

# **B.Sc. BOTANY**

## **SYLLABUS: 2011**

**CHOICE BASED CREDIT SYSTEM (CBCS)**



**St. JOSEPH'S COLLEGE (Autonomous)**

*Re-accredited with A+ Grade by NAAC*

*College with Potential for Excellence by UGC*

**TIRUCHIRAPPALLI - 620 002**

## B.Sc. BOTANY: COURSE DETAIL – 2011

Sem.	Part	Code	Subject Title	Hrs	Credit	
I	I	Language	11UGT110001	General Tamil-I/Hindi-I/French-I	4	3
	II	English	11UGE120101	General English I	5	3
	III	Major-Core	11UBO130201	Algae and Bryophytes	5	4
			11UBO130202	Fungi, Plant Pathology and Lichens	5	4
			11UBO130203	Practical I: Algae, Fungi, Bryophytes, Plant Pathology and Lichens	3	3
	Allied	11UBO130401	Allied : Zoology I	4	3	
		11UBO130402	Practical: Zoology 1	2	2	
	IV	NMC	11UCE140801	Communicative English	-	5
		V. Educ.	11UFC141001	Value Education-I: Essential of Ethics, Yoga and Stress Management	2	2
	<b>Total for Semester I</b>				<b>30</b>	<b>29</b>
II	I	Language	11UGT210002	General Tamil-II/Hindi-II/French-II	4	3
	II	English	11UGE220102	General English II	5	3
	Major-Core	11UBO230204	Pteridophytes, Gymnosperms and Paleobotany	5	4	
		11UBO230205	Practical II: Pteridophytes, Gymnosperms, Anatomy and Embry.	3	3	
	Allied	11UBO230403	Allied : Zoology II	4	3	
		11UBO230404	Practical Zoology II	2	2	
	A. Core	11UBO230501	Anatomy and Embryology	3	(2)	
	IV	NMC	11UCE240802	Computer Literacy	2	2
		V. Educ.	11UFC241002	Value Education – II: Fundamentals of Human Rights	2	1
	<b>Total for semester II</b>				<b>30</b>	<b>21</b>
III	I	Language	11UGT310003	General Tamil-III/Hindi-III/French-III	4	3
	II	English	11UGE320103	General English III	5	3
	Major-Core	11UBO330206	Taxonomy of Angiosperms	5	4	
		11UBO330207	Practical III : Taxonomy of Angiosperms	3	3	
	Allied	11UBO330405A	Allied: Chemistry for Biologists I (OR)	4	4	
		11UBO330405B	Allied: Biometrics and Computer Applications I			
	IV	V. Educ.	11UCE340901	Environmental Studies	4	2
			11UFC341003A	Professional Ethics-I: Social Ethics (OR)	2	2
			11UFC341003B	Professional Ethics-I: Religious Doctrine		
			Library	1	-	
<b>Total for Semester III</b>				<b>30</b>	<b>21</b>	

IV	I	Language	11UGT410004	General Tamil-IV / Hindi- IV / French-IV	4	3	
	II	English	11UGE420104	General English IV	5	3	
	Major-Core	11UBO430208	Cell and Molecular Biology	5	4		
		11UBO430209	Practical IV: Cell & Molecular Biology, Genetics, Plant Breeding and Evolution	3	3		
	Allied	11UBO430406A	Allied: Chemistry for Biologists II (OR)	4	4		
		11UBO430406B	Allied: Biometrics and Comp. App II				
		11UBO430407A	Allied: Chemistry for Biologists II Practical (OR)	2	2		
	11UBO430407B	Allied: Biometrics and Comp. App II Practical					
	IV	V. Educ.	A. Core	11UBO430502	Genetics, Plant Breeding and Evolution	4	(2)
			11UFC441004A	Professional Ethics-II : Social Ethics (OR)	2	2	
11UFC441004B			Professional Ethics-II : Religious Doctrine				
		Library	1	-			
<b>Total for Semester IV</b>				<b>30</b>	<b>21</b>		
V	Major-Core	11UBO530210	Biophysics and Biostatistics	5	4		
		11UBO530211	Practical V: Biophysics and Biostatistics	3	3		
		11UBO530212	Microbiology	5	4		
	Core Elec.	11UBO530213	Practical VI: Microbiology & Genetic engineering	3	3		
		11UBO530301A	Biopesticides (OR)	4	4		
		11UBO530301B	Organic Farming				
		11UBO530302A	Biodiversity and Climate Change (OR)	4	4		
	11UBO530302B	Horticulture and Landscaping					
	A. Core	11UBO530503	Genetic Engineering	4	(3)		
	IV	S Elec.	11UBO540601	Mushroom Culture	2	2	
<b>Total for Semester V</b>				<b>30</b>	<b>24</b>		
VI	Major-Core	11UBO630214	Plant Physiology	5	4		
		11UBO630215	Practical VII: Plant Physiology	3	3		
		11UBO630216	Biotechnology	5	4		
	Core Elec.	11UBO630217	Practical VIII: Biotechnology and Biochemistry	3	3		
		11UBO630303A	Stem Cell Technology (or)	4	4		
		11UBO630303B	Bioinformatics				
		11UBO630304A	Immunology (or)	4	3		
11UBO630304B	Sericulture						
A. Core	11UBO630504	Biochemistry	4	(3)			
IV	S. Elec.	11UBO640602	Herbal Technology	2	2		
I-V	V		11 UCE 551101	Extension Service: SHEPHERD & Gender Studies		6	
<b>Total for Semester VI</b>				<b>30</b>	<b>23</b>		
<b>Total credit for all semester Basic 145 + Additional credit 10 = 155</b>					<b>145</b>		

பருவம் -1  
11UGT110001

மணி நேரம் - 4  
புள்ளிகள் - 3

### பொதுத்தமிழ் - I

#### நோக்கங்கள்

1. சமூக மாற்றச் சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியங்களை அறிமுகம் செய்தல்.
2. புதுக்கவிதை, சிறுகதை, உரைநடை ஆகிய இலக்கியங்களின் நயம் பாராட்டுதல்.
3. சந்திப்பிழையின்றி எழுத மாணவர்களைப் பயிற்றுவித்தல்.

#### பயன்கள்

1. மாணவர்கள் சமூக மாற்றச்சிந்தனைகளை அறிந்துகொள்வர்.
2. சந்திப்பிழைகளை நீக்கி எழுதும் திறன் பெறுவர்.
3. புத்திலக்கியங்களைப் படைக்கும் திறனையும், திறனாய்வு செய்யும் திறனையும் பெறுவர்.

#### அலகு-1

(10 மணி நேரம்)

மகாகவி பாரதியார் கவிதைகள்  
பாரதிதாசன் கவிதைகள்  
உரைநடை—முதல் மூன்று கட்டுரைகள்  
(கட்டுரைக்களஞ்சியம்)

#### அலகு-2

(12மணி நேரம்)

கவிமணி தேசிகவிநாயகம் கவிதைகள்  
நாமக்கல்கவிஞர் வெ.இராமலிங்கம் கவிதைகள்  
இலக்கணம் -வலிமிகும் இடங்கள்

#### அலகு-3

(10 மணி நேரம்)

கவிஞர் கண்ணதாசன் கவிதைகள்  
இலக்கியவரலாறு- மூன்றாம் பாகம்  
சிறுகதை- முதல் ஆறு சிறுகதைகள்

#### அலகு-4

(14 மணி நேரம்)

பாவலரேறு பெருஞ்சித்திரனார் பாடல்கள்  
அப்துல் ரகுமான் கவிதைகள்  
இலக்கிய வரலாறு – நான்காம் பாகம்  
இலக்கணம் - வலி மிகா இடங்கள்

#### அலகு-5

(14 மணி நேரம்)

கவிஞர் மேத்தா கவிதைகள்  
மொழிபெயர்ப்புக்கவிதைகள்  
சிறுகதை- 7 முதல் 12 முடிய உள்ள சிறுகதைகள்  
உரைநடை- 4முதல் 6 முடிய உள்ள கட்டுரைகள்  
(கட்டுரைக்களஞ்சியம்)

#### பாடநூல்

1. பொதுத்தமிழ் - செய்யுள் திரட்டு- தமிழ்த்துறை வெளியீடு- 2011-2014
2. சமூகவியல் நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழ்த்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
3. உரைநடை நூல் - தமிழ்த்துறை வெளியீடு, 2011-2014
4. சிறுகதைத்தொகுப்பு  
(கட்டுரைக்களஞ்சியம்)

#### மதிப்பெண் பகிர்வு

பிரிவு	பாகம் -1	பாகம் -2	பாகம்-3
செய்யுள்	12 (12 வினாக்கள்)	8 (2 வினாக்கள்)	30 (2 வினாக்கள்)
இலக்கியவரலாறு	6 (6 வினாக்கள்)	8 (2 வினாக்கள்)	15 (1 வினா)
உரைநடை	-----	-----	15 (1வினா)
இலக்கணம்	2 (2 வினாக்கள்)	4 (1 வினா)	-----
சிறுகதை	-----	-----	15 (1 வினா)

Semester: I  
Code:11UGE120101

Hours :5  
Credits: 3

### GENERAL ENGLISH – I

#### Objectives:

1. To enable the students to develop their effective communicative skills in English.
2. To empower the students with fluency and accuracy in the use of English Language.
3. To transform them into globally employable persons with placement skills.

#### UNIT-I 12 Hrs

**Prose** Education.  
Employment.  
Unemployment.

**Poem** William Shakespeare— “All the World’s a Stage.”

**Letter Writing** Formal and Informal.

**Short Story** O Henry – Robe of Peace. (Extensive Reading).

**Essential English Grammar** – 1-6 units

#### UNIT-II 12 Hrs

**Prose** Application.  
Planning.  
Curriculum Vitae.

**Poem** Ben Jonson—“On Shakespeare”  
Reading Comprehension

**Short Story** Rudyard Kipling—The Miracle of Puran Bhagat  
(Extensive Reading).

**Essential English Grammar** – 7-12 units.

#### UNIT-III 11 Hrs

**Prose** Interview.  
Reporting.  
General Knowledge.

**Poem** Robert Herrick—“Gather Ye Rosebuds.”  
Note Making

**Short Story** H.G.Wells—The Truth About Pyecraft (Extensive Reading).

**Essential English Grammar** – 13-18 units

#### UNIT-IV 20 Hrs

**Prose** Review.(Super Toys)  
Stress.  
No Time.

**Poem** Oliver Goldsmith—“ The Village Schoolmaster”  
Developing story from hints

**Short Story** John Galsworthy—“Quality” (Extensive Reading).

**Essential English Grammar** – 19-24 units

#### UNIT-V 15 Hrs

**Prose** Killers.  
Galloping Growth.  
A Short Story.

**Poem** William Blake—“ From Auguries of Innocence”  
Précis Writing

**Short Story** William Somerset Maugham— Mabel  
(Extensive Reading).

**Essential English Grammar** – 25-30 units

#### Text Books

1. Krishnaswamy. N, Sriraman T. Current English for Colleges. Hyderabad: Macmillan Indian Ltd,2006.
2. Dahiya SPS Ed. Vision in Verse, An Anthology of Poems. New Delhi: Oxford University Press,2002.
3. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge University Press,2009.
4. Seshadri, K G Ed. Stories for Colleges.Chennai: Macmillan India Ltd,2003.

**Semester - I**  
**11UBO130201**

**Hours/week : 5**  
**Credits : 4**

### **ALGAE AND BRYOPHYTES**

#### **Objectives**

1. To understand the salient features of Algae and Bryophytes.
2. To study the structure and reproduction of various genera mentioned in the syllabus.

#### **Unit - I Algae**

General characteristics of algae. Classification of Algae according to F.E. Fritsch. General 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 in Algae-mode of reproduction in Algae-Life cycle patterns in Algae-Mass culture of Algae-Economic importance of Algae.

#### **Unit - III**

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

#### **Unit - IV Bryophytes**

General characteristics of Bryophytes, Classification based on Rothmaler (1951), vegetative reproduction in Bryophytes. Economic importance of bryophytes. Evolution of gametophytes and sporophytes in Bryophytes.

#### **Unit V**

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

#### **Text Book**

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

#### **Reference**

1. Sharma, OP. 1992. Text Book of Algae. Tata Mc Graw Hill, New Delhi.
2. Gangulee, HC. & Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
4. Prem Puri. 1981. Bryophytes – morphology growth and differentiation. Atma Ram & Sons. Lucknow.
5. Singh V, Pande PC & Jain OK. A text book of Botany, Rastogi Publications, Meerut.
6. Smith, GM. 1955. Cryptogamic Botany Vol-1&II, McGraw Hill, New York.

**Semester - I****11UBO130202****Hours/week : 5****Credits : 4****FUNGI, PLANT PATHOLOGY AND LICHENS****Objectives**

1. To understand the general characteristics of Fungi and Lichens.
2. To study the etiology and control of various plant diseases.

**Unit - I Fungi**

General characteristics of Fungi. Classification according to J. Alexopoulos and G.C. Ainsworth. General characteristics of the various divisions and classes in Fungi. Mode of reproduction. Economic importance of Fungi.

**Unit - II**

Detailed study of morphology and reproduction of the following genera: *Plasmodiophora*, *Albugo*, *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. Defence mechanism in plant.

**Unit - IV**

Detailed study of the following diseases-Mosaic disease of tobacco, Citrus canker, Late blight of Potato, Paddy blast, Red rot of Sugarcane, Bunchy top of Banana, Little leaf of Brinjal.

**Unit - V Lichens**

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

**Text Book(s):**

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

**Reference**

1. Sharma, OP. 1989. Text Book of fungi. Tata Mc Graw Hill, New York.
2. Vasishtha, 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, ME Jr. 1983. The biology of Lichens, New Age International publishers, New Delhi.

**Semester - I**  
**11UBO130203**

**Hours/week : 3**  
**Credits : 3**

**PRACTICAL-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).**

**Semester - I**  
**11UBO130401**

**Hours/week : 4**  
**Credits : 3**

**ALLIED: ZOOLOGY-I**

**Objectives**

1. To understand the animal organization, their structure and function
2. 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 subphyla: Urochordata, Cephalochordata, Hemichordata and Vertebrata (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; larval forms of echinoderms.

**Unit - III**

Principles of 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.

**Text Book(s):**

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., 6<sup>th</sup> 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, 4<sup>th</sup> Edn., New Delhi.

**Semester - I**  
**11UBO130402**

**Hours/week : 2**  
**Credits : 2**

**ALLIED: PRACTICAL-I (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 invertebrate, and vertebrate phyla. Different tissues.human blood cell identification. Campus fauna identification. **Visit to a vermicompost farm and submission of report.**



பருவம் -2  
11UGT210002

மணி நேரம் - 4  
புள்ளிகள் - 3

### பொதுத்தமிழ் - II

#### நோக்கங்கள்

1. சமய நல்லிணக்க உணர்வை வளர்த்தல்.
2. தமிழ்க் காப்பியங்களில் அழகும், அறிவுணர்வும் ஊட்டும் பகுதிகளைப் படித்துப் புரிந்து கொள்ளுதல்.
3. உரைநடைக் கட்டுரை எழுதும் திறன் பெறுதல்.

#### பயன்கள்

1. தமிழைத் திருத்தமாகப் படிக்கவும், பேசவும், பிழையின்றி எழுதவும் கூடிய திறன் பெறுவர்.
2. இலக்கியங்களில் படித்தவற்றை முறையாக வாழ்க்கையில் கடைப்பிடிப்பர்.

#### அலகு : 1

(12 மணி நேரம்)

சிலப்பதிகாரம் – அடைக்கலக் காதை - மதுரைக் காண்டம்  
இலக்கிய வரலாறு – சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.

#### அலகு : 2

(12 மணி நேரம்)

மணிமேகலை – சிறைக்கோட்டம் அறக்கோட்டம் ஆக்கிய காதை  
பெரியபுராணம் – திருநாளைப்போவார் நாயனார் புராணம்  
உரைநடை – 7 முதல் 9 முடிய உள்ள கட்டுரைகள்  
(கட்டுரைக்களஞ்சியம்)

#### அலகு : 3

(12 மணி நேரம்)

கம்பராமாயணம் – வாலி வதைப்படலம்  
செம்மொழியான தமிழ்மொழியே:1 – 20 பக்கங்கள்  
இலக்கணம் – எழுத்திலக்கணம்

#### அலகு : 4

(12 மணி நேரம்)

தேம்பாவணி – மகன் நேர்ந்த படலம்  
சீறாப்புராணம் – அபீறாகு வதைப்படலம்  
உரைநடை – 10 முதல் 12 வரையிலான கட்டுரைகள்  
செம்மொழியான தமிழ்மொழியே – 21- 37 பக்கங்கள்

#### அலகு : 5

(12 மணி நேரம்)

இராவண காவியம் – ஆரியப் படலம்  
இலக்கிய வரலாறு – தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய.  
இலக்கணம் – சொல்லிலக்கணம்

#### பாடநூல்கள்

1. செய்யுள் திரட்டு – தமிழாய்வுத்துறை வெளியீடு, 2011 – 2014.
2. இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, 2010.
3. உரைநடைநூல், தமிழாய்வுத்துறை வெளியீடு, 2011-2014
4. செம்மொழியான தமிழ்மொழியே, சங்கம் வெளியீடு, மதுரை.2010

#### மதிப்பெண் பகிர்வு

பிரிவு	பாகம் -1	பாகம் -2	பாகம்-3
செய்யுள்	12 (12 வினாக்கள்)	8 (2 வினாக்கள்)	30 (2 வினாக்கள்)
இலக்கியவரலாறு	4 (4 வினாக்கள்)	4 (1 வினா)	15 (1 வினா)
உரைநடை	-----	-----	15 (1வினா)
இலக்கணம்	2 (2 வினாக்கள்)	4 (1 வினா)	-----
செம்மொழி	2 (2 வினாக்கள்)	4 (1 வினா)	15 (1 வினா)

Sem: II  
Code: 11UGE220102

Hours :5  
Credits: 3

### GENERAL ENGLISH –II

#### Objectives:

1. To enable the students to develop their effective communicative skills in English.
2. To empower the students with fluency and accuracy in the use of English Language.
3. To transform them into globally employable persons with placement skills.

<b>UNIT-I</b>		<b>12 Hrs</b>
<b>Prose</b>	Environment. A Dead Planet. Riddles.	
<b>Poem</b>	William Wordsworth—Nutting. Shelley- Ozymandias. Filling Money Order Chalan and Bank Chalan	
<b>Short Story</b>	G.K.Chesterton – The Hammer of God (Extensive Reading)	
<b>Essential English Grammar:</b> -31-36 Units		
<b>UNIT-II</b>		<b>12 Hrs</b>
<b>Prose</b>	Qahwah A Dilemma Computeracy	
<b>Poetry</b>	John Keats—La Belle Dame Sans Merci Robert Browning- The Last Ride Together	
<b>Short Story</b>	Katherine Mansfield—A Cup of Tea (Extensive Reading)	
<b>Dialogue Writing</b>		
<b>Essential English Grammar:</b> 37-42Units		
<b>UNIT-III</b>		<b>11 Hrs</b>
<b>Prose</b>	Review (Use Your English) Entertainment You and Your English	
<b>Poetry</b>	Walt Whitman- I Celebrate Myself. Mathew Arnold—Dover Beach.	

**Short Story** Thomas Wolfe—The Far and the Near (Extensive Reading)  
**Conversations**  
**Essential English Grammar:**43-48Units

#### UNIT-IV 20 Hrs

**Prose** War Minus Shooting .  
Usage and Abusage.  
**Poetry** Sarojini Naidu—The Gift of India..  
Robert Frost—Design .  
**Short Story** R.K. Narayan—Half a Rupee Worth (Extensive Reading)  
Manohar Malgonkar—Bacha Lieutenant  
**Story Telling**  
**Essential English Grammar:**49-54Units

#### UNIT-V 15 Hrs

**Prose** Who's Who.  
**Poetry** Nissim Ezekiel. The Night of The Scorpion  
**Short Story** Anita Desai—A Devoted Son (Extensive Reading)  
Ruskin Bond—The Boy Who Broke the Bank(Extensive Reading)  
Report Writing  
**Letter to the Editor**  
**Essential English Grammar:** 55-60Units

#### Text Books

1. Krishnaswamy. N, Sriraman T. Current English for Colleges. Hyderabad: Macmillan Indian Ltd,2006.
2. Dahiya SPS Ed. Vision in Verse, An Anthology of Poems. New Delhi: Oxford University Press,2002.
3. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge University Press,2009.
4. Seshadri, K G Ed. Stories for Colleges.Chennai: Macmillan India Ltd,2003

**Semester - II**  
**11UBO230204**

**Hours/week : 5**  
**Credits : 4**

### **PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY**

#### **Objectives**

1. To study the salient features of plants belonging to Pteridophytes and Gymnosperms.
2. 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 divisions, *Psilophyta*, *Lycophyta*, *Sphenophyta* and *Pterophyta*. Stellar evolution, homosporous, heterosporous seed habit and economic importance,

#### **Unit - II**

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

#### **Unit - III Gymnosperms**

General characteristics, distribution, classification (Sporne, K.R). Vegetative, anatomical and reproductive characteristics of major divisions, *Cycadophyta*, *Coniferophyta* and *Gnetophyta*.

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

#### **Unit - IV**

A detailed study of the following genera: *Cycas*, *Araucaria* and *Gnetum* (developmental details not required).

#### **Unit - V Paleobotany**

Fossils, fossilization process, different types of fossils (compression, impression, petrification, coal balls). Geological time table. Carbon dating. A

detailed study of external and internal morphology and reproduction in *Rhynia*, *Lepidodendron*, *Calamites* *Lyginopteris* and *Medullosa*.

#### **Text Book(s):**

1. Vasishtha PC, Sinha AK & Anilkumar. 2005. Botany for degree students, Gymnosperms. S Chand And Company Ltd., New Delhi.
2. Pandey, BP. 1998. A text book of Botany Vol. II. S. Chand & Co. Ltd. New Delhi.

#### **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.
4. Arnold, C.R. 1947 (Rep. 1979). An Introduction to Paleobotany. Mc Graw Hill Publishing Co. Ltd., New Delhi.

**Semester - II**  
**11UBO230205**

**Hours/week : 3**  
**Credits : 3**

### **PRACTICAL - II**

#### **(Pteridophytes, Gymnosperms, Anatomy and Embryology)**

Detailed study of the types mentioned in the theory.

#### **Pteridophytes**

*Lycopodium, Selaginella, Equisetum* (no dissection), *Adiantum* and *Marsilea*.

#### **Gymnosperms**

*Cycas, Araucaria* and *Gnetum*.

#### **Fossils**

*Rhynia, Lepidodendron, Calamites, Lyginopteris* and *Medullosa*.

#### **Anatomy**

Study of simple and complex tissues. Study of internal structure of young and old dicot stem and root. T.S of dicot and monocot leaves. Internal structure of aerial root and monocot stem.

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 young and mature anther, ovule, endosperm types and dissection and isolation of developmental stages of embryos.

**Semester – II**  
**11UBO230403**

**Hours/week : 4**  
**Credits : 3**

**ALLIED: ZOOLOGY-II**

**Objectives**

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

**Unit – I**

Insect morphology: head, external structure, tentorium, compound eye, types of antennae- thorax- tergum, sternum, pleuron. Wing structure and coupling mechanism, wing venation, Legs and their modification, Abdomen- abdominal appendages, Male and female external genitalia.

**Unit – II**

Physiology of digestive, respiratory, circulatory, nervous and reproductive systems, Immature stages of insects-metamorphosis – types-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 (*Orycytes rhinoceros*, *Rhycolophorus ferrugineus*, *Nephanthis serinopa*)

**Text Book(s):**

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

**Semester - II**  
**11UBO230404**

**Hours/week : 2**  
**Credits : 2**

**ALLIED: PRACTICAL-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 sericulture center and submission of report.

**Semester - II**  
**11UBO230501**

**Hours/week : 3**  
**Credits : 2**

### **ANATOMY AND EMBRYOLOGY**

#### **Additional Core**

#### **Objectives**

1. To impart knowledge about the various components and characters of wood.
2. To study the basic principles of embryo.

#### **Unit - I**

Tissues - Definition, Types - Simple permanent - Parenchyma, Collenchyma, Sclerenchyma. Fibres and Sclereids - Structure and functions; Complex permanent tissues - Xylem and Phloem. Meristems - Classifications. Vegetative shoot apex and Root apex.

#### **Unit – II**

Nodal Anatomy-unilacunar, trilacunar and multilacunar. The stem - Primary and Secondary structure of dicotyledonous and monocotyledonous stems. The Root - Primary and Secondary structure of dicotyledonous and monocotyledonous roots. Leaf - Anatomy of monocot and dicot.

#### **Unit - III**

Wood Anatomy – secondary xylem, Physical and Chemical properties of wood. Classification of wood. Commercial wood species of South India.

#### **Unit - IV**

Microsporangium, Microsporogenesis - Development of male gametophyte. Megasporangium, Megasporogenesis. Development of female gametophyte - 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 significance, Polyembryony, Parthenogenesis and their significance.

#### **Text Book(s):**

1. Pandey B.P. 2007. Plant Anatomy, S. Chand & Co. De, New Delhi.
2. Bhojwani, SS. & Bhatnagar, SP. 1994. Embryology of Angiosperms, Vikas Publishing House (P) Ltd., New Delhi.
3. HP Brown, AJ Panshin & CC. Farsaith, 1981. Text book of Wood Technology, Mc Graw Hill Inc. New York.
4. Maheshwari, P. 1950. An introduction to the embryology of Angiosperms. McGraw Hill, New York.

#### **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.
3. Maheshwari, P. (ed.) 1963. Recent advances in embryology. Intl. Soc. Pl. Morphol, New York.
4. Pullaiah, T., Lakshminarayana, K. and Hanumantha Rao, K. 2001. Text Book of Embryology of Angiosperms, Regency Publications, New Delhi.
5. Raghavan, V. 1979, Experimental embryogenesis of vascular plants. Cambridge University Press, Cambridge. U.K.

பருவம் - 3  
11UGT310003

மணி நேரம் - 4  
புள்ளிகள் - 3

### பொதுத் தமிழ் - III

#### நோக்கங்கள்

1. செம்மொழித் தமிழ்ச்செய்யுள்களான பதினென்மேல் கணக்கு, பதினென்கீழ்க் கணக்குப் பாடல்களைப் படித்துப் பொருள் புரிந்து கொள்ளும் திறன் பெறுதல்
2. பண்டைய இலக்கியங்களில் அமைந்துள்ள சமூகக் கருத்துக்களை உணர்தல்.
3. மரபுக் கவிதை வடிவங்களை அறிதல்.
4. கவிதைகளில் அணிகள் அமைந்துள்ள பாங்கைப்பிரிதல்.
5. புதினம் வழித் தற்காலச் சமுதாயச் சிக்கல்களையும், அதற்கான தீர்வுகளையும் ஆராய்ந்தறிதல்.

#### பயன்கள்

1. செம்மொழியாம் தமிழ் மொழியின் சிறப்பை அறிந்துகொள்வர்.
2. பண்டைய இலக்கியங்கள் உணர்த்தும் அறக்கருத்துக்களை அறிந்து, மாணவர் ஒழுக்க நெறியில் வாழ்ந்து சமூகத்தை மேம்படுத்துவர்.
3. மாணவர் புதினத்தைக் கற்பதன் மூலம் சமுதாயச் சிக்கல்களை உணர்ந்து அவற்றிற்குத் தீர்வு காண்பர்.

அலகு : 1

(16 மணி நேரம்)

பத்துப்பாட்டு - குறிஞ்சிப்பாட்டு (முழுமையும்)

அலகு : 2

(10 மணி நேரம்)

நற்றிணை, குறுந்தொகை, யாப்பிலக்கணம் (வெண்பா, ஆசிரியப்பா)

அலகு : 3

(10 மணி நேரம்)

இலக்கிய வரலாறு – ‘தமிழ்மொழியின் தொன்மையும் சிறப்பும்’ முதல் ‘சங்கத் தொகை நூல்கள்’ முடிய.

புதினம் – முழுமையும்.

அலகு : 4

(12 மணி நேரம்)

கலித்தொகை, பதிற்றுப்பத்து, புறநானூறு, அணியிலக்கணம்.

அலகு : 5

(12 மணி நேரம்)

திருக்குறள்

இலக்கிய வரலாறு – சங்க இலக்கியங்களின் தனித்தன்மைகள் முதல் இரட்டைக் காப்பியங்கள் முடிய.

#### பாடநூல்கள்

1. செய்யுள் திரட்டு, தமிழாய்வுத்துறை வெளியீடு (2011 - 2014)
2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, 2010
3. புதினம் (ஒவ்வொரு கல்வியாண்டும் ஒவ்வொரு புதினம்).

#### மதிப்பெண் பகிர்வு

பிரிவு	பாகம் -1	பாகம் -2	பாகம்-3
செய்யுள்	12 (12 வினாக்கள்)	8 (2 வினாக்கள்)	30 (2 வினாக்கள்)
இலக்கியவரலாறு	6 (6 வினாக்கள்)	8 (2 வினாக்கள்)	30 (2 வினாக்கள்)
புதினம்	-----	-----	15 (1வினா)
இலக்கணம்	2 (2 வினாக்கள்)	4 (1 வினா)	-----



Sem: III  
Code: 11UGE320103

Hours :5  
Credits: 3

### GENERAL ENGLISH -III

#### Objectives:

1. To enable the students to complete the pre-reading task to comprehend the local and global issues in the lessons..
2. To enable the students to complete the post-reading task centering on Grammar and Skill Development
3. To empower the students with globally employable skills.

#### UNIT-I

12 Hrs

Larry Collins & Dominique Lapierre  
Freedom at Midnight (Extract)  
Alfred Uhry  
Driving Miss Daisy  
Extensive Reading—Robinson Crusoe (Chapters 1-3)  
Essential English Grammar—61-66.

#### UNIT-II

12 Hrs

Alfred Lord Tennyson  
Ulysses  
Nathaniel Branden  
Our Urgent Need for Self-esteem  
Extensive Reading—Robinson Crusoe (Chapters 4-6)  
Essential English Grammar—67-72.  
Reader's Mail :The Hindu

#### UNIT-III

11 Hrs

Daniel Goleman  
Emotional Intelligence  
Marcel Junod  
The First Atom Bomb.  
Extensive Reading—Robinson Crusoe (Chapters 7-9)  
Essential English Grammar—73-78.  
Job Application.

#### UNIT-IV

20 Hrs

E.K.Federov  
Climate Change and Human Strategy.  
Paolo Mauro  
Corruption: Cases, Consequences and Agenda for further Research.  
Extensive Reading—Robinson Crusoe (Chapters 10-12)  
Essential English Grammar—79-84.  
Minutes Writing.

#### UNIT-V

15 Hrs

Anne Frank  
The Diary of Young Girl  
A.P.J.Abdul Kalam  
Wings of Fire  
Extensive Reading—Robinson Crusoe (Chapters 13-15)  
Essential English Grammar— 85-90.  
Resume Writing.

#### Text Books

1. Elango K. *Insights*. Hyderabad: Orient Blackswan Pvt Ltd,2009.
2. Murphy, Raymond. *Essential English Grammar*. New Delhi. Cambridge University Press India Ltd,2009.
3. Defoe, Daniel. *Robinson Crusoe*. Chennai: MacMillan India Ltd,2009.
4. Stevenson R L. *Treasure Island*. Chennai: MacMillan India Ltd,2009.
5. Ram N Ed. *The Hindu*. Tiruchirappalli.

**Semester - III**  
**11UBO330206**

**Hours/week : 5**  
**Credits : 4**

### **TAXONOMY OF ANGIOSPERMS**

#### **Objectives**

1. To observe the variations among plants, especially angiosperms.
2. To understand the way of description of a plant.
3. To study the floral characters with an aim to identify the taxa authentically.

#### **Unit - I**

Taxonomy and its importance. Herbaria and Botanical Gardens – their role; Botanical Survey of India. Systems of classification: Broad outline of Linnaeus, Bentham & Hooker and Engler & Prantle's system of classification. Plant nomenclature: Elementary knowledge of ICBN: Principles, Rank of taxa, Type method, Principle of priority, Effective and valid publication and Author Citation.

#### **Unit - II**

Recent trends in Taxonomy: Brief account of Chemotaxonomy, Cytotaxonomy, Molecular taxonomy and Numerical taxonomy. Morphology of angiosperms – Study of stem and leaf morphological features, Inflorescence types, terminology of flower and floral parts, preparation of floral diagram and 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, Cruciferae, Tiliaceae, Rutaceae, Anacardiaceae, Rosaceae, Caesalpiniaceae, Myrtaceae, Lythraceae.

#### **Unit- IV**

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

#### **Unit- V**

Labiatae, Amaranthaceae, Euphorbiaceae, Casuarinaceae, Moraceae. **Monocotyledons**: Orchidaceae, Amaryllidaceae, Pontederiaceae, Palmae, Typhaceae, Gramineae.

#### **Text Book(s):**

1. Jeffrey, C. 1982. An Introduction to Plant Taxonomy, Cambridge University Press, UK.
2. Pandey, BP. 1999. Taxonomy of Angiosperms, S.Chand & Co. Ltd., New Delhi.
3. Gurcharan Singh, 2004. Plant Systematics: An Integrated Approach, Science Publishers Inc., New Hampshire, USA.

#### **Reference**

1. Clive AS. 1989. Plant Taxonomy and Biosystematics, Chapman and Hall Inc. New York.
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. New York.

**Semester - III**  
**11UBO330207**

**Hours/week : 3**  
**Credits : 3**

**PRACTICAL-III**  
**(Taxonomy of Angiosperms)**

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 (Except Orchid avae).
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 five herbarium sheets of common angiosperms are to be prepared and submitted at the time of Practical Examination.

**Semester - III**

**The students are required to take any one of the following allied courses in his choice.**

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

08UBO330405 A **ALLIED: CHEMISTRY FOR BIOLOGIST – I**

08UBO330405B **ALLIED: BIOMETRICS AND COMPUTER APPLICATIONS – I**

**Hours/week : 4**

**Credit : 3**

(OR)

08UBO330406A **ALLIED: CHEMISTRY FOR BIOLOGIST – I (PRACTICAL)**

08UBO330406B **ALLIED: COMPUTER LAB – I (EXCEL)**

**Hours/week : 4**

**Credit : 3**

**Semester - III**  
**08UBO330405A**

**Hours/week : 4**  
**Credits : 3**

### **Allied: CHEMISTRY FOR BIOLOGISTS-I**

#### **Objectives**

1. To understand the various chemical principles involved in Biological processes.
2. To apply the various concepts of chemistry in Applied Biology.

#### **Unit - I Inorganic Chemistry**

Covalent bond – Properties of covalent molecules, Structures of  $\text{BCl}_2$ ,  $\text{BF}_3$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{SiH}_4$ ,  $\text{ClF}_3$ ,  $\text{AF}_4$ ,  $\text{PCl}_5$ . 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;  $[\text{Fe}(\text{CVN})_6]^{2-}$  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. 2. Aromatic electrophilic substitution. Addition Reaction: 1. Electrophilic addition of HX to alkene. 2. Nucleophilic addition of  $\text{NH}_3$  to aldehyde or ketone. Condensation Reaction: 1. Aldol condensation. 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 silt 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.

#### **Text Book(s):**

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

#### **Reference**

1. Puri B.R., Sharma L.R., Pathania M.S. 1993. Principles of Physical Chemistry (23<sup>rd</sup> edition), Shoban Lal Nagin Chand & Co., New Delhi.
2. Tiwari. K. S., S. N. Meharotra. N. K. Vishnoi. 2006. A Text Book of Organic Chemistry, Vikas Publishing House Pvt. Ltd., New Delhi.
3. R. Gopalan, *Elements of Analytical Chemistry*, S. Chand & Company Pvt. Ltd., New Delhi.

**Semester - III**  
**11UBO330405B**

**Hours/week : 4**  
**Credits : 4**

**Allied: BIOMETRICS AND COMPUTER APPLICATIONS – I**

**Objectives**

1. To learn the basics of statistics in Biological context.
2. 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,  $y = a + bx$ ,  $y = ax^2 + bx + c$ ,  $y = ab^x$ ,  $y = ae^x$  – 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.

**Text Book(s):**

Nageswara Rao G.: Statistics for Agricultural Science, Oxford & IBH publishing Co.

**Reference**

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

**Semester - III**  
**08UBO330406B**

**Hours/week: 4**

**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.

பருவம் - 4  
11UGT410004

மணி நேரம் - 4  
புள்ளிகள் - 3

**பொதுத் தமிழ் - 4**

**நோக்கங்கள்**

1. நாடகத்தின் நோக்கம், அதன் போக்கு, உத்திகள், பாத்திரப் பாங்கு, உரையாடல் முறை, கற்பனைத் திறம் போன்றவற்றை வெளிப்படுத்துதல்.
2. புதிய நாடகங்களைப் படைக்கும் திறனை மாணவர்களிடையே உருவாக்குதல்.

**பயன்கள்**

1. நாடகவழி அழகியல் உணர்வுகளை வளர்த்துக் கொள்வர்.
2. நாடகங்களைச் சமூகப் பயன்பாட்டிற்கு ஏற்ப உருவாக்கும் திறன் பெறுவர்.

**அலகு : 1** (12 மணி நேரம்)  
மனோன்மணியம், பாயிரம், அங்கம் - 1, களம் 1 - 5 வரை.

**அலகு : 2** (12 மணி நேரம்)  
மனோன்மணியம், அங்கம் - 2, களம் 1 - 3 வரை.  
உரைநடை நாடகம் - ஈரோடு தமிழன்பன் - ஈர நெருப்பு  
(முதல் மூன்று நாடகங்கள்)

**அலகு : 3** (12 மணி நேரம்)  
மனோன்மணியம், அங்கம் - 3, களம் 1 - 4 வரை.

**அலகு : 4** (12 மணி நேரம்)  
மனோன்மணியம், அங்கம் - 4, களம் 1 - 5 வரை.

**அலகு : 5** (12 மணி நேரம்)  
மனோன்மணியம், அங்கம் - 5, களம் 1 - 3 வரை.  
உரைநடை நாடகம் - ஈரோடு தமிழன்பன் - ஈர நெருப்பு,  
(4, 5, 6 ஆம் நாடகங்கள்)

**பாடநூல்கள்**

1. சுந்தரனார், பெ. மனோன்மணியம், தமிழாய்வுத்துறை (பதிப்பு), தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2. (அங்கம் - 3 இல் களம் - 4 நீங்கலாக)
2. உரைநடை நாடகம் - ஈரோடு தமிழன்பன் - ஈர நெருப்பு, அய்யா நிலையம், நாஞ்சிக் கோட்டை சாலை, தஞ்சாவூர் - 613 006.

**மதிப்பெண் பகிர்வு**

பிரிவு	பாகம் -1	பாகம் -2	பாகம்-3
மனோன்மணியம்	20 (20 வினாக்கள்)	20 (5 வினாக்கள்)	60 (4 வினாக்கள்)
உரைநடை நாடகம்	-----	-----	15 (1 வினா)

Sem: IV  
Code: 11UGE420104

Hours :5  
Credits: 3

### GENERAL ENGLISH -IV

#### Objectives:

1. To enable the students to complete the pre-reading task to comprehend the local and global issues in the lessons..
2. To enable the students to complete the post-reading task centering on Skill Development and Grammar..
3. To empower the students with globally employable soft skills.

#### UNIT-I

12 Hrs

##### Life Stories

F.G.Herod  
Mother Teresa  
R.K.Narayan  
Swami and Friends  
Treasure Island (1-4)  
91—95.

Extensive Reading  
Essential English Grammar  
Film Review (The Hindu).

#### UNIT –II

12 Hrs

Imogen Grosberg  
See Off the Shine  
George Orwell  
The Porting Spirit  
Treasure Island (5-8)  
96-100.

Extensive Reading  
Essential English Grammar  
Article Writing on Current Issues.

#### UNIT-III

11 Hrs

Philip Agre  
Building an Internet Culture  
Satyajit Ray  
Odds Against Us  
Treasure Island (9-12)  
101-105.

Extensive Reading  
Essential English Grammar  
Mock Interviews

#### UNIT-IV

20Hrs

Jerzy Kosinski  
TV as Babysitter.  
E.F.Scumacher  
Technology With Human Face.  
Treasure Island (13-17)  
106-110.

Extensive Reading  
Essential English Grammar  
Mock Group Dynamics

#### UNIT-V

15 Hrs

Aluizio Borem, Fabrico  
R.Santos & David E.Bower  
Advent of Biology  
Mark Ratner & Daniel Ratner  
Nanotechnology  
Treasure Island (18-22)  
111-114.

Extensive Reading  
Essential English Grammar  
Presentation Skills

#### Text Books

1. Elango K. *Insights*. Hyderabad: Orient Blackswan Pvt Ltd,2009.
2. Murphy, Raymond. *Essential English Grammar*. New Delhi. Cambridge University Press India Ltd,2009.
3. Defoe, Daniel. *Robinson Crusoe*. Chennai: MacMillan India Ltd,2009.
4. Stevenson R L. *Treasure Island*. Chennai: MacMillan India Ltd,2009.
5. Ram N Ed. *The Hindu*. Tiruchirappalli.

**Semester - IV**  
**11UBO430208**

**Hours/week : 5**  
**Credits : 4**

### **CELL AND MOLECULAR BIOLOGY**

#### **OBJECTIVES**

1. To study basic molecular mechanism in organisms
2. To understand how the gene unravels conferring the traits on the organism.

#### **Unit - I**

**Cell cycle; cellular mechanisms in development and differentiation; Cytoplasmic organelles: membrane structure, organization and functions of nucleus, mitochondria, chloroplasts, ER, ribosomes, golgi complex, lysosome, vacuole and cytoskeleton.**

#### **Unit - II**

DNA replication: Semi conservative model, mechanism of replication in Prokaryotes; replication of RNA genome – replicase and reverse transcriptase. Mutation: Types of mutations. Physical and chemical mutagens. 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, spliceosomes.

#### **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* and *trp* operon in *E. coli*. Differences in gene expression regulation in Eukaryotes. Principles of RNA interference and RNA silence.

#### **Text Book(s):**

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, 3<sup>rd</sup> Ed. Oxford University, Oxford.



**Semester - IV**  
**11UBO430209**

**Hours/week : 3**  
**Credits : 3**

**PRACTICAL-IV**  
**(Cell & Molecular Biology and Genetics,**  
**Plant Breeding and Evolution)**

**Practical**

1. Ultra structure of cell organelles.
2. Study of mitosis in root tips
3. Study of meiosis in Anthers
4. Inheritance Pattern
5. Linkage Mapping.
6. Estimation of allele frequency in natural (random mating) populations.
7. Isolation of nuclear DNA from onion.
8. Extraction of human genomic DNA from saliva.
9. Isolation and display of polytene chromosomes.
10. Estimation of DNA (Colorimetric method).
11. Emasculation
12. Techniques in breeding-layering, grafting, bagging.

**Semester - IV**

The Student is required to select the optional in concordance with the one selected in the semester III.

08UBO430407 A **ALLIED : CHEMISTRY FOR BIOLOGIST – II**  
08UBO430407 B **ALLIED : BIOMETRICS AND COMPUTER APPLICATIONS – II**

**Hours/week : 4**

**Credit : 3**

(OR)

08UBO430408 A **ALLIED : PRACTICAL-II (CHEMISTRY)**  
08UBO430408 B **ALLIED : COMPUTER LAB – II (Statistical Software Package)**

**Hours/week : 4**

**Credit : 3**

**Semester - IV**  
**11UBO430406A**

**Hours/week : 4**  
**Credits : 4**

### **Allied: CHEMISTRY FOR BIOLOGISTS II**

#### **Objectives**

1. To understand the chemistry of plant components and products so as to exploit chemistry in the improvement and production of phytochemicals.
2. To import knowledge in some basic techniques necessary to handle the above objective.

#### **Unit - I Physical Chemistry**

Thermodynamics of a chemical reaction - Terms  $\Delta E$ ,  $\Delta H$ ,  $\Delta S$ ,  $\Delta G$ , 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 structure properties and SAR): Analgesics, Antiinflammatory agents: General and local anaesthetics: Inhalation anaesthetics ( $N_2O$ ,  $CHCl_3$ , 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 (  $-OCH_3$ ,  $-OH$ ,  $-COOH$ ,  $-COOR$ , 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  $\alpha$ -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 High performance liquid – chromatographic techniques (HPTLC).

#### **Text Book(s):**

1. Tiwari. K. S., S. N. Meharotra. N. K. Vishnoi. 2006. A Text Book of Organic Chemistry, Vikas Publishing House Pvt. Ltd., New Delhi.
2. R. Gopalan, Elements of Analytical Chemistry, S. Chand & Company Pvt. Ltd., 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.

**Semester - III & IV**  
**11UBO430407A**

**Hours/week : 2**  
**Credits : 2**

**Allied: PRACTICAL CHEMISTRY FOR BIOLOGISTS II**

**I Volumetric Analysis**

1. Estimation of HCl (Std. oxalic acid x NaOH x HCl)
2. Estimation of NaOH (Std. Na<sub>2</sub>CO<sub>3</sub> x HCl x NaOH)
3. Estimation of oxalic acid (Std. FAS x KMnO<sub>4</sub> x oxalic acid)
4. Estimation of FAS (Std. oxalic acid x KMnO<sub>4</sub> x FAS)
5. Estimation of KMnO<sub>4</sub> (Std. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> x FAS x KMnO<sub>4</sub>)
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. Gurtu J.N. and Kapoor, S. 1987. Experimental Chemistry, Chand and Co., New Delhi.
2. N.S. Gnanapragasam and G. Ramamurthy, 1998. Organic Chemistry - Lab Manual, S. Viswanathan & Co. Pvt. Ltd.

**Semester - IV**  
**11UBO430406B**

**Hours/week : 4**  
**Credits : 4**

**Allied: BIOMETRICS AND COMPUTER APPLICATIONS – II**

**Objectives**

1. To understand the various applications of statistics with reference to biological sciences.
2. To enable the students to handle and analyse biological data.

**Unit - I**

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 - II**

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 - III**

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 - IV**

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

**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).

**Text Book(s):**

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

**Reference**

Olive Jean Dunn. Basic Statistics: A primer for the Biomedical Sciences – John Wiley and Sons.

**Semester - IV**  
**11UBO430502**

**Hours/week : 4**  
**Credits : 2**

**GENETICS, PLANT BREEDING AND EVOLUTION**  
**(Additional Core)**

**OBJECTIVES**

1. To study the progress made in the field of cell, cell organelles and their functions.
2. To understand the principle, the hereditary mechanism, the structure and functions of genetic materials.

**Unit - I**

Mendel's laws of heredity, gene interaction 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 - II**

DNA is the genetic material: proof: Griffith's, Avery *et al.*, and Hershey and Chase. RNA as genetic material. Structure of DNA and RNA. Nucleosides and nucleotides, polynucleotide chain. Primary, secondary and tertiary structures. Chromatin nucleosomes and chromosomal proteins, protamines and histones, organization of genomes-eukaryotic and prokaryotic. Special types – polytene & Lamp brush.

**Unit - III**

Population genetics : gene frequency, gene pool, Hardy–Weinberg equilibrium. Gene frequencies – conservation and changes. Decline of human gene pool and eugenics. Basic knowledge and applications of genomics and proteomics. Genomics: plant, animal and structural and functional genomics, human genome project.

**Unit – IV**

Objectives of plant breeding, conventional methods – introduction and selection (mass, pure and clonal). Hybridization techniques and types.

Heterosis – mechanism and the basis. 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. Evolution through ages and human evolution. Evidences for evolution, Adaptive radiation, Biological evolution. Population genetics: Hardy-Weinberg principle; gene frequencies; and the factors that change it.

**Text Book(s):**

Verma, P.S. & V.K. Agarwal, 2003, Genetics. S. Chand & Co.Ltd., 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., 8<sup>th</sup> Edn., New York.
3. Sinnott, E.W., Dunn, L.L. & Dobzhansky, T. 1997. Principles of Genetics, Tata Ma Graw Hill Publishing Co., New Delhi.

**Semester - IV** **Hours/week : 2**  
**08UBO430407B** **Credits : 2**

**ALLIED: COMPUTER LAB – II**  
**(Statistical Software Package)**

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.

Semester - V  
11UBO530210

Hours/week : 5  
Credits : 4

## BIOPHYSICS AND BIOSTATISTICS

### 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 – Pattern of decay – Effects of Radiation – 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) – Quality and intensity of Solar radiation – 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 (Fluorescence – Phosphorescence – delayed light emission – Bioluminescence. **Electrophysics**: Ionization and electrolytic dissociation; classification of electrolytes – acids and bases; dissociation of weak acids, pKa and pH.

### Biostatistics

#### Unit - III

**Introduction** - Definition – Data: Primary & Secondary; Observational & Experimental; Probabilistic & Deterministic; Variable: discrete & continuous – Population & Sample; Random sample. **Sampling technique** - Judgment Sampling, Random Sampling by Lottery and Random number table methods, stratified random (proportionate and disproportionate) Sampling; Systematic random sampling; Multistage Random Sampling merits and demerits of the above methods. **Classification** - 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.

#### Text Book(s):

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

#### Reference

1. Gupta, S.P. 2008. Elementary Statistical Methods Sultan Chand & Sons, New Delhi.
2. Conn, E. & Stumpf, P.K., 1979. Outline of Biochemistry, Niley Easdtern Ltd., 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., New Delhi.
7. Saim, A.S., 1994. Text Book of Biochemistry, CBS Publishers, New Delhi.

**Semester - V**  
**11UBO530211**

**Hours/week : 3**  
**Credits : 3**

**Practical – V**  
**BIOPHYSICS AND BIOSTATISTICS**

**Biophysics**

1. Colorimetry to illustrate Beer – Lambert Law
2. Preparation of Reference Curves for amino acids, Glucose and BSA
3. Determination of osmotic potential of potato tuber
4. Separation of cell and tissue components by centrifugation
5. Separation of pigments by Paper and Column chromatography
6. Acid – Base Titration and determination of pKa and preparation of buffers
7. Absorption spectrum of macromolecules and pigments

**Biostatistics**

1. Sampling Technique using Random Number Table Method.
2. Data collection from a sample of 50 cluster bean Seeds for Discrete and pod length for continuous data
3. Frequency Distribution: Discrete, continuous and cumulative
4. Statistical Diagrams Histogram, Frequency curve, bar charts and ogive curve
5. Calculation Mean, Median, and mode for the ungrouped and grouped data obtained in the Experiment number 10
6. Determination of Measures of Dispersion – Range, Mean Deviation, Standard Deviation and coefficient of variation for the ungrouped and grouped data obtained in the Experiment number 10.

**Semester - V**  
**11UBO530212**

**Hours/week : 5**  
**Credits : 4**

### MICROBIOLOGY

#### OBJECTIVES

1. To study the different types of micro-organisms and their activities.
2. To understand and exploit their potentialities in agriculture, industry and other environmental aspects.

#### Unit - I

History 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 (Plaque 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

Industrial microbiology – role of microbes in various industries - Fermentors and fermentation technology. – large scale production of ethanol,

single cell protein, lactic acid, glutamic acid, amylase, penicillin, insulin, vaccines and interferons.

#### Unit - V

Role of microbes in agriculture – microbes in nitrogen fixation and phosphate solubilization – Biofertilizers – algal (BGA), bacterial (*Azospirillum*, *Rhizobium*) and mycorrhizal (AMF). Biopesticides - their types and applications – *Bacillus thuringiensis* and Baculoviruses. Microbes and biogas production – sewage treatment – primary, secondary and tertiary treatments. Biodegradation of cellulose, lignin, petroleum wastes and heavy metals.

#### Text Book(s):

1. Pelczar, J., Chan, ECS & Krieg, R. 1999. Microbiology, Tata McGraw Hill, New Delhi.
2. Sullia, SB & Shantharam, S. 2005. General microbiology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

#### Reference

1. Casida, LE. 1989. Industrial microbiology, Wiley Eastern, New Delhi.
2. Dubey, RC & Maheshwari, DK. 2004, A text book of microbiology. S. Chand & Company Ltd., New 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.



**Semester - V**  
**11UBO530213**

**Hours/week : 3**  
**Credits : 3**

**PRACTICALS - VI**  
**(Microbiology & Genetic Engineering)**

**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.
8. Isolation and identification of Azospirillum, Rhizobium

**Genetic Engineering**

1. Isolation of genomic DNA from plant tissue (cauliflower) using potassium acetate method.
2. CTAB extraction of DNA from plant tissue (Ipomoea leaves)
3. Isolation of genomic DNA from animal tissue by SSI methods.
4. SDS-PAGE (demonstration only)

**Visit to TNAU or Dairy farm and submission of report.**

**Semester - V**  
**11UBO530301A**

**Hours/week : 4**  
**Credits : 4**

**BIOPESTICIDES**  
**(Core Elective)**

**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: 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)

**Text Book(s):**

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

**Semester - V**  
**11UBO530301B**

**Hours/week : 4**  
**Credits : 4**

**ORGANIC FARMING**  
**(Core Elective)**

**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.

**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*, *Azetobacter*, cyanobacteria, *Azolla*, *Frankia*. *Azospirillum* and Vasicular 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**

IPR and Patenting issues, Principles of biosafety, GMO and regulations; organic produce – consumer confidence, conversion period. Inspection and certification. Accredited certifying agents (natl and intl), Equality assurance – logo and labeling.

**Text Book(s):**

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

**Reference**

NIIR Board, 2004. The Complete Technology Book on Biofertilizer and Organic Farming, National Institute of Industrial Research.

**Online Resources**

[http://ec.europa.eu/agriculture/organic/organic-farming/what-organic\\_en](http://ec.europa.eu/agriculture/organic/organic-farming/what-organic_en)

<http://attra.ncat.org/organic.html#list>

<http://www.epa.gov/agriculture/tbio.html>

**Semester - V**  
**11UBO530302A**

**Hours/week : 4**  
**Credits : 4**

**BIODIVERSITY AND CLIMATE CHANGE**  
**(Core Elective)**

**Objective:**

To understand the emerging trends of low-carbon economy; and to elucidate the strategies of protecting the bioresources.

**Unit – I Biodiversity**

Types – Genetic, species and ecosystem diversity; global biodiversity. Plant diversity - crop plants and their relatives, trees and forests. Animal diversity – domesticated and other animals, fish and aquatic diversity. Human diversity and indigenous people. Genetic Diversity - Plant genetic resources, mega-centres of origin of genetic diversity. World's major plant gene banks.

**Unit – II Conservation**

Endangered flora and fauna – their identification and documentation - Red Data Book. Conservation strategies; *In situ* approach, biosphere reserves, reserve forests, parks and sanctuaries. *Ex situ* approach: collection garden and cryopreservation. Animal genetic resources conservation: live animal programs and cryopreservation. *Ex situ* gene banks and captive breeding. International organizations in conservation – IUCN, IBPGR, WWF, UNEP, and FAO.

**Unit – III Climate change**

Components of the atmosphere, the greenhouse gases & greenhouse effect, global warming and climate change, consequences and evidence of climate change. Greenhouse gas emissions and the causes – electricity generation, transport. Burning fossil fuels, deforestation.

**Unit - IV**

CO<sub>2</sub> capture and storage methods: Geological storage, Ocean storage, Mineral storage & Leakage. CO<sub>2</sub> reuse mechanisms - single step

methods: CO<sub>2</sub> → methanol, CO<sub>2</sub> → hydrocarbons and CO<sub>2</sub> → CO → hydrocarbons. CCS projects.

**Unit - V**

Climate change adaptation and mitigation: strategies for emission reduction - Alternative energy sources and Energy efficiency and conservation. Kyoto protocol, Bali Action Plan – IET, CDMs and JI. Carbon credits and carbon economics; UNFCCC & IPCC, climate change conference - Copenhagen & Mexico – attempt towards legally binding protocol.

**Text Book(s):**

1. Melchias G 2001. Biodiversity and Conservation. Science Publishers, NH USA
2. Krishnamurthy KV 2003. Advanced Textbook on Biodiversity. Oxford & IBH, New Delhi IUCN 1985.
3. The World Conservation Strategy. IUCN, Switzerland.

**Semester - V**  
**11UBO530302B**

**Hours/week : 4**  
**Credits : 4**

**HORTICULTURE AND LANDSCAPING**  
**(Core Elective)**

**Objectives**

1. This course is designed to provide theoretical knowledge about the gardening to enable them to be self reliant knowledge and self employment.

**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 repotting. Preparation of soil mixture.

**UNIT- III**

Garden operations-planting and transplantation, pinching, disbudding, defoliation, staking, pruning watering, mulching, topiary.

**UNIT- IV**

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

**UNIT- V**

Cut flowers, Flowers arrangements, commercial floriculture, cultural practices of rose, jasmine, chrysanthemum and orchids.

**Text Book(s):**

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, Agra.
2. Edmund J.B. Senn T.L Andrews F.S & Halforce R.G., 1990, Fundamentals of Horticulture 14<sup>th</sup> Edn., Tata McGraw Hill Co. Pvt., London.
3. Gopaldaswami Iyengar K.S., 1970, Complete Gardening in India, Kalyan Press, Bangalore.

**Semester - V**  
**11UBO530503**

**Hours/week : 4**  
**Credits : 3**

**GENETIC ENGINEERING**  
**(Additional Core)**

**OBJECTIVES**

1. To understand the basic mechanism involved in the production of transgenic microbes, plants and animals
2. To know the role of advanced techniques such as PCR, RFLP and RAPD in molecular biology.

**Unit - I**

Steps in Recombinant DNA Technology. Methods to generate desired foreign genes: cDNA and isolation by restriction enzymes. Strategies of joining DNA molecules: ligases, linkers and homopolymers. Significance of genetic engineering.

**Unit - II**

Cloning vectors: natural *E. coli* plasmids, *In vitro* vectors (pBR), Cosmids & derivatives, Single stranded DNA vectors (M13) & Shuttle vectors. Selectable markers and reporters. Selection and screening of recombinants.

**Unit - III**

Enzymes used in genetic engineering: restriction enzymes; DNA modifying enzymes; and enzymes used in cloning. Gene cloning strategies: cDNA library and Genomic library.

**Unit - IV**

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

**Unit - V**

Principles and applications of molecular techniques: DNA sequencing strategies, gene mapping and nucleic acid hybridization techniques

(Southern, Northern, Western, Southwestern blotting) – DNA fingerprinting, PCR, RFLP, RAPD and microarrays.

**Text Book(s):**

1. Bernard R Glick & Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
2. Jogdand, SN. 1997. Gene biotechnology, Himalaya Publishig House, New Delhi.

**Reference**

1. Ernst L. Winnaccker, 2002. From Genes to Clones-introduction to gene technology, VCR Pub., Weintein.
2. James D Watson *et al.*, 1992. Recombinant DNA (2<sup>nd</sup> Edition), WH Freeman and Co., New York.
3. Old, RW & Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to genetic engineering, Black Well Science Ltd., NewYork.

**Semester -V**  
**11UBO540601**

**Hours/week : 2**  
**Credits : 2**

**MUSHROOM CULTURE**  
**(Skill base Elective)**

**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 d) Milky 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.

**Text Book(s):**

Nita Bahl, Handbook on Mushrooms, S.Chand & Co. Ltd.

**Reference**

Dubey, RC. A text book of biotechnology, S.Chand & Co. Ltd.

Semester – VI  
11UBO630214

Hours/week : 5  
Credits : 4

## PLANT PHYSIOLOGY

### Objectives

1. To learn the underlying principles of the various physiological processes of plants
2. To study the various physicochemical 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 – Water an ideal solvent system of living cell – Importance of water to life – Diffusion and Osmosis – Osmotic pressure, Turgor pressure and wall pressure – Relationship of OP, TP & DPD – Plasmolysis and its importance – Mechanism of absorption of water – Passive and active absorption – Ascend of sap – Theories on absorption and transport of Minerals – Translocation of organic solutes – source sink relationship – 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: root nodule formation, Biochemistry of Nitrogen Fixation, Nitrification and Denitrification. Nitrate assimilation: Synthesis of Glutamic acid by GS/GOGAT pathway – Reductive amination and Transamination – Synthesis of other aminoacids.

### 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 - Chemiosmotic Model. Mechanism of CO<sub>2</sub> fixation in C<sub>3</sub>, C<sub>4</sub> and CAM plants – Chemosynthesis.

### Unit - IV

**Respiration:** Aerobic and Anaerobic Respiration - Glycolysis – TCA cycle – Mitochondrial Electron Transport System: Components, Arrangement, Electron transport and Proton flow, proton motive force – Oxidative phosphorylation and ATP synthesis – Chemiosmotic Model – Glyoxylate cycle – Amphibolic nature of TCA – Anaplerotic Reactions - Photorespiration – Pentose Phosphate Pathway. **Intermediary Metabolism:** Characteristics of Anabolism, Catabolism and amphibolism – Stages of Intermediary Metabolism – Convergent nature of Anabolism and Divergent nature of Catabolism

### Unit - V

**Growth:** Stages of Growth – Plant Growth Substances: Discovery, Bioassay, Mode of Action and physiological effects of Auxins, Gibberellins, Cytokinins, Ethylene and Absciscic acid – Irritability and Plant Movements – Dormancy: Seed and bud - 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

### Text Book(s):

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.

### Reference

1. Noggle and Fritz, 1976. Introductory Plant Physiology, Prentice Hall, New Delhi.
2. Pandey, SN & Sinha, BK. 1989. Plant Physiology, Vikas Publishing House Ltd., New Delhi
3. Robert M. Devlin. 1970. Plant Physiology, East West Press, New Delhi.
4. Verma, S.K, 1999, A Text book of Plant Physiology, S.K.Chand & Co., New Delhi.
5. Bajjal, BD & Ravisharma, 1981. A Textbook of Plant Physiology, Shiva Lal Agarwal & Co., Agra.
6. Salisbury, F.B. & Ross, CN. 1995. Plant Physiology. CBS Publishers, New Delhi.



**Semester - VI**  
**11UBO630215**

**Hours/week : 3**  
**Credits : 3**

**PRACTICAL - 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. Lifting power of transpiration.
6. Effect of environmental factors on the rate of transpiration.
7. Extraction and separation of leaf pigments.
8. Effect of light and CO<sub>2</sub> on photosynthesis.
9. Aerobic respiration and fermentation.
10. Measurement of lipase activity.
11. Demonstration experiment
  - i. Phototropism,
  - ii. Geotropism,
  - iii. Arc Auxanometer
  - iv. Dialatometer
  - v. Hydroponics

**Semester - VI**  
**11UBO630216**

**Hours/week : 5**  
**Credits : 4**

## **BIOTECHNOLOGY**

### **OBJECTIVES**

1. To study the emerging trends in biotechnology such as gene therapy, DNA finger printing and molecular cloning
2. To enumerate the role of 21st century science, biotechnology in increasing productivity of crop plants, to enhance the production of high value metabolites.

### **Unit - I**

Tissue culture techniques – constituents of MS medium: preparation, Callus induction and somatic embryogenesis. Somaclonal variations: sources and applications. Culture of haploids, protoplast fusion technology. Applications of plant tissue culture in agriculture and forestry.

### **Unit - II**

Production of Transgenic plants for tolerance against herbicide, insects, drought and salinity. Genetic Use Restriction Technology (GURT); Challenges and applications.

### **Unit - III**

Anti-sense RNA technology and the flavr savr tomato. Post Transcriptional gene silencing (RNA interference), Plantibodies. Monoclonal antibodies and hybridoma technology; Gene therapy, immunotoxins and recombinant vaccines.

### **Unit - IV**

Cloning – therapeutic and reproductive; Xenografting. Biotechnology in aquaculture ploidy induction, gynogenesis, and androgenesis; production of transgenic fish – the salmon and tilpias.

### **Unit - V**

IPR and patenting issues, release of GMOs: Bt brinjal in India. Principles of biosafety: Advance informed consent, Labelling, Substantial equivalence, Precautionary principle, and Containment. Concerns over GM foods and horizontal gene transfers. Biological warfare.

### **Text Book(s):**

1. Anon. 1988. Animal cell Biotechnology, Academic Press, New York.
2. Bernard R Glick & Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.

### **Reference**

1. Butler, M. 1987. Animal cell technology, Principles and Products, Open University Press, New York.
2. Gamborg, OL & Phillips, GC. 1995. Plant cell, Tissue and Organ culture a Fundamental methods, Narosa publishing House, New Delhi.
3. George, EF & Sherrington, PD. 1984. Plant propagation by Tissue culture, Exegetics Limited, London.

Semester - VI  
11UBO630217

Hours/week : 3  
Credits : 3

**PRACTICAL - VIII  
(Biotechnology & Biochemistry)**

**Biotechnology**

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

**Biochemistry**

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, peroxidase and amylase

Semester - VI  
11UBO630303A

Hours/week : 4  
Credit : 4

**Core Elective : STEM CELL TECHNOLOGY**

**Objectives**

1. To acquaint students of biology with the latest development in biotechnology.
2. To understand the pros and cons of stem cell technology.

**Unit - I** : Stem cells - definition; unique properties – proliferation and differentiation; Potency definitions: totipotent, pluripotent, multipotent and unipotent; basics of early human embryology; History and key stem cell research events.

**Unit - II** : Isolation, culture, identification and assays. Types: unlimited and limited; Embryonic and adult stem cells - bone marrow, cord blood, neural, endothelial, hematopoietic, epithelial, pancreatic, hepatic, glandular, cardiac and gastrointestinal.

**Unit - III** : Stem cells and cloning; germ line stem cells; Recruiting Donors and Banking hES Cells; IPRs and hES Cells.

**Unit - IV** : Genetically engineered stem cells and experimental therapies. Stem cell based therapies: stem cells and repair of heart and nervous system; regeneration strategies.

**Unit - V** : Guidelines for hES cell research - Scientific background of hESC research; Ethical and scientific concerns; Current Regulation of Human Embryonic Stem Cell Research. Future of SC research.

**Text Book(s):**

1. Stewart Sell 2003 (Ed) Stem Cells Handbook, Humana Press, NY
2. Verma IM and Gage FH 2002 (Ed) Regenerative Medicine, Natl Acad Sci & Engg, USA

**Reference**

1. The Natl Academies, USA 2007 Understanding Stem Cells
2. The Natl Academies, USA 2002 Stem Cells and the Future of Regenerative Medicine
3. Stem Cells Info 2008, NIH USA
4. Terese Winslow 2006 Regenerative Medicine, Natl Acad Sci & Engg, USA.

**Semester - VI**  
**11UBO630303B**

**Hours/week : 4**  
**Credits : 4**

**BIOINFORMATICS**  
**(Core Elective)**

**OBJECTIVES**

1. To know the various databases available.
2. To learn sequence analysis.

**Unit - I**

Computer concepts – Structural organization of Computer – evolution of computer – operating system – computer applications Biology. Bioinformatics and its applications. Information networks – EMB net and NCBI. Databases; Primary Nucleic acid databases – EMBL; Gene Bank and DDBJ. Structure of Gene bank entries.

**Unit – II**

Protein sequences databases; primary databases PIR, MIPS, SWISS – PROT, TrEMBL, NRL-3D. Structure of SWISS – PROT entries. Secondary Databases; PROSITE, PROFILES, PRINTS, Pfam, BLOCKS and IDENTITY. Composite protein Databases.

**Unit - III**

Gene structure and DNA sequences CDS – open reading frames – The EST alphabet – The expression profile of a cell, cDNA libraries and ESTs. EST analysis tools – sequences similarity search tools, sequence assembly tools and sequence clustering tools. Alignment techniques; use of characters. Identity and similarity.

**Unit - IV**

Dotplot, Pairwise database searching Global alignment, FASTA and BLAST Building a sequence search protocol. Phylogenetic analysis – Parsimony, Distance Matrix, Distance maximum Likelihood. Construction of phylogenetic tree with reference to DNA, RNA and protein sequences. Biological importance of computerized phylogenetic analysis. Web browsing.

**Unit - V**

Genome annotation, Protein structural genomics, Comparative genomics, Computational identification of Genes. Hawaii biological survey. The role of EBI and USGS. Human Genome Programme.

**Text Book(s):**

1. Attwood T.K. and Parry Smith D.J (1999), Introduction to Bioinformatics, Addison Wesley Longman Ltd., England.
2. Baxovans A.D. and Francis Ouellette B.P. (1998), Bioinformatics a practical guide to the analysis of gene and proteins, Wiley – Interscience Publication, New York.
3. Primrose, S.B. and Twyman R.M. (2003), Principles of Genome analysis and Genomics

**Reference**

1. Balagurusamy, E. 1985. Programming in BASIC, Tata McGraw Hill Publication Co. Ltd., New Delhi.
2. Dheenadayalu, R. 1987. Computer Science, Tata McGraw Hill Publication Co. Ltd., New Delhi.

**Semester – VI**  
**11UBO630304A**

**Hours/week : 4**  
**Credits : 3**

### **IMMUNOLOGY**

#### **Objectives**

1. To understand the basic immune system of the human beings
2. To understand the mechanism of antigen and antibody interaction

#### **Unit - I**

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

#### **Unit - II**

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.

#### **Unit - III**

Characteristic features of antigens – Immunogen – Hapten – Adjuvant – Epitope – Paratope – Antigen – Antibody interactions – Affinity, Avidity, Cross reactivity, precipitation, agglutination. Production of B & T lymphocytes in the body – Antibody production by plasma cells.

#### **Unit - IV**

Primary and secondary immune responses. Vaccines – Definition, Types; Vaccination schedule. Immune response against intracellular pathogens (virus & bacteria) and extra cellular pathogens (bacteria, fungi, protozoans and worms).

#### **Unit - V Basic Immunological Techniques and their applications.**

Principle, protocol, and applications of Blood grouping (ABO/Rh) – Total Lymphocyte count- Isolation of T & B lymphocytes- Raising antibodies

in rabbit- VIDAL test for Typhoid- VDRL test for Syphilis- Latex agglutination test for RA- ELISA (types)- Sandwich ELISA for pregnancy. Immunoelectrophoresis.

#### **Text Book(s):**

Chakravarty, AK. 2000. Immunology, Tata McGraw Hill Publication Co. Ltd., New Delhi.

#### **Reference**

1. Janeway, CA & Travers, P. Immunobiology, Third Edition, Garland Publishing Inc. New York.
2. Daniel P. Stites & Abba I. Jerr. 1998. Medical Immunology, 9<sup>th</sup> Ed., Prentice-Hall International Inc.
3. Janis Kuby, 2000. Immunology – 5<sup>th</sup> edition, W.H.Freeman.
4. Roitt, IM. 1990. Essential immunology, 6<sup>th</sup> Edition, Black Well Scientific Publications, Oxford.

**Semester - VI**  
**11UBO630304B**

**Hours/week : 4**  
**Credits : 3**

**SERICULTURE**  
**(Core Elective)**

**OBJECTIVES**

1. To learn the various techniques and procedures to produce optimum herbage yield of mulberry crop.
2. To understand the silkworm rearing technology.

**Unit - I**

**Introduction:** History of Sericulture – Silk in the ancient world – Silk Road – Silk production. Uses of silk. Scope and limitations of Sericulture. Classification of Silk.

**Unit - II**

**Silk Worms:** Introduction – Classification – Types of silkworms. Systematic Position of *Bombyx mori* – Morphology and Life History of *Bombyx* – Metamorphosis – Parental Races – Distribution – Voltinism, moulting – Non-Mulberry Silkworms – Distribution – Salient features of non-mulberry Silkworms – Silkworm Diseases (Protozoan; Bacterial; Viral; Fungal) – Silkworm Pests (Major and minor pests).

**Unit - III**

**Mulberry Cultivation:** Conditions required for mulberry growth – Soil and preparation of land; Selection, Preparation and Layout of plantation – Mulberry varieties – Sexual and Asexual propagation – Nurseries – Leaf harvesting methods and preservation of leaves; Mulberry Diseases (bacterial, viral, fungal and parasitic)

**Unit - IV**

**Methods of Rearing:** Stock maintenance – Selection and Procurement of seed races – Hatching and Brushing – Chawki Rearing and Late-Age worm Rearing; Importance of late age rearing – Environmental

condition – Quality of mulberry leaf – Leaf selection – Feeding schedules – Bed cleaning – Spacing – Moulting – Rearing methods.

**Unit - V**

**Silk Production:** Spinning and Mounting – Ripening of worms – Silk gland – Process of spinning – Mountages – Mounting – Environmental conditions – Care curing mounting – Cocoon harvesting – Cocoon sorting – Stifling methods – Storage of cocoons – Sorting of cocoons – Deflossing – Riddling – Mixing – Silk reeling and Testing.

**Text Book(s):**

Madan Mohan Rao M. 1999. Comprehensive Sericulture Manual, BS Publishing's, New Delhi.

**Reference**

Ramana, 1981. Economics of Sericulture and Silk, Deep & Deep Publ., New Delhi.

**Semester - VI**  
**11UBO630504**

**Hours/week : 4**  
**Credit : 3**

**BIOCHEMISTRY**  
**(Additional Core)**

**Objectives**

1. To understand the structure and properties of the biomolecules
2. To know the reactions performed by the biological macromolecules
3. To understand the role of molecules like vitamins and minerals in the net-working of the biological cell

**Unit - I**

**Carbohydrates:** Classification, Stereochemistry of simple sugars,  $\alpha$  &  $\beta$  glycosidic linkages; structure and properties of mono - and disaccharides. Polysaccharides: chemical structure and function of starch, glycogen and cellulose. Chemical nature of prokaryotic and eukaryotic cell wall.

**Unit - II**

**Lipids:** Classification, saturated and unsaturated fatty acids. Properties and synthesis of lipids:  $\beta$ -oxidation and  $\alpha$ -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:** Biocatalists – 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**

**Vitamins:** Classification – water soluble (B complex, ascorbic acid) and fat soluble (A, D, E, K). Structure, function and properties of vitamins – states of deficiency and excess.

**Text Book(s):**

- x Berg JM, Tymoczko JL & L Stryer. 2006. Biochemistry, 6th edition, W.H. Freeman and Company, New York.

**Reference**

1. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3<sup>rd</sup> Ed. Oxford University, Oxford.
2. Devlin TM. (ed.), 2006. Text book of Biochemistry, 6<sup>th</sup> Ed. A John Wiley & Sons, Inc. Publication, New York.

**Semester - VI**  
**11UBO640602**

**Hours/week : 2**  
**Credits : 2**

**HERBAL TECHNOLOGY**  
**(Skill based Elective)**

**Objective:**

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 role of advance technologies in the conservation and production of Medicinal plants and unraveling of the phytochemistry of the active principles of the medicinal plants which will provide the basis for drug designing

**Unit - I**

**General Introduction:** Definition, source of herbal raw materials, identification, authentication, standardization of medicinal plants as per WHO guidelines & different herbal pharmacopoeias. Collection and processing of herbal drugs. Seasonal & geographical variations; natural & artificial drying methods. Packaging & labeling of herbal drugs prior to extraction.

**Unit - II**

**Standardizations:** Determination of physical and chemical constants such as extractive values, moisture content, volatile oil content, ash values, bitterness value and foreign matters applicable to the various herbal drugs.

**Unit - III**

Nutraceuticals, Pesticides from natural origin, Natural Allergens and other toxic plants. Herbal Formulations: Principle, methods, single herb formulation, poly-herbal formulation & their merits and demerits. Standardization of various herbal formulations.

**Unit - IV**

Plant Tissue Culture Techniques & its Application in Pharmacy: Introduction, techniques of initiation and maintenance of various types of

cultures. Immobilized cell techniques & biotransformation studies including recent developments in production of biological active constituents in static, suspension and hairy root cultures.

**Unit - V**

Analysis of Bioactive Components of Natural Sources: Phyto-chemical standardization of raw herbal extracts and their formulation by using TLC, HPTLC, GC, HPLC, UV& IR techniques.

**Text Book(s):**

1. Kokate, C.K., Purokit A.P and Gokahale, 2002. Pharmacognosy, Nirali Prakashan, Pune.
2. Gary Walsh 1998. Biopharmaceutical, John Wisley and Sons, NY.

**Reference**

1. Peter B. Kaufmann *et al.*, 1999, Natural Products from Plants, C.R.C. Press.
2. K. Peach and M.V. Tracey. 1964. Modern Methods of Plant Analysis, Springer-Verlag, Berlin. Quality control of herbal drugs: an approach to evaluation of botanicals by Pulok K. Mukherjee).



### SKILL BASED ELECTIVES

#### BOTANY

11UBO540601	Mushroom Culture
11UBO640602	Herbal Technology

#### BUSINESS ADMINISTRATION

11UBU540601	Personality Development
11UBU640602	Managerial Skills

#### CHEMISTRY

11UCH540601	Food and Nutrition
11UCH640602	Everyday Chemistry

#### COMMERCE

11UCO540601A	Accounting for Executives
11UCO540601B	Soft Skills for Managers
11UCO640602A	Total Quality Management
11UCO640602B	Fundamentals of Accounting Packages

#### COMMERCE (CA)

11UCC540601	Soft Skills
11UCC640602	Basics of Accounting

#### COMPUTER APPLICATIONS (Dept of IT)

11UBC540601A	Fundamentals of IT
11UBC540601B	Internet Concepts
11UBC640602A	Visual Programming
11UBC640602B	Flash

#### COMPUTER SCIENCE

11UCS540601A	Office Automation
11UCS540601B	Internet Concepts
11UCS640602A	Fundamentals of Computer Networks
11UCS640602B	E-Commerce

#### ECONOMICS

11UEC540601	Security Analysis
11UEC640602	Economics of Insurance

#### ELECTRONICS

11UEL540601	DVD Troubleshooting and Assembling
11UEL640602	PC Assembling

#### ENGLISH LITERATURE

11UEN540601	Business English Writing
11UEN640602	Media Skills

#### HISTORY

11UHS540601	Indian History for Competitive Exams
11UHS640602	Tourism and Travel Management

#### MATHEMATICS

11UMA540601	Mathematics for Competitive Exams
11UMA640602	MATLAB

#### PHYSICS

11UPH540601	Cell Phone Servicing
11UPH640602A	Electrical Wiring
11UPH640602B	Videography

#### STATISTICS

11UST540601	Data Analysis for Competitive Exams
11UST640602	Statistics for Management

#### TAMIL

11UTA540601	தமிழ் இலக்கியத்தில் மனித உரிமைகள்
11UTA640602	மைய அரசுப் பணித் தேர்வுத்தமிழ்