

B. Sc. BOTANY
SYLLABUS - 2014

SCHOOLS OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF BIOLOGICAL SCIENCES
St. JOSEPH'S COLLEGE (Autonomous)

Accredited at 'A' Grade (3rd Cycle) by NAAC
College with Potential for Excellence by UGC
TIRUCHIRAPPALLI - 620 002, INDIA

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POST GRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from this academic year 2014 – 15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCH and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The **multi-discipline** nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of 150 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

SUMMARY OF HOURS AND CREDITS UG COURSES BOTANY

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
I	I-IV	Languages (Tamil/Hindi/French/Sanskrit)	4	16	12	12
II	I-IV	General English	4	20	12	12
III	I-VI	Core Theory Practicals Internship & Project Work Comprehensive Exam	17	90	69	98
		Core Electives	3	12	11	
		Allied	4	24	18	
		Additional Core Courses for Extra Credits	-	-	-	
IV	V-VI	Skilled Based Electives Between Schools (BS) Within School (WS)	1 1	2 2	2 2	4
		Inter Departmental Courses (IDC) - Soft Skills	1	2	2	2
	I-IV	NMC Communicative English Computer Literacy	1 1	0 2	5 2	7
		Environmental Studies	1	2	2	2
			Value Education	4	8	8
V	I-V	SHEPHERD & Gender Studies	1	-	5	5
	I-V	AICUF, Fine Arts, Nature Club, NCC & NSS				
TOTAL				180		150

Course Pattern

The Under Graduate degree course consists of Five vital components. They are as follows:

Part-I : Languages (Tamil / Hindi / French / Sanskrit)

Part-II : General English

Part-III : Core Course

(Theory, Practical, Core Electives, Allied, Project, Internship and Comprehensive Examinations)

Part-IV : SBE, NMC, Value Education, Soft Skills & EVS

Part-V : SHEPHERD, AICUF, Finearts, Nature Club, NCC, NSS, etc.

Non-Major Courses (NMC)

There are three NMC's – Communicative English, Computer Literacy and Environmental Studies offered in the I, II & III Semesters respectively.

Value Education Courses:

There are four courses offered in the first four semesters for the First & Second UG students.

Non Major Elective / Skill Based Elective:

These courses are offered in two perspectives as electives "With-in School" (WS) and "Between School" (BS).

Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

14	UXX	X	X	XX	XX
↓	↓	↓	↓	↓	↓
Year of Revision	UG Code of the Dept	Semester of the Part	Specification	Subject Category	Running in that part
14	UBO	1	3	2	1

For Example :

I B.Sc. Botany, first semester Algae and Bryophytes

The code of the paper is 14UBO130201.

Thus, the subject code is fixed for other subjects.

Subject Category

- 00 - Languages (Tamil / Hindi / French / Sanskrit)
- 01 - General English
- 02 - Core (Theory, Practicals, Comprehensive Exams, Internship & Project viva-voce)
- 03 - Core Electives
- 04 - Allied
- 05 - Additional core Courses for Extra Credits (If any)
- 06 - Skill Based Electives (BS) & (WS)
- 07 - Soft Skill
- 08 - NMC (Communicate English, Computer Literacy/SAP)
- 09 - EVS
- 10 - Value Education
- 11 - SHEPHERD & Gender Studies
- 12 - AICUF / Nature Club / Fine Arts / NCC / NSS / etc.

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks	
Passing Minimum: 40 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

MID-SEM & END – SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
4. The 10 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE / FALSE; and FILL-IN BLANKS.
5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.
6. English Composition once a fortnight will form one of the components for UG general English

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: 30 Marks

Objective MCQs only

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

Part-B + C = 70 Marks

Descriptive

Part-B: 5 x 5 = 25 marks; inbuilt choice;

Part-C: 3 x 15 = 45 marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25

Part-B: 25 x 3 = 75 marks.

Duration of Examination must be rational; proportional to teaching hours
90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

EVALUATION

Percentage Marks, Grades & Grade Points
UG (Passing minimum 40 Marks)

Qualitative Assessment	Grade Points	Grade	Mark Range (%)
Exemplary	10	S	90 & above
Outstanding	9	A+	85-89.99
Excellent	8	A	80-84.99
Very Good	7	B	70-79.99
Good	6	C	60-69.99
Satisfactory	5	D	50-59.99
RA	4	E	40-49.99
	0	RA	<40

CGPA - Calculation

Grade Point Average for a semester is calculated as indicated here under:

$$\frac{\text{Sum total of weighted Grade Points}}{\text{Sum of Credits}}$$

Weighted Grade Points is *Grade point x Course Credits*. The final CGPA will only include: Core, Core Electives & IDCs.

A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

Continuous Internal Assessment (CIA):

Class	Mark Range (%)
Distinction	75 & above, first attempt
First	60 & above
Second	50 to 59.99
Third	40 to 49.99

Declaration of Result:

Mr./Ms. _____ has successfully completed the Under Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part – III is _____ and the class secured is _____ by completing the minimum of 150 credits.

The candidate has acquired _____ (if any) more credits from SHEPHERD / AICUF/ FINE ARTS / SPORTS & GAMES / NCC / NSS / NATURE CLUB, ETC. The candidate has also acquired _____ (if any) extra credits offered by the parent department courses.

B. Sc. BOTANY
Course Pattern - 2014 Set

Sem	Part	Code	Course	Hrs	Crs	
I	I	Language	14UGT110001	Language - I: (Tamil / Hindi / French / Sanskrit)	4	3
	II	English	14UGE120101	General English I	5	3
	III	Core	14UBO130201	Algae and Bryophytes	5	3
			14UBO130202	Fungi, Plant Pathology and Lichens	5	3
			14UBO130203	Lab. Course 1	3	2
	Allied	14UBO130401	Allied I: Zoology I - General Zoology	4	3	
		14UBO130402	Allied I: Lab. Course: Zoology 1	2	2	
	IV	NMC	14UCE140801	Communicative English: Bridge Course	-	5
Val. Edn.		14UFC141001	Value Education: Essential of Ethics, Yoga and Stress Management	2	2	
Total for Semester I				30	26	
II	I	Language	14UGT210002	Language - II: (Tamil / Hindi / French / Sanskrit)	4	3
	II	English	14UGE220102	General English II	5	3
	III	Core	14UBO230204	Pteridophytes, Gymnosperms and Paleobotany	4	4
			14UBO230205	Morphogenesis, Anatomy and Embryology	4	3
			14UBO230206	Lab. Course 2	3	2
	Allied	14UBO230403	Allied I: Zoology II – Agricultural Entomology	4	3	
		14UBO230404	Allied I: Lab. Course: Zoology II	2	2	
	IV	NMC	14UCE240802	Computer Literacy	2	2
V. Edn.		14UFC241002	Techniques of Social Analysis	2	2	
Total for Semester II				30	24	
III	I	Language	14UGT310003	Language - III: (Tamil / Hindi / French / Sanskrit)	4	3
	II	English	14UGE320103	General English III	5	3
	III	Core	14UBO330207	Taxonomy of Angiosperms	5	3
			14UBO330208	Plant Breeding and Evolution	3	2
			14UBO330209	Lab Course 3	3	2
	Allied	14UBO330405 A	Allied II: Chemistry for Biologists I OR	4	3	
		14UBO330405 B	Allied II: Biometrics & Computer Applications I			
		14UBO330406	Allied II: Lab. Course 1	2	2	
	IV	NMC	14UCE340901	Environmental Studies	2	2
		Val. Edn.	14UFC341003 A	Professional Ethics-I: Social Ethics OR	2	2
14UFC341003 B			Professional Ethics-I: Religious Doctrine			
Total for Semester III				30	22	

IV	I	Language	14UGT410004	Language - IV: (Tamil / Hindi / French / Sanskrit)	4	3
	II	English	14UGE420104	General English IV	5	3
	III	Core	14UBO430210	Molecular Biology	5	3
			14UBO430211	Cell Biology and Genetics	5	3
			14UBO430212	Lab Course 4	3	2
	Allied	14UBO430407 A	Allied II: Chemistry for Biologists II OR	4	3	
		14UBO430407 B	Allied II: Biometrics & Computer Applications II			
	Allied	14UBO430408	Allied II: Lab Course 2	2	2	
		IV	Val. Edn.	14UFC441004 A	Professional Ethics-II : Social Ethics OR	2
	14UFC441004 B			Professional Ethics-II : Religious Doctrine		
Total for Semester IV				30	21	
V	III	Core	14UBO530213	Biophysics and Biostatistics	4	3
			14UBO530214	Ecology and Phytogeography	4	3
			14UBO530215	Lab. Course 5	3	2
			14UBO530216	Microbiology and Immunology	4	3
			14UBO530217	Lab. Course 6	3	2
	Core Elec.	14UBO530301 A	Biopesticides OR	4	4	
		14UBO530301 B	Organic Farming			
		14UBO530302 A	Medicinal Botany OR	4	4	
	14UBO530302 B	Horticulture and Landscaping				
	IV	SBE	14UBO540601	(BS): Mushroom Culture	2	2
IV	IDC	14USS540701	Soft Skills	2	2	
Total for Semester V				30	25	
VI	III	Core	14UBO630218	Internship	-	2
			14UBO630219	Plant Physiology	5	3
			14UBO630220	Lab. Course 7	3	2
			14UBO630221	Genetic Engineering & Biotechnology	5	3
			14UBO630222	Biochemistry	4	3
	Core Elec.	14UBO630223	Lab. Course 8	3	2	
		14UBO630224	Comprehensive Examination	-	2	
		14UBO630303 A	Bio-instrumentation OR	4	4	
	14UBO630303 B	Seed Technology				
	Core Elec.	14UBO630304 A	Biological Techniques OR	4	4	
14UBO630304 B		Wood Technology				
IV	SBE	14UBO640602	(WS): Herbal Technology	2	2	
Total for Semester VI				30	27	
I-V	V		14UCW651101	SHEPHERD and Gender Studies		5
Total for all Semesters				180	150	

* Code numbers according to the subject chosen

@ Practical examination in the following even semester.

gUtk; 1
14UGT110001

kz p Neuk; 4
Gssrfs; 3

ngHJ j j kpo;-I

Nehf;fqfs;

1. r%f khwwr; rpej i dfi s c s s l f f i a j w f h y , y f f i a q f i s m w p k f k ; n r a j y ;
2. G J f f t p i j > r p w f i j > c i u e i l M f i a , y f f i a q f s ; p d e a k ; g h u h l l j y ;
3. r e j i g g p i o a p d w p v o j k h z t h f i s g ; g a p w w t i j j y ;

gad;fs;

1. k h z t h f s ; r % f k h w w r r p e j i d f i s m w p e j n f h s ; t h ;
2. r e j i g g p i o f i s e f f p v o j k ; j p w d ; n g w t h ;
3. G j j y f f i a q f i s g ; g i l f f k ; j p w i d a k ; j p w d h a ; T n r a A k ; j p w i d a k ; n g w t h ;

myF-1: k f h f t p g h u j p a h h ; f t p i j f s ;

g h u j i j h r d ; f t p i j f s ;
c i u e i l - K j y ; % d w f l l i u f s ; (10 k z p Neuk)

myF-2: g l l f n f h l i l a h h ; g h l y f s ;

g h t y n u w n g u o r j j p d h h ; g h l y f s ;
, y f f z k ; - t y p k p f h , l q f s ; (12 k z p Neuk)

myF-3: G J f f t p i j t b t q f s ;

, y f f i a t u y h w - % d w h k ; g h f k ;
r p w f i j - K j y ; M W r p w f i j f s ; (10 k z p Neuk)

myF-4: G J f f t p i j f s ;

n g z z p a f ; f t p i j f s ;
, y f f i a t u y h w - e h d ; f h k ; g h f k ;
, y f f z k ; - t y p k p f h , l q f s ; (14 k z p Neuk)

myF-5: n k h o p n g a h g G f f t p i j f s ;

r p w f i j - 7 K j y ; 12 K b a c s s r p w f i j f s ;
c i u e i l - 4 K j y ; 6 K b a c s s f l l i u f s ; (14 k z p Neuk)

ghl E)y;

1. n g H J j j k p o ; n r a A s ; j p u l l - j k p o h a ; T j ; J i w n t s p a l - 2 0 1 4 - 2 0 1 7
2. r % f t p a y ; N e h f ; f i y ; j k p o ; , y f f i a t u y h w > j k p o h a ; T j ; J i w n t s p a l > J } a t s d h h ; f y ; Y } h p j p U r r p u h g g s s p 2 > 2 0 1 4
3. c i u e i l f ; N f h i t - j k p o h a ; T j ; J i w n t s p a l > 2 0 1 4
4. r p w f i j j n j h F g G

Sem. I
14UGE120101

Hours/Week: 5
Credits: 3

GENERAL ENGLISH-I

Objectives

To help students

- * Use words and phrases related to self, home, friends and relatives in meaningful contexts.
- * Use language to perform basic functions like describing, clarifying, suggesting, and giving directions.

Unit-1

01. Personal Details
02. Positive Qualities
03. Listening to Positive Qualities
04. Relating and Grading Qualities
05. My Ambition
06. Abilities and Skills
07. Self-Improvement Word Grid
08. What am I doing?
09. What was I doing?
10. Unscramble the Past Actions
11. What did I do yesterday?

Unit-2

12. Body Parts
13. Actions and Body Parts
14. Value of Life
15. Describing Self
16. Home Word Grid
17. Unscramble Building Types
18. Plural Form of Naming Words
19. Irregular Plural Forms
20. Plural Naming Words Practice
21. Whose Words?

Unit-3

22. Plural Forms of Action Words
23. Present Positive Actions
24. Present Negative Actions
25. Un/Countable Naming Words
26. Recognition of Vowel Sounds
27. Indefinite Articles

28. Un/Countable Practice
29. Listen and Match the Visual
30. Letter Spell - Check
31. Drafting Letter

Unit 4

32. Friendship Word Grid
33. Friends' Details
34. Guess the Favourites
35. Guess Your Friend
36. Friends as Guests
37. Introducing Friends
38. What are We Doing?
39. What is (s)he / are they Doing?
40. Yes / No Question
41. What was s/he doing?
42. Names and Actions
43. True Friendship
44. Know your Friends
45. Giving Advice/Suggestions
46. Discussion on Friendship
47. My Best Friend

Unit 5

48. Kinship Words
49. The Odd One Out
50. My Family Tree
51. Little Boy's Request
52. Occasions for Message
53. Words denoting Place
54. Words denoting Movement
55. Phrases for Giving Directions
56. Find the Destination
57. Giving Directions Practice
58. SMS Language
59. Converting SMS
60. Writing Short Messages
61. Sending SMS
62. The family debate
63. Family Today

Textbook

1. Joy, J.L. & Peter, F.M. (2014). *Let's Communicate*, New Delhi, Trinity Press.

Sem. I
14UBO130201

Hours/Week: 5
Credits: 3

ALGAE AND BRYOPHYTES

Objectives

- i) To understand the salient features of Algae and Bryophytes.
- ii) To study the structure and reproduction of various genera mentioned in the syllabus.

Unit I

Algae: General characteristics and classification (F.E. Fritsch). Characteristics of the various Classes as per Fritsch's system. Cell structure of prokaryotic algae (Cyanophyceae cell) and eukaryotic algae (Chlorophyceae cell).

Unit II

Thallus organization, mode of reproduction, life cycle patterns - haplontic and diplobiontic. Mass culture (Spirulina). Economic importance of algae.

Unit III

Detailed study of structure and reproduction of the following genera: Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and Polysiphonia.

Unit IV

Bryophytes: General characteristics, classification (Rothmaler, 1951). Vegetative reproduction and economic importance. Evolution of gametophytes and sporophytes in bryophytes.

Unit V

Detailed study of the following genera: Marchantia, Anthoceros and Funaria.

Book

Pandey, B.P. 2005. Simplified course in Botany, S. Chand, New Delhi.

Reference

- 1) Sharma, O.P. 1992. Text Book of Algae. Tata Mc Graw Hill, New Delhi.
- 2) Gangulee, H.C. & Kar, A.K. 1989. College Botany, Vol-II, Books & Allied, Calcutta.
- 3) Prem Puri. 1981. Bryophytes - Morphology Growth and Differentiation. Atma Ram & Sons. Lucknow.
- 4) Smith, G.M. 1955. Cryptogamic Botany Vol-1&II, Mc Graw Hill, New York.

Sem. I
14UBO130202

Hours/Week: 5
Credits: 3

FUNGI, PLANT PATHOLOGY AND LICHENS

Objectives

- i) To understand the general characteristics of Fungi and Lichens.
- ii) To study the etiology and control of various plant diseases.

Unit I

Fungi: General characteristics; Classification (J. Alexopoulos and G.C. Ainsworth). General characteristics of the various Divisions and Classes. Mode of reproduction and economic importance of fungi.

Unit II

Detailed study of morphology and reproduction of the following genera: Plasmodiophora, Albugo, Penicillium, Peziza, Puccinia and Cercospora.

Unit III

Plant Pathology: Classification of diseases - general symptoms and method of control of plant diseases mechanical, chemical and biological methods. Pathogenesis and defence mechanism.

Unit IV

Detailed study of the following diseases - mosaic disease of tobacco, Citrus canker, Late blight of potato, Red rot of sugarcane, Bunchy top of banana, Little leaf of brinjal and blast of paddy.

Unit V

Lichens: Occurrence, distribution, classification, reproduction and economic importance of lichens. Detailed study of Usnea.

Book

1. Pandey, BP 2005. Simplified course in Botany. S.Chand and Company Ltd. New Delhi.

Reference

1. Sharma OP. 1989. Text Book of fungi. Tata McGraw Hill, New York.
2. Vasishta BR & Sinha AK. 2003. Botany for degree students: Fungi. S Chand and Company Ltd., New Delhi.
3. Mehrotra, RS & Aneja, KR. 1999. An Introduction to Mycology, 2nd Ed. New Age International Publishers, New Delhi.
4. Hale, 1996. The biology of Lichens, New Age International Publishers, New Delhi.

Sem. I
14UBO130203

Hours/Week: 3
Credits: 2

Lab Course - I

Algae, Fungi, Bryophytes, Plant Pathology and Lichens

Detailed study of the types mentioned in the theory.

- **Algae:** Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and Gracilaria.
- **Bryophytes:** Marchantia, Anthoceros and Funaria.
- **Fungi:** Plasmodiophora, Albugo, Peziza, Puccinia and Cercospora.
- **Plant Pathology:** Tobacco mosaic Virus, Citrus canker, Late blight of Potato, Red rot of Sugarcane, Bunchy Top of Banana, Little leaf of Brinjal, Paddy blast
- **Lichen:** Usnea
- Visit to mushroom culture farm / study of campus flora (Algae & Fungi).

Sem. I
14UBO130401

Hours/Week: 5
Credits: 3

Allied: Zoology-I (General Zoology)

Objectives

- i) To understand the animal organization, their structure and function.
- ii) To understand the various physiological processes in human beings.

Unit I

Basic principles of Zoological Taxonomy and Nomenclature. General classification of the animal kingdom up to phylum with examples. Salient features of all phyla with examples. General features of the subphylum Chordata and Salient features of Vertebrates (Classes: Pisces, Amphibia, Reptilia, Aves and Mammalia).

Unit II

A detailed Type study of Aurelia aurita, Lampito marutii, Asterias rubens and Rana hexadactyla - morphology, all systems and life history. General topics - Human diseases caused by protozoans; Canal system of sponges.

Unit III

Human physiology: Digestion: Physiology of Digestion, Absorption and Excretion of food - Accessory glands and their role. Respiration: Transport

of Oxygen and Carbon dioxide, cellular oxidation, respiratory quotient, oxygen debt. Excretion: Structure of a nephron, Physiology of urine formation, physical characteristics and chemical composition of urine.

Unit IV

Circulation - Structure and working of artery, vein and heart. Blood: Haemopoiesis, Types of blood cells, structure of haemoglobin; Mechanism of Blood clotting, functions of plasma proteins. Blood grouping. Lymph and its functions. Muscles: Contraction. Proteins involved and theories of contraction.

Unit V

Hormones: Types, control and general mode of action of water soluble and steroid hormones. Reproduction - male and female reproductive organs and formation of gametes, Pregnancy and birth. Nervous control: Structure of neuron; Types of neurons; nerve impulse transmission, synaptic transmission.

Book

1. Ekambaranantha Ayyar & Ananthakrishnan. 1985. Outlines of Zoology - Vol.I, S. Viswanathan Pvt. Ltd., Chennai.

Reference

1. Rajan K & McConnell, MS. 2010. Manual of Zoology. Theory and practicals, Dept. of Plant Biology and Plant Biotechnology, St. Joseph's College, Tiruchirappalli.
2. Gerard, J. Tortord, R.L.Evans & Anagnostakos, NP. 1982. Principles of Human Physiology, Harpor Roul Publishers, New York.
3. Jordan, E.L. & Verma, P.S. 1976 Invertebrate Zoology, S.Chand & Co. Ltd., 6th Edn., New Delhi.
4. Kotpal, RL 1976. Modern Text Book of Zoology (Invertebrate), Rastogi Publications, Meerat.
5. Nagabhushan & Kodarkar. 1976. Text Book of Animal Physiology, Oxford & IBH.
6. Paul B. Weisz. 1975. The Science of Biology, Tata McGraw Hill, 4th Edn., New Delhi.

Sem. I
14UBO130402

Hours/Week: 2
Credits: 2

Allied: Lab Course - II **ZOOLOGY-I**

- **Earthworm**
External features and dissection of digestive and nervous systems - mounting of body and penial setae, ovary and spermatheca
- **Pila**
Structure of shell - Dissection of mantle cavity and radula, dissection of digestive system.
Representative animal for each class in vertebrate, and invertebrate phyla.
Different tissues.human blood cell identification. Campus fauna identification.

Visit to a vermicompost farm and submission of report.

gUtk; 2
14UGT210002

kz p Neuk; 4
GSSpfs; 3

ngHJ j j kp;II

Nehffqfs; :

1. rka eyyrz f;f cz hi t tshj j y;
2. j kp;f; fhggjaqfs;py; moFk; mwTz hTk; C I Lk; gFj pfi sg; gbj ;Jg; GhpeJ nfhsSj y;
3. c i uei l f; fl Li u vOJk; j p;wd; ngWj y;

gadfs; :

1. j kpi oj ; j pUj j khfg; gbffFTk; NgrTk; gpi oapdwp vOj Tk; Nj hrrp ngWj y;
2. , yffjaqfs;py; gbj j twi w Ki wahf thofi fapy; fi l ggobj j y;

myF: 1 (12 kz p Neuk)

rpyggj pfhuk; - kJi uf; fhz ;l k; (fhL fhz ; fhi j)
, yffja tuyhW - i rtk; tsuj j j kp; Kj y; Guhz qfs;Kba.

myF : 2 (12 kz p Neuk)

kz pNkfi y - ghj j uk; ngww fhi j
nghpGuhz k; - nkagngHUsehadhh; Guhz k;

myF : 3 (12 kz p Neuk)

fkguhkhaz k; - fhL rpggl yk;
c i uei l - 7 Kj y; 9 Kba c ss fl Li ufs;
, yffz k; - vOj j pyffz k;

myF : 4 (12 kz p Neuk)

Fz qFb k] j hd; rhf;g ghl y;fs;
rwwpyffjaqfs; - fypqfj ;Jgguz p
c i uei l - 10 Kj y; 11 ti uapyhd fl Li ufs;

myF : 5 (12 kz p Neuk)

, ul rz pa ahj j p;pfk; kuz ggl yk;
, yffja tuyhW - j kp; , yffz E)y;fs; Kj y; rwwpyffjaqfs;
Kba.
, yffz k; - nrhyypffz k;

ghl E)y;

1. nraAs; j pul L - j kpha;Tj ;Ji w ntsjaL> 2014-2017.
2. r%ft;ay; Nehffpy; j kp; , yffja tuyhW> j kpha;Tj ;Ji w ntsjaL> J}atsdhh; fy;Y)hp j pUrrpuhggssp 2014.
3. c i uei l fNfhi t> j kpha;Tj ;Ji w ntsjaL> 2010.

SEM-II
14UGE220102

Hours/week: 5
Credits: 3

GENERAL ENGLISH-II

Objectives

To help students

- * Use words and phrases related to education, entertainment, career, and society in meaningful contexts.
- * Use language to perform basic functions like comparing, debating, and storytelling.

Unit 1

01. Education Word Grid.
02. Reading Problems and Solutions.
03. Syllabification.
04. Forms for Expressing Quality.
05. Expressing Comparison.
06. Monosyllabic Comparison.
07. Di/polysyllabic Comparison.
08. The best monosyllabic Comparison
09. The best di/polysyllabic Comparison.
10. Practising Quality Words.

Unit 2

11. Wh Words
12. Yes/No Recollection
13. Unscramble Wh Questions
14. Wh Practice
15. Education and the Poor
16. Controlled Role play
17. Debate on Education
18. Education in the Future
19. Entertainment Word Grid
20. Classify Entertainment Wordlist
21. Guess the Missing Letter
22. Proverb-Visual Description
23. Supply Wh Words
24. Rearrange Questions
25. Information Gap Questions

Unit 3

26. Asking Questions
27. More about Actions
28. More about Actions and Uses

29. Crime Puzzle
30. Possessive Quiz
31. Humorous News Report
32. Debate on Media and Politics
33. Best Entertainment Source

Unit 4

34. Career Word Grid
35. Job-Related Wordlist
36. Who's Who?
37. People at Work
38. Humour at Workplace
39. Profession in Context
40. Functions and Expressions
41. Transition Fill-in
42. Transition Sord Selection
43. Professional Qualities
44. Job Procedures
45. Preparing a Resume
46. Interview Questions
47. Job Cover Letter Format
49. E-mailing an Application
50. Mock Interview

Unit 5

51. Society Word Grid
52. Classify Society Wordlist
53. Rearrange the Story
54. Storytelling
55. Story Cluster
56. Words Denoting Time
57. Expressing Time
58. What Can You Buy?
59. Noise Pollution
60. Positive News Headlines
61. Negative News Headlines
62. Matching Conditions
63. What Would You Do?
64. If I were the Prime Minister
65. My Dream Country

Textbook

1. Joy, J.L. & Peter, F.M. (2014). *Let's Communicate*, New Delhi: Trinity Prss.

Sem. II
14UBO230204

Hours/Week: 4
Credits: 4

PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Objectives

- i) To study the salient features of plants belonging to pteridophytes and gymnosperms.
- ii) To study the fossilization process and formation of different types of fossils.

Unit I

Pteridophytes - General characteristics, Classification (Reimer's System, 1954). General characteristics of major classes: Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Stelar evolution, homosporous, heterosporous seed habit and economic importance.

Unit II

A detailed study of the morphology and anatomy of the following genera - Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.

Unit III

Gymnosperms - General characteristics, distribution, classification (Sporne, 1965).

Vegetative, anatomical and reproductive characteristics of major classes: Cycadopsida, Coniferopsida and Gnetopsida.

Salient features of Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Gnetales.

Unit IV

Detailed study of the following genera: Cycas, Pinus and Gnetum (developmental details not required).

Unit V

Paleobotany - Fossils, fossilization process, different types of fossils (compression, impression, petrification, coal balls). Geological time table. A detailed study of external and internal morphology and reproduction in Rhynia, Lepidodendron, Calamites and Medullosa.

Books

1. Vasishtha BR, Sinha AK & Anilkumar. 2005. Botany for degree students: Pteridophytes. S Chand, New Delhi.
2. Vasishtha PC, Sinha AK & Anilkumar. 2005. Botany for degree students: Gymnosperms. S Chand and Company Ltd., New Delhi.
3. Pandey et al., 1998. A Text Book of Botany Vol. II. S. Chand & Co. Ltd. 1980.

Reference

1. Rashid, A. 1976. An Introduction to Pteridophytes. Vikas Publishing House, New Delhi.
2. Sporne, KR. 1967. The Morphology of Gymnosperms, Hutchinson & Co., London.
3. Sporne, KR. 1975. The Morphology of Pteridophytes, Hutchinson & Co., London.

Sem. II
14UBO230205

Hours/Week: 4
Credits: 3

MORPHOGENESIS, ANATOMY AND EMBRYOLOGY

Objectives

- i. To inculcate the basics of tissues and anatomical features of plants.
- ii. To impart the knowledge about the various aspects of morphogenesis.

Unit I

Tissues - Definition, Types - Simple tissue - Parenchyma, collenchyma, sclerenchyma. Fibres and sclereids - structure and functions; complex tissues - xylem and phloem. Meristems - classification. Vegetative shoot apex and root apex. Concept of totipotency, differentiation, dedifferentiation and redifferentiation

Unit II

The stem - Primary and Secondary structure of dicotyledonous and monocotyledonous stems. Nodal Anatomy-unilacunar, trilacunar and multilacunar. Leaf- Anatomy-monocot and dicot. The root - primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth.

Unit III

Wood anatomy - secondary xylem. Physical and chemical properties of wood. Classification of wood. Commercial wood species of South India (Teak wood, Rose wood, Sandal wood and Red sandal wood).

Unit IV

Microsporangium, Microsporogenesis - Development of male gametophyte. Megasporangium, Megasporeogenesis. Development of female gametophyte (Polygonum). Monosporic (Polygonum), bisporic (Allium), tetrasporic (Peperomia).

Unit V

Double fertilization. Triple fusion. Development of dicot embryo-Capsella, Development of monocot embryo - Luzula. Endosperm -Definition. Apomixis - types and significances, Polyembryomy, Parthenogenesis and their significance.

Books

1. Pandey B.P. 2007 Plant Anatomy, S. Chand & Co. De, New Delhi.
2. Bhojwani, S S. & Bhatnagar, SP. 2008. Embryology of Angiosperms, Vikas Publishing House (P) Ltd., New Delhi.
3. Brown et al., 1981. Text book of Wood Technology, Mc Graw Hill Inc. New York.
4. Pullaiah, T., Lakshminarayana, K. and Hanumantha Rao, K. 2001. Text Book of Embryology of Angiosperms, Regency Publications, New Delhi.

Reference

1. Cuttler, EG 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
2. Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi.

Sem. II
14UBO230206

Hours/Week: 3
Credits: 2

Lab Course-II
PTERIDOPHYTES, GYMNOSPERMS, ANATOMY AND
EMBRYOLOGY

Detailed study of the types mentioned in the theory.

- **Pteridophytes:** Lycopodium, Selaginella, Adiantum and Marsilea.
- **Gymnosperms:** Cycas, Pinus and Gnetum.
- **Fossils:** Rhynia, Lepidodendron, Calamites, Lyginopteris and Medulosa.
- **Anatomy**
Study of simple and complex tissue.
Internal structure of young and old dicot and monocot stem.
Internal structure of dicot and monocot root.
Anomalous secondary thickening in Aristolochia, Bignonia, Boerhaavia, Thunbergia and Dracaena.
- **Nodal anatomy.**
Preparation of keys to identify any five important timbers of South India on the basis of anatomical characters.
- **Embryology**
TS of anther, ovary, endosperm types and dissection and isolation of developmental stages of embryos.

Sem. II
14UBO230204

Hours/Week: 4
Credits: 4

Allied: Zoology-II
AGRICULTURAL ENTOMOLOGY

Objectives

- To study the classification of insects.
- To study beneficial and harmful insects and various control measures of harmful insects.

Unit I

General classification of insects. Morphology of insects: head, external structure. Mouth parts, tentorium, compound eye, types of antennae- thorax-

tergum, sternum, pleuron. Wing structure and coupling mechanism, wing venation; legs and their modification; abdomen- abdominal appendages; and male and female external genitalia.

Unit II

Physiology of digestive, respiratory, circulatory, nervous and reproductive systems. Immature stages of insects and metamorphosis - types and hormonal regulation.

Unit III

Economically important insect orders - Coleoptera, Dictyoptera, Diptera, Hemiptera, Hymenoptera, Isoptera and Lepidoptera. General characters and classification upto order, social behavior/life of insects.

Unit IV

Economic classification of insects - beneficial (predators, parasites, pollinators, weed killers and scavengers). Destructive insects, a general knowledge of Apiculture, sericulture, lac culture. Recent trends in Integrated Pest Management. Plant protection-physical, chemical and biological methods of pest control.

Unit V

Pests of stored food materials (Sitophilus oryzae, Rhizopertha dominica, Tribolium castaneum, Sitotroga cerealella, Oryzaephilus surinamensis, Trogoderma granarium) and their control, Study of Bionomics and control of pests of Paddy (Tryporyza incertulas, Chilo polycharysa, Spodoptera mauritia), Sugarcane (Chilo infuscatellus, C. sacchariphagas, T. nivella), Cotton (Aphis gossypii, Amarasca biguttula, Thrips tabaci, Earis insulana, Platyedra gossypiella) and Coconut (Oryctes rhinoceros, Rhycolophorus ferrugineus, Nephenthis serinopa)

Books

1. Ambrose, PD. 2004. The Insect: Structure, function and biodiversity, First edition. Kalyani Publishers, New Delhi.

Reference

1. Imms, AD. 1963. General Text Book of Entomology, Asia Publ House, New Delhi.
2. Daly, HV., Doyen, JT. & Ehrlich, PR. Introduction to Insect Biology Diversity, First Edition, McGraw Hill Book, New York.

- Rajan, K & McConnell, MS. 2006. Manual of agricultural entomology - theory and practicals, Dept. of Plant biology & Plant biotechnology, St. Joseph's College, Trichy.
- Nayar, KK., Ananthakrishnan, TN. & David, BV. 1976 General and Applied Entomology, Tata McGraw Hill, New Delhi.
- Vasantharaj D B & Kumaraswami, T. 1978. Elements of Economic Entomology, Popular Book Department, Chennai.

Sem. II
14UBO230404

Hours/Week: 2
Credits: 2

Allied: Lab Course-II
ZOOLOGY-II

- * Study of distinguishing features of insects studied in theory and making sketches.
- * Collection, identification and preservation of insects of agricultural importance, predators, pollinators, and weed killers - plant galls.
- * Study of different categories of insect pests and types of damage done by them in the field, godowns and warehouses.
- * Dissection of Cockroach to study the mouthparts, digestive, nervous and reproductive systems, Salivary gland, Haemocytes. Modification of Antenna, legs, mouth parts.
- * Light trap collection and identification.
- * Visit to a local sericulture center and submission of report.

gUtk; 3
14UGT310003

kz p Neuk; 4
GSSPFS; 3

nghJ j j kpo;III

Nehffqfs; :

- nrknkhoj; ; j kpo; nraAs;fshd gj pndz Nky; fz fF> gj pndz ; fb; fz fFg; ghl y;fi sg; gbj ;Jg; nghUs; Ghpe;J nfhS;S k; j pwd; ngWj y;
- gz i l , yffpaqfs;mi keJss r%ff;fUj ;J ffi s c z hj ;Jj y;
- kuGf; ftpi j tbtqfi s mwpar; nraj y;
- ftpi j fs;py; mz pfs; mi keJss ghqi fg; Ghj y;
- Gj pdk; top j wfhyr; rKj har; rpf;fy;fi sAk> mj wfhd j h;Tfi sAk; Muhaej wj y;

gadfs; :

- nrknkhopahk; j kpo; nkhopaid; rpwgi g mwj y;
- gz i l , yffpaqfs; c z hj ;Jk; mwf;fUj ;J ffi s mwpe;J khz th; xOf;f newpary; thoe;J r%fj ; j NkkgLj ;J th;
- khz th; Gj pdj i j f; fwgj d; %yk; rKj har; rpf;fy;fi s c z h;J mtwppwFj ; j h;T fhz gh;

myF : 1 (16 kz p Neuk)
nghUeuhwWggi l (KOi kAk)

myF : 2 (10 kz p Neuk)
FWenj hi f> ahgg;pyf;fz k; (ntz gh> Mrhp;aggh)

myF : 3 (10 kz p Neuk)
fyij nj hi f , yffpa tuyhW - lj kpo; nkhopaid; nj hdi kAk; rpwgGk; Kj y; |rqfj ; nj hi f E}y;fs| Kba. Gj pdk; - KOi kAk;

myF : 4 (12 kz p Neuk)
gj mwggj ;J> GwehD}W> mz pary;f;fz k;

myF : 5 (12 kz p Neuk)
j pUf;Fws; - mwk;
ehybahh; - nghUI ghy;
, yffpa tuyhW - rqf , yffpaqfs;pd; j dtj j di kfs; Kj y; , ul i l f; fhggpaqfs; Kba.

ghl E}y;fs; :

- nraAs; j pul l> j kpha;Tj ;J i w ntspal (2014-2017)
- r%ft;pay; Nehff;py; j kpy;ffpa tuyhW> j kpha;Tj ;J i w ntspal>2014
- Gj pdk; (xtnthU fy;tpahz lK; xtnthU Gj pdk).
nehej NrhW (2014-2015)

SEM-III
14UGE320103

Hours/week: 5
Credits: 3

GENERAL ENGLISH-III

Objectives:

- * To enable the students to comprehend the local and global issues through the lessons.
- * To enable the students to do the tasks centering on Skill Development and Grammar.
- * To empower the students with interactive skills.

Tasks Designed for Each Unit	Skills Focused to be Developed for Each Unit	Hours Allotted
1. Pre-reading Task	Listening and Reading Skills through teacher-led reading practice	2 Hours
2. Objectives	Listening and Reading Skills	
3. Text	Listening and Reading Skills through teacher-led reading practice	
4. Glossary (Using Words and Phrases in Sentences)	Referring and Language Using Skills	2 Hours
5. Reading Comprehension	Reading, Speaking, and Writing Skills	1 Hour
6. Critical Analysis	Critical Thinking and Speaking Skills	2 Hours
7. Creative Task	Creative Thinking and Speaking Skills	2 Hours
8. General Writing Skills	Writing Skill	1 Hour
9. Activities on Grammar	Grammar Using and Writing Skills	2 Hours

UNIT I

- * Suggestions to Develop Your Reading Habit 12 Hrs
Grammar: Simple Present Tense

UNIT II

- * The Secret of Success: An Anecdote 12 Hrs
Grammar: Present Continuous Tense

UNIT III

- * Hygiene 12 Hrs
Grammar: Simple Past Tense

UNIT IV

- * Dr. A.P.J. Abdul Kalam: A Short Biography 12 Hrs
Grammar: Past Continuous Tense

UNIT V:

- * "Golden Rule": A Poem 12 Hrs
Grammar: Simple Future Tense & Future Continuous Tense

Textbook:

1. Jayraj, S. Joseph Arul *et al.* (2014). *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*, New Delhi, Trinity.

Sem. III
14UBO330207

Hours/Week: 5
Credits: 3

TAXONOMY OF ANGIOSPERMS

Objectives

- i) To observe the variations among plants, especially angiosperms.
- ii) To understand the way of description of a plant.
- iii) To study the floral characters with an aim to identify the taxa authentically.

Unit I

Taxonomy and its importance. Systems of classification: Brief account of Linnaeus and Engler & Prantle's classification. Detailed study of Bentham and Hooker's classification. Plant nomenclature: Elementary knowledge of ICBN: Principles, Rank of taxa, Type method, Principle of priority, Effective and valid publication and Author Citation. Herbarium technology and its uses.

Unit II

Recent trends in Taxonomy: Brief account of Cytotaxonomy, Chemotaxonomy, Molecular taxonomy and Numerical taxonomy. Morphology of angiosperms: Technical description of stem, leaf, root, Inflorescence types, flower, floral parts, preparation of floral diagram, floral formula and fruit types.

Unit III

Detailed study of the range of characters and plants of economic importance in the following families: Dicotyledons: Annonaceae, Tiliaceae, Rutaceae, Anacardiaceae, Rosaceae, Caesalpiniaceae, Myrtaceae, Lythraceae.

Unit IV

Cucurbitaceae, Apiaceae, Rubiaceae, Compositae, Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae.

Unit V

Labiatae, Amaranthaceae, Euphorbiaceae, Moraceae.

Monocotyledons: Orchidaceae, Liliaceae, Pontederiaceae, Typhaceae, Gramineae.

Books

1. Jeffrey, C. 1982. *An Introduction to Plant Taxonomy*, Cambridge University Press, UK.
2. Pandey, BP. 1999. *Taxonomy of Angiosperms*, S. Chand, New Delhi.

Reference

1. Clive AS. 1989. Plant Taxonomy and Biosystematics, Chapman and Hall Inc. NY
2. Harborne, JB & Turner, BL. 1984. Plant Chemosystematics, Acad. Press, London.
3. Lawrence, GH. 1955. Taxonomy of Vascular Plants, MacMillan Co., USA.
4. Samuel, BJ & Arlene, EL. 1987. Plant Systematics, Mc Graw Hill Inc. NY.

Sem. III

14UBO330208

Hours/Week: 3

Credits: 2

PLANT BREEDING AND EVOLUTION

Objectives

- i) To study the progress made in the field of plant breeding.
- ii) To understand the principles, techniques and applications of plant breeding.

Unit I

Plant Breeding: Historical aspect of plant breeding and genetic basis. Objectives of plant breeding - Modes of reproduction in relation to breeding methods, sexual, asexual and apomitic reproduction - Floral Biology in relation to selfing and crossing techniques. Breeding Methods: Plant introduction - Types and procedures - Centres of diversity and origin of cultivated plants.

Unit II

Hybridization: Objectives - Choice of parents - problems and causes of failure of hybridization - incompatibility and sterility. Methods of handling genetic consequence of hybridization - method of handling segregation material for isolation of superior strains - Bulk method and pedigree method of selection - Role of interspecific and intergeneric hybridization in plant improvement.

Unit III

In breeding depression and heterosis: Genetic basis and application in plant breeding. Steps in the production of single cross, double cross, three way cross and synthetics - induced polyploidy in plant breeding; role of auto and allopolyploidy - Heteroploids - Mutagen and crop improvement. Population genetics: Hardy-Weinberg principle; gene frequencies; and the factors that change it.

Unit IV

Back Crossing: Theory and procedure for transferring various types of character. Preservation and utilization of germplasm. Breeding of rice, sugarcane, groundnut and maize. Breeding for disease resistance and drought tolerance.

Unit V

Evolution: Origin of life, theories of evolution of life forms: Lamarkism, Darwinism and Speciation. Variations - Definition, causes and types, Mutations (Principles of Hugo de'veries), Role of mutations in speciation. Evidences for evolution, adaptive radiation, biological evolution.

Book

1. Chaudhari, H.K., (1995) Revised Ed., Elementary Principles of Plant Breeding.

Reference

1. Chandrasekaran & Parthasarathy, (1990). Cytogenetics and Plant Breeding.
2. Sinha, U. and Sinha, S., (1992). Cytogenetics, Plant Breeding and Evolution.
3. J.R. Sharma (1996) Principles and Practice of Plant Breeding.

Sem. III

14UBO330209

Hours/Week: 3

Credits: 2

Lab Course-III TAXONOMY OF ANGIOSPERMS AND PLANT BREEDING

1. Description of plant in technical terms.
2. A detailed study of the range of vegetative and floral characters of plants belonging to the families mentioned in the theory part.
3. Field trip to any place within or outside the state to study the plants in their natural habits.
4. Spot identification (Binomial, Family) of plants from families included in the theoretical syllabus.
5. Field note-book and 15 herbarium sheets of common angiosperms are to be prepared and submitted at the time of Practical Examination.
6. Breeding techniques: Emasculation, Layering and Grafting.

Sem. III
14UBO330405A

Hours/Week: 4
Credits: 3

CHEMISTRY FOR BIOLOGISTS-I

Objectives

- i) To understand the various chemical principles involved in Biological processes.
- ii) To apply the various concepts of chemistry in Applied Biology.

Unit I:

Inorganic Chemistry

Covalent bond - properties of covalent molecules, structures of BCl_2 , BF_3 , NH_3 , H_2O , CH_4 , SiH_4 , ClF_3 , AF_4 , PCl_5 . Ionic bond - ionization energy, electronegativity, electron affinity, lattice energy, properties of ionic molecules crystalline structure of ionic molecules. BCC, FCC, NaCl, CsCl. Coordinate bond - ligands, classification of ligands, nomenclature of complexes, oxalate, citrate tartrate, DMG, EDTA ligands and their importance. Structure of $[\text{Ag}(\text{NH}_3)_2]^+$ linear; $[\text{Cu}(\text{NH}_3)_4]^{2+}$ square planar; $[\text{Ni}(\text{Cl})_4]^{2-}$ Td; $[\text{Pt}(\text{CN})_4]^{2-}$ square planar; $[\text{Fe}(\text{CN})_6]^{2-}$ octahedral. Hydrogen bond - Kinds-intra and inter consequences of H-bond mp, bp, dimer formation, importance of it in biopolymers (proteins and Nucleic acid).

Unit II:

Organic Chemistry

Hydrocarbons: Classification (Aliphatic / Aromatic, Saturated / Unsaturated, cyclic / acyclic) nomenclature. Elimination reactions: 1. dehydrohalogenation of alkyl halides to alkenes; 2. dehydration of alcohols to alkenes. Substitution reaction: 1. aliphatic nucleophilic substitution; and 2. aromatic electrophilic substitution. Addition reaction: 1. electrophilic addition of HX to alkene; and 2. nucleophilic addition of NH_3 to aldehyde or ketone. Condensation reaction: 1. aldol condensation; and 2. condensation to polymerization (phenol to bakelite).

Unit III:

Quantitative Analysis

Error Analysis: accuracy, precision, errors, determinate and indeterminate errors, eliminating and minimizing error, relative error, absolute error. Quantitative Analysis: titrimetry, gravimetry, colorimetry. Titrimetric analysis: acid-base, redox, complexometric, precipitation. And example each with indicators used. Concentration units: mole, molarity, molality, formality,

normality, ppb, ppm, mole fraction, % W/V, V/V. Acid-base titration: primary standard, secondary standard, $V_1N_1 = V_2N_2$, acid-base titration, indicators in the illustration.

Unit IV:

Agricultural Chemistry

Soil types-red soil, black soil, alluvial soil, desert soil, red soil; role of humus: Manures and their importance. Chemical fertilizers: Natural and synthetic fertilizers: NPK fertilizers: manufacture of NPK fertilizers, mixed fertilizers; role of macronutrients and micronutrients: Pesticides: classification-insecticides, herbicides and fungicides; Structure of important pesticides: DDT, BHC, 2,4-D, 2,4,5-T; biomass and its utilization; triple revolution India (Green, Blue and White).

Unit V:

Bioinorganic Chemistry

Chemistry of chlorophyll, porphyrin unit and photosynthesis. Nitrogen fixation, carbon cycle. Chemistry of haem proteins: haemoglobin, myoglobin. Oxygen transport and respiration. Metallo enzymes, vitamins containing metals.

Books

1. Puri B.R., Sharma L.R., Kalia K.K., (1993) Principles of Inorganic Chemistry (23rd edition), New Delhi, Shoban Lal Nagin, S. Chand New Delhi.
2. Jayashree Ghosh, (1999) Text Book of Pharmaceutical Chemistry, S. Chand, New Delhi.

Reference

1. Puri B.R., Sharma L.R., Pathania M.S., (1993) Principles of Physical Chemistry (23rd edition), Shoban Lal Nagin, S. Chand, New Delhi.
2. Tiwari, Organic Chemistry, 2000 S. Chand & Company Pvt. Ltd., New Delhi.
3. R. Gopalan, 1999 Elements of Analytical Chemistry, S. Chand, New Delhi.

Sem. III
14UBO330405B

Hours/Week: 4
Credits: 3

BIOMETRICS & COMPUTER APPLICATIONS-I

Objectives

- i) To learn the basics of statistics in Biological context.
- ii) To apply the statistical principles in designing Biological experiments and solving Biological problems.

Unit I

Types of measurements - (Interval, ratio, rank order, categorical) logarithm, permutation and combination.

Unit II

Solving a simple linear equation involving one variable and two variables. Matrices - operation on matrices - Determinants - Inverse - Solving a system of equations of order 3x3 using Cramer's rule, inverse method - Gauss Elimination method.

Unit III

Mathematical modeling: The simple function and their graphs revisited - principle of least squares (concepts only) - normal equations for curves, straight line, parabola - power curves, exponential curves, $y = a + bx$, $y = ax^2 + bx + c$, $y = abx$, $y = aex$ - Solving the above system of equation.

Unit IV

Statistics - meaning - population and samples - reasons for using samples - Types of sampling (SRS, Stratified, systematic) - Describing a sample - Frequency table - Frequency graphs - Diagrammatic representation of data.

Unit V

Measures of location: Mean, Median and Mode. Measures of variability: Range, Mean deviation, Standard deviation and coefficient of variation. Skewness and Kurtosis.

Books

1. Nageswara Rao G, 1989. Statistics for Agricultural Science, Oxford & IBH, New Delhi

Reference

1. Olive Jean Dunn, 1995. Basic Statistics. A primer for the Biomedical Sciences, John Wiley and Sons.

Sem. III
14UBO330406A

Hours/Week: 2
Credits: 2

Practical: Allied Lab Course-I

The students are required to take any one of the following allied courses of their choice.

(The Botany Students can take any one of the following allied courses for their course of study).

Sem. III
14UBO330406B

Hours/Week: 4
Credits: 3

Practical: ALLIED COMPUTER LAB-I (EXCEL)

Using the Excel packages the students are asked to solve the following exercises:

1. Solving a system of equations - Inverse Matrix, Cramer's rule.
2. Curve fitting - Straight line, Regression line and second degree.
3. Construction of frequency table - Univariate, Bivariate and Cross tabs.
4. Drawing frequency graphs.
5. Pictorial presentation - Bar diagrams, Pie diagrams etc.

gUtk; 4
14UGT410004

kz p Neuk; 4
Gsspfs; 3

ngHJ j j kp;IV

Nehf;fqfs; :

- ehl fj j pd; Nehf;fk; mj d; NghfF; c j j pfs; ghj j µg; ghqF; c i uahl y; Ki w; fwi dj j µwk; Nghdwtwi w ntspggLj j y;
- Gj pa ehl fqfi sg; gi l fFk; j µwi d khz tufspi l Na c UthfFj y;

gad;fs; :

- ehl ftop mofpay; cz u;Tfi s tsuj j y;
- ehl fqfi sr; r%fg; gadghl bwF Vwg c UthfFj y;

myF : 1 (12 kz p Neuk)

kNdhdkz bak; ghapuk; mqfk; - 1> fsk; 1 - 5 ti u.

myF : 2 (12 kz p Neuk)

kNdhdkz bak; mqfk; - 2> fsk; 1 - 3 ti u.
c i uei l ehl fk; (Kj y; , uz l ehl fqfs)

myF : 3 (12 kz p Neuk)

kNdhdkz bak; mqfk; - 3> fsk; 1 - 4 ti u.

myF : 4 (12 kz p Neuk)

kNdhdkz bak; mqfk; - 4> fsk; 1 - 5 ti u.

myF : 5 (12 kz p Neuk)

kNdhdkz bak; mqfk; - 5> fsk; 1 - 3 ti u.
c i uei l ehl fk; (3> 4Mk; ehl fqfs)

ghl E)y;fs; :

- Rej udhu; kNdhdkz bak; j kpha;Tj j i w (gj µg) > J)a tsdhu; fy;Y)µ; j µUrrµhggs;2. (mqfk; : 3 fsk; : 4 ebl;fyhf)
- mz z hki y.rµ (nj h.M.)> Nr., uhkhD[k; ehl fqfs; fhtah ntsµal; nrdi d

kj µngz ; gµµ;T :

kNdhdkz bak; - 80
c i uei l ehl fk; - 20
c i uei l ehl fk; ghfk; - 3, y; fl Li u tpdhtµ; kl Lk; , l k; ngwy;
Ntz Lk;

SEM-IV
14UGE420104

Hours/week: 5
Credits: 3

GENERAL ENGLISH-IV

Objectives:

- * To enable the students to comprehend the local and global issues through the lessons.
- * To enable the students to do the tasks centering on Skill Development and Grammar.
- * To empower the students with interactive skills.

Tasks Designed for Each Unit	Skills Focused to be Developed for Each Unit	Hours Allotted
1. Pre-reading Task	Listening and Reading Skills through teacher-led reading practice	2 Hours
2. Objectives	Listening and Reading Skills	
3. Text	Listening and Reading Skills through teacher-led reading practice	
4. Glossary (Using Words and Phrases in Sentences)	Referring and Language Using Skills	2 Hours
5. Reading Comprehension	Reading, Speaking, and Writing Skills	1 Hour
6. Critical Analysis	Critical Thinking and Speaking Skills	2 Hours
7. Creative Task	Creative Thinking and Speaking Skills	2 Hours
8. General Writing Skills	Writing Skill	1 Hour
9. Activities on Grammar	Grammar Using and Writing Skills	2 Hours

UNIT-I: Women through the Eyes of Media 12 Hrs

Grammar: Present Perfect Tense

UNIT-II: Effects of Tobacco Smoking 12 Hrs

Grammar: Present Perfect Continuous Tense

UNIT-III: The Impact of Liquor Consumption on the Society 12 Hrs

Grammar: Past Perfect Tense

UNIT-IV: An Engineer Kills Self as Crow Sat on his Head: A News Paper Report 12 Hrs

Grammar: Past Perfect Continuous Tense

UNIT-V: Traffic Rules 12 Hrs

Grammar: Future Perfect Tense & Future Perfect Continuous Tense

Text Book:

Jayraj, S. Joseph Arul. et al. (2014). *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*, New Delhi, Trinity.

Sem. IV
14UBO430210

Hours/Week: 5
Credits: 3

MOLECULAR BIOLOGY

Objectives

- i) To study basic molecular mechanism in organisms
- ii) How the genes unravel themselves in conferring the traits on the organism.

Unit I

Organisation of genome - bacterial and eukaryotic: linear and circular. Mutation - types, causes and detection, mutant types - lethal, conditional, biochemical, germinal vs somatic mutants, insertional mutagenesis. Basic idea about mobile genetic elements - IS elements and transposons.

Unit II

DNA replication: semiconservative model, DNA polymerase, chemistry of synthesis, mechanism of replication in E. coli. Replication of RNA genome - replicase and reverse transcriptase. DNA repair mechanisms - mismatch and proof reading, photoreactivation, excision, recombination and SOS mechanisms in E. coli

Unit III

Gene expression and the Central Dogma, transcription: RNA polymerase, signals, chemistry of RNA synthesis, mechanism of initiation, elongation and termination in E. coli. Differences in eukaryotes, post-transcriptional processing.

Unit IV

Translation - organization of mRNA, genetic code and its characterization, ribosome and rRNA, amino acyl synthetase, tRNA and amino acid activation. Mechanism of initiation elongation and termination. Translation factors, post-translation processing.

Unit V

Regulation of gene expression: The principles, cooperative and on-off regulations. Molecular mechanism: Negative and positive, repressors and inducers. Mechanism of lac operon and trp operon in E. coli. Differences in gene regulation in eukaryotes.

Book

1. Freifelder, D.1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.

Reference

1. De Robertis & De Robertis. 1990. Cell and Molecular Biology, Saunders College, Philadelphia, USA.
2. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford.

Sem. IV
14UBO430211

Hours/Week: 5
Credits: 3

CELL BIOLOGY AND GENETICS

Objectives

- i) To understand the principle, hereditary mechanism, structure and functions of genetic materials.
- ii) To study the cellular organization and function of different cell organelles.

Unit I

Cell cycle and its regulation; organisation of cytoskeleton and microtubules; cellular mechanisms in development and differentiation. Structure, organization and functions of nucleus, mitochondria, chloroplasts, ER, ribosomes, golgi complex, lysosome and vacuole.

Unit II

Cytoplasmic membrane - structure and functions. Structure of DNA and RNA. Nucleosides and nucleotides. Primary, secondary and tertiary structures. Chromatin nucleosomes and chromosomal proteins, protamines and histones. Special chromosome types - polytene & lamp brush.

Unit III

Mendel's laws of heredity and chromosome basis of heredity. Modified Mendelian ratios. Multiple alleles, linkage and crossing over; Sex linked inheritance, sex determination mechanism. Cytoplasmic inheritance and plastid inheritance.

Unit IV

DNA as the genetic material - proof: Griffith's, Avery et al., and Hershey and Chase. RNA as genetic material. Population genetics: gene frequency, gene pool, Hardy-Weinberg equilibrium. Gene frequencies - conservation and changes. Decline of human gene pool and eugenics.

Unit V

Basic knowledge and applications of genomics and proteomics. Genomics: plant, animal and structural and functional genomics, the Arabidopsis genome, rice genome, and the human genome. Objectives of human genome project and the controversies.

Book

1. Verma, P.S. and V.K. Agarwal, 2003, Genetics. S. Chand, New Delhi.

Reference

1. Freifelder, D.1987. Essentials of Molecular Biology, Jones & Bartlett, Boston.
2. Gardner, E.J., Simmons, M.J. & Snustad, D. 1991. Principles of Genetics, John Wiley & Sons Inc., New York.
3. Sinnott, E.W., Dunn, L.L. & Dobzhansky, T. 1997. Principles of Genetics, Tata McGraw Hill, New Delhi.

Sem. IV**14UBO430212****Hours/Week: 3****Credits: 2**

Laboratory Course-4
MOLECULAR BIOLOGY, CELL BIOLOGY AND
GENETICS

1. Ultra structure of cell organelles.
2. Study of mitosis in root tips.
3. Study of meiosis in anthers.
4. Inheritance Pattern - Mendelian and Non-Mendelian ratios.
5. Linkage Mapping.
6. Estimation of allele frequency in natural (random mating) populations.
7. Extraction of human genomic DNA from saliva.
8. Isolation and display of polytene chromosomes.
9. Estimation of DNA (Colorimetric).

Sem. IV**14UBO430407A****Hours/Week: 4****Credits: 3**

Allied:
CHEMISTRY FOR BIOLOGISTS-II

Objectives

- i) To understand the chemistry of plant components and products so as to exploit chemistry in the improvement and production of phytochemicals.
- ii) To impart knowledge in some basic techniques necessary to handle the above objective.

Unit I Physical Chemistry

Thermodynamics of a chemical reaction - Terms DE, DH, DS, DG endothermic, exothermic reactions, conditions for spontaneity of reactions. Calorific value of food substances.

Chemical Kinetics - rate, order, molecularity of reactions. Importance of kinetic study, activation energy, activated complex, factors affecting rate of the reactions, the order of biological reactions.

Catalysis - act of catalysis, kinetics of enzyme catalysis, Michaelis - Menten constant, active sites, turn over number, factors affecting enzyme catalysis-concentration of substrate, temperature, pH and inhibitors.

Unit II Pharmaceutical Chemistry

Classification of drugs: Definitions of: Drug, pharmacophore, pharmacognony, pharmacy, pharmacokinetics, pharmacodynamics, pharmacopoeia (IP, BP, USP). Antibiotics: Penicillin, chloramphenicol, tetracyclins, streptomycin (only the structural properties and SAR): Analgesics, Antiinflammatory agents: General and local anaesthetics: Inhalation anaesthetics (N₂O, CHCl₃, haloethane, ethylchloride). Intravenous anaesthetics (thiopental sodium); Sedatives and hypnotics. Cardiovascular Drugs: classification and examples: cardiac glycosides, anti-hypertensive and anti-hypotensive drugs, antiarrhythmic agents, vasodepressor drugs. Antimalarials & sulphonamides.

Unit III Chemistry of Natural Products

Structural elucidation of the functional groups in natural products by chemical methods (-OCH₃, -OH, -COOH, -COOR, oxidation, reduction). Alkaloids: classification, occurrence: structure, physical properties and uses of papaverine, nicotine, coniine, terpenes: Classification, isolation, structure,

properties and uses of camphor, citral and a-pinene. Importance and uses of anthocyanins, flavones and flavonoids.

Unit IV Organic Analysis

Qualitative analysis of organic substances: test for saturation and unsaturation; aliphatic & aromatic; acidic, basic and neutral nature; elements test for N, S and halogens: functional groups like acid, phenol, aldehyde, ketone, carbohydrate, amine, ester, amide and diamide.

Unit V Chromatography

Chromatographic Techniques: Principles, instrumentation, sampling and applications of Paper, thin layer, column chromatography - gas chromatography and HPTLC.

Books

1. Tiwari, 2000 Organic Chemistry, S. Chand & Company Pvt. Ltd., New Delhi.
2. R. Gopalan, 2000 Elements of Analytical Chemistry, S. Chand, New Delhi.

Reference

1. Puri B.R., Sharma L.R., Kalia K.K., 1993. Principles of Inorganic Chemistry (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.
2. Puri B.R., Sharma L.R., Pathania M.S., 1993. Principles of Physical Chemistry (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.
3. Jayashree Ghosh, 1999. Text Book of Pharmaceutical Chemistry, S. Chand & Company Pvt. Ltd., New Delhi.

Sem. IV
14UBO430407B

Hours/Week: 4
Credits: 3

Allied:

BIOMETRICS AND COMPUTER APPLICATIONS-II

Objectives

1. To understand the usefulness of statistics in biological sciences.
2. To enable the students to handle and analyse biological data.

Unit I

Probability: Normal distribution - Definition - Properties - areas under normal curve - Interpreting areas as probabilities - importance of normal

distributions. Confidence interval: confidence interval for means - between two means, variance and proportion.

Unit II

Testing of hypothesis: Null hypothesis - Two kinds of errors - Testing of hypothesis based simple mean - difference between mean and population proportion; difference between the population proportion. Chi-square test, Goodness of fit, Test for independence, F test: Equality of variances.

Unit III

Correlation and regression: Correlation: types of correlation - scatter diagram - Pearson's coefficient of correlation - Rank correlation. Simple regression: meaning of regression lines - Regression equations Y on X and X on Y only - Regression Coefficient - Simple problems.

Unit IV

Theory of Attribute: Introduction - notations - dichotomy - classes and class frequencies - consistency of data - criteria of independence - Yule's coefficient of association - coefficient of colligation.

Unit V

Comparison between parametric and non parametric tests. Non-parametric tests - Single test, Run test for randomness, Wald-Wolfowitz run test, Median test, Wilcoxon single rank test, Mann Whitney U test - (no derivations - conceptual and applications, understanding are to be tested).

Books

1. Nageswara Rao G. 1999. Statistics for Agricultural Science OXFORD & IBH publishing Co.

Reference

1. Olive Jean Dunn, 2001. Basic Statistics: A primer for the Biomedical Sciences - John Wiley and Sons.

Sem. III & IV
14UBO430408A

Hours/Week: 2
Credits: 2

Allied:

PRACTICAL CHEMISTRY FOR BIOLOGISTS - II

I. Volumetric Analysis

1. Estimation of HCl (Std. oxalic acid \checkmark NaOH \checkmark HCl)
2. Estimation of NaOH (Std. NaCO₃ \checkmark HCl \checkmark NaOH)
3. Estimation of oxalic acid (Std. FAS \checkmark KMnO₄ \checkmark oxalic acid)
4. Estimation of FAS (Std. oxalic acid \checkmark KMnO₄ \checkmark FAS)
5. Estimation of KMnO₄ (Std. K₂Cr₂O₇ \checkmark FAS \checkmark KMnO₄)
6. Estimation of ascorbic acid (iodimetry)
7. Estimation of phenol / aniline (iodimetry)
8. Estimation of copper (iodimetry)
9. Estimation of zinc (edta titration)
10. Estimation of magnesium (edta titration)
11. Estimation of hardness of water (edta titration)

II. Organic Analysis

- a) Identification of acidic, basic, phenolic and neutral organic substances.
- b) Test for aliphatic and aromatic nature
- c) Test for saturation and unsaturation.
- d) Detection of N, S and halogens.
- e) Identification of functional groups.
 - i) Carboxylic acid (mono-, di-& unsaturated)
 - ii) Phenol
 - iii) Aldehyde
 - iv) Ketone
 - v) Ester
 - vi) Carbohydrates
 - vii) Primary amine
 - viii) Amide (mono-&di-)

References

1. J.N. Gurtu and Kapoor, 1987. Experimental Chemistry, S. Chand and Co.
2. N.S. Gnanapragasam and G Ramamurthy, 1998. Organic Chemistry - Lab Manual, S. Viswanathan & Co. Pvt. Ltd.

Sem. IV
14UBO430408B

Hours/Week: 2
Credits: 2

MOLECULAR BIOLOGY

1. Finding Mean and Variance.
2. Finding correlation coefficient, Rank Correlation.
3. T-test
4. F-test
5. Chi-square test
6. Non-parametric tests.

Sem. V
14UBO530213

Hours/Week: 4
Credits: 3

BIOPHYSICS AND BIOSTATISTICS

Objectives

1. To provide further understanding of the fundamental physical principles while applying them to biological systems.
2. To learn to critically evaluate topics in the emerging field of biophysics.
3. To understand the various applications of statistics with reference to biological sciences.

BIOPHYSICS

Unit I

Bioenergetics - Energy and work. Laws of thermodynamics - Concept of Entropy and Enthalpy - Gibb's Free Energy - Energy transduction in Biological systems - High energy compounds - ATP bioenergetics. Radioactivity - structure of an atom - isotopes - types of radiations - detection of radiation - autoradiography. Application of radioactive isotopes in biological studies.

Unit II

Photobiology - Electromagnetic Spectrum - Visible range of spectrum - Dual nature of light (wave & particle nature) - Solar energy and photosynthesis - Energy states of atom - Spin property - Absorption spectra of molecules - Energy states - Excitation - singlet and triplet states - De-excitation - Heat emission - Light emission. Bioluminescence. pH - definition and its biological significance. Buffer - definition, types, some importance of buffers.

BIOSTATISTICS

Unit III

Introduction - Definition - Data: Primary & Secondary; Observational & Experimental; Probabilistic & Deterministic; Variable: discrete & continuous - Population & Sample; Sampling techniques - Classification of data - Frequency Distribution: Discrete, Continuous and Cumulative Frequency Distributions - Parts of a statistical Table - Advantages of classification of Data. Presentation of Data - Histogram, Frequency polygon, Frequency curve, Ogive curve, Bar Charts: Simple, Multiple, Subdivided, percentage - Pie diagram.

Unit IV

Measures of Location - Measures of Central Value: Mean, Median, Mode - Measures of dispersion: Range, Mean Deviation, Standard Deviation,

Coefficient of Variation - Skewness and Kurtosis. Correlation & Regression - Definition - Types - Methods of studying correlation: Scatter diagram Method and Karl Pearson's coefficient of correlation for simple and linear data - Regression: definition - Regression Lines.

Unit V

Probability - Definition - Binomial, Poisson and Normal distributions. Tests of Significance General procedure - Large sample testing & Small sample testing: t-Test, Chi-square test and F test.

Books

1. Bose, 1981. Elementary Biophysics, Vijaya Printers, Chennai.
2. Nageswara Rao, G. 1983. Statistics for Agricultural Science Oxford & IBH, Calcutta.

Reference

1. S.P. Gupta, 2008. Elementary Statistical Methods, Sultan Chand & Sons, New Delhi.
2. Conn, E. & Stumpf, P.K., 1979. Outline of Biochemistry, Niley Easdtorn, New Delhi.
3. Das Gupta, S.K., 1977. Biochemistry Vol.II, Macmillan & Co., New Delhi.
4. Metz, E.T., 1960. Elements of Biochemistry, V.F & S (P) Ltd., Bombay.
5. Casey, E.J., 1969. Biophysics; Concepts and Mechanisms, East & West Press, New Delhi.
6. Renganatha Rao, K., 1986. Text Book of Biochemistry, Prentice-Hall of India (P) Ltd., ND.
7. Saim, A.S., 1994. Text Book of Biochemistry, CBS Publishers, New Delhi.

Sem. V
14UBO530214

Hours/Week: 4
Credits: 3

ECOLOGY AND PHYTOGEOGRAPHY

Objectives

1. To enable the students to understand the fundamentals of ecology and phytogeography.
2. To study the structure, function and components of different types of ecosystems.

Unit I

Introduction to ecology. The biosphere, biomes and impact of climate on biomes. Biogeochemical cycles (carbon, nitrogen, phosphorous).

Autecology: Definition and different aspects of autecology. Ecological indicators - Role of indicators in environmental monitoring.

Unit II

Synecology: Definition, Classification units of vegetation, Community composition, Classification of community, Study of plant community structure. Plant Succession: Definition, Primary and Secondary succession, Autogenic and allogenic succession, Mechanism of plant succession, xerosere and hydrosere.

Unit III

Plant interactions: Symbiosis, mutualism, parasitism. Concept of species diversity: a, b, g. Sampling techniques in plant community studies - Quadrat and transect methods - species area curve - density, frequency, abundance, dominance of populations - importance value index - construction of phytographs.

Unit IV

Definition, concept, scope and significance of phytogeography. Centres of origin and distribution of species. Patterns of plant distribution - continuous distribution and discontinuous distribution, vicarism, migration and extinction.

Unit V

Continental drift - evidences and impact; glaciation; theory of land bridges. Endemic distribution, theories on endemism, age and area hypothesis. Phytogeographical zones of India.

Book

1. Sharma, P.D. (1995) Ecology and Environment. Rastogi Publications, Meerut

References

1. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
2. Melchias G 2001 Biodiversity and Conservation. Science Publishers Inc., NH USA
3. Smith, R.L. 1996. Ecology and Field Biology, Harper Collins, New York.
4. Dash M C 1993. Fundamentals of Ecology. Tata McGraw Hill.
5. Begon, M. Harper, J.L. and Townsend, C.R. 1996. Ecology, Blackwell Sci, Cambridge
6. N.S. Subrahmanyam and A.V. S.S. Sambamurty. 2000. Ecology. Narosa, Delhi.

Sem. V
14UBO530215

Hours/Week: 3
Credits: 2

Lab Course-V BIOPHYSICS, BIOSTATISTICS, ECOLOGY AND PHYTOGEOGRAPHY

Biophysics and Biostatistics

1. Separation of cell and tissue components by centrifugation
2. Separation of pigments by Paper chromatography
3. Absorption spectrum of macromolecules and pigments - UV, FTIR
4. Sampling by Random Number Table
5. Data Collection
6. Classification of Data: Discrete, continuous and cumulative.
7. Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogive curve
8. Measures of Central Values: Mean, Median and Mode
9. Measures of Dispersion: Range, Mean deviation and standard Deviation.

Ecology and Phytogeography

1. Chemical analysis of water and Soil -Total hardness, Carbonates and Bicarbonates and Dissolved oxygen.
2. Vegetation Analysis: Quadrant, Line transect, Species Density, abundance and richness, Basal area and relative dominance.
3. Field trip.

Sem. V
14UBO530216

Hours/Week: 4
Credits: 3

MICROBIOLOGY AND IMMUNOLOGY

Objectives

1. To study the micro-organisms and their activities.
2. To exploit their potentialities in agriculture, industry and other environmental aspects.
3. To understand the mechanism of immunity and cells of the immune system.

Unit I

Histry and scope of microbiology, characterization and classification of microorganisms. - Whittaker's five kingdom concept - Bergey's manual of

systematic bacteriology - outline only- Morphology, cell structure, cell wall chemistry, growth, nutrition and reproduction of bacteria. Viruses - structure, classification and multiplication. A general account on Rickettsias, Chlamydiae and Mycoplasmas.

Unit II

Culture of microorganisms: Pure cultures, batch and continuous cultures. Preservation of microorganisms. Microorganisms and Human diseases. Food borne (Botulism and Gastroenteritis), water borne (typhoid & cholera) air borne (small pox and tuberculosis), vector borne (plague and malaria) and contact diseases (mycoses and candidiasis). Control of microorganisms - physical, chemical and biological methods.

Unit III

Soil microbiology - role of microbes in biogeochemical cycles (carbon, nitrogen and sulphur). Aquatic microbiology - microbiology of air. Food microbiology, types of food spoilage and methods of food preservation. Microbiology of milk & dairy products.

Unit IV

Immune system - adaptive, innate, humoral and cellular immunity. Origin, structure and immunological role of primary lymphoid organs (bone marrow and thymus) and Secondary lymphoid organs (spleen, lymph nodes, Payer's patches, tonsils and appendix).

Unit V

Origin, structure and immunological role of immune cells (Leucocytes and lymphocytes) Lymph - composition and functions. Antibody types - study of Ig G, its structure and immunological role.

Books

1. Pelczar, J., Chan, ECS & Krieg, R.1999. Microbiology, Tata McGraw Hill, New Delhi.
2. Sullia, SB & Shantharam, S. 2005. General microbiology. Oxford & IBH, New Delhi.
3. Chakravarty, AK. 2000. Immunology, Tata McGraw Hill Publication Co. Ltd., New Delhi.

Reference

1. Casida, LE.1989. Industrial microbiology, Wiley Eastern, New Delhi.
2. Dubey, RC & Maheshwari, DK. 2004, Text book of microbiology. S.

Chand, Delhi.

3. Frazier, NC.1974. Food Microbiology, II Edn., Tata McGraw Hill, New Delhi.
4. Martin Alexander. 1978. Introduction to Soil Microbiol, Wiley Eastern, New Delhi.
5. Janeway, CA & Travers, P. 2002. Immunobiology, Garland Publishing, NY.

Sem. V
14UBO530217

Hours/Week: 3
Credits: 2

Lab Course-VI MICROBIOLOGY AND IMMUNOLOGY

Microbiology

1. Preparation of common media (Nutrient agar & Potato dextrose agar).
2. Staining of Bacteria (Simple & Grams staining).
3. Isolation and enumeration of microbes in soil and water.
4. Study of motility by Hanging Drop.
5. Pure cultures of bacteria - Streak plate, Pour plate and Spread plate.
6. Microbiology of milk (Qualitative and Quantitative tests).
7. Antibiosis.

Immunology

1. Blood grouping
2. WIDAL- test for typhoid
3. RPR- test for syphilis
4. RF- test for rheumatoid arthritis
5. Immunoelectrophoresis - Demo
6. ELISA - Demo

Sem. V
14UBO530301A

Hours/Week: 4
Credits: 4

Core Elective:
BIOPESTICIDES

Objectives

1. To know the principles, types and mode of action of Biopesticides.
2. To develop skill in crop protection using environmentally safe technology.

Unit I

Biological control of Insect Pests: Scope and principles, factors affecting biological control. Biopesticides: Introduction, importance and classification - living creatures to control pests - weeds for controlling pest.

Unit II

Botanical pesticides: Present status and future prospects; opportunities for botanical pesticides in crop rotation; multiple cropping for controlling pests. Plants as a source of natural pesticides: Mustard, Chrysanthemum, Pepper, Garlic, Turmeric and Citronella as biopesticides.

Unit III

Biocontrol agents: Isolation, identification, mode of action and mass production of *Pseudomonas fluorescens* (bacterial agent), *Trichoderma viride* (fungal agent); application against seed borne and soil borne diseases.

Unit IV

Biological Pesticides: Isolation, identification, bacterium as biopesticide: *Bacillus thuringiensis*. Fungus as biopesticide (entomophagous); *Beauveria bassiana* and *Trichoderma*. Insect as biopesticide Reduviid predators: *Rhynocoris kumarii*, *R. fuscipes* *R. marginatus*: *Trichogramma*. Virus as biopesticide: *Baculovirus-NPV*.

Unit V

Production methods of biopesticides: Liquid culture fermentation and solid state fermentation - Types of biopesticide formulations; Dry inoculum, Granules, Pellets, Capsules, Wettable powder and Liquid formulations. Genetic engineering and pest resistant plants (outline only)

Books

1. Ghosh G K, 2000, Biopesticide and Integrated pest Management, A P H Publishing Corporation, New Delhi.

2. Subba Rao N S, 1982, Advances in Agricultural Microbiology, Oxford & IBH Publishing Company, Chennai.

Reference

1. Krishna Chandra, Greep and Srivathsa, 2005, Bio Control Agents & Biopesticides, Ministry of Agriculture, New Delhi and Regional Centre of Organic Farming, Bangalore.
2. Franklin R. Hell and Julius J. Menn, 1999, Biopesticides - Use and delivery Humene Press, New Jersey.
3. Dent, D. 2000, Insect Pest Management 2nd Ed, ABI Publishers, UK.

Sem. V
14UBO530301B

Hours/Week: 4
Credits: 4

Core Elective
ORGANIC FARMING

Objectives

1. To discuss on the impact of products of chemical based agriculture.
2. To discuss on the importance of sustainable agriculture.

Unit I

Soil - physical, chemical properties. Soil pollution - oil, chemicals - fertilizers, pesticide and herbicide - non-degradable solids, biomagnification, consequences of land pollution - damage to soil and crops, heavy metal contamination. Soil residues and impact of monoculture.

Unit II

Organic farming - definition, basic concept of organic farming, integrated plant nutrient supply management, integrated insect pest and diseases management, integrated soil and water management. Sustainable agriculture practice - crop rotation, crop diversification, mixed cropping, biological nitrogen fixation.

Unit III

Management of organic wastes and green manures: Farm manures, Composts, Mulches, Tillage and Pest control. Organic manures - organic residue, chemical nature of organic manure, green manure, importance of green manure, crops of green manure, oil cake. Animal based organic manure - cow dung, poultry waste, vermicompost - methods, production and utilization. Preservation of Panchakavya.

Unit IV

Biofertilizers - classification, nitrogen fixers - Rhizobium, Azotobacter, cyanobacteria, Azolla, Frankia. Azospirillum and Vascular Mycorrhizae. Pest and disease management: classification of pest, integrated pest management - components; cultural, mechanical, physical control of pest. Biopesticides against microbial parasites, predators and insects.

Unit V

GMO and regulations; organic produce - consumer confidence, conversion period. Inspection and certification. Accredited certifying agents (natl and intl), Equality assurance - logo and labeling.

Book

1. Sharma, A.K., 2003, Biofertilizers for sustainable agriculture, Agrobios.

Reference

1. NIIR Board, 2004, The Complete Technology Book on Biofertilizer and Organic Farming, National Institute of Industrial Research.
2. Online Resources
3. http://ec.europa.eu/agriculture/organic/organic-farming/what-organic_en
4. <http://attra.ncat.org/organic.html#list>
5. <http://www.epa.gov/agriculture/tbio.html>

Sem. V
14UBO530302A

Hours/Week: 4
Credits: 4

MEDICINAL BOTANY

Objectives

1. To understand the different Indian system of medicines.
2. To study the ethnobotanical importance of various medicinal plants.

Unit I

History of Medicinal plants. Traditional Medicinal systems: Ayurvedha, Siddha, Unani and Naturopathy. Definition of Drug. Classification of natural drugs, (Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological).

Unit II

Ethnobotany - definition. Major tribes of South India and their ethnobotanical and ethnobiological heritage. Ethnomedicines. Ethnobotany

and conservation of plants with special reference to India - Mythology and conservation of ecosystems, conservation of selected plant species: sacred groves, ethnobotanical field methods.

Unit III

Cultivation, collection and preparation of natural drugs, macroscopic (physical and organoleptic characters), therapeutic and pharmaceutical characterization of the following medicinal plants: Adathoda vasica, Aloe vera, Centella asiatica, Piper nigrum, Allium sativum, Curcuma longa, Ocimum sanctum and Vinca rosea.

Unit IV

Drugs from leaves (Eucalyptus), flower (Eugenia), fruits and seeds (Coriander), roots (Withania), underground stem (Ginger), bark (Cinchona) and wood (Ephedra). Cultivation and utilization of selected medicinal plants. Bacopa monnieri, Cassia senna, Gloriosa superba, Phyllanthus amarus and Rauwolfia serpentina.

Unit V

Drug adulteration, Drug evaluation: Chemical and Biological. Phytochemical investigations. Quality control of herbal drugs. Role of NMPB, AYUSH and CDRI.

Books

1. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. NiraliPrakashan, Pune.
2. Arumugam, K.R. and Murugesu, N. (1990). Text book of pharmacognosy. Sathya Publishers, Chinnalapatti (Tamilnadu) 624 201.

Reference

1. Amruth, (1996) The Medicinal plants Magazine (All volumes) Medplant Conservatory Society, Bangalore.
2. Bhattacharjee, S.K. 2004. Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
3. Handa, S. S. and V. K. Kapoor, (1993). Pharmacognosy. Vallabh Prakashan, New Delhi.
4. Harbourne, J. B. (1998). Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.
5. Jain, (2001). Medicinal plants. National Book Trust, New Delhi.

6. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy. JPR Publication, Vallioor, Tirunelveli.
7. Joshi, S.G. (2001). Medicinal plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.
9. Purohit and Vyas, (2004). Medicinal Plants Cultivation. Agrobios Publications, Jodhpur.

Sem. V
14UBO530302B

Hours/Week: 4
Credits: 4

Core Elective:
HORTICULTURE AND LANDSCAPING

Objectives

1. To study the basic principles and maintenance of horticulture crops.
2. To understand the landscaping technique and its implications.

Unit I

Introduction -scope and division of Horticulture, History of Gardening- some famous gardens in India, Types of Garden-Indoor garden, public garden, kitchen garden. Garden implements and accessories.

Unit II

Nursery structures-Nursery beds, propagating frames, hot beds, green house and glass house. Nursery Management-cuttage, layerage, graftage potting and reporting. Preparation of soil mixture. Garden operations-planting and transplantation, pinching, disbudding, defoliation, staking, pruning watering, mulching, topiary.

Unit III

Terrace garden, rock garden hydroponics, terrarium, arches, pergolas, Bonsai and lawn.

Unit IV

Cut flowers, Flower arrangements, Commercial floriculture, Cultural practices of Rose, Jasmine, Chrysanthemum and Orchids.

Unit V

Landscaping principles - planning designs for house gardens, institutional and industrial gardens - Lawns: different grasses, maintenance of lawns and

turf in play grounds, gardens and golf courses; special types of gardens: traffic islands, vertical garden, roof / terrace garden, bog garden, water garden, planning parks and public garden; beautification of urban areas.

Books

1. Kumar N., 1990, Introduction to Horticulture, Rohini agencies, Nagercoil.
2. Prasad, 2005, Principles of Horticulture, International Book Dept., Deharadun.

Reference

1. Chauhan, D.V.S., 1968, Vegetable production in India, Ram Prasad sms, Agra.
2. Edmund J.B. Senn T.L Andrews F.S and Halforce R.G., 1990, Fundamentals of Horticulture 14th Edn., Tata McGraw Hill Co. Pvt., London.
3. Gopalswami Iyengar K.S., 1970, Complete Gardening in India, Kalyan Press, Bangalore.

Sem. V
14UBO540601

Hours/Week: 2
Credits: 2

Skill Based Elective:
MUSHROOM CULTURE

Objectives

1. To facilitate self-employment.
2. To know the nutrient value of mushroom.

Unit I

Introduction -Classification - Tests for identification - Nutritive value of mushrooms.

Unit II

Characteristics of common edible mushrooms a) Paddy straw, b) Button, c) Oyster mushrooms. Life cycle of a common mushroom (Agaricus).

Unit III

Culture Techniques - Preparation of spawn, preparation of compost - Spawn running - Harvesting marketing.

Unit IV

Preservation and storage of mushrooms - Diseases and pests of mushrooms.

Unit V

Delicious recipes of mushroom - Economic importance of mushrooms.

Book

1. Nita Bahl, (1984). Handbook on Mushrooms, Oxford and IBH Publishing Company

Reference

1. Dubey, RC. (2001) A text book of Biotechnology, S.Chand & Co. Ltd.

Sem. V
14USS540701

Hours/Week: 2
Credits: 2

IDC: SOFT SKILLS

Objectives

This course is aimed at introducing the students to the nuances of developing the basic skills that required of an educated youth; and to train them to present the best of themselves as job seekers.

Module 1: Effective Communication & Resume Writing

Basics of communication - definition of communication, Barriers of Communication, Non-verbal Communication; Effective Communication - Johari Window, The Art of Listening, Conversation Techniques, Good manners and Etiquettes.

Module II: Resume Writing & Interview skills

Resume Writing: What is resume? Types of Resume - Chronological, Functional and Mixed Resume, Steps in preparation of Resume. Interview Skills: Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Module III: Group Discussion

Group Discussion Basics, GD Topics for Practice, Points for GD Topics. Personal Effectiveness: Self Discovery; and Goal Setting

Module IV: Numerical Ability

Average, Percentage; Profit and Loss, Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns; Time and Distance, Problems on Trains, Boats and Streams; and Calendar, Rations and Proportions.

Module V: Test of Reasoning

Verbal Reasoning: Series Completion, Analogy; Data Sufficiency, Assertion and Reasoning; and Logical Deduction. Non-Verbal Reasoning: Series; and Classification

References

1. Aggarwal, R.S. 2010. A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand, New Delhi.
2. Covey, Stephen. 2004. 7 Habits of Highly effective people, Free Press. Egan, Gerard. (1994). The Skilled Helper (5th Ed). Pacific Grove, Brooks/Cole.
3. Khera, Shiv 2003. You Can Win. Macmillan Books , Revised Edition.
4. Murphy, Raymond. 1998. Essential English Grammar. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. Group Discussion and Public Speaking. M.I. Pub, Agra, 5th ed., Adams, Media.
5. Trishna's 2006. How to do well in GDs & Interviews, Trishna Knowledge Systems.
6. Yate, Martin. 2005. Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting.

Sem. VI
14UBO630219

Hours/Week: 5
Credits: 3

PLANT PHYSIOLOGY

Objectives

1. To learn the underlying principles of the various physiological processes of plants.
2. To study the various physiochemical and morphogenetic processes taking place during the various stages of plant growth.

Unit I

Water, Mineral and Solute: Uptake and Transport. Molecular Structure and properties of water - Diffusion and Osmosis - Osmotic pressure, Turgor pressure and wall pressure - Plasmolysis and its importance - Mechanism of absorption of water - Passive and active absorption - Ascent of sap - Theories on absorption. Uptake and transport of Minerals - Translocation of organic solutes - Transpiration: types, mechanism, role and factors affecting transpiration.

Unit II

Mineral Nutrition: Plant Nutrients: Essential and Non-essential Elements - Micro and Macro nutrients - Source, Physiological role and deficiency symptoms of minerals - Hydroponics and aeroponics. Nitrogen Metabolism: importance of nitrogen to plants - sources of nitrogen - nitrogen cycle - nitrogen fixation - nitrification and denitrification. Nitrate assimilation - Synthesis of amino acids - reductive amination and Transamination.

Unit III

Photosynthesis: Photosynthetic apparatus and pigment systems - Emerson enhancement Effect and two pigment systems - photosynthetic electron transport system - Hill reaction - Oxygen evolving complex - mechanism of electron transport, cyclic, noncyclic and pseudocyclic phosphorylations - synthesis of ATP by photophosphorylation - mechanism of CO₂ fixation in C₃, C₄ and CAM plants.

Unit IV

Respiration: Introduction, Aerobic and Anaerobic Respiration - Glycolysis - TCA cycle - Mitochondrial Electron Transport System and its components - Oxidative phosphorylation and ATP synthesis, glyoxylate cycle, photorespiration, Pentose Phosphate Pathway. Measurement of R.Q.

Unit V

Vitamins and plant growth substances: physiological effects of Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid. Dormancy: definition, causes of seed dormancy, breaking of seed dormancy, significance of seed dormancy - physiology of seed germination - photoperiodism, vernalization and flowering - plant rhythm and biological clock.

Books

1. Verma V. 2007. Text book of Plant Physiology, Ane Books India, New Delhi.
2. Jain V.K. 2006. Fundamentals of Plant Physiology, S. Chand & Co, New Delhi.
3. Pandey, SN & Sinha, BK. 2006. Plant Physiology, 4th Ed. Vikas Publishing, ND.

Reference

1. Noggle and Fritz, 1976. Introductory Plant Physiology, Prentice Hall, New Delhi.
2. Bajjal, BD & Ravisharma, 1981. A Textbook of Plant Physiology, SL Agarwal, Agra.
3. Salisbury, F.B. & Ross, CN. 1995. Plant Physiology. CBS Publishers, New Delhi.

Sem. VI
14UBO630220

Hours/Week: 3
Credits: 2

Lab Course-VII **PLANT PHYSIOLOGY**

1. Effect of temperature on membrane permeability.
2. Osmosis - Thistle funnel, potato osmoscope.
3. Determination of water potential and solute potential.
4. Determination of root pressure and sap exudation.
5. Effect of environmental factors on the rate of transpiration.
6. Extraction and separation of leaf pigments.
7. Effect of light and CO₂ on photosynthesis.
8. Aerobic respiration - Ganong's respiroscope.
9. Ascent of sap - Balsam plant experiment.

10. Measurement of lipase activity.
11. Demonstration experiment
 - i. Phototropism.
 - ii. Geotropism.
 - iii. Arc Auxanometer.
 - iv. Dialatometer.
 - v. Hydroponics.

Sem. VI
14UBO630221

Hours/Week: 5
Credits: 3

GENETIC ENGINEERING AND BIOTECHNOLOGY

Objectives

1. To understand the basic mechanism of transgenic microbes, plants and animals.
2. To study the emerging trends in biotechnology.

Unit I

Crown gall disease and Agrobacterium. Steps in Recombinant DNA Technology. Methods to generate desired foreign genes: isolation by restriction enzymes and by cDNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers.

Unit II

Cloning vectors: natural E. coli plasmids, In vitro vectors (pBR), Cosmids, Single stranded DNA vectors (M13) & Shuttle vectors. Selectable markers. Gene cloning strategies: cDNA library and Genomic library.

Unit III

Methods of gene transfer to animals, plants and bacteria: Microinjection, Ca-transfection, electroporation, shotgun, lipofection, somatic cell nuclear transfer (SCNT), embryonic stem cells.

Unit IV

Protoplast fusion technology. Applications of plant tissue culture in agriculture and forestry. Transgenic plants for tolerance against herbicide, insects, drought and salinity. Genetic Use Restriction Technology (GURT). Anti-sense RNA technology and the Flavr Savr tomato.

Unit V

Plantibodies, monoclonal antibodies and hybridoma technology. Gene therapy, Cloning animals - therapeutic and reproductive; Xenografting. Principles of biosafety. Intellectual Property Rights (IPRs): meaning, types and rationale. Industrial Properties (IP), Copy Rights and Patents. Arguments for and against patenting genes and life forms.

Books

1. Bernard R Glick & Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
2. Old, RW & Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to genetic engineering, Black Well Science Ltd., New York.

Reference

1. Gamborg, OL & Phillips, GC. 1995. Plant cell, Tissue and Organ culture, Narosa, New Delhi.
2. George, EF & Sherrington, PD. 1984. Plant propagation by Tissue culture, Exegetics, London.
3. Old, RW & Primrose, SB. 2001. Principles of Gene Manipulation - an introduction to Genetic engineering, Black Well Science Ltd., New York.
4. James D Watson et al., 1992. Recombinant DNA (2nd Edition), WH Freeman and Co., NY.

Sem. VI
14UBO630222

Hours/Week: 4
Credits: 3

BIOCHEMISTRY

Objectives

1. To understand the structure and properties of the biomolecules.
2. To know the reactions performed by the biological macromolecules.

Unit I

Carbohydrates: Classification. Stereochemistry of simple sugars, a & b glycosidic linkages; structure and properties of mono- and disaccharides. Polysaccharides: chemical structure and function of starch, glycogen and cellulose. Structure of plant cell wall and bacterial cell wall.

Unit II

Lipids: Classification, saturated and unsaturated fatty acids. Properties and synthesis of lipids; β -oxidation and α -oxidation; derived lipids and their biological role. Function and structure of biological membranes - the Singer - Nicolson's "fluid-mosaic" membrane model.

Unit III

Amino acids: basic structure & properties (physical and chemical); function, essential and standard amino acids. Proteins: classification based on shape, solubility and composition. The peptide bond, amino acid sequence and primary structure; backbone folding and secondary structure; tertiary structure of collagen and the forces of stabilization.

Unit IV

Enzymes: Biocatalysts - definition and characteristics, IUB classification; principles of catalysis, activation energy, transition state / steady state, active site. Mode of action: lock & key and induced fit. Factors affecting enzyme action - pH, temperature, [S] & [E]. Enzyme regulation by inhibition - competitive, non-competitive, uncompetitive & feedback.

Unit V

Secondary carbon metabolism and the metabolites: terpenoids; N-containing metabolites - phenolics, classification, properties, structure and significance. Shikimic acid pathway, mevalonic acid pathway, synthesis of alkaloids from amino acids..

Books

1. Jain JL 2009 Fundamentals of Biochemistry S. Chand, New Delhi.
2. Bohinsky, R.C., 1987. Modern Concepts in Biochemistry, Allyn & Bacon, USA.
3. Stryer, L. 2002. Biochemistry, W.H. Freeman & Co., 5th edn.
4. Robert K. Murray 2000. Harper's Biochemistry (25th Edition). (Appleton and Lange Stamford Connecticut).

Reference

1. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford Univ Press.
2. Lehninger, A., 1987. Biochemistry, CBS Publications.
3. Goodwin & Mercer, 1986. Introduction to Plant Biochemistry, Pergamon Press.
4. Rawn, D. 1989. Biochemistry, Neil Patterson USA.

Sem. VI

14UBO630223

Hours/Week: 3

Credits: 2

Lab Course-VIII: GENETIC ENGINEERING, BIOTECHNOLOGY AND BIOCHEMISTRY

1. Culture media and sterilization techniques
2. Generation of In vitro plants
3. Embryo culture
4. Callus induction and differentiation
5. Somatic embryogenesis.
6. Micropropagation and Synthetic seeds
7. Qualitative estimation of sugars.
8. Estimation of total lipids.
9. Estimation of total free amino acids.
10. Determination of strength of amino acids.
11. Quantitative estimation of total protein.
12. Separation of plant pigments by Column chromatography
13. Assay of alkaline phosphatase and amylase.

Sem. VI

14UBO630303A

Hours/Week: 4

Credits: 4

Core Elective: BIOINSTRUMENTATION

Objectives

1. To initiate the students into research activities.
2. To learn to handle various instruments, their principles and procedures.

Unit I

Microscopy: - Simple, Compound, Phase contrast, Fluorescence, Electron (SEM and TEM) microscopy, Micrometry. Buffers: Characteristics and preparation; pH meter - principle, measurement of pH and pKa. Electrometric determination - glass and reference electrodes.

Unit II

Centrifugation: - Principles, types and operation; Rotors, Bench top, Low speed, High speed, Cooling and Ultracentrifuge. Gas-measuring electrodes- basic principles, activity and concentration of Clarke electrode.

Unit III

Chromatography:- principles and applications of Paper, TLC, HPTLC, HPLC, Ion exchange, molecular sieve and affinity chromatography. Electrophoresis - basic principles- gel electrophoresis, its types, electrophoretic mobility and factors. Isoelectric focusing, application, SDS-PAGE and AGE.

Unit IV

Colorimeter: - principles and instrumentation. Spectrophotometry :- principles, instrumentation and types UV/Vis, Flame photometer - general principles and instrumentation. Atomic absorption spectrophotometer, NMR and ESR.

Unit-V

Tracer techniques: nature of radioactivity, patterns of decay, half life - detection of radiation and measurements - GM Counter Scintillation Counter, autoradiography, X-ray crystallography and applications of isotopes.

Books

1. Kothari, C.R. 2000. Research Methodology - Methods & Techniques. Wishwa Prakashan
2. Misra, R.P, 2000 Research Methodology - a handbook, Concept Publishing Company, New Delhi.

Reference

1. Hawkins, C and Sorgi, M. 2000 Research, Narosa Publishing House, New Delhi.
 2. Willard, H.D. et al., 1965, Instrumental Methods of Analysis, D Van Nostrand, New York.
 3. Wilson, E. & Goulding, K.H. 2000 A Biologists' Guide to Principles and Techniques of Practical Biochemistry ELBS.
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Sem. VI

14UBO630303B

Hours/Week: 4

Credits: 4

Core Elective: SEED TECHNOLOGY

Objectives

1. To have a thorough knowledge of the seed structure and different types of seeds.
2. To improve the knowledge of students about storing seeds, seed testing etc.

Unit I

History of seed testing and its importance to agriculture, International Seed Testing Association (I.S.T.A.) - rules, prescriptions and recommendations. Sampling of seeds, purity analysis (physical and genetical), seed moisture content, germination test, rapid test of viability, seedling evaluation and various method of seed separation, cleaning and drying.

Unit II

Gross architecture of seed structure of angiosperms, identification and structure of seeds of important crop plants and their weeds (with special reference to Tamil Nadu). Principles of seed production, seed production in self and cross pollinated plants; hybrid seed production.

Unit III

Physiology and biochemistry of seed germination; seed and seedling vigour. Seed dormancy and longevity. Seed storage methods, principles for safe seed storage, effects of storage, mycotoxins, Deterioration of seeds in storage by micro-organisms, insects and rodents; control of seed deterioration.

Unit IV

Seed certification standards and quarantine regulations. International cooperations, International Seed Testing, Association - Certificates, other seed certificates; Indian Seed Act and National and Regional Seed Corporation of India - their organisation, aims and functions. Practical work will be based on the theory syllabus.

Unit V

Introduction and importance of seed pathology in modern agriculture. History of seed pathology. Seed-borne inoculum. Kinds and various method for testing seed borne fungi, bacteria and viruses. Avenues of seed infection,

environment influencing seed infection, infected/contaminated part of seed, morphology and anatomy of seeds in relation to invasion and location of inoculum of the pathogen in seed.

Books

1. Baskin, CC and Baskin, JM (2001). Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination, Academic Press, San Diego.
2. Bedell, PE. (1998) Seed Science and Technology: Indian Forestry Species. Allied Publishers Limited, New Delhi.
3. Bewley, JD and Black M (1994) Seeds: Physiology of Development and Germination. 2nd edn. Plenum Press, New York.
4. Mayer, AM and Poljakoff-Mayber, A (1989) The Germination of Seeds 4th edn. Pergamon Press, England.

Sem. VI
14UBO630304A

Hours/Week: 4
Credits: 4

BIOLOGICAL TECHNIQUES

Objectives

1. To understand the various techniques in Biology
2. To develop the skills and apply them in higher studies

Unit I

Principle and application of Microscope - Light and Electron microscopes, camera lucida, micrometry, Haemocytometer, pH meter, Calorimeter, spectrophotometer and chromatography (Paper, column and thin layer).

Unit II

Microtechniques - selection of material, fixation, acid and basic. Dehydration process, infiltration of wax, embedding, sectioning, mounting, preparation of permanent slide, leaf clearing, smear and squash techniques.

Unit III

Stains: Classification- single, double, triple staining. Nuclear, cytoplasmic, cell wall stains and their rationale. Herbarium - collection, drying, pasting of plant specimen, protection of Herbarium- importance.

Unit IV

Techniques of the preparation of vertebrate skeletons and transparency preparations (Alizarian Red) Cartilage staining Museum Techniques: Dry

and Wet preparation, Taxidermy Arthropod squash, Blood grouping ABO and Rh, Blood smear preparation, WIDAL, VDRL and RF tests.

Unit V

Earthworm and its characters, Preparatory methods of vermiculture, culture techniques, Economic and ecological importance of vermiform manure. Animal rearing : Rearing of Albino Rats, Rabbits, Fruit fly (*Drosophila melanogaster*).

Books

1. Verma, P.S and Agarwal, Concept of Cell Biology, (New Delhi: S. Chand & Co., 1999).
2. Chamberlain, C.J., Methods in Plant Histology(Jaipur: Arihant Publishers, 1990).
3. Jayaraman, J., Techniques in biology, (Chennai: Higginbothoms Ltd., 1972).
4. Mahoney, R., Lab Techniques in Zoology, (UK: Butterworth, 1966).
5. Vasantaraj David, S. and kumaraswamy. T., Elements of Economic Entomology, (Chennai: Popular Book Depo, 1998).

Sem. VI
14UBO630304B

Hours/Week: 4
Credits: 4

WOOD TECHNOLOGY

Objectives

1. To equip the student with the knowledge of developmental anatomy of woody plants.
2. To impart knowledge about the properties of wood.
3. To understand the important techniques of wood seasoning and preservation.

Unit I

Types of plants producing wood- Soft wood and hard wood. Developmental anatomy of wood - Cambium and its derivatives. Comparative wood anatomy of Angiosperms and Gymnosperms. Wood formation in monocotyledons. Minute structure of compression wood and tension wood.

Unit II

General and physical features of wood: sapwood and heartwood, growth rings, rays, porous and non-porous woods. Features visible on longitudinal surface of wood- Color, Luster, odor, taste, weight, grain, texture, figure.

Chemical constituents of wood: Occurrence of cellulose, hemicellulose and lignin in different morphological regions of cell wall.

Unit III

Wood deterioration: Agents responsible for wood deterioration- Fungi, bacteria, insects, marine borers. Micro-structural changes in wood due to fungal attack- Brown rot, white rot, dry rot and soft rot of timber- decay of standing trees and stored logs. Natural defects of wood - knots, reaction wood, other defects due to stress, silica content.

Unit IV

Seasoning and preservation of wood: General principles of wood seasoning. Wood seasoning procedures - air seasoning, kiln seasoning. Moisture content of timber for different uses in different localities. Natural durability of timber. Wood preservation: basic principles, preservative chemicals. Different wood preservation techniques.

Unit V

Paper and Pulp technology: Pulping- mechanical and chemical methods. Pulp cleaning and bleaching. Stock preparation and sheet formation. Paper machine - principles of forming paper, steam drying and its effects. Coating and finishing.

Book

1. Brown, H.P. 1985. Manual of Indian Wood Technology. International Books and periodicals supply service, New Delhi.

Reference

1. Christopher J. Bierman, 1993. Handbook of Pulping and Paper Making. Academic Press, California, 2nd Edition.
2. David N-S Hon and Nobuo Shiraishi. 2000. Wood and Cellulosic Chemistry 2nd ed.
3. Gary A. Smook. 2003. Handbook for Pulp & Paper Technologists (3rd Edition).
4. Panshim, A.J, Zeeauw, C.D., (1980), Text Book of Wood Technology, U S A, McGraw Hill Book.
5. Wilson, K and White, D.J.B. 1986. The Anatomy of Wood: Its Diversity and Variability. Stobart and son Ltd.
6. Zobel, B.J. and van Buijtenen, J.P. 1989. Wood Variation: Its Causes and Control. Springer-Verlag, New York.

Sem. VI
14UBO640602

Hours/Week: 2
Credits: 2

Skill Based Elective: **HERBAL TECHNOLOGY**

Objectives

1. To understand the importance of the Medicinal plant wealth in India and the role of Medicinal plants in human health care.
2. To know the medicinally useful plants and Herbal medicine preparation for common diseases.

Unit I

Herbal Decoction Preparation: *Andrographis paniculata*, *Tinospora cordifolia*, *Alpinia officinarum*, *Hygrophila auriculata*, *Adhatoda vasica*.

Unit II

Herbal Powder (Sooranam) Preparation: *Withania somnifera*, *Cyanodon dactylon*, *Nymphaea nouchali*, *Vernonia anthelmintica*.

Unit III

Herbal Massage Oil Preparation: *Pinda Thylam*, Herbal Bath Conditioner Preparation: *Nalankumavu*, *Panchakarbam*.

Unit VI

Herbal Hair Oil Preparation: *Neelibirikathi*, Herbal Cream Preparation: *Mathan Thylam*. Herbal Health Drinks Preparation: *Mathulai Manabaku* (*Punica granatum*).

Unit V

Herbal preparation of tea, soup, sweet and natural cosmetics.

Books

1. *Materia Medica Siddha Volume I&II*, Murukasha Muthaliar
2. Kokate, C.K., Purokit A.P and Gokahale, 2002. *Pharmacognosy*, Nirali Prakashan, Pune.

Reference

1. S. Somasundaram 1997. *Maruthuva Thavaraiyal*, Ilangovan Padhippagam, Palayamkottai.
2. Peeter B. Kaufmann et al., 1999. *Natural Products from Plants*, C.R.C. Press.

Sem. VI
14UBO630224

Credits: 2

COMPREHENSIVE EXAMINATION

Sem. VI
14UCW650801

Credits: 5

COMMUNITY WORK (SHEPHERD)
&
GENDER STUDIES
