology, Vikas publishing house, New Delhi



**III YEAR – V SEMESTER
COURSE CODE: 4BBO5P1**

CORE COURSE XI – PRACTICAL – III (Covering the Core courses VIII, IX & X)

Taxonomy of angiosperms and economic Botany

1. Dissect out the floral parts of plants coming under the families prescribed in the theory syllabus. Write descriptions in technical terms, Draw diagrams of vegetative and floral parts. Draw floral diagram and write floral formula.
2. Preparation of artificial keys and identification of fresh and herbarium plants using flora.
3. 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,
4. Submit minimum of twenty herbarium Plants with a proper field note book with correct identification for external valuation
5. Identify the economic products related to theory syllabus and write Botanical name, family and uses.

Genetics and Plant breeding

6. Observe the genetic variations among inter and intra specific plants.
7. Workout the genetic problems – monohybrid, dihybrid, testcross and backcross.
8. Inter and intra-specific hybridization techniques.
9. Calculate and draw a genetic map
10. Demonstration of emasculation experiment
11. Photographs, Demonstrations, Setups, Instruments, materials connected with genetics and Molecular biology. DNA/RNA Model, DNA Replication. Chemical mutagens, Thyamine dimer, Nucleosome, Plasmids, Enzymes.

Plant ecology and biostatistics

12. Arrive primary data from the given sample (leaves/pods) and give diagrammatic representation (Histogram), Calculate mean, median and mode and standard deviation.
13. Ecological field study-Quadrats and Line transect methods of vegetation study.
14. Morphological and anatomical features of hydrophytes, xerophytes and halophytes(vivipary)

Submission of bonafide record Note Book is mandatory for External Practical



**III YEAR – V SEMESTER
COURSE CODE: 4BBO5P1**

**CORE COURSE XI – PRACTICAL – III
(Covering the Core course VIII, IX & X)**

INTERNAL QUESTION

Time: 3 hours

Max. Marks- 40

1. **A** – Give a technical description from the angiosperm specimen selected from families in the syllabus (1x5=5 marks)
2. **B & C** - Angiosperm specimen of fresh or herbarium plants submitted by the students (2x2=4 marks)
3. 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=6 marks)
4. **D** – Construct a genetic map from given problem (1x5=5 marks)
5. **E & F** from ecologically adapted plants (2x2=4 marks)
6. **G, H & I** Spot at sight from genetics and molecular biology– Photograph/Diagram or demonstration of genetically interest. (3x2=6 marks)
7. Continuous assessment. (10 marks)

Total = 40

**INTERNAL
KEY AND SCHEME OF VALUATION**

Time: 3 hours

Max. Marks- 40

1. **A** – Angiosperm specimen selected from families in the Syllabus (Technical description 2, Sketches-1, Floral diagram-1, Floral formula-1) (1x5=5 marks)
2. **B & C** - Angiosperm specimen of fresh or herbarium plants submitted by the students (Binomial -1, Author citation-1) (2x2=4 marks)
3. 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-1, Graph-2, Interpretation-1) (1x6=6 marks)
4. **D** –Construct a genetic map (Construction of map-3, Diagram -2) (1x5=5 marks)
5. **E & F** from ecologically adapted plants (Identification- ½, Diagram- 1/2, Notes-1) (2x2=4 marks)
6. **G, H & I** Spot at sight from genetics and molecular biology– Photograph/Diagram or demonstration of genetically interest. (Identification- ½, Diagram- 1/2, Notes-1) (3x2=6 marks)
7. Continuous assessment by practical in-charge based on the performance in the practical, attendance, record submission etc. (10 marks)

Total = 40



**III YEAR – V SEMESTER
COURSE CODE: 4BBOE1A**

ELECTIVE COURSE I (A) – MEDICAL BOTANY

Unit I

Ethnobotany – folklore – Native medicine – Herbalism – Medicinal plants – History of herbal medicine.

Unit II

Indian systems of medicine – Siddha, Ayurvedha, Unani systems – Plants useful in Indian systems of medicine – Vernacular and botanical names of local medicinal plants

Unit III

Definition – Pharmacognosy – pharmacology – Phytochemistry – Phytochemicals – Therapeutics – uses taxonomy – Morphology of local medicinal plants.

Unit IV

Definition – Herbarium – Preparation of medicinal plant – Herbarium – Collection – Processing – preparation of herbal drugs – Medicinally useful parts of plants.

Unit V

Establishment of Herbal Garden – pot culture and uses of medicinal plants.

Text books

1. Sathyarathi et al – 1982 – Indian Medicinal Plants, Vols., I, II & III. ICMR, New Delhi.

References

1. J.S. Gamble – 1935 – Flora of the Presidency of Median vols. I, II & III. Govt. Press Calcutta, India.
2. K.M. Mathew – 1989 – Flora and Tamil Nadu carnatic reprint herbarium, St. Joseph's College, Tiruchirappalli.
3. Anonymous – 2001 – CSIR – The Wealth of India Vol.1 – 20. CSIR, New Delhi.
4. K.M. Natkarni – 1998 – Indian Materia Medica, Vols. I, II & III. Popular Prakashan, New Delhi.
5. Chopra – 1980 – Glossary Indian Medicinal Plants – CSIR – New Delhi.
6. Anonymous – 1982 – Useful Plants of India – CSIR – New Delhi.



**III YEAR – V SEMESTER
COURSE CODE: 4BBOE1B**

ELECTIVE COURSE I (B) – MUSHROOM CULTIVATION

Unit I

Introduction and Importance of mushrooms; History of Mushroom's cultivation; Present status of mushroom industry in India;

Unit II

Cultivable edible mushroom; Biology of mushroom; food value of edible mushrooms; Uses of mushrooms, Poisonous mushrooms, and Medicinal mushrooms.

Unit III

Mushrooms farm structure; design and layout; Spawn principles and techniques of spawn production; Principle and techniques of compost and composting;

Unit IV

Cultivation techniques of White button mushroom, oyster mushroom; Management of fungal, bacterial and viral diseases in mushroom; Competitors, pests and nematodes in mushrooms.

Unit V

Post harvesting techniques ,preparation Mushroom Recipes and Economics of mushroom cultivation.

Text books

1. Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

References

1. Marimuthu, T. *et al.* (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
2. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
4. Tewari Pankaj Kapoor,S.C.(1988).Mushroom Cultivation. Mittal Publication, New Delhi.



**III YEAR – V SEMESTER
COURSE CODE: 4BBOE2A**

ELECTIVE COURSE II (A) – SEAWEED TECHNOLOGY

Unit I

Structure, Reproduction and life history of Rhodophyta(*Gracilaria*), Phaeophyta(*Sargassum*) and Chlorophyta(*Ulva*). Seaweed resources in India and abroad.

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 seedlings, Planting, Harvesting, Pre-harvest activities, Harvesting procedures, Drying. Maintenance of the farm. Marking of seaweeds.

Note: Two day field visit along the coast for studying seaweeds near to the Institute is compulsory.

Text book

1. The Biology of Seaweeds – S. Lobban and J. Wynne.

Reference Books

1. Biology of Algae – Bold and Wynne.
2. Elements of Marine Ecology – Tait.
3. Algae – Vashista.



**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6C1**

CORE COURSE XII – PLANT PHYSIOLOGY AND BIOPHYSICS

A.Plant Physiology

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 organicsolutes, Evidences – mechanism.

Unit II

Photosynthesis:Introduction-pigment systems-Light Reaction – Photosynthetic unit – PSI & PSII cyclic and noncyclic reactions–Dark reaction – C₃ & C₄ 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,

B.Biophysics

Unit V

Bio-Energetics: Laws of Thermodynamics – concept of free energy – Redox potential – ATP as a high energy compound – Role of chloroplast and Mitochondrial Bioenergetics.

Photophysiology: Nature of light – solar radiation, Absorption and emission – Biological Energy conversion – Fluorescence and Bioluminescence.

Text books

1. GILL.P.S. Plant physiology, S. Chand & Company Ltd., New Delhi – 1.
2. Jain, V.K. Fundamentals of plant physiology, S. Chand & Co., New Delhi.
3. Dr. Salilbose. Elementary Biophysics.

Reference Books

1. Frank,B.Salisbury and Cleon W.Ross.Plant physiology,Publishers and Distribution,NewDelhi
2. Ray Noggle G and George J. Fritts. Introductory plant physiology. Prentice Hall of India Pvt. Ltd, New Delhi.
3. Devlin and Barker – photosynthesis. Affiliated East - West Press Pvt. Ltd., New Delhi.
4. Casey, E.J. Biophysics – affiliated East – West Press Pvt., Ltd. New Delhi
5. Albert L. Lehninger. Biophysics – concepts and mechanics.
6. Fulleret al. Biophysics – concepts and mechanics.

**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6C2**

CORE COURSE XIII – MICROBIOLOGY

Unit I

Introduction and scope of Microbiology – Discovery of Microorganisms. Contributions of F.Redi, J.Needham, Spallanzani, L.Pasteur and R.Koch – Size, Shape and arrangement of Bacteria – Prokaryotic cell organization – Structure of Gram Positive and Gram Negative Cell Wall – Capsule – Slime layer – Pili – Flagella: Structure and arrangement – Bacterial Chromosomes – Plasmids – Bacterial endospore structure.

Unit II

Nutritional types of microorganism – Types of Media – Nutritional requirements – Growth curve of Bacteria – Anaerobic respiration – Alcoholic and Lactic acid fermentations – Microbial Taxonomy – Major Characteristics used in Taxonomy (Classical and Molecular) Bergey's Manual of Systemic Bacteriology – II edition 5 Volumes – Major groups, their Characteristics and representative genera

Unit III

Methods of Sterilization – Viruses: General properties – Classification viruses bases on symmetry, host and nucleic acid content – Structure and reproduction of bacteriophages e.g.T4 and Lambda phages. Mycoplasma: Properties and salient features

Unit IV

Microbial Genetics: Gene mutation – Spontaneous and induced – Physical and chemical mutagens – Molecular mechanism of mutation – Operon concept – Regulation of Lac operon in E.coli – Gene transfer mechanism in Bacterial conjugation, Transformation and Transduction

Unit V

Applied Microbiology – Soil Microorganisms – Rhizosphere, Mycorrhizae, Phyllosphere free living and symbiotic Nitrogen fixing organism, legume / Rhizobium symbiosis – Analysis of Drinking water for coliforms – MPN test – Plant – Microbe interaction – Sewage treatment – Primary, Secondary and Tertiary treatments – Bioremediation and Biomagnifications

Text books

1. Text book of Microbiology – R.C.Dubey & D.K.Maheshwari S.Chand & Co. New Delhi.
2. Microbiology – Pelczar, Chan and Krieg. Tata – McGraw Hill 1993

Reference Books

1. Microbiology with CD Prescott, Harley and Klein (McGraw – Hill companies, Inc 2002)
2. Microbial Ecology IVth Edition – R.M. Atlass and Bartha R.
3. Microbiology – A Lab Manual J.G. Cappucino and N.Sherman Addison Wesley 1999
4. General Microbiology – H.G.Schlegel.
5. Modern Concepts of Microbiology – H.D.Kumar
6. Instant Notes in Microbiology – J.Nicklin et al



**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6C3**

CORE COURSE XIV – BIOTECHNOLOGY

Unit I Introduction & Recombinant DNA technology

1. Definition
2. Basic Principles, history and scope.
3. Tools of genetic engineering.
4. Techniques of gene manipulation and its applications,
5. Recombination of DNA.
6. Cloning vectors-PBR 322, Ti plasmid, cosmid, pagemid, YAP
5. Cloning of Insulin gene.

Unit II Agricultural Bio-technology

1. Bio-fertilizers Mass cultivation and uses of
 - a. Bacterial biofertilizers– Rhizobium, Azospirillum
 - b. Algal biofertilizers – Anabaena, Nostoc
 - c. Fungal biofertilizer – Mycorrhiza (VAM)
2. Plant Pesticides – Bio-Insecticides.

Unit III Industrial Biotechnology

1. Fermentation Technology
 - a. Production of ethanol
 - b. Production of Penicillin
2. Vaccines – Types, Source, production and uses.
3. Biofuel – Hydrogen Production, and the conversion of light energy Importance of biological production of hydrogen, photoproduction of hydrogen. Cell free hydrogen production, Hydrogen production from Marine organisms, Microbial production of hydrogen.

Unit IV

1. Mushroom cultivation and its nutritional value
 - a. Paddy straw mushroom.
 - b. Oyster mushroom.
2. Biogas production – Methanogenesis.
3. Waste treatment – Aerobic and anaerobic. Reusage of Sewage.

Application of Recombinant DNA technology

Unit V

Bio-pesticides, Biomining, Bioleaching, Transgenic plants- Bt cotton, Bt brinjal, Flavr savour tomato, golden rice, Hybrid maize.

Text books

1. Ignacimuthu, S. 1996. Basic Bio-Technology. Tata-McGraw, Hill Publishing Co. Ltd., New Delhi.
2. Dubey, R.C.1993. A Text book of Bio-Technology. S.Chand & Co. Ltd. New Delhi.
3. Trehan, K. 1991. Bio-Technology. Wisley Eastern Publishers, New Delhi.

References

1. Kumar, H.D.1993. A Text book of Bio-Technology. East West Affiliated Press Ltd., New Delhi.
2. Srivastava "H.S. An Introduction to Bio-Technology. Rastogi Publishing Company Meerrut.
3. Treven, M.D.S. Baffery, R.H.Goulding and F.Standbury. Bio-Technology – The biological principles. Tata-McGraw, Hill Publishing, Co. Ltd., New Delhi.
4. Wiseman, A. Principles of Bio-Technology. Surrey University Press. U.K.
5. Attwood, Introduction to Bio-Informatics.
6. Misener, Bio-Informatics, Methods and protocols.
7. Mishra, Bio-Informatics and human genome.



**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6P1**

**CORE COURSE XV – PRACTICAL – IV
(Covering the Core Courses XII, XIII & XIV)**

Plant physiology and biophysics

Major Experiments

1. Determination of Osmotic Pressure – Plasmolytic method.
2. Measurement of Water Potential – Chardakov's method.[Falling drop method]
3. Measurement of Water Potential – Gravimetric method
4. Determination of Suction Pressure – Weighing method.
5. Rate of Photosynthesis – *Hydrilla* Experiment of Willmont's Bubbler using different colour filters.
6. Rate of Photosynthesis using different concentrations of sodium-bicarbonate (Bubble method).
7. Extraction and separation of Photosynthetic Pigments by Chromatography techniques (any one method).
8. Imbibition – Direct weight method for different seeds.

Minor Experimental Setups (Demonstrations only)

1. Thistle funnel experiment.
2. Root Pressure
3. Potato Osmoscope
4. Suction due to Transpiration
5. Guttation
6. Transpiration – bell Jar experiment
7. Farmer's Potometer
8. Ganong's Respiroscope.
9. Evolution of Heat during Respiration
10. Anaerobic Respiration
11. Fermentation (Khune's Tube)
12. Light screen experiment.
13. Mohl's half leaf Experiment
14. Lever Auxanometer
15. Clinostat
16. Phototropic chamber
17. Water and sand Culture

Photographic models of action and absorption spectra, red drop, growth regulators (Auxin, GA, cytokine & ethylene)

Microbiology

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. Microscopic Observation of Bacteria, yeast and Molds using permanent slides
6. Motility of Bacteria – Hanging Drop Technique
7. Simple (Methylene Blue) and Differential Staining (Gram Stain) of Bacteria
8. Viable count of Bacteria by serial Dilution Technique
9. Dye Reduction test for assessing the quality of Milk

Biotechnology

Protocol and demonstration is important for all biotechnological experiments

1. Demonstration of Structural details – rDNA, Cloning vectors - PBR 322, Ti plasmid, cosmid, pGEM, YAP – transgenic Plants (photographs or models)
2. Flow chart or Photographic models of production of Ethanol, Penicillin, Vaccine, algal, bacterial and fungal biofertilizers and hydrogen production.
3. Identification and cultivation of paddy straw mushroom, Oyster mushroom-Demo
4. Preparation of biogas from cow dung.
5. Modern biogas plant/simple laboratory method / sewage degrading microbes

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



**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6P1**

**CORE COURSE XV – PRACTICAL IV
(Covering the Core Courses XII, XIII & XIV)**

EXTERNAL QUESTION

Time: 3 hours

Max-marks- 60

1. Taking a lot, ask for requirement, write the procedure, setup and perform the experiment 'A' as indicated, collect data/ measurements, present them and interpret the results
(Requirements-5, Procedure-5, Setup-5, and Result-5) (20 marks)
2. Write notes on B&C- (Identification-1, Procedure/Notes-2) (2x3=6 marks)
3. Demonstrate the experiment in Microbiology as indicated D
(Procedure-5, Demonstration-5) (1x10=10 marks)
4. Perform Gram Staining using the given bacterial culture E.
Write the procedure and submit the slide for valuation.
(Procedure-6, Slide-2, Comment-2) (10 marks)
5. Write notes of microbiological interest on F
(Identification -1, Diagram – 1, Notes - 2) (1x4=4 marks)
6. Record Note (10 marks)

Total = 60

EXTERNAL

KEY AND SCHEME OF VALUATION

Time: 3 hours

Max. Marks- 60

1. 'A' – From physiology Major experiments
(Requirements-3, Procedure-5, Setup-5, and Result-5, Interpretation-2) (20 marks)
2. B&C- Physiology spotters (Identification-1, Procedure/Notes-2) (2x3=6 marks)
3. D - Microbiology Experiments (any one Plating techniques)
(Procedure-5, Demonstration-5) (1x10=10 marks)
4. E – Gram Staining (Positive/negative)
(Procedure-6, Slide-2, Comment-2) (1x10=10 marks)
5. F – Microbiology spotters (Media/ Dye/Sterilization tools)
(Identification -1, Diagram – 1, Notes - 2) (1x4=4 marks)
6. Record Note (10 marks)

Total = 60



**III YEAR – VI SEMESTER
COURSE CODE: 4BBO6P1**

**CORE COURSE XV – PRACTICAL – IV
(Covering the Core Courses XII, XIII & XIV)
INTERNAL QUESTION**

Time: 3 hours

Max. Marks- 40

- | | |
|--|-------------|
| 1. From minor physiology experiments setup <u>A</u> -
(Procedure-5, Interpretation-2) | 07 marks |
| 2. Write critical notes on <u>B</u> -
(Identification-1, Notes-2) | 03 marks |
| 3. Write notes of Microbiological interest on <u>C&D</u> -
(Identification-1, sketch-1, Notes-1) | 2x3=6 marks |
| 4. Write the procedure for biotechnology <u>E</u> as indicated -
(Identification-1, sketch-1, Procedure-4, Interpretation -2) | 1x8=8 marks |
| 5. Write notes on of Biotechnological interest on <u>F & G</u> -
(Identification-1, sketch-1, Notes-2) | 2x3=6 marks |
| 6. Continuous assessment . | 10 marks |

Total = 40

INTERNAL

KEY AND SCHEME FOR VALUATION

Time: 3 hours

Max. Marks- 40

- | | |
|--|-------------|
| 1. From minor physiology experiments setup <u>A</u> -
(Procedure-5, Interpretation-2) | 7 marks |
| 2. Write critical notes on <u>B</u>
(Photographs/models from Physiology spotters)
(Identification-1, Notes-2) | 3 marks |
| 3. Write notes of Microbiological interest on <u>C&D</u> -
(Identification-1, sketch-1, Notes-1) | 2x3=6 marks |
| 4. Write the procedure for biotechnology <u>E</u> as indicated -
(Identification-1, sketch-1, Procedure-4, Interpretation -2) | 1x8=8 marks |
| 5. Write notes on of Biotechnological interest on <u>F & G</u> -
(Identification-1, sketch-1, Notes-2) | 2x3=6 marks |
| 6. Continuous assessment by practical in-charge based on the
performance in the practical, attendance, record submission etc. | 10 marks |

Total = 40



**III YEAR – VI SEMESTER
COURSE CODE: 4BBOE3A**

ELECTIVE COURSE III (A) – BIOFERTILIZERS & BIOPESTICIDES

Unit I

Biofertilizers – Definition, kinds, microbes as biofertilizers, Symbiotic associates – Rhizobium taxonomy, Physiology, Host cell – Rhizobium interactions, mass cultivation, inoculants and serology.

Unit II

Frankia woodland and Actinorhizal nitrogen fixing plants and its host plants, Characteristics, identification, cultural methods and maintenance of Azospirillum, Azotobacter, Azolla and Anabaena.

Unit III

Mycorrhiza – VAM association, types, occurrence, collection, isolation and inoculum production.

Unit IV

Large scale production of biofertilizer, Organic farming, Carrier materials, general outline of microbes as fertilizers, Rhizosphere effect microbial products influencing plant growth.

Unit V

Biopesticides – Definition, Kinds and commerce of biopesticides, Bacillus thuringiensis, insect viruses and entomopathogenic fungi – its characteristics, physiology, mechanism of action and application.

Text books

1. Yaacovokan, (1994) – Azospirillum, CBS press.
2. Subba Rao, N.S. (2000) Soil Microbiology, Oxford and IBH Publishing Co., Ltd.

Reference

1. Verma A and Hock B. (1995) Mycorrhiza, ISBN.
2. Wicklow, D.T. and B.E. Soderstrom, (1997) Environmental and Microbial relationships., Springer ISBN.



**III YEAR – VI SEMESTER
COURSE CODE: 4BBOE3B**

ELECTIVE COURSE III (B) - BIOINFORMATICS

Unit I

Bioinformatics – Definition – Biological & Specialized Databases – Nucleic acid sequence databases: GenBank, EMBL, DDBJ – Protein sequence databases: SWISS – PROT, TrEMBL, PIR_PSD – Genome Databases at NCBI, EBI, TIGR, SANGER – Virtual Library.

Unit II

Bioinformatics servers – NCBI – EBI – GENOMENET – Bibliographic resources and literature databases – PUBMED, MEDLINE, AGRICOLA – Database Searching techniques – ENTREZ – Data Mining – techniques & tools – Data Warehousing – Top Down & Bottom up approaches.

Unit III

Sequence patterns & representation – consensus, regular expression, contigs, motifs and blocks – Sequence Analysis – FASTA – BLAST – Scoring matrices – PAM and BLOSUM – Pairwise alignments – Multiple sequence alignments – CLUSTALW and Pileup – dendrograms and its interpretation.

Unit IV

Phylogenetic analysis – taxonomy and phylogeny – molecular evolution – Data used in Taxonomy and Phylogeny – Phylogenetic trees – Definition and description – types of trees – tree construction – tree analysis – homologous – orthologous – paralogous – Phylip and phylogenetic analysis.

Unit V

Application of Bioinformatics – Drug designing – Drug discovery cycle – Role of Bioinformatics in drug design – Target identification – lead discovery – Structure-based drug design – Modeling of target – small molecule interactions.

Text books

1. Attwood, T.K. and D.J. Parrysmith, 2001, Introduction to Bioinformatics. Pearson Education (Singapore) Pte. Ltd., Indian Branch, Delhi.

Reference books

1. Bryan Bergersen, M.D., 2003. Bioinformatics computing. Pearson Education (Singapore) Pte. Ltd., Indian Branch, Delhi.
2. Rastogi, S.C., Mamita Menderatta, Parag Rastogi, 2004. Bioinformatics – concepts, skills and applications. CBS Publishers & Distributors, New Delhi.
3. Westhead, D. R. and J. H. Parish and R.M. Twyman, 2003. Bioinformatics. Viva Books Private Ltd., New Delhi.
4. Sahai, S., 1999. Genomics and Proteomics: Functional and computational aspects. Viva Books Private Ltd., New Delhi.
5. Hooman Rashidi H. & L.K. Buchler, Bioinformatics

