KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF BOTANY (UG)

CURRICULUM AND SCHEME OF EXAMINATIONS
(CBCS)
(2021 - 2022 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029

Vision:

- Developing the total personality of every student in a holistic way by adhering to the principles of **Swami Vivekananda** and **Mahatma Gandhi.**

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

DEPARTMENT OF BOTANY

Vision:

- Disseminate the knowledge on plants and their utility to the society.
- To develop feasible strategies in plant sciences for obtaining sustainable benefits from them.

Mission:

- Designing the curriculum by frequently updating the syllabi according to the present need.
- Preparing the students with more aptitude, skill and leadership quality by educating them.
- Make the students as entrepreneurs in the plant based industries.
- Identification and encouragement to turn the students into eminent Scientists/ Laurels.

PROGRAMME OUTCOMES (PO)

PO1

- Botany has immense carrier potential in areas such as Taxonomy, Genetics, Biotechnology, Pharmaceuticals, Agriculture and Environment.

PO2

- Students get an excellent opportunity to enrich scientific knowledge on botanical and ecological dimension of many plants and to study the species richness of the plant kingdom

PO3

- Knowledge on conservation of natural bioresources and various other hotspots augment students to explore their therapeutic values economically, culturally and aesthetically

PO4

- Gain introductory experience on various biochemical pathways and their role in living systems

PO5

- Apply contextual knowledge on the importance of ethical environmental principles, norms and consequent responsibilities relevant to biodiversity conservation practice and sustainable use of plants.

PO6

- Address the socioeconomic challenges related to plant sciences and to disseminate knowledge on various aspects of medicinal plants and appropriate considerations on human health problems.

PO7

- Knowledge on conservation of natural bioresources and various other hotspots augment students to explore their therapeutic values economically, culturally and aesthetically

PO8

- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1

- Highest priority is given to morphology, taxonomy, anatomy and embryology to know each and every character of the plant both in external and internal characters for their identification and classification to involve plants further in biochemical and pharmaceutical aspects.

PSO 2:

- Students will be able to apply fundamental biostatistics, bioinformatics tools and biophysical principles for the analysis of relevant biological situations and for developing intellectual skills on biological data and databases.

PSO3

- Students will be able to explicate the ecological interconnections of life on earth by tracing energy and nutrient flows through the environment by the microbial and degradation of the waste. They will be able to relate the physical features of the environment to that of the structure of populations, communities and ecosystem.

PSO4

- Study on medicinal plants provide firsthand knowledge on local, rare, endangered, endemic and exotic medicinal plants in their original habitats, their therapeutic values acquired through their physiological pathways and their cultivation practices for effective conservation for future use.

PSO5

- Through microbiological core concepts the students were able to inter-relate integral and ubiquitous role of microbes with their environment. In plant pathology, students are expected to recognize plant diseases and their disease management in economically important crop plants.

UBO1

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

Course Name: B.Sc., Botany

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2021-2022)

Semester	Part	Subject code	Title of the Paper	Instruction Hours / Cycle	Exam. Marks			Duration of Exam.(hours)	Credit
					CIA	ESE	Total		
I	I	**21TML101**	**Part-I -Lang. -Tamil-I** /Hindi-I/French -I / Malayalam -I/ Sanskrit-I	6	50	50	100	3	3
	II	**21ENG101**	**Part - II – Lang.** - English – I	6	50	50	100	3	3
	III	**21UBO101**	**C.P.1-** Biodiversity – I	7	50	50	100	3	4
		21UZO1A1	**Allied -1** Zoology – I	5	30	45	75	3	4
			C.Pr.1 - Biodiversity - I	2	-	-	-	-	-
			Allied Pr. Zoology – I	2	-	-	-	-	-
	IV	**21EVS101**	Environmental studies**	2	-	50	50	3	2
			Total	**30**	-	-	**425**	-	**16**
II	I	**21TML202**	**Part - I- Tamil-II** /Hindi-II /French-II / Malayalam-II / Sanskrit – II	6	50	50	100	3	3
	II	**21ENG202**	**Part- II- Lang. -** English – II	6	50	50	100	3	3
	III	**21UBO202**	**C.P.2** - Plant Diversity - II	7	50	50	100	3	4
		21UZO2A2	**Allied - 2** - Zoology – II	5	30	45	75	3	4
		21UBO2CL	**C.Pr.1** – Biodiversity - I & Plant Diversity II	2	50	50	100	3	2
		21UZO2AL	**Allied. Pr.** Zoology - I & II	2	25	25	50	3	2
	IV	**21VED201**	Value Education - Moral and Ethics**	2	-	50	50	3	2
			Total	**30**	-	-	**575**	-	**20**
III	I	**21TML303**	**Part-I-Tamil-III** /Hindi- III / French-III / Malayalam - III / Sanskrit – III	6	50	50	100	3	3
	II	**21ENG303**	**Part - II – Lang. -** English – III	6	50	50	100	3	3
	III	**21UBO303**	**C.P. 3 –** Anatomy and Embryology of Angiosperms	5	50	50	100	3	4
		21UCH3A3	**Allied - 3 -** Chemistry – 1	5	30	45	75	3	4
			C. Pr. 2. – Anatomy and Embryology of Angiosperms	2	-	-	-	-	-
			Allied - Pr. – Chemistry	2	-	-	-	-	-
	IV	**21UGA3S1**	Skill Based Subject -I General awareness	2	50	50	100	3	3
		21TBT301/ 21TAT301/ 21UHR3N1	Basic Tamil* / Advanced Tamil**/ Non Major Elective - I**	2	-	75	75	3	2
			Total	**30**	-	-	**550**	-	**19**
IV	I	**21TML404**	**Part-I-Tamil-IV** / Hindi-IV / French - IV/ Malayalam - IV / Sanskrit – IV	6	50	50	100	3	3
	II	**21ENG404**	**Part-- II -Lang.** - English IV	6	50	50	100	3	3
	III	**21UBO404**	**C.P.4-** Biophysics and Biostatistics	5	50	50	100	3	4
		21UCH4A4	**Allied 4** - Chemistry – 2	5	30	45	75	3	4

UBO2

		21UBO4CM	**C. Pr.2.-** Anatomy and Embryology of Angiosperms & Biophysics and Biostatistics	2	50	50	100	3	2
		21UCH4AL	**Allied Pr.** Chemistry	2	25	25	50	3	2
	IV	**21UBO4S2**	Skill based subject-II - Applied Microbiology	2	50	50	100	3	3
	IV	**21TBT401/ 21TAT402 21UWR4N2**	Basic Tamil*/ Advanced Tamil**/ Non Major Elective-II **	2	-	75	75	3	2
			Total	**30**	**-**	**-**	**700**	**-**	**23**
V	III	**21UBO505**	**C.P. 5 -** Fundamentals of Computer and Bioinformatics	4	50	50	100	3	4
		21UBO506	**C.P. 6 -** Taxonomy of Angiosperms and Economic Botany	4	50	50	100	3	5
		21UBO507	**C.P.7 -** Cytology, Genetics and Plant Breeding	4	50	50	100	3	5
		21UBO508	**C.P. 8 -** Plant Ecology, Phytogeography and Resource Conservation	4	50	50	100	3	5
		21UBO5E1	**Major Elective – I**	4	50	50	100	3	5
		21UBO5CN	**C.Pr.3** – Fundamentals of Computer and Bioinformatics	2	50	50	100	3	2
			C.Pr. 4 - Taxonomy of Angiosperms, Economic Botany, Cytology, Genetics and Plant Breeding, Plant Ecology, Phytogeography and Resource Conservation	6	-	-	-	-	-
	IV	-	EDC - Extra Departmental course	2	50	50	100	3	3
	-	**21UBO5IT**	Internship Training	**Grade******					
			Total	**30**	**-**	**-**	**700**	**-**	**29**
VI	III	**21UBO609**	**C.P.9** – Biochemistry and Bioinstrumentation	6	50	50	100	3	4
		21UBO610	**C.P.10 -** Plant Physiology	6	50	50	100	3	5
		21UBO611	**C.P.11-** Horticulture	6	50	50	100	3	4
		21UBO6CO	**C.Pr. 4-** Taxonomy of Angiosperms, Economic Botany , Cytology, Genetics and Plant Breeding & Plant Ecology, Plant Phytogeography and Resource Conservation	-	50	50	100	3	2
		21UBO6CP	**C. Pr. 5** – Biochemistry, Bioinstrumentation, Plant physiology & Horticulture	4	50	50	100	3	2
		21UBO6E2	**Major Elective- II**	4	50	50	100	3	5
		21BO6Z1	Project***	2	50	50	100	-	5
	IV	**21UBO6S3**	Skilled Based Subject III- Cultivation and Marketing of Medicinal Plants	2	50	50	100	3	3
			SWAYAM - MOOC	-	-	-	-		2
			Total	**30**	**-**	**-**	**800**	**-**	**32**
	V	**21NCC/NSS/ YRC /PYE/ECC/R CC/WEC101 #**	Extension activity *	-	50	-	50	-	1
			Grand Total	**-**	**-**	**-**	**3800**	**-**	**140**

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

@ Hindi/Malayalam/ French/ Sanskrit - 21HIN/MLM/FRN/SAN101 - 404

***** - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

******- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

***- Project Report - 35 marks; Viva-voce - 15 marks; Internal - 50 marks

****-The students shall undergo an Internship training/field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective Faculty. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

Major Elective Papers

(2 papers are to be chosen from the following 6 papers)

1. **Forestry**
2. **Biotechnology**
3. **Food Science**
4. **Seed Biology**
5. **Pharmacognosy**
6. **Mushroom Cultivation Technology**

Non-Major Elective Papers

1. **Human Rights**
2. **Women's Rights**
3. **Consumer Affairs**

Sub code & Title of the Extra Departmental Course (EDC)

21UBO5X1 - Medicinal Botany and Human Welfare

UBO4

 # List of Extension Activities:

1. National Cade Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below:

Tally Table:

S. No.	Part	Subject	Marks	Credits
1.	I	Language - Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core - Theory/Practical	1600	58
		Allied	400	20
		Elective/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		Extra Departmental Course (EDC)	100	3
		Environmental Studies	50	2
		Value Education	50	2
		Extension Activities	50	1
5.		SWAYAM – MOOC	-	2
6.	V	**Total**	**3800**	**140**

- 50% CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.

- UG students should complete **SWAYAM-MOOC** courses before the completion of 5th semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Two credit points will be given to the candidates who have successfully completed the course. In case the students have completed more than one online course, the appropriate 2 extra credits shall be awarded to such candidates upon the submission of certificate through the HOD to the Controller of Examinations.

- A **Field Trip** preferably relevant to the course should be undertaken every year.

UBO5

Certificate Course

- **Bonsai**

Semester	Subject Code	Title of the Paper	Instruction hours /cycle	Exam Marks			Duration of Exam (hours)	Credits
				CIA	ESE	Total		
	21CCB101	**C.P.1- Introduction to Bonsai Principles and Techniques**	2	50	50	**100**	3	**2**
	21CCB102	**C.P.2- Ethics, Values and Marketing of Bonsai**	2	50	50	**100**	3	**2**
	21CCB1CL	**C.Pr.1. Bonsai Techniques**	2	50	50	**100**	3	**2**
	21CCB1Z1	**Project**	2	50	50	**100**	3	**2**
		Grand Total	**8**	**-**	**-**	**400**	**-**	**8**

Note:

CBCS - Choice Based Credit System
CIA - Continuous Internal Assessment
ESE - End of Semester Examinations

Components of Continuous Internal Assessment (CIA)

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			50
CIA Practical		50 Converted to 30	
Observation Notebook		15	
Attendance		5	
Project			
Review		45	50
Regularity		5	

***Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. etc.**

****** Two Assignments to be given. (Each 5 marks)**

UBO6

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1 - Remembering; **K2 -** Understanding; **K3 -** Applying; **K4 -** Analyzing; **K5 –** Evaluating)

1. Theory Examination - Part I, II & III

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ-10/Fill ups-5/One word-5	75**
K2 – K5 Q21 to 28	B (5out of 8)	5 x 5 = 25	Short Answers	
K2 - K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

****For ESE 75 marks converted to 50 marks**

(ii) CIA I & II and ESE: 45 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 10	A (Answer all)	10 x 0.5 = 5	MCQ	45
K2 – K5 Q11 to 15	B (Either or type)	5 x 3 = 15	Short Answers	
K2 - K5 Q16 to 20	C (Either or type)	5 x 5= 25	Descriptive / Detailed	

2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments & Record Work	45	50
K4		05	
K5			

3. Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report & Viva voce	35	50
K4			
K5		15	

UBO7

21UBO101

Programme Code: 05		**Title: B.Sc., BOTANY**		
Core Paper: 1 - BIODIVERSITY – I (Bacteria, Virus, Algae, Fungi, Lichens and Plant Pathology)				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**7**	**105**	**4**

COURSE OBJECTIVES

- To acquire knowledge on evolution of Microbes and Thallophytes and to know about the diversity patterns of lower life forms on earth.
- To understand the distribution, structure, reproduction and life cycle patterns of lower life forms like bacteria, virus, algae, fungi and lichens.
- To know the economic value of lower organisms.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	To know the bacteria, virus and primitive plants of the earth. Know about the distribution and mode of nutrition of algal, fungal species
	CO2	Differentiate, identify and classify the algal species using algal pigments.
	CO3	To study the structure, reproduction and life cycle patterns of algae.
	CO4	Apply knowledge on the involvement and beneficial aspects of fungi to mankind.
	CO5	To disseminate knowledge on disease causing organisms like bacteria and virus with their control measures

UNIT I **(21 HOURS)**

Microbiology – **Virus** – outline classification of Virus, Morphology and general characteristics of plant viruses. **Bacteria** – Outline Classification (Bergey‟s Manual of systematic bacteriology), Morphology, Ultrastructure and Economic importance.

UNIT II **(21 HOURS)**

Algae - General characters of Algae. Outline classification (Fritsch, 1945). Detailed study of occurrence, thallus structure, reproduction and life cycle of Cyanophyceae – *Nostoc*, Chlorophyceae – *Volvox, Caulerpa*.

UNIT III **(21 HOURS)**

Occurrence, thallus structure and reproduction of Bacillariophyceae – *Diatoms*. Occurrence, thallus structure, reproduction and life cycle of Phaeophyceae - *Sargassum*, Rhodophyceae – *Polysiphonia*. *****Economic importance of Algae**.**

UNIT IV **(21 HOURS)**

Fungi -General characters of the fungi. Outline classification (Alexopoulos and Mims, 1979) Detailed study of occurrence, structure, reproduction and life cycle of *Albugo, Rhizopus, Saccharomyces, Penicillium* and *Lycoperdon*. Economic importance of fungi.

21UBO101

UNIT V **(21 HOURS)**

Lichens: Phycobionts and mycobionts. Morphology, anatomy of thallus and reproduction of Ascolichen. Economic importance of Lichen. **Pathology –** Introduction, definition and classification of diseases. Symptoms, Causative organisms and Control measures of Tobacco Mosaic Viral diseases, Bunchy top of Banana, Tikka disease of groundnut (*Arachis hypogea*) and Citrus canker.

*** Self study**

Teaching Methods

Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Gangulee, Das & Kar. 2001. College Botany Vol. II. New central Book agency Pvt. Ltd., Calcutta.
2. Sharma, O.P. 2002.Text book of Fungi. Tata McGraw-Hill Publications, New Delhi.
3. Michael. J. Pelczar, J.R, E.C.S. Chan, Noel R. Krieg and Merna Foss Pelczar Microbiology 1993.Tata McGraw–Hill Publishing Company Limited. New Delhi.
4. Rangasami G and Mahadevan. Diseases of crop plants in India. 2006. Prentice-Hall of India Private Limited, New Delhi - 110001

REFERENCES

1. Smith, G.M. 1955. Cryptogamic Botany. Alage and Fungi Vol. I M. Vadamalai media Pvt. Ltd. Bangalore
2. Alexopoulos C.J & Mims – 1979. Introductory Mycology.
3. Vashishta, B.R. 1998. Fungi. S. Chand & Co., New Delhi.
4. Vashishta, B.R. 1998. The Algae. S. Chand & Co., New Delhi.
5. Chopra, C.L. 1982. Algae. S. Nagin & Co., New Delhi.
6. Fritsch, F.E- 1972. The structure and reproduction of Algae Vol. I & II.
7. Watson.1974. Structure and life cycle of Bryophytes. B.I. Publications, New Delhi.
8. Sharma, O.P. 1986. Text book of Algae. Tata Mc Graw – Hill Publications, New Delhi

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	L	H	S	M
CO2	H	M	S	H	S
CO3	H	H	M	S	H
CO4	S	M	H	S	M
CO5	S	H	M	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO9

21EVS101

Title: For B.A., BBA, B.Com, BCA and B.Sc., Degree Students				
PART IV – ENVIRONMENTAL STUDIES				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**2**	**30**	**2**

COURSE OBJECTIVES

- The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good "Ecocitizens" thereby catering to global environmental needs.
- This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
- The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
↑	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
↑	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
↑	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
↓	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems
K5		

UBO10

21EVS101

SYLLABUS

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT (6 HOURS)

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS (6 HOURS)

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem –Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION (6HOURS)

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *Insitu* Conservation of Biodiversity – *Exsitu* Conservation of Biodiversity

UNIT IV ENVIRONMENTAL POLLUTION (6 HOURS)

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 HOURS)

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

UBO11

21EVS101

Teaching Methods

- Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion

Text Book

1. P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.
2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.
3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001

Question Paper Pattern

(External only)

Duration: 3 hours Total Marks: 50

Answer all Questions (5 × 10 = 50 Marks)

Essay type, either or type questions from each unit.

UBO12

21UBO202

Programme Code: 05	**Title: B.Sc., BOTANY**			
Core Paper: 2 - PLANT DIVERSITY – II				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**7**	**105**	**4**

COURSE OBJECTIVES

- To know about the diversity of Cryptogams and Phanerogams.
- To understand the life cycle patterns of Bryophytes, Pteridophytes and Gymnosperms.
- To study the fossil remains of plants belonging to various eras of Palaeobotany.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Acquire knowledge on diversity among Bryophytes, Pteridophytes and Gymnosperms.
	CO2	Understand the internal structural and reproduction of Cryptogams and Phanerogams
	CO3	Apply the medicinal and economic knowledge of Bryophytes, Pteridophytes and Gymnosperms for the benefit of human welfare.
	CO4	Implement knowledge on the structural organization and life cycle patterns of Gymnosperms
	CO5	Compare and evaluate the Cryptogamic and Phanerogamic characters along with fossil forms and their past evidences for the identification and determination of their age through radiocarbon dating.

SYLLABUS

UNIT I **(21 HOURS)**

Bryophytes: Introduction and general characters of Bryophytes. Classification of Bryophytes (K.R. Sporne, 1935).Occurrence, structure, reproduction and life cycle of *Marchantia*#, *Anthoceros*# and *Funaria*#. Economic importance of Bryophytes.

UNIT II **(21 HOURS)**

Pteridophytes: Introduction and general characters of Pteridophytes. Classification of Pteridophytes (Riemer, 1954). Occurrence, structure, reproduction and life cycle of *Lycopodium*#, *Selaginella*# and *Equisetum*#.

UNIT III **(21 HOURS)**

Occurrence, structure, reproduction and life cycle of *Ophioglossum*# and *Adiantum*#. Vascular organization and Stelar evolution in Pteridophytes. Apogamy and Apospory. Economic importance of Pteridophytes*.

UNIT IV **(21 HOURS)**

Gymnosperms: Introduction and general characters of Gymnosperms. Classification of Gymnosperms (Coulter & Chamberlain 1956). Detailed study of the structure and reproduction of *Cycas*# and *Gnetum*#. Economic importance of Gymnosperms.

21UBO202

UNIT V **(21 HOURS)**

Palaeobotany: Geological time scale, fossilization and types. Radiocarbon dating. Study of the following fossils – *Rhynia*, *Lepidodendron*, *Lepidocarpon* and *Williamsonia*.

 # (Developmental studies are excluded)

*** Self study**

Teaching Methods

- Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Gangulee, Das &Kar. (2001). College Botany Vol II. New central Book agency Pvt. Ltd. Calcutta.
2. Vashista, P.C. (1992). Pteridophyta. Chand & Co., New Delhi.
3. Pandey, B.P. (1981). Gymnosperms. Chand & Co., New Delhi.
4. Vashista, P.C., Sinha and Anil Kumar. (2008). Text book of Bryophytes. Chand & Co., New Delhi.
5. Shukla and Mishra. (1982). Essentials of Paleobotany. Vikas Publishing House, Pvt Ltd., New Delhi.

REFERENCES

1. Pandey, B.P. (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.
2. Rashid. (1995). An introduction to Pteridophytes. Vikas Publishing House, Pvt. Ltd., New Delhi.
3. Sporne, K.R. (1980). Morphology of Petridophytes -B.I. Publications, New Delhi
4. Smith, G.M. (1955). Cryptogamic Botany Vol. II. Tata McGraw Hill Publications, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	S	M
CO2	S	M	H	H	M
CO3	H	L	S	M	H
CO4	S	H	M	H	M
CO5	S	M	H	S	M

S - Strong **H** - High **M** - Medium **L** – Low

UBO14

21UBO2CL

Programme Code: 05		**Title: B.Sc., BOTANY**		
Core Practical 1: BIODIVERSITY I & PLANT DIVERSITY – II				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**2**	**30**	**2**

COURSE OBJECTIVES

- To enable students to know about the diversity of lower organisms.
- To understand the life cycle pattern of Bacteria, Virus, Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Paleaobotany.
- To study the fossil remains of plants in the division of Palaeobotany.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3 ↕ K5	CO1	Understand the primitive and advanced nature of Microbes and Thallophytes
	CO2	Appraisal of the morphological features of lower life form habitats
	CO3	Examine the internal structural organization of Cryptogams and Phanerogams
	CO4	Demonstrate the nature of occurrence and reproduction patterns of Lichens
	CO5	Analyze the pathogenic microorganisms causing various plant diseases

Core Practical 1 –BIODIVERSITY I & PLANT DIVERSITY II

I. BIODIVERSITY I

1. **Bacteria:** Gram Staining Method – Gram positive and Gram negative
2. **Algae:** Internal and reproductive structures of the following:-
   Nostoc
   Volvox
   Caulerpa
   Diatoms
   Sargassum
   Polysiphonia.
3. **Fungi:** Structure and reproduction of the following:-
   Albugo
   Rhizopus
   Saccharomyces
   Penicillium
   Lycoperdon
4. **Lichen:** Structure and reproduction of *Usnea*.
5. **Pathology**: Symptoms, causative organisms and control measures of
   TMV disease
   Tikka disease of Groundnut and Citrus canker

UBO15

21UBO2CL

II. PLANT DIVERSITY - II

Structure and reproductive characters of the following:-

Bryophytes

Marchantia
Anthoceros
Funaria

Pteridophytes

Lycopodium
Selaginella
Equisetum
Ophioglossum
Adiantum

Gymnosperms

Cycas
Gnetum

Palaeobotany

Rhynia
Lepidodendron
Lepidocarpon
Williamsonia

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	H	H	M
CO3	S	H	M	S	S
CO4	S	H	S	S	M
CO5	S	S	M	H	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO16

21UBO2CL

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

UG MODEL QUESTION PAPER (PRACTICALS)

End of semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 1 - BIODIVERSITY I & PLANT DIVERSITY II

I. Micro-preparation	**- 20 Marks**
II. Gram Staining	**- 4 Marks**
II. Spotters (6 × 2)	**- 12 Marks**
III. Plant systematic position	**- 04 Marks**
IV. Plant pathology	**- 05 Marks**
Submission of Record	**- 05 Marks**
TOTAL	**- 50 Marks**

UBO17

21VED201

Title: For all UG First year Degree Students			
Title: MORAL AND ETHICS			
Batch 2021-2022	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

Course Objectives

- To impart Value Education in every walk of life.
- To help the students to reach excellence and reap success.
- To impart the right attitude by practicing self introspection.
- To portray the life and messages of Great Leaders.
- To insist the need for universal brotherhood, patience and tolerance.
- To help the students to keep them fit.
- To educate the importance of Yoga and Meditation.

Course Outcomes (CO)

After completing the course the students:

K1 ↑	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
K5	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

SYLLABUS

UNIT I **4 HOURS**

Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

UNIT II: **6 HOURS**

Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III: **4 HOURS**

Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: **8 HOURS**

Physical Fitness and Mental Harmony: Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam – Life Force – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries

UNIT V: **8 HOURS**

Yoga and Meditation – The Asset of India: Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

Text Books:

1. Value Based Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition (2020).

Reference Books:

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication (2000).
5. Yoga Practices - 1 – The World Community Service Centre – Vethathiri Publications, Sixth Edition (2017), Erode.
6. Yoga Practices - 2 – The World Community Service Centre – Vethathiri Publications – Eighth Edition (2017), Erode.

Question paper pattern

(External only)

Duration: 3 hrs **Total Marks: 50**

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

UBO19

21UBO303

Programme Code : 05	**Title: B.Sc., BOTANY**			
Core Paper: 3 – ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS				
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2021-2022	**III**	**5**	**75**	**4**

COURSE OBJECTIVES

- To inculcate knowledge on the basics of tissues and anatomical features of plants
- To differentiate the primary and secondary anatomical structure of dicot and monocot plants
- To understand the key aspects of reproductive systems of flowering plants.

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Know about the various developmental aspects of Angiospermic plants.
	CO2	Compare and identify the structural differences existing among the vascular plants.
	CO3	Acquire knowledge on secondary growth of Angiosperms.
	CO4	Imply the embryological and anatomical knowledge to differentiate the plant taxa.
	CO5	Recognize the evolutionary studies of dicot and monocot embryo

SYLLABUS

Unit I **(15 HOURS)**

Scope and significance of plant anatomy; Apical organization: Origin and structure of primary meristem (Angiosperm), theories of apical organization, Structure and function of simple tissues and complex tissues

Unit II **(15 HOURS)**

Epidermal tissue system : Stomata - types and functions; Trichomes - Types and functions, structure and functions of secretory trichomes in *Drosera* and *Nepenthes*, salt gland, collectors, floral and extrafloral nectaries, resin duct, oil glands and lacticiferous (articulated and non-articulated). Primary structure of dicot and monocot root, stem and leaf

Unit III **(15 HOURS)**

Vascular cambium and cork cambium: Structure and function. Secondary xylem and phloem: Structure and functions. Anomalous secondary growth: Dicotyledons - *Achyranthes* and *Nyctanthes*, Monocotyledons - *Dracena*. Wood: Porous, non-porous, patterns and distribution, physical, chemical and mechanical properties. Plant fibres - Distribution, structure and commercial importance of coir, jute and cotton.

Unit IV **(15 HOURS)**

Angiosperm life cycle*. Microsporangium**:** Structure and development of anther, wall of microsporangium, Tapetum - structure, types and functions, Pollen morphology –

NPC formula, pollen wall features, pollen kit. Megasporangium**:** Structure, types of ovule, ultrastructure of mature Embryosac (*Polygonum*).

Unit V **(15 HOURS)**

Fertilization: Double fertilization. Endosperm**:** Nuclear, Cellular, Helobial and Ruminate types, haustorial behavior of endosperm and function. Embryo**:** Embryogeny in Dicotyledons (Crucifer type) and Monocotyledons (Caryophyllad type). Polyembryony & Parthenocarpy**:** Classification, types and applications. Apomixis**:** types and significance.

*** Self study**

TEACHING METHODS

- Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Fahn, A. (1982). Plant Anatomy. (3rd edition). Pergamon Press, Oxford.
2. Pandey, B.P.1978. Plant Anatomy. Chand and Co, New Delhi.
3. Esau.K. (1985) - Anatomy of Seed Plants -John Willey
4. Singh, Pandey and Jain, (2007). Anatomy of Seed plants, Rastogi Publications. New Delhi.
5. S. S. Bhojwani, S. P. Bhatnagar, (1985). Embryology of Angiosperms, Vikas Publishing House, Noida.
6. Maheswari, P. (1950). Introduction to the embryology of Angiosperms. Vikas Publishing House, New Delhi.
7. Raghavan, V. (1997). Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
8. Prathibha Saxena and Susheela M. Das. (2012) Text book of Plant Anatomy
9. Johri, B.M. 2011. Embryology of Angiosperms. Berlin Heidelberg, New York.
10. Annie Regland. Plant Anatomy and Microtechniques. Saras Publication, Kanayakumari

REFERENCES

1. De Roberties. (1989). Cell and Molecular Biology. Mc Graw Hill, New Delhi.
2. Annie Regland. (2000). Developmental Botany -Saras Publication, Kanyakumari
3. Fahn, A (1985). Plant Anatomy. Pergamon Press, Great Britain.
4. Esau, K. (1991). Plant Anatomy. Wiley Eastern Ltd. New Delhi. 7th Edition

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	H
CO2	H	H	M	S	M
CO3	S	H	S	H	H
CO4	H	S	H	M	M
CO5	M	H	S	H	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO21

21UGA3S1

Programme Code: 05	Title: B.Sc., BOTANY		
	SKILL BASED SUBJECT 1 - GENERAL AWARENESS		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	2	30	3

Course Objectives

- To acquire knowledge in relation to various competitive examinations
- To encourage the students to newspaper reading and journals
- To familiarise the students with online examinations which are being adopted in competitive examinations

Course Outcomes (CO)

K1	CO1	Knowledge about literature, Reasoning, Science and Technology and Youth Red Cross
↕	CO2	Remembering important data on general knowledge
	CO3	Make use of the data for competitive examinations
	CO4	Analyse social phenomena
K5	CO5	Comprehend a glimpse and overview of civil service exams

SYLLABUS

UNIT I **(6 HOURS)**

1. **Tamil and other Literatures**
   Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. **Economics and Commerce**
   Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. **Social studies**
   Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II **(6 HOURS)**

4. Numerical Aptitude

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area**.**

5. Verbal Aptitude

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. Abstract Reasoning

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III **(6 HOURS)**

7. General Science and Technology

SCIENCE - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. Computer Science

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis

– Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counseling.

UNIT IV **(6 HOURS)**

10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency –

Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V **(6 HOURS)**

13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Dril – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrational setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

Text Book

1. **General Awareness Question Bank**. Kongunadu Arts and Science College, Coimbatore, First Edition 2014.

Reference Books

1. **General Knowledge Manual 2007**, Tata McGraw Hill Publication Company Limited, New Delhi, 2007.
2. Edgar Thorpe and Showick Thorpe, **The Pearson General Knowledge Manual 2013**, Dorling Kindersley India Pvt. Ltd, 2013.
3. Dr. Sanjay R Agashe, Introduction to **Physical Education Fitness and Sports**, Koncept Book, Uttarkhand, 2007.

Teaching Methods

Quiz/Discussion

UBO24

Question Paper Pattern

Max. Marks 100

End of Semester Examination (ESE) - On-Line Examination 75 Marks*

1. 150 questions are to be given. Each question carries ½ mark.

2. In each unit, 30 questions are to be given, covering all the 5 units.

***For ESE 75 marks converted to 50 marks**

Continuous Internal Assessment (CIA) (through On-Line) 50 Marks

a) Two Exams (CIA I & II)	(75+75) converted to 30
b) Assignment**	10 Marks
c) Attendance	5 Marks
d) Others*	5 Marks

**** Each student has to submit an assignment in the topic Current Affairs area.**

***Class Participation, Case Studies Presentation, Group Discussion, Quiz, Report/Content writing. Etc.**

UBO25

21UBO404

Programme Code: 05	**Title: B.Sc., BOTANY**			
Core Paper: 4 - BIOPHYSICS AND BIOSTATISTICS				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**IV**	**5**	**75**	**4**

COURSE OBJECTIVES

- To understand the nature, pathways and application of light energy.
- To learn the basic principles of biostatistics.
- To impart knowledge to solve the biological problems.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	Recognize the dual nature of the light and its reactions with the matter with reference to plants.
	CO2	Understand the basic concepts of radioactivity and the methods of detection.
	CO3	Impart knowledge on the tools of biostatistics.
	CO4	Analyze and solve the biological related problems using biostatistical formulae.
	CO5	Evaluate scientific findings through various statistical tools.

SYLLABUS

UNIT I **(15 HOURS)**

Biophysics: Introduction, scope and importance. Electromagnetic radiation and absorption. Excitation and de-excitation. Absorption of light in photosynthesis, Efficiency of photosynthesis. Thermodynamic laws (enthalpy, entropy, free energy).

UNIT II **(15 HOURS)**

Radioactivity and Biological traces: Alpha, beta and gamma radiations. Radioactive isotopes and half-life period. Ionization and detection - biological effects of ionizing radiation - uses of biological traces in metabolic studies. Autoradiography, Geiger-Muller and Scintillation counter.

UNIT III **(15 HOURS)**

Biostatistics: - Definition, steps in statistics, data collection methods - sampling - census and sampling method, law of statistical regularities, law of inertia of large numbers. Essential of sampling and methods of sampling - probability of sampling - simple, random sampling, stratified random sampling, cluster sampling, non-probability sampling - judgment sampling, quota sampling and convenient sampling (theory only). Primary and secondary data.

21UBO404

UNIT IV **(15 HOURS)**

Classification of data and Frequency distribution-Simple, Discrete and Continuous series. Tabulation, graphical representation-Time series graph, Histogram and diagrammatic representation of data - Line, Bar and Pie diagram. Cartogram and Pictogram*.

UNIT V **(15 HOURS)**

Measures of central tendency - Mean [Arithmetic only] median and mode. Rounding off figures. Precision, accuracy and error. Dispersion or deviation- range, average deviation, variance, standard deviation and standard error. Test of significance- Chi-square test and t- test.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint Presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Palanichamy, S. (1986). Principles of Biophysics. Paramount Publication, Palani.
2. Palanichamy, S & M. Manoharan. (1994). Statistical Methods for Biologists. Paramount Publication, Palani.
3. Arumugam, N. (2003). Basic Concepts of Biostatistics. Saras Publications, Nagarcoil.
4. S.P. Gupta, S.P. (2001). Statistical Methods. Sultan Chand & Sons, Educational Publishers, New Delhi.

REFERENCES

1. Salil Bose. (1981). Elementary biophysics - Part 1. Vija Printers, Madurai.
2. Khan, I.D. and A. Khanum. (1994). Fundamentals of Biostatistics. Mc Graw Hill, New Delhi.
3. Vasantha Pattabhi & N. Gautham. (2004). Bistatistics. Narosa Publishing House, Chennai.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	S	H	S
CO3	S	H	H	M	H
CO4	H	M	H	S	H
CO5	S	H	H	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO27

21UBO4CM

Programme Code : 05		**Title : B.Sc., Botany**		
Core Practical: 2 – ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS & BIOPHYSICS AND BIOSTATISTICS				
Batch **2021 – 2022**	**Semester** **IV**	**Hours/Week** **2**	**Total Hours** **30**	**Credits** **2**

COURSE OBJECTIVES

- To learn about the special structures associated with the plants.
- To obtain knowledge on primary, secondary and anomalous structures of the plants
- To understand and solve the biological related problems

COURSE OUTCOME

K3 ↕ K5	CO1	Analyze various internal and external structures of the plants.
	CO2	Dissect and examine different stages of embryos of *Tridax* plant.
	CO3	Demonstrate interrelationships between nature and radiation
	CO4	Evaluate the normal distribution pattern of a given population.
	CO5	Apply problem solving skills using statistical tools

I. PLANT ANATOMY

1. To study the stomatal index and different types of stomata.
2. Localization of lacticiferous cells of any Apocynaceae and Asclepiadaceae members.
3. Primary structure of dicot and monocot root stem and leaf.
4. Plant fibres – Cotton.
5. Anomalous secondary thickening - Dicot - *Nyctanthus, Achyranthes.* Monocot - *Dracaena*.

II. EMBRYOLOGY OF ANGIOSPERMS

1. Dissection and display of any two stages of embryo in *Tridax.*
2. Identification using permanent slides
    i. T.S. of anther
    ii. Morphology of pollen grains
    iii. Types of ovules
    iv. Ultrastructure of embryosac
    v. Endosperm types
    vi. Types of embryos
    vii. Polyembryony

I11. BIOPHYSICS

1. Nature of Electromagnetic Radiation (EMR) and Spectrum.
2. Diagrams of fluorescence, Phosphorescence, Delayed light emission, Autoradiography, Geiger-Muller counter and Scintillation counter.

21UBO4CM

IV. BIOSTATISTICS

Simple problems in biostatistics:

- Mean
- Median
- Mode
- Standard Deviation
- Standard Error
- Chi-Square Test.
- t- test

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	H
CO2	H	M	H	S	M
CO3	S	H	M	H	H
CO4	S	H	M	H	S
CO5	S	H	S	S	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO29

21UBO4CM

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 2 – Anatomy, Embryology of Angiosperms, Biophysics and Biostatistics

I. Anatomy section (A & B)		**- 16 Marks**
II. Embryo dissection (C)		**- 05 Marks**
III. Biostatistics (D, E & F)		**- 12 Marks**
IV. Spotters		**- 12 Marks**
	Record	**- 05 Marks**
	TOTAL	**- 50 Marks**

UBO30

21UBO4S2

Programme Code: 05		**Title: B.Sc., BOTANY**		
Skill Based Subject: II – APPLIED MICROBIOLOGY				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**IV**	**2**	**30**	**3**

COURSE OBJECTIVES

- To provide the basic knowledge of microbes
- To introduce the techniques involved in microbiology
- To assess the role of microorganisms in human welfare

.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Acquire knowledge on the fundamental techniques in microbiology.
	CO2	Understand the use of microbes in industries for the welfare of mankind.
	CO3	Apply knowledge on preservation of food and vegetables using suitable techniques for the commercial uses throughout the year.
	CO4	Discover the knowledge on distribution of microbes in the environment and prevent their harmful effects.
	CO5	Predict the pathogenesis and control of disease causing microbes.

SYLLABUS

UNIT I **(6 HOURS)**

Fundamentals of Microbiology: Scope of microbiology - Culture of bacteria: Pure culture techniques - Culture media and preparation: solid and liquid - Preservation of cultures - Sterilization: principles, methods of sterilization-physical method and Chemical Method.

UNIT II **(6 HOURS)**

Industrial Microbiology: Fermentation - aerobic and anaerobic fermentations - production of microbial products - alcohol - lactic acid- penicillin - L-lysine- L-protease and riboflavin.

UNIT III **(6 HOURS)**

Microbial flora of fresh food – Botulism – Mycotoxins – food preservation methods – microbiology of milk and milk products (yoghurt and cheese) – fermented fruits and vegetables – single cell protein (*Spirulina* and *Chlorella*).

UNIT IV **(6 HOURS)**

Environmental Microbiology: Microbes in water, air and soil environment - interactions between microbes and plants: rhizosphere, phyllosphere, mycorrhizae– biodegradation of pesticides and pollutants in soil- role of microorganisms in sewage treatment

21UBO4S2

UNIT V **(6 HOURS)**

Medical Microbiology: Distribution and significance of normal human microbial flora. Infections- sources of infections - Epidemiology of infectious diseases - microbial pathogens: Bacterial –*Salmonella typhi*, *Mycobacterium tuberculosis*; Viral - Dengue, SARS Virus-COVID-19; Fungal-*Candida*, *Aspergillus*

***Self study**

Teaching Methods

- Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Michael J. Pelczar, E.C.S. Chan and Noel R. Krieg (2008), „Microbiology" 5th edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. Dubey, R.C. and D.K. Maheshari (2005), A Text Book of Microbiology" S. Chand and Company Limited, New Delhi.
3. Prescott, L.M., Harley, J.P. and Klien, D.A. 1996. Microbiology (3rd ed.), Brown W.C. Publishers, Boston, USA.

REFERENCES

1. Sullia, S.B. and Shantharam, S. 1998. General Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Nduka Okafor, Benedict C. Okeke. 2017. Modern Industrial Microbiology and Biotechnology, CRC Press, New Delhi.
3. Apurba S. Sastry and Sandhya Bhat, 2019. Essentials of Medical Microbiolgy. Jaypee Brothers Medical Publishers (P) Ltd. New Delhi.
4. Sanjai Saxena. 2015. Applied Microbiology, Springer, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	M
CO2	S	H	M	H	H
CO3	H	S	H	M	S
CO4	S	H	M	H	M
CO5	S	H	H	L	S

S - Strong **H** - High **M** - Medium **L** - Low

UBO32

21UBO505

Programme Code: 05		**Title: B.Sc., BOTANY**		
Core Paper: 5 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS				
Batch **2021-2022**	**Semester** **V**	**Hours / Week** **4**	**Total Hours** **60**	**Credits** **4**

COURSE OBJECTIVES

- To acquire basic knowledge about the computers
- To know how to create the databases
- To impart knowledge on biological informations available in the databases

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Inherit computer knowledge and internet usage.
↕	CO2	Understand the components of computers and usage of biological databases.
	CO3	Applying the technical skills to know the sequences of nucleic acids and amino acids in genes and protein molecules.
	CO4	Identify the structures of various biomolecules using biomolecular visualization techniques.
K5	CO5	Evaluate evolutionary relationships using sequence alignments.

SYLLABUS

UNIT I **(12 HOURS)**

Introduction to computer - applications, types, generations, capabilities - components of computer - hardware - CPU, input and output devices, memory units, auxiliary storage devices.

UNIT II **(12 HOURS)**

Computer architecture, number system, Software - classification of software. Language - machine language - high level language - compilers, translators. Operating systems / DOS / windows. Internet - www, E-mail, browser and search engines*.

UNIT III **(12 HOURS)**

Windows- 2010 an overview. MS-Excel- preparation of workbook and charts, MS-Power Point - features and slide presentation. MS-ACCESS- Creating and querying a database. Database languages, database independence and database administrator. Data warehousing and data mining. Basic concept of Photoshop.

UNIT IV **(12 HOURS)**

Introduction to Bioinformatics. Regulation of gene expression in Prokaryotes and Eukaryotes. Protein Structure - Primary, secondary, tertiary and quatern (Outline only).Biological databases, importance and classification (Outline only). Gene finding methods.

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UNIT V **(12 HOURS)**

Sequence alignment, evolutionary basis of sequence alignment, global Vs local alignment, searching for similarities using scoring matrices and gap penalty. Biomolecular visualization, phylogenetic analysis and computer aided drug designing.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Mani, K and N. Vijayaraj. (2002). Bioinformatics for beginners. Kalaikathir Achakam, Coimbatore.
2. David W. Mount. (2001). Bioinformatics -Sequence and Genome analysis. Cold Spring Harbor Laboratory Press.
3. Rajaraman, V. (2004). Fundamentals of computer. Prentice Hall of India Pvt Ltd.

REFERENCES

1. A.D. Baxevanis and B.J.Francis (Eds.). (1998). Bio-informatics - A practical guide to the analyzing of gene protein. John Wiley and sons.
2. Stuart M. Brown. (2000). Bioinformatics- A biologists guide to bio computing and the internet. Eaton Publishing Co.
3. Arthor M. Lesk. (2002). Introduction to Bioinformatics. Oxford University Press, UK. T.K. Attwood and Parry-Smith (2007).
4. Introduction to bioinformatics. Samiron Phukan Dorling Kinders India, Pvt., Ltd.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	S	S	S	H	M
CO3	H	H	S	M	S
CO4	S	H	H	S	M
CO5	H	S	L	M	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO34

21UBO505

Programme Code: 05	**Title: B.Sc., BOTANY**			
Core Paper 6 - TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**V**	**4**	**60**	**5**

COURSE OBJECTIVES

- To recognize the plant families of major flowering plants and their diagnostic features.
- To acquire basic knowledge on the principles of phylogeny and biosystematics.
- To familiarize knowledge on plants with immense economic values.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Understanding the systems of classification of angiosperms, plant morphology terminologies and identifying morphological peculiarities
	CO2	Understand nomenclature principles of flowering plants and gain hands on experience on herbarium preparation techniques
	CO3	Recognize members of the major Angiospermic families by identifying their diagnostic features
	CO4	Analyzing the comparative account among the families of Angiosperms
	CO5	Evaluate the economic and beneficial aspects of plants to human mankind

SYLLABUS

UNIT I **(12 HOURS)**

Aims and objectives of taxonomy. Systems of classification - Natural (Bentham and Hooker, 1862-1983), Phylogenetic (Engler & Prantl, 1884- 1930) and Modern (Takhtajan,1969 & 1980). Merits and Demerits, Guidelines for the identification of plant specimen.

UNIT II **(12 HOURS)**

Herbarium techniques and uses. National herbarium - CNH - Regional herbarium - MH. Botanical Survey of India. Nomenclature - ICN, Binomial - principles. Typification, Author citations, Effective and valid publication. Retention and rejection of names.

UNIT III **(12 HOURS)**

Detailed study of the following families with reference to the Morphology, Taxonomy and their economic importance. Annonaceae, Capparidaceae, Rutaceae, Anacardiaceae, Caesalpiniaceae, Mimosaceae, Myrtaceae, Curcurbitaceae, Apiaceae, Rubiaceae, Asteraceae, Sapotaceae and Apocynaceae.

UNIT IV **(12 HOURS)**

Detailed study of the following families with reference to the Morphology, Taxonomy and their economic importance. Solanaceae, Acanthaceae, Verbenaceae, Lamiaceae,

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Amaranthaceae, Euphorbiaceae, Hydrocharitaceae, Orchidaceae, Zingiberaceae, Liliaceae, Arecaceae and Poaceae.

UNIT V **(12 HOURS)**

Economic Botany- study of botany, cultivation and utilization of the following: Fiber yielding plants (*Gossypium hirsutum*), sugar yielding plant (*Saccharum officinarum*) and food crops - (cereals - paddy and pulses - soybean). Spices and condiments (*Piper nigrum* and *Curcuma longa*)*.

*** Self Study**

TEACHING METHODS

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Sharma, O.P. (1986). Modern taxonomy. Rastogi Publications, New Delhi.
2. Subramanyam, N.S. (1987). Modern Plant Taxonomy, Vikas Publishing House, New Delhi.
3. Sambamoorthy A.V and N.S. Subramanyam. (1989). A text book of Economic Botany. Wilay Easters, New Delhi.
4. Verma, V. (2006). A textbook of Economic Botany. Emky Publication, New Delhi.

REFERENCES

1. Singh, V. and D.K. Jain. (1997). Taxonomy of Angiosperms. Rastogi Publications, New Delhi.
2. Pandey, B.P.(1997). Taxonomy of Angiosperms. Chand & Co., New Delhi.
3. Jain, S.K. and R.R. Rao. (1977). A. Handbook of Field and Herbarium methods. Today and Tomorrow Publishers, New Delhi.
4. Henry, A.N. and Chandrabose. (1982). An aid to the international code of botanical nomenclature. BSI Calcutta.
5. Gurucharan Singh (2004). Plant systematic-theory and practices. Oxford and IBH publishers, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	H
CO2	S	M	H	S	S
CO3	H	H	M	H	S
CO4	S	H	S	M	H
CO5	H	S	M	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO36

21UBO505

Programme Code: 05	**Title: B.Sc., BOTANY**			
Core Paper 7 - CYTOLOGY, GENETICS & PLANT BREEDING				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**V**	**4**	**60**	**5**

COURSE OBJECTIVES

- To learn the cellular details, cell organelles and their functions.
- To acquire knowledge on genes and their interactions.
- To gain knowledge on plant breeding methods and crop improvement programmes.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Understand the structural organizations of cells and their cellular mechanisms
	CO2	Understand and explain scientific principles behind nature and function of genes and their process of inheritance.
	CO3	Apply the acquired knowledge on character exchanges among the individuals due to crossing over.
	CO4	Understand the role of genetic mechanisms during evolution
	CO5	To study the techniques behind the production of superior crop varieties

SYLLABUS

UNIT I **(12 HOURS)**

Cell Wall- Structure, function, biogenesis and growth, cell differentiation, Plasma Membrane - Membrane architecture, sites for ATPase membrane transport-Ion carriers, channels, pumps and aquaporins, receptor, Plasmodesmata - Structure role in movement of molecules and macromolecules, comparison with gap junction, Cell Organelles - Mitochondria, Endoplasmic reticulum, Golgi apparatus, Chloroplast, Ribosome, Nucleus and Chromosomes

UNIT II **(12 HOURS)**

DNA as a genetic material, structure, properties, replication of DNA (Conservative, semi-conservative and dispersive methods) and functions. RNA - types and functions. Cell division - Cell cycle, Amitosis, Mitosis & Meiosis and their significances.

UNIT III **(12 HOURS)**

Genetics - field of genetics, Mendel‟s experiments, Mendel‟s laws of inheritance, monohybrid and dihybrid cross. Gene Interaction - Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes.

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UNIT IV **(12 HOURS)**

Multiple alleles. Linkage - Complete and incomplete, Crossing over - mechanism, kinds & controlling factors, Cytoplasmic inheritance in plants - male sterility in maize.

UNIT V **(12 HOURS)**

Introduction and Objectives of Plant breeding, breeding methods - pureline selection, mass selection and clonal selection, Hybridization, Heterosis, National and international organizations for crop improvement, Achievements in crop improvement - Sugarcane and Cotton.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Veerbala Rastogi. (1994). Text book of Genetics. National Press, Meerut.
2. Verma, P.S. & Agarwal V.K. (1983). Cytology. Chand & Co. New Delhi.
3. Gupta, P.K. & M.S. Swaminathan. (2000). Cytology, genetics and Evolution. Rastogi Publication, Meerut.
4. Arumugam, D.N. (1999). Cell Biology. Saras Publication, Nagarcoil.
5. Singh, B.D. (2000). Plant Breeding-Principles and Methods. Kalyani Publishers, New Delhi.

REFERENCES

1. De Roberties. (1989). Cell Biology. McGraw Hill Publication, New Delhi.
2. Chaudhari, H.K. (2005). Elementary principles of plant breeding (25th Ed.). Oxford & IBH Publishing Co. (P) Ltd., New Delhi.
3. Allard. (1960). Principles of plant breeding. John Wiley & Sons, New York.
4. Gardner, E.J., P. Snustad & D. Dobzzonsky, (1995). Principles of Genetics.TATA Mc Graw Hill Company Ltd. New Delhi.
5. Gupta, P.K. (2004). Elements of genetics. FNA 2nd Edition.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	H	H	H	M
CO3	H	S	M	S	H
CO4	S	H	H	H	M
CO5	S	H	H	M	S

S - Strong **H** - High **M** - Medium **L** - Low

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Programme Code: 05	**Title: B.Sc., BOTANY**			
Core Paper 8 - PLANT ECOLOGY, PHYTOGEOGRAPHY AND RESOURCE CONSERVATION				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**V**	**4**	**60**	**5**

COURSE OBJECTIVES

- To understand the principles of ecosystem.
- To acquire basic knowledge about community succession
- To ensure knowledge on resource conservation and related environmental acts

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Pertain knowledge on principle factors controlling the environment.
	CO2	Understand the pattern of distribution of plant species in various communities and their adaptive features.
	CO3	Assess the structure and functions of various ecosystems.
	CO4	Explore knowledge on the pattern of distribution of natural resources.
	CO5	Evaluation the management practices for the sustainable utilization of natural resources.

SYLLABUS

UNIT I **(12 HOURS)**

Principles of Ecology. Climatic factors - role and importance of light, temperature, wind and rainfall on the growth of plants. Edaphic factors, Biotic factors - Characters of community and methods of studying plant communities (quadrat and transect methods alone).

UNIT II **(12 HOURS)**

Community succession - Kinds and causes. Structural and functional changes in communities (Hydrosere and Xerosere - Lithosere). Climax concept. Morphological and anatomical adaptations of Hydrophytes, Xerophytes, Halophytes and Epiphytes.

UNIT III **(12 HOURS)**

Ecosystem - Basic structure and functions: Pollution - causes and possible control measures of air, water, soil, noise and radioactive pollutions. Plants - indicator of pollution. Disaster Management.

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UNIT IV **(12 HOURS)**

Phytogeographical realms of the world. Origin of cultivated plants. Botanical regions of India. Continental drift. Age and area hypothesis, theory of Island biogeography, endemism, plant distribution, migration and barriers.

UNIT V **(12 HOURS)**

Resource conservation - types of resources, conservation of soil, water, agriculture resources, range, forest and freshwater bodies. Important Environmental acts in India, Case study* - Project Tiger and Biosphere reserves - Nilgiri Biosphere Reserve (NBR).

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Sharma, P.D. (2000). Ecology and Environment. Rastogi Publications, New Delhi
2. Shukla. R.S. and P. S. Chandal. (2000). Plant Ecology and soil science. Chand & Co. Ltd., New Delhi.
3. Vasishta, P.C. (1993). Plant Ecology. II Edition. Vishal Publications.
4. Verma and Agarwal. (1998). Principles of Ecology, Chand & Co. Ltd., New Delhi.

REFERENCES

1. Ambasht R.S. (1992). Text book of Plant Ecology, Students and Friends & Co. Varanashi.
2. Schimper, A.F. (1960). Plant geography. Lubrecht & Cramer Ltd., New York.
3. Richard, S. Ostfeld and William H. Schlesinger. (2011). The year in Ecology and conservation Biology, Willey - Blackwell Publications.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	H	H	S	M	H
CO3	S	M	H	H	M
CO4	H	H	H	M	S
CO5	S	H	S	M	S

S - Strong **H** - High **M** - Medium **L** - Low

UBO40

21UBO5CN

Programme Code: 05	**Title : B.Sc., BOTANY**			
Core Practical 3 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS				
Batch **2021-2022**	**Semester** **V**	**Hours/Week** **2**	**Total Hours** **30**	**Credits** **2**

COURSE OBJECTIVES

- To insist basic knowledge on the components of the computer.
- To create a document, table, chart and database using MS Office.
- To learn sequence and structure of genes and protein molecules.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3	CO1	Apply knowledge to create biological databases.
↕	CO2	Apply knowledge on preparation and presentation of data base
	CO3	Analyze secondary structure predictions of any protein molecules using appropriate biological softwares.
	CO4	Examine macromolecular structures through visualization tools.
K5	CO5	Evaluate pattern of phylogenetic interrelation ship among plants

Core Practical: 3 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

I. FUNDAMENTALS OF COMPUTER

1. Creating, editing and printing a document using MS-Word
2. Creating, editing and printing a table using MS-word
3. Data entry and chart preparation using MS-Excel
4. Creating a presentation using MS-PowerPoint
5. Creating and querying the database using MS-ACCESS

II. BIOINFORMATICS

1. Similarity search using BLASTS (nBLAST and pBLAST)
2. Protein structure prediction using GOR-IV
3. Protein structure prediction using SOPMA
4. Phylogenetic analysis using Clustal-X
5. Bio-Molecular Visualization using RASMOL
6. Multiple sequence alignment using Clustal sigma

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MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	M	S	M	H
CO3	H	S	S	H	M
CO4	H	S	H	M	H
CO5	S	H	S	H	M

S - Strong **H** - High **M** - Medium **L** - Low

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029
UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 3 - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

I. Write Algorithms for A, B & C (10 + 10 + 08) **- 28 Marks**

II. Results for A, B & C (03 + 03 + 03) **- 09 Marks**

III. Viva-voce for A, B & C (03 + 03 + 02) **- 08 Marks**

Record **- 05 Marks**

TOTAL **- 50 Marks**

UBO42

21UBO609

Programme Code: 05		**Title: B.Sc., BOTANY**		
Core Paper 9 – BIOCHEMISTRY AND BIOINSTRUMENTATION				
Batch **2021-2022**	**Semester** **VI**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **4**

COURSE OBJECTIVES

- To study the structure of atom and chemical bonds
- To learn the metabolism of chemical reactions in a cell
- To seed the basic knowledge about instruments
- To make students understand the applications of instruments and to train the students handle and maintain the instruments

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Gain knowledge on chemical bonds, atoms and molecules.
	CO2	Understand the chemical structure of macro molecules.
	CO3	Assess the structural organization of biomolecules
	CO4	Analyze the working principles and mechanisms of instruments
	CO5	Evaluate the direct applications and benefits of instruments used for biological experiments

SYLLABUS

UNIT I **(18 Hours)**

Basic concepts of atoms and molecules, types of bonding: primary chemical bonds-covalent, hydrogen bonds, isotopes and isomerism. Acids, bases, solutions, colloids, pH and buffer systems, Introduction to phytoconstituents

UNIT II **(18 Hours)**

Carbohydrates - classification, Monosaccharaides-structure (glucose), open chain and cyclic (or) ring structure. Biological functions. Oligosaccharides (sucrose) - glycosidic linkages and biological functions. Polysaccharides (cellulose). **Lipids**-classification, structure, properties and functions. Fatty acids - saturated and unsaturated.

UNIT III **(18 Hours)**

Amino acids : Structure, classification, properties and biosynthesis. **Proteins** - classification, structure - primary, secondary, tertiary and quaternary structures. **Enzymes:** definition, structure, properties, mode of action and factors affecting enzyme activity.

UNIT IV **(18 Hours)**

Principle, working mechanism, types and applications: pH meter, Microscopy - light and electron, Centrifugation, Autoclave and Laminar air flow chamber. Principle, working mechanism and applications: Colorimetry and UV-visible spectrophotometry.

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UNIT V **(18 Hours)**

Principle, working mechanism and applications: Paper chromatography*, Thin layer chromatography (TLC), Column chromatography, Ion exchange chromatography, Ion exchange chromatography, affinity chromatography and Lyophilization.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. H. S. Srivastava, (1993). Elements of Biochemistry. Rastogi Publications, Meerut.
2. Jain, J.L. (2002). Fundamentals of Biochemistry. S. Chand & Co. New Delhi
3. Narayanan L.M., Dulsy Fathima, K.Nallasingam, R.P. Meyyan Pillai, N.Arumugam, S.Prasanna Kumar. (2010). Biochemistry. Saras Publication
4. Veerakumari, L. 2009. Bioinstrumentation. MJP Publishers, New Delhi, India
5. Sharma, B.K. 2005. Instrumental Methods of Chemical analysis. 24th Revised Edition, Goel Publishing House, Meerut.

REFERENCES

1. Weel, J.H. (1990). General Biochemistry. Wiley Eastern Ltd.
2. Skoog and Leary. (1992). Principles of Instrumental analysis, 4th Edition. Saunder‟s College Publishing, New York
3. Holme and Peck. (1998). Analytical Biochemistry, 3rd Edition, Pearson Education Ltd, Essex, England
4. Wilson, K. and Walker, J. (2000). Principles and Techniques of Practical Biochemistry, 5th edition, Cambridge University Press, Cambridge.
5. Albert L. Lehninger. (2002). Principles of Biochemistry. ICAR, Delhi.
6. Satyanarayana, V. (2005). Essentials of Biochemistry. Arunabha Sen & Allied Pvt., Ltd

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	H
CO2	S	H	M	L	S
CO3	H	H	S	M	H
CO4	S	M	H	H	M
CO5	S	S	H	M	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO44

21UBO610

Programme Code: 05	**Title : B.Sc., BOTANY**			
Core Paper: 10 - PLANT PHYSIOLOGY				
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2021-2022	**VI**	**6**	**90**	**5**

COURSE OBJECTIVES

- To study about water potential and its components
- To understand the mechanism of various metabolic process in plants
- To acquire inherent knowledge on mineral nutrients, growth and development in plants

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Gain knowledge on the relationship of complementary metabolic process in energy acquisition and understand the water potential and its effects on cellular functions
	CO2	Learn about the movement of sap and absorption of water in plant body
	CO3	Assess the process of photosynthesis and respiration in higher plants with particular emphasis on aerobic and anaerobic respiration
	CO4	Analyze the physiological effects of growth regulators in plants
	CO5	Validate the biosynthetic pathways of plant growth regulators.

SYLLABUS

UNIT I **(18 HOURS)**

Plant - water relationship - structure, properties and biological significance of water, water potential and its components, physical forces involved in absorption of water - diffusion, osmosis, imbibition. Absorption of water - mechanism and affecting factors. Absorption of minerals - mechanism (Active and Passive).

UNIT II **(18 HOURS)**

Ascent of sap - path and mechanism; Translocation of organic solutes - directions, path, mechanism, assimilates partitioning and controlling factors. Transpiration - kinds, mechanism of stomatal transpiration, significance and factors affecting stomatal movement and Guttation.

UNIT III **(18 HOURS)**

Photosynthesis – pigment types, pigment system (PS-I & II), Mechanism - Light reaction, Dark reaction - Calvin cycle, Hatch and Slack pathway and CAM pathway, Photorespiration and Factors controlling photosynthesis. **Respiration-** Glycolysis, Anaerobic (Fermentation) and aerobic (Krebs cycle) and ATP synthesis and Respiratory quotient. Factors influencing respiration.

UNIT IV **(18 HOURS)**

Nitrogen metabolism - Nitrogen cycle, Biological Nitrogen Fixation - Symbiotic and Non- Symbiotic. Formation of root nodules in leguminous plants, role of nitrogenase enzyme and Leg-haemoglobin. Factors controlling biological nitrogen fixation.

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UNIT V **(18 HOURS)**

Plant growth regulatory substances - Distribution, biosynthesis and physiological effects of Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid. Physiology of flowering: Photoperiodism - Phytochrome, Vernalization. Seed dormancy*.

***Self study**

TEACHING METHODS

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Jain, V.K. (1993). Fundamentals of plant physiology. S. Chand & Co. New Delhi
2. Verma, S.K. (1999). A textbook of Plant physiology. S. Chand & Co. New Delhi
3. Annie Ragland, Rajkumar, Rajaatnam and Jayakumar. (2007). Plant Physiology. Saras Publications, Nagarcoil.
4. Chopra. (1995). A text book of Plant Physiology. EMKAY Publications, New Delhi.

REFERENCES

1. Noggle and Fritz. (1992). Introductory plant physiology. Prentice Hall of India. Pvt. Ltd. New Delhi.
2. Malik. (2002). Plant physiology. Kalyani Publishers, New Delhi.
3. Devilin, (1986). Plant physiology. CBS Publishers and distributors, New Delhi.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**H**	**M**	**H**	**M**
CO2	**H**	**H**	**S**	**M**	**H**
CO3	**S**	**M**	**H**	**H**	**S**
CO4	**H**	**S**	**S**	**M**	**H**
CO5	**S**	**H**	**H**	**S**	**H**

S - Strong **H** - High **M** - Medium **L** - Low

UBO46

21UBO611

Programme Code: 05		**Title: B.Sc., BOTANY**		
Core Paper 11- HORTICULTURE				
Batch **2021-2022**	**Semester** **IV**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **4**

COURSE OBJECTIVES

- To learn about the propagation methods of horticultural crops.
- To study the various types of gardening, landscaping and their management.
- To know about commercial floriculture and their significance.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Gain inherent knowledge on various horticultural practices
↕	CO2	Understand in depth knowledge on gardening techniques and their organizations.
	CO3	Able to provide comprehensive account on cultivation practices and techniques of horticultural crops.
	CO4	Analyze various designs and patterns of arrangement of cut flowers.
K5	CO5	Evaluate various post-harvest handling strategies for various fruits and vegetables

SYLLABUS

UNIT I **(18 HOURS)**

Introduction to Horticulture - History**,** scope and divisions of Horticulture - Methods of vegetative propagation - cutting, layering, grafting and budding. Manures*: organic- Pancha kavya, and inorganic. Irrigation.

UNIT II **(18 HOURS)**

Gardening - Types of gardens - Japanese. Styles of garden - Formal and Informal. Garden components - shrubbery, fernery, arches and pergolas, edges and hedges, climbers and creepers, cacti and succulents. Special types of garden - rock garden and sacred groves. Lawn making, Terrarium and Bonsai techniques.

UNIT III **(18 HOURS)**

Olericulture - Cultivation of vegetables - Bhendi and Tomato. **Pomology** - Cultivation of fruits - Banana and Grapes. Growth regulators in horticulture. Plant protection measures for horticultural crops. Bioinsecticides and Biopesticides.

UNIT IV **(18 HOURS)**

Floriculture - Cultivation of flowers - Jasmine and Rose. Cut flowers and Flower arrangements. Cultivation of plantation crops - Tea and Cardamom. Basics of greenhouse design, different types of structures - glasshouse, shade net, poly tunnels - Design and development of low cost greenhouse structures.

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UNIT V **(18 HOURS)**

Extraction of Jasmine concrete and papain. Postharvest handling of fruits and vegetables. Preservation of fruits and vegetables. Cultivation of medicinal plants - *Gloriosa superba* and *Aloe vera*.

* **Self study**

Teaching Methods

Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. George Aquach (2002). Horticulture - Principles and Practices.. Parson Education Ltd. Delhi
2. Kumar, N. (1999). An introduction to horticulture. Rajalakshmi Publication, Nagarcoil.
3. Bhattacharjee, S.K. (2006). Advances in Ornamental Horticulture. Pointer Publications, Jaipur.
4. Kumar N. (2006). Horticulture: Principles and practices. New India Publishing agency, New Delhi 88.

REFERENCES

1. Chaha, K.L. (2001). Handbook of horticulture. ICAR, New Delhi.
2. Edwin Biles. (2003). The complete book of gardening. Biotech book, New Delhi.
3. Singh, S.P. 1999. Advances in Horticulture and Forestry. Scientific Publishers, Jodhpur.
4. Sharma, V.K. (2004). Advances in Horticulture: Strategies, Production, Plant Protection and Value Addition - Deep and Deep Publications, New Delhi.
5. Desh Beer Singh and Poonam Wazir. (2002). Bonsai-An Art. Scientific Publishers, Jodhpur.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	M
CO2	S	H	M	H	H
CO3	H	S	H	M	S
CO4	S	H	M	H	M
CO5	S	H	M	H	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO48

21UBO6CO

Programme Code: 05	**Title : B.Sc., BOTANY**			
Core Practical 4: Taxonomy of Angiosperms, Economic Botany, Cytology, Genetics, Plant Breeding, Plant Ecology, Plant Phytogeography and Resource Conservation				
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2021- 2022	**VI**	**4**	**60**	**2**

COURSE OBJECTIVES

- To learn the morphological, taxonomical and economic values of the plants
- To impart knowledge on the determination of types of vegetations using quantitative ecological characters
- To study the different types of eco-system
- To study the cellular details, genetic constitution and plant breeding techniques.

COURSE OUTCOMES

K3 ↕ K5	CO1	Provide lab based training in writing short species descriptions and illustration
	CO2	Apply knowledge on identification of plants and assigning their families based on diagnostic features
	CO3	Analyze the progress of cell division and their significance
	CO4	Apply knowledge on the pattern of distribution of plants in any ecological niche
	CO5	Determine the distribution of vegetations in a given habitat using various quadrat methods.

I. TAXONOMY OF ANGIOSPERMS & ECONOMIC BOTANY

1. Identification of plant specimens with reference to their families prescribed in the syllabus following Bentham & Hookers system of classification
2. Identification of economically important products with reference to their plant name and family
3. Technical description of plant parts, including floral parts L.S. of flower, floral diagram and floral formula with reference to the families mentioned in the theory
4. Field visit to nearby floristic regions for the study of flora
5. Submission of 25 herbarium sheets (relevant to syllabi) with field notes for internal and external valuation

21UBO6CO

II. CYTOLOGY, GENETICS & PLANT BREEDING

1. Study of cell wall structure and cell organelles (plasma membrane, mitochondria, ER, golgi apparatus, chloroplast, ribosomes, nucleus and chromosomes) through slides and photographs
2. Study of mitosis using onion root tip
3. Study of meiosis using *Rheo* flower buds
4. Simple problems in genetics (Monohybrid and Dihybrid cross, Incomplete dominance, Codominance, Collaborator genes, Epistasis, Complementary genes, Duplicate genes and Lethal genes)
5. Selection, mass selection and clonal propagation methods.
6. Emasculation technique

III. PLANT ECOLOGY, PHYTOGEOGRAPHY & RESOURCE CONSERVATION

1. Quadrat - determination of frequency and density of vegetation in the surrounding areas of college premises
2. Line transects - frequency determination of vegetation in the surrounding areas of college premises
3. Belt transects - frequency determination of vegetation in the surrounding areas of college premises
4. Observation of adaptive morphological and anatomical features of xerophytes hydrophytes, halophytes and epiphytes
5. Ecosystems (pond, forest and grasslands)
   Community succession patterns - hydrosere and lithosere
6. Global Positioning System (GPS)
7. Locate major Phytogeographical zones of India using photographs

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	S
CO2	H	H	H	M	H
CO3	S	M	H	S	M
CO4	S	H	M	S	H
CO5	H	S	M	H	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO50

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)

COIMBATORE - 641 029
UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical 4: Taxonomy of Angiosperms, Economic Botany, Cytology, Genetics, Plant Breeding, Plant Ecology, Plant Phytogeography and Resource Conservation

I. Family description	- 05 Marks
II. Identification of Family	- 03 Marks
III. Economic Botany	- 03 Marks
IV. Genetics problem	- 05 Marks
V. Cytology	- 03 Marks
VI. Phytogeography	- 03 Marks
VII. Plant ecology	- 03 Marks
VIII. Ecology experiment	- 05 Marks
IX . Spotters	- 10 Marks
X. Herbarium	- 05 Marks
Record	- 05 Marks
TOTAL	- 50 Marks

UBO51

21UBO6CP

Programme Code: 05	**Title : B.Sc., BOTANY**			
Core Practical 5 – BIOCHEMISTRY, BIOINSTRUMENTATION, PLANT PHYSIOLOGY AND HORTICULTURE				
Batch **2021-2022**	**Semester** **VI**	**Hours/Week** **4**	**Total Hours** **60**	**Credits** **2**

COURSE OBJECTIVES

- To acquire skills on handling of the instruments.
- To learn sequence and structure of genes and protein molecules.
- To learn principles and applications of instruments
- To provide hands-on techniques on instruments
- To learn metabolic process of the plants.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3	CO1	Able to quantify the amount of macromolecules in a given sample
↑	CO2	Able to apply the principles in any biological experiments
↕	CO3	Apply indepth knowledge on instrumentation techniques.
↕	CO4	Apply knowledge on handling and troubleshooting of instruments in any biological experiments.
K5	CO5	Evaluate and design for horticultural applications

Core Practical 5 – BIOCHEMISTRY, BIOINSTRUMENTATION, PLANT PHYSIOLOGY AND HORTICULTURE

I. BIOCHEMISTRY

1. Estimation of Carbohydrate by Anthrone method
2. Estimations of aminoacids by Ninhydrin method.
3. Estimation of protein by Lowry's method.
4. Estimation of Vitamin C
5. Preparation of Phosphate Buffers.

II. BIOINSTRUMENTATION

1. Analyze the pH of samples (soil, water and plant extract)
2. Colorimetry
3. Soxhlet apparatus
4. Clevenger apparatus
5. Column Chromatography
6. Centrifugation

UBO52

III. PLANT PHYSIOLOGY 21UBO6CP

1. Determination of osmotic pressure of cell sap of onion/*Rheo* leaf.
2. Separation of plant pigments by paper chromatography.
3. Measurement of oxygen evolution using different light intensities using Wilmott‟s bubbler.
4. Determination of photosynthetic rate in water plants under different CO_2 concentration.
5. Measurement of rate of respiration using flower buds/ germinated seeds with simple respiroscope.
6. Effect of light intensity on transpiration using Ganong‟s photometer.
7. Determination of absorption and transpiration ratio in plants.
8. Nitrification in soil.
9. Solution culture.
10. Effect of Auxin in apical dominance
11. Effect of Gibberellins in shoot elongation
12. Arc auxanometer

IV. HORTICULTURE

1. Introduction - General introduction to the field of horticulture and horticulture greenhouse facility
2. Flower garden design - Garden design for annual and perennial flowering plants
3. Landscape design - Landscape design principles, landscape installation and maintenance
4. Interior plants - Identification of foliage plants.
5. Methods of training and pruning in horticultural crops
6. Cut flower arrangement

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	S	S	S	H	M
CO3	H	H	M	H	S
CO4	S	H	H	M	S
CO5	S	H	S	S	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO53

21UBO6CP

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

CORE PRACTICAL: 5 – BIOCHEMISTRY, BIOINSTRUMENTATION, PLANT PHYSIOLOGY AND HORTICULTURE

I. Biochemistry	**- 09 Marks**
II. Bioinstrumentation	**- 09 Marks**
III. Physiology Experiment	**- 09 Marks**
IV. Horticulture	**- 08 Marks**
V. Spotters (5 × 2)	**- 10 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

UBO54

21UBO6S3

Programme Code: 05		**Title: B.Sc., BOTANY**		
SKILL BASED SUBJECT III: CULTIVATION AND MARKETING OF MEDICINAL PLANTS				
Batch 2021-2022	**Semester VI**	**Hours / Week 2**	**Total Hours 30**	**Credits 3**

COURSE OBJECTIVES

- To gain the knowledge on scope, importance and conservation strategies of medicinal plants
- To understand the medicinal values of various parts of the medicinal plants
- To understand the present scenario on marketing of medicinal plants
- To obtain basic knowledge on Intellectual property rights (IPR)

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO1	To know about *in situ* and *ex situ* conservation strategies for various medicinal plants.
	CO2	To gain knowledge on sustainable utilization of various herbal medicines for home remedies.
	CO3	Lean about the medicinal aspects of selected plant species
	CO4	Examine quality management, marketing and trade of medicinal plants
	CO5	Apply the principles and concepts of IPR and their applications

SYLLABUS

UNIT I **(6 HOURS)**

Scope, importance and Present scenario of medicinal plants in India. Conservation - *In situ* and *ex situ.* National Medicinal Plants Board (NMPB)

UNIT II **(6 HOURS)**

A general account on the methodology of cultivation, therapeutic uses of plants. Rhizome - *Curcuma longa*, Root tubers - *Asparagus racemosus* Twigs - *Adathoda vasica*

UNIT III **(6 HOURS)**

Cultivation of Medicinal Plants: Leaves- *Andrographis paniculata*. Bark - *Cinchona officinalis*, Flower bud- *Syzygium caryophyllatum* - Fruits- *Phyllanthus emblica*, Seed - *Gloriosa superba*.

UNIT IV **(6 HOURS)**

Marketing Scenario of Medicinal Plants - Domestic Market, Global Market, Export: Standard and Quality control (Constraints). Future strategy for Medicinal plants*

21UBO6S3

UNIT V **(6 HOURS)**

Intellectual property rights (IPR): Definition, Origin, Classification and forms, Patents: Concepts and principles – Patent act in India, Procedure for obtaining patent – Rights of patent, Forms of IPR – Copyright – Trademark – Patents – Industrial Designs – Trade Secrets – Geographical Indications: Tamil Nadu and India. Application of different forms of IPR.

***Self study**

Teaching Methods

Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Purohit, S.S and S.P. Vyas (2005). Medicinal Plant Cultivation. A Scientific Approach. Agrobios Publishers, Jodhpur, India.
2. G. E. Treases and W. G. Evans. (1983).Pharmocognosy Bailliare, Tindall Esaibolarna.

REFERENCES

1. D.N. Guha Bakshi, P. Sensarma, DC pal, (2001). A lexicon of medicinal plants in India. Vol. II. Naya Prakash, Calcutta.
2. S. Thirugnanam (2003). Mooligai maruthuvam, Selvi Pathipagam, Trichy.
3. R.S. Satoskar, S.D. Bhanalarkar, S.S. Ainapure. (2002) Pharmacology, Pharmaco Therapeutics - popular Prakasam, Mumbai.
4. Anil K. Dhiman, (2003). Sacred plants and their medicinal uses - Daya Publishing House, New Delhi.
5. H. Panda, (2001). Essential oils- hand book, national Institute of Industrial Research, New Delhi.
6. H. Panda, (2001) Hand book of herbal medicines. Asia Pacific Business Press, New Delhi.
7. International Encyclopaedia of Laws: Intellectual Property (Kluwer Law International, 1997) (loose leaf). I, MON K 1401. I5828 (1997) vols. 1-5
8. V. K. Ahuja, Law relating to Intellectual Property rights, 2nd Edition, (2013) LexisNexis.
9. Barrett, Margreth, Intellectual Property, (2009) 3nd, New York Aspen publishers.
10. Nard, Craig Allen, Law of Intellectual Property, (2008) 2nd, New York Aspen publishers

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	S
CO2	H	S	H	M	S
CO3	H	H	M	S	H
CO4	S	M	S	M	H
CO5	S	M	S	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO56

21UBO6Z1

Programme Code: 05		**Title: B.Sc., BOTANY**		
PROJECT WORK & VIVA – VOCE				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**VI**	**2**	**30**	**5**

COURSE OBJECTIVES

- To know the practical problems in various fields of Botany.
- To understand and collect related data in the selected fields.
- To apply suitable skills and to solve the selected problems through proper execution.

COURSE OUTCOME

On successful completion of the project work, the students will be able to

K3	CO1	Applying theoretical skill sets in lab oriented experiments
↕	CO2	Analyzing the importance of project work while collecting necessary data
	CO3	Evaluating variations between theories and experiments.
	CO4	Apply the principles and concepts in their research components
K5	CO5	Executing standard operating procedures and interpretation of appropriate results.

Group project work will be allotted to a group of students under the supervision and guidance of the Faculty members during VI Semester. Project works will be given based on the various fields of specialization of the supervisors under whom the students are allotted. They are allotted based on the lot system. The fields of specialization are Systematic Botany, Microbiology and Plant Pathology, Medicobotany, Ecology and Conservation Biology. The students shall do their projects under their supervisors and submit their dissertation at the end of VI Semester. Both the Internal and External Examiners shall jointly evaluate the project report submitted by the students and marks will be awarded on the basis as mentioned below.

Guidelines to the Distribution of Marks:

CIA	Project Review	45	**50**
	Regularity	5	
ESE	Project Report Present	35	**50**
	Viva – Voce	15	
	Grand Total		**100**

MAPPING

PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	S	M	S
CO2	S	S	H	S	H
CO3	S	H	S	H	S
CO4	S	H	M	S	M
CO5	H	M	S	M	L

S - Strong **H** - High **M** - Medium **L** - Low

ELECTIVE PAPERS

UBO58

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective: 1 - FORESTRY		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**4**	**60**	**5**

COURSE OBJECTIVES

- To understand the basic concepts of forest and their distribution types
- To acquire knowledge on forest resources and their utilization
- To gain knowledge on laws of conservation of forests

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Recognize the importance of forest produce to mankind.
↕	CO2	Understand the economic value of forest and their importance to the society.
	CO3	Reclamation of wastelands with suitable tree species.
	CO4	Implement the socio - economic benefits of trees in day to day life
K5	CO5	Evaluate the plants used as source of food

SYLLABUS

UNIT I **(12 Hours)**

Introduction to Forests: General introduction to forests, Natural, man-made forest. Classification of forest (Champion and Seth, 1968). Tropical, subtropical, temperate, evergreen, semi-ever green and deciduous forests. Mangrove forests-species,

UNIT II **(12 Hours)**

Silviculture - concept, scope; clear felling, uniform shelter, wood selection, coppice. Conservation systems - *In vitro* and *In vivo.* Silviculture of some of the economically important species in India- *Casuarina, Dalbergia sisso* and *Tectona grandis.*

UNIT III **(12 Hours)**

Social and Agro forestry. Selection of species and role of multipurpose trees. food, fodder, energy and avenue plantation. Sacred grooves - definition and importance. Significance of sacred trees - *Terminalia arjuna, Aegle marmelos* and

UNIT IV **(12 Hours)**

Introduction to forest laws: Forest laws, necessity, General principles, Indian forest act, 1927, Forest conservation act, 1980, Indian forest law, 1988, Wild life protection act, 1972 and their amendments, Endangered species act, 1982.

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UNIT V **(12 Hours)**

Plants as sources for food, fodder, fibres, spices, beverages, drugs, narcotics, insecticides, timber, gums, resins and dyes. Ethnobotany in human welfare*, Major Botanical garden - Kew.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Sagreiya, K.P. (1994). Forests and Forestry (Revised by S.S. Negi). National book trust. New Delhi.
2. Tribhawan Mehta, (1981). A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.

REFERENCES

1. Kollmann and Cote (1988). Wood Science and Technology. Vol.I & II Springer verlag.
2. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, Meerut
3. Singh, M.P. and Vinita Vishwakarma. (1997). Forest Environment and Biodiversity. Daya Publishing House, New Delhi
4. Tiwari.K.M. (1983). Social forestry in India.
5. Gray L. Rolfe, Johan, M. Edgington, I. Irving Holland and Gayle C. Fortenberry. (2005). Forests and Forestry. International book distributing Co., Lucknow.
6. B.S.Chundawat & S.K. Gautams. (1996). Textbook of Agroforestry. Oxford and IBH Publishnig Co., Pvt. Ltd., Kolkatta
7. Anil Kumar Dhiman. (2003). Sacred Plants and their medicinal uses. Daya publishing house, New Delhi.
8. Bedell, P.E. (1998). Seed Science & Technology. Allied Publishers Ltd.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	H	H	S	M	S
CO3	S	M	H	H	H
CO4	H	S	H	H	M
CO5	S	M	H	H	H

S - Strong **H** - High **M** - Medium **L** – Low

UBO60

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective: 2 - BIOTECHNOLOGY		
Batch 2021-2022	Hours / Week 4	Total Hours 60	Credits 5

COURSE OBJECTIVES

- To familiarize the fundamental principles of biotechnology and plant tissues techniques
- To obtain knowledge on various developments and potential applications of gene cloning technology and Genetic transformation and their application in plants
- To know the basic principles, knowledge and applications of bio-fertilizers, waste water treatment and biomass and bioenergy production
- To acquire inherit knowledge on the basic principles and applications of Bioethics and Biosafety

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Students can gain the basic concepts of biotechnology and plant cell and tissue culture techniques
↑	CO2	Students can understand and gain knowledge on gene cloning techniques, methods of gene transfer in plants and various applications and tools in molecular biology
↓	CO3	Students can acquire knowledge and applications of microbes used for biofertilizer preparation, waste water treatments, biomass and energy production
	CO4	Students can analyze the principles of biosafety assessment procedures of food related products
K5	CO5	Students can evaluate the acquired biotechnological knowledge in their practical life

SYLLABUS

UNIT I **(12 HOURS)**

History, scope, importance and basic branches. Plant tissue culture media (composition and preparation), Plant growth regulators, Micropropagation, Callus culture, Somatic embryogenesis and Artificial seeds, Protoplast culture- isolation, fusion and somatic hybridization, Haploid production: Anther and Pollen culture, Somaclonal variation.

UNIT II **(12 HOURS)**

Genetic engineering - enzymes used in gene cloning - Polymerases, Restriction endonucleases, Ligases, Vectors for gene cloning-General properties of a vector, Plasmids, Cosmids, Phages and Shuttle vector, Gene cloning procedure. Tools and Techniques for Molecular Biology-Agarose gel electrophoresis, PCR-working principles, procedure and applications

UNIT III **(12 HOURS)**

Methods of gene transfer in plants - *Agrobacterium* mediated (Ti and Ri plasmids), Mechanism of T-DNA transfer, Gene gun (Particle bombardment) method, Blotting techniques to detect the transgene in transgenic plants - Southern, Northern and

Western blots. Application of genetic engineering- Golden rice, Flavr Savr, Bt cotton, and herbicide resistance.

UNIT IV **(12 HOURS)**

Microbial Biotechnology: Biofertilizers - Advantages, mass cultivation and application techniques of *Rhizobium*, and *Azospirillum*, *Azolla* and VAM. **Environmental Biotechnology:** Wastewater treatment. Treatment of paper and distillery effluents - oxidation ponds. Source of alternate fuel - biomass and bioenergy production of biogas and its advantage.

UNIT V **(12 HOURS)**

Bioethics: Principles**,** Scope and importance **Biosafety**: Definition of Biosafety. Requirements, Biosafety for human health and environment, Use of genetically modified organisms and their release into the environment, Biosafety assessment procedures for biotech foods & related products, Various committees for Genetically Engineered Organisms in India - RDAC, GEAC, RCGM, IBSC, SBCC, and DLC.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Dubey. R.C. (2014). A Text Book of Biotechnology. S Chand & Company P. Ltd, New Delhi.
2. Kumaresan, V.K. (2015). Biotechnology. Saras Publications, Nagercoil, Tamil Nadu.
3. Ignacimuthu, S. (1996). Applied Plant Biotechnology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Ignacimuthu, S. (1997). Plant Biotechnology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Kalyan Kumar De (2020). Plant tissue culture. New Central Book Agency (NCBA), Kolkata, West Bengal.
6. Sathyanarayanan U. 2018. Biotechnology, Generic Publisher
7. Shantharam S., and Jane F. Montgomery, (1999), Biotechnology Biosafety, and Biodiversity, Scientific and Ethical Issues for Sustainable Development, CC Now Science Publishers.

REFERENCES

1. Chhatwal. (1995). Text book of Biotechnology. Anmol Publications Pvt. Ltd., New Delhi.
2. Gupta, P.K. (2004). Elements of Biotechnology, 2004. Rastogi Publications, Meerut.
3. Primrose, S.B. and Twyman, R. (2006). Principles of Gene Manipulation and Genomics. 7th Edition, Blackwell Publishing, Malden, MA, USA.
4. Slater, Scott and Fowler, (2008). Plant Biotechnology, 2nd Edition, Oxford University Press

UBO62

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	L	M
CO2	S	M	H	S	H
CO3	H	S	H	M	S
CO4	H	H	M	H	M
CO5	S	S	H	H	H

S - Strong **H** - High **M** - Medium **L** – Low

UBO63

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective: 3 - FOOD SCIENCE		
Batch **2021-2022**	**Hours / Week** **4**	**Total Hours** **60**	**Credits** **5**

COURSE OBJECTIVES

- To know about the food groups and food preparation
- To understand the food processing technology and preservation of food
- To analyze and disseminate food related issues

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Acquire knowledge on manufacturing processes and technologies used in the production of food products
	CO2	Understand the knowledge on the nutritive value, process of food product development and their environmental considerations.
	CO3	Explain the functional properties of food in human nutrition.
	CO4	Develop skills in researching, analyzing and communicating food related issues.
	CO5	Assess the chemical and physiological changes during food processing techniques.

SYLLABUS

UNIT I **(12 Hours)**

Food groups: Basic groups- basic four, five and seven, food in relation to health. Preliminary preparation of food- cleaning, peeling, stinging, cutting and grating, soaking, marinating, sprouting, fermenting, grinding, drying and filtering - their advantages and disadvantages.

UNIT II **(12 Hours)**

Cereals and cereal products - structure, composition and nutritive value - Wheat and wheat products; fermented and unfermented products.

UNIT III **(12 Hours)**

Biotechnology in food - biofortification, nutraceuticals, space food. Fruits and vegetables - classification, composition and nutritive value. Milk and milk products* - processing, clarification, pasteurization and homogenization. Tea processing and marketing.

UNIT IV **(12 Hours)**

Food preservation by high and low temperatures- outline. Preservation by high osmotic pressure, high concentration of sugar, jam and jelly preparation. High concentration of salts. Principles and preparation of pickles- preservation by

dehydration. Principles and methods of drying - freeze drying, sun drying, mechanical driers - spray drying and foam mat drying and by smoking.

UNIT V **(12 Hours)**

Packing of food- classification of package, materials used for packing, active food packing, packing of fruits and vegetables. Nutrition labeling - principles, codex guidelines. Recent development on the food labeling front in India.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Srilakshmi, B. (2003). Food science. New Age International Pvt. Ltd.
2. James, M. Jay. (1987). Modern Food Microbiology. CBS, Mylapore, Chennai.

REFERENCES

1. Subbulakeshmi, G. (2003). Food processing and preservation. New Age International Pvt. Ltd.
2. Srilakshmi, B. (2005). Food and Health. National Institute of Nutrition, ICMR, Hyderabad.
3. Janet, D Ward and T. Larry. (2002). Principles of Food Science. Good Heart, Wilcox, Illinois.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	S
CO2	S	S	H	S	M
CO3	H	M	H	M	H
CO4	H	H	M	H	M
CO5	S	S	M	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO65

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective: 4 - SEED BIOLOGY		
Batch **2021-2022**	**Hours / Week** **4**	**Total Hours** **60**	**Credits** **5**

COURSE OBJECTIVES

- To study the structure of angiospermic seeds
- To analyze various products produced by the seeds.
- To examine the germination capacity of the seeds.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Recognize the chemical and physical properties of seeds
↕	CO2	Understand the factors responsible for seed germination
	CO3	Apply the various methods of processing of seeds for storage
	CO4	Implement knowledge to break seed dormancy and enhance plant growth
K5	CO5	Compare various methods of seed treatment and trace their patterns of growth in Angiospermic seeds

SYLLABUS

UNIT- I **(12 Hours)**

Scope of seed biology - Structure of monocot and dicot seeds / grains. Albuminous (endospermic) and ex-albuminous (non-endospermic) seeds. Chemical composition - cereals (Paddy) - Oil seed (Castor) - Fibre (Cotton) and Pulses (Bean).

UNIT- II **(12 Hours)**

Seed germination: Factors affecting germination. Methods of germination test (using paper, sand and soil) - Seed viability (Tetrazolium test), vigour (Direct and Indirect test). Concept of seed vigour.

UNIT- III **(12 Hours)**

Seed drying, Process and Equipments. Methods of moisture determination of seed. Seed cleaning and upgrading - Equipments involved. Seed testing and quality control.

UNIT- IV **(12 Hours)**

Seed dormancy: Primary and Secondary dormancy - significance - Factors involved - methods used to break dormancy*.

UBO66

UNIT- V **(12 Hours)**

Seed treatment - methods of seed treatment, seed treating formulations and equipments, seed disinfestations, identification of treated seeds; Pelleting and their significance, packaging, bagging and labeling, storage and marketing.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Agarwal R. L. (1982). Seed Technology -. Oxford and IBH Publishing Company, New Delhi.
2. Bewley, J.D and M. Black (1978). Seed Biology Vol. I & II Academic press, New York

REFERENCES

1. Bewley, J.D and M. Black. (1985). (Eds.) Seeds; Physiology of development and germination Plenum Press: New York.
2. Murray, D.R. (1984). (Ed.) Seed physiology. Vol. I & II Academic Press: Sydney - New York- London
3. Khan, A.A. (Latest Edition) (Ed.). The Physiology and Biochemistry of seed Dormancy and germination. North-Holland Publishing Company: Amsterdam- New York- Oxford.
4. Mehta S.L. Lodha, M.L. and Sane P.V. (1993). (Eds.) Recent advances in Plant Biochemistry. Publication and information division ICAR, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	M	S
CO2	S	S	H	H	S
CO3	H	S	H	M	H
CO4	H	H	M	S	H
CO5	M	M	H	H	S

S - Strong **H** - High **M** - Medium **L** - Low

UBO67

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective: 5 – PHARMACOGNOSY		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**4**	**60**	**5**

COURSE OBJECTIVES

- To study the drug development from medicinal plants
- To understand the traditional systems of medicines like Ayurveda, Siddha & Unani
- To know the pharmacological actions of plant drugs

COURSE OUTCOME

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Acquire knowledge on the therapeutic uses of plant drugs.
	CO2	Understand the traditional and modern systems of medicine.
	CO3	Relates physiological action of various plant drugs.
	CO4	Recognize the nature of pharmaceutical bioactive components in plant sources.
	CO5	Predict the identification and purity of the natural drug source for their efficacy and safety.

SYLLABUS

UNIT I **(12 Hours)**

Definition, history and scope of Pharmacognosy. Study of various system of classification of drugs. Traditional system of medicine (AYUSH - Ayurveda Siddha, Unani and Homeopathy). Glossary of medicinal plants

UNIT II **(12 Hours)**

A general survey of biological sources, Geographical sources and cell cultures in the production of drugs. Factors involved in the production of drugs.

UNIT III **(12 Hours)**

Pharmacological action of plant drugs - act on central nervous system- Lysergic acid Diethylomids, cannabis, Cocaine and reserpine. Action on heart muscles - Digitalis, Quinidine, Papaverine and Ergotamine.

UNIT IV **(12 Hours)**

Drugs of plant origin - Phytochemical tests and application of plant derived Phenols, Resins, alkaloids, flavonoids, terpenoid, steroids, Glycosides and Vitamins. A general procedure for separation of the compounds by TLC technique.

UBO68

UNIT V **(12 Hours)**

Organized natural products - wood and bark. Quassia and *Cinchona*. Leaves and Flowers - Adhathoda and Clove Seed and fruits- Fennel, Nutmeg. Unorganized products - Acacia gum and Castor oil*.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Trease G.E. and W. C Evans (1983) Pharmocognosy, ELBS, Britain
2. Medical microbiology (1983) Churchill Livingstone ELBS Britain.

REFERENCES

1. Hocking, G.M. (1955). A dictionary of terms used in Pharmacognosy, Spring Field.
2. Ballow M. H. (1969). Marine Pharmacology, Williams and Wilkins.
3. Chopra, R.N, Badhwa, R. L and Ghosh, S. (1965). Poisonous plants of India Govt. of India Press.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	M	S	H
CO3	H	S	H	M	S
CO4	H	M	H	H	M
CO5	S	H	M	M	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO69

Programme Code: 05	Title: B.Sc., BOTANY		
	Major Elective 6 - MUSHROOM CULTIVATION TECHNOLOGY		
Batch **2021-2022**	**Hours / Week** **4**	**Total Hours** **60**	**Credits** **5**

COURSE OBJECTIVES

- To understand the Importance of mushrooms.
- To learn the methodology involved in mushroom cultivation.
- To know the disease management.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Recognize the nutritive, medicinal and food values of mushrooms.
	CO2	Determine suitable climate and cultivation techniques for mushrooms.
	CO3	Relate knowledge on designing of farming house for mushrooms.
	CO4	Apply knowledge on processing and storage of mushrooms for marketing.
	CO5	Assess the various developments in modern technologies to enhance productivity of mushrooms.

SYLLABUS

UNIT I **(12 HOURS)**

Mushroom an Introduction - Importance, Identification and classification of Mushrooms. Nutraceutical properties, Food value and composition, Medicinal value of Mushrooms, Identification of Mushrooms, Classification of edible mushrooms*, Medicinal Mushrooms, Poisonous Mushroom.

UNIT II **(12 HOURS)**

Systematic position, morphology and life cycle of white button mushroom (*Agaricus bisporus*). Cultivation- farm designing, spawn preparation- Spawn production Technology, Preparation of the planting spawn from master spawn, Multiplication of spawn from Mass culture and harvesting.

UNIT III **(12 HOURS)**

Systematic position, morphology and life cycle of oyster mushroom (*Pleurotus sajor-caju*). Cultivation- farm designing, spawn preparation- Spawn production Technology, Preparation of the planting spawn from master spawn, Multiplication of spawn from Mass culture and harvesting.

UNIT IV **(12 HOURS)**

Systematic position, morphology and life cycle of paddy straw mushroom (*Volvariella* Sp.). Cultivation- farm designing, spawn preparation- Spawn production Technology, Preparation of the planting spawn from master spawn, Multiplication of spawn from Mass culture and harvesting.

UBO70

UNIT V **(12 HOURS)**

Common fungal and bacterial diseases of button, oyster and paddy straw mushrooms and their control measures. Post harvesting techniques- packaging, transport, short term and long term storage of mushrooms (canning, drying, freeze drying, sun drying and pickling), commercial value of Mushrooms.

***Self study**

Teaching Methods

Smart Class Room/Powerpoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS:

1. Reeti Singh and U.C. Singh (2005). Modern mushroom cultivation, Agrobios India, Jodhpur.
2. Kumaresan, V. (2001). Biotechnology, Saras-publication, Nagarcoil.
3. Gupta, P.K. (2004). Elements of biotechnology, Rastogi publication, Meerut.

REFERENCES:

1. Singh, B.D. (2002). Biotechnology. Kalyani Publishers, New Delhi.
2. Kaul, T.N. (2001). Biology and conservation of Mushrooms. Oxford & IBH Publishing Company Pvt. Ltd. New Delhi.
3. Giovanni Pacioni.(1985). Mushrooms and Toadstools. Mac Donald & Co. Ltd., London.
4. Pandey, B.P. (1996). A text book of fungi. Chand & Co., New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	M	S
CO2	H	S	M	S	H
CO3	S	S	H	M	H
CO4	M	H	S	H	S
CO5	M	M	S	H	H

S - Strong **H** - High **M** - Medium **L** - Low

ALLIED PAPER

UBO72

21UBO1A1

Programme Code: 05	**For B.Sc., ZOOLOGY**			
ALLIED-1 BOTANY: 1 (PHYCOLOGY, MYCOLOGY, PLANT PATHOLOGY, BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS) (FOR ZOOLOGY STUDENTS)				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**5**	**75**	**4**

COURSE OBJECTIVES

- To study the classification of Cryptogams & Gymnosperms.
- To learn the structure and life cycle patterns of primitive to advanced life forms.
- To impart knowledge on the economic values of plants.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑	CO1	Gain knowledge on lower life form habits, habitats and their phylogeny
	CO2	Understand structural organization and reproduction of lower life forms
	CO3	Apply their knowledge to identify plant diseases and their control measures
	CO4	Explore the economic aspects of lower life forms for the betterment of mankind
↓ K5	CO5	Evaluate the life cycle patterns of Cryptogams and Gymnosperms

SYLLABUS

UNIT I **(15 HOURS)**

Phycology: Classification by Fritsch (1945) (outline only), Structure, Reproduction and life cycle of the following Genus: *Oscillatoria*, *Caulerpa*, and *Chara*. Economic importance of algae (briefly).

UNIT II **(15 HOURS)**

Mycology and Plant Pathology: Classification by Alexopoulos and Mims (1979) (outline only), Structure, Reproduction and Life cycle of the following Genus: *Albugo* and *Agaricus*. Tikka disease of ground nut and Citrus canker. Economic importance of Fungi.

UNIT III **(15 HOURS)**

Bryophytes: Classification by Smith (1955) (outline only), Structure, Reproduction and Life cycle of *Marchantia* and *Funaria***.** Economic importance of Bryophytes.

21UBO1A1

UNIT IV **(15 HOURS)**

Pteriodophytes: Classification by Riemers (1954) (outline only), Structure, Reproduction and Life cycle of *Lycopodium* and *Adiantum*. Economic importance of Pteridophytes.

UNIT V **(15 HOURS)**

Gymnosperms: Classification by K.R. Sporne (1962) (outline only), Structure, Reproduction and Life cycle of *Cycas* and *Gnetum*. Economic importance of Gymnosperms*

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Gangulee, Das & Kar. (2001). College Botany Vol II. New central Book agency Pvt. Ltd. Calcutta.
2. Pandey, B.P. (1994). A Text book of Botany - Pteridophyta. Chand & Co. New Delhi.

REFERENCES

1. Vashishta, B.R. (1998). The Algae.S. Chand & Co., New Delhi.
2. Vashishta, B.R. (1998). Fungi. S. Chand & Co., New Delhi.
3. Vashista, P.C., Sinha and Anil Kumar. (2008). Text book of Bryophytes. Chand & Co., New Delhi.
4. Vashista, P.C. (1992). Pteridophyta. Chand & Co., New Delhi.
5. Pandey, B.P. (1981). Gymnosperms. Chand & Co., New Delhi.
6. Gilbert M Smith (1951). Manual of Phycology.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	H	H
CO2	S	S	H	M	S
CO3	H	H	M	S	M
CO4	S	M	S	H	H
CO5	M	H	H	S	M

S - Strong **H** - High **M** - Medium **L** - Low

UBO74

21UBO1A1

Programme Code: 05	**For B.Sc., ZOOLOGY**			
Allied-2 Botany 2 : ANATOMY, EMBRYOLOGY, TAXONOMY OF ANGIOSPERMS, PHYSIOLOGY AND ENVIRONMENTAL BOTANY (FOR ZOOLOGY STUDENTS)				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**5**	**75**	**4**

COURSE OBJECTIVES

- To differentiate the anatomical and reproductive features of monocot and dicots
- To acquire knowledge on the classification and nomenclature of Angiosperms
- To understand physiological process and metabolism in plants

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑	CO1	Recognize anatomical features and morphological variations among Angiospermic taxa.
	CO2	Understand the structure and development of different types of embryos
	CO3	Apply keys and manuals for identifying any unknown plants at species level.
	CO4	Explore the nature of application of micronutrients and growth regulators for the development of plants.
K5	CO5	Determine the strategies for the conservation of natural resources

SYLLABUS

UNIT I **(15 HOURS)**

Anatomy: Scope and significance of plant anatomy. A brief account of meristems and tissues (simple and complex tissue). Primary structure of dicot and monocot stem and root.

UNIT II **(15 HOURS)**

Embryology: Microsporogenesis. Development of Male gametophyte, Megasporogenesis, Development of female gametophyte (*Polygonum* type). Structure of mature embryo sac. Type of embryo sac - Polygonum type (8 nucleus) and Oenothera type (4 nucleus). Types of endosperms. Development of Dicot embryo (*Capsella* type).

UNIT III **(15 HOURS)**

Taxonomy of Angiosperms: Bentham and Hooker‟s classification (outline only). Study of the following families with their economic importance- Annonaceae, Cucurbitaceae, Asteraceae, Apocynaceae, Lamiaceae, Amaranthaceae, Liliaceae and Poaceae. Herbarium techniques.

21UBO2A2

UNIT IV **(15 HOURS)**

Physiology: Water relationships of plants. Osmosis, absorption of water, absorption of ions. **Photosynthesis:** Photosynthetic apparatus, primary photochemical reaction, path of carbon (Calvin cycle). **Respiration:** Glycolysis and Krebs‟s cycle. **Phytohormones:** auxins and cytokinins.

UNIT V **(15 HOURS)**

Environmental Biology: Scope and significance of environmental studies**.** Structure and functions of ecosystems. Vegetational types of Southern India. Pollution - Air*, water and noise. Soil conservation methods.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Gangulee H C Das, K S Dutta CT (1986). College Botany Vol. - I.AIU publications. New Delhi
2. Gangulee and Kar, A K. (1986). College Botany Vol. - II. AIU Publications. New Delhi

REFERENCE BOOKS

1. Pandey, B.P. (1997). Taxonomy of Angiosperms. Chand & Co., New Delhi.
2. Jain, V.K. (1993). Fundamentals of plant physiology. S. Chand & Co. New Delhi
3. Shukla. R.S. and P. S. Chandal. (2000). Plant Ecology and soil science. Chand & Co. Ltd., New Delhi.
4. Bhojwani & Bhatnager. (1977). The embryology of angiosperms. Vikas Publishing House, New Delhi
5. Pandey, B.P. (1978). Plant Anatomy. Chand and Co, New Delhi.
6. Maheswari P (1950). An introduction to the embryology of Angiosperms. McGraw Hill.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	H
CO2	S	H	H	M	S
CO3	H	M	S	H	M
CO4	S	H	M	S	H
CO5	H	S	H	M	S

S - Strong **H** - High **M** - Medium **L** - Low

UBO76

21UBO2AL

Programme Code: 05		For B.Sc., ZOOLOGY		
ALLIED PRACTICAL BOTANY- I & II				
Batch **2021 – 2022**	**Semester** **II**	**Hours/Week** **2**	**Total Hours** **30**	**Credits** **2**

COURSE OBJECTIVES

- To acquire knowledge on the morphological and anatomical features of vascular plants.
- To create basic skills on biosystematics and herbarium preparation techniques.
- To learn the basic concepts and principles of ecosystem.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K3 ↕ K5	CO1	Apply knowledge on the identification of lower life forms.
	CO2	Analyze various diseases and their impact on crop plants.
	CO3	Dissect and determine the structural organization of lower life forms.
	CO4	Assign and identify plants to their families based on their morphological characters.
	CO5	Examine the physiological process that occur in plant life.

LIST OF PRACTICALS

ALLIED PR. BOTANY - I

1. **Phycology**: Structure and the reproduction of the following:
   - *i. Oscillatoria*
   - *ii. Caulerpa*
   - *iii. Chara*
2. **Mycology**
   - *i. Albugo*
   - *ii. Agaricus*
3. **Plant pathology:** Symptoms, causative organisms and control measures of
   - i. Tikka disease of Groundnut
   - ii. Citrus canker
4. **Bryophytes**
   - *i. Marchantia*
   - *ii. Funaria*
5. **Pteridophytes**
   - *i. Lycopodium*
   - *ii. Adiantum*
6. **Gymnosperms**
   - *i. Cycas*
   - *ii. Gnetum*

UBO77

21UBO2AL

ALLIED PR. BOTANY - II

1. **Anatomy**
    1. Primary and secondary structure of dicot stem and root
    2. Primary structure of monocot stem and root.

2. **Embryology**
    1. T.S. of mature anther
    2. Types of the endosperm

3. **Taxonomy of Angiosperms:**
    1. Study of morphology and systematic position of plant families mentioned in theory

4. **Physiology**
    1. Osmosis, O_2 evolution during photosynthesis

5. **Environmental Botany**
    1. Aquatic and terrestrial ecosystem.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	H
CO2	S	H	H	M	S
CO3	H	M	S	H	M
CO4	S	M	H	S	M
CO5	S	H	M	S	H

S - Strong **H** - High **M** - Medium **L** - Low

UBO78

21UBO2AL

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029
UG MODEL QUESTION PAPER (PRACTICALS)

End of Semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2021-22 onwards)

Time: 3 Hours **Max. Marks: 25 Marks**

BREAK UP OF MARKS

ALLIED PRACTICAL BOTANY - I & II

I. Algae and Bryophytes	**- 04 Marks**
II. Pteridophytes/Gymnosperm	**- 04 Marks**
III. Anatomy section	**- 03 Marks**
IV. Taxonomy	**- 03 Marks**
IV. Physiology setup	**- 02 Marks**
V. Spotters	**- 04 Marks**
Record	**- 05 Marks**
TOTAL	**- 25 Marks**

EXTRA DEPARTMENTAL COURSE (EDC) PAPER

UBO80

21UBO5X1

Programme Code: 05		**For UG STUDENTS**		
Extra Departmental Course (EDC) - MEDICINAL BOTANY AND HUMAN WELFARE				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**V**	**2**	**30**	**3**

COURSE OBJECTIVES

- To study the Indian system of traditional medicine
- To gain knowledge on pharmacognosy of medicinal plants
- To familiarize cultivation technologies of medicinal plants

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1	CO1	Recognize crude drugs used in traditional system of medicine
↑	CO2	Understand the therapeutic potential of crude drugs
↕	CO3	Apply knowledge for the cultivation practices of medicinal plants
↕	CO4	Implement knowledge in identifying novel drug leads against allopathic medicine
K5	CO5	Assess the methods of cultivation and processing of medicinal plants

SYLLABUS

UNIT-I **(6 Hours)**

Indian systems of medicine - Ayurveda, Unani, Siddha and Homeopathy. Classification and evaluation of crude drugs. Drug adulteration.

UNIT-II **(6 Hours)**

Morphological and histological studies Chemical constituents. Therapeutic and other pharmaceutical uses of bark - *Cinchona*, Leaves - *Adathoda* and Flower-*clove*.

UNIT-III **(6 Hours)**

Fruits and seeds - Gooseberry and poppy seeds, Underground stem-ginger-Unorganized drugs. Gum - Gugul, Resin - *Ferula*, Fixed oil- Castor oil.

UNIT-IV **(6 Hours)**

A brief account of the following: Drugs acting on the central nervous system, Drugs used in disorders of the gastro-intestinal tract and Cardio vascular drugs.

21UBO5X1

UNIT-V **(6 Hours)**

Botanical features, medicinal uses and cultivation of medicinal plants - *Emblica officinalis, Gloriosa superba* and *Rauwolfia serpentina*.*

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOK

1. Trease and Evans. (1978). Pharmacognosy, Baillere Tindall London.
2. T.E.Wallis. (2005). Text book of Pharmacognosy Fifth Edition. Publishers- CBS publishers and distributions Delhi.

REFERENCES

1. S.S Handa and V.K. Kapoor. (1989). Pharmacognosy, Second Edition. Publishers- CBS Publishers and Distributors, Delhi.
2. Kumar N.C. (1993). An introduction to Medical Botany and Pharmacognosy, Emky Publications, New Delhi.
3. Supriya Kumar B. (2005). Hand Book of Medicinal Plants, Pointers Publishers, Jaipur.
4. Kokate C.K., A.Purohit and S.R. Gokhale. (2002). Pharmacognosy, 13th Edition Publishers Nirali Prakashan. Pune.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	S	H
CO2	S	M	S	H	M
CO3	H	S	M	H	H
CO4	S	H	S	H	M
CO5	S	H	M	H	S

S - Strong **H** - High **M** - Medium **L** - Low

Non-Major Elective

UBO83

21UHR3N1

Programme Code : 05	Title: B.Sc., BOTANY		
	PART IV - Non- Major Elective 1 – HUMAN RIGHTS		
Batch	**Hours/Week**	**Total Hours**	**Credits**
2021-2022	**2**	**30**	**2**

Course Objectives

- To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
- To impart education on national and international regime on Human Rights.
- To sensitive students to human suffering and promotion of human life with dignity.
- To develop skills on human rights advocacy
- To appreciate the relationship between rights and duties
- To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

K1	CO1	To understand the hidden truth of Human Rights by studying various theories.
↕	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities
K5	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

SYLLABUS

UNIT I **(6 Hours)**

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT II **(6 Hours)**

United Nations Charter and Human Rights - U.N. Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT III **(6 Hours)**

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

21UHR3N1

UNIT IV **(6 Hours)**

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights.

UNIT V **(6 Hours)**

Rights of Women, Child, Refugees and Minorities - Media and Human Rights - NGO‟s in protection of Human Rights - Right to Election

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Human Rights Compiled by Dr. V. Sugantha, Kongunadu Arts and Science College, Coimbatore -29.

REFERENCES

1. Human Rights, Jaganathan, MA., MBA., MMM., ML., ML., Humanitarian Law and J.P.Arjun Proprietor, Usha Jaganathan Refugee Law Law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai - 625014.
2. Promoting Women‟s Rights Publisher : United Nations. As Human Rights New York., 1999.

Question Paper Pattern
(External only)

Duration: 3 hrs **Max: 75 marks**

Section A (5x5=25)

Short notes
Either - Or/ Type - Question from each unit

Section B (5x10=50)

Essay type
Either - Or/ Type - Question from each unit

UBO85

21UWR4N2

Programme Code : 05	Title: B.Sc., BOTANY			
	PART IV - NON- MAJOR ELECTIVE – II WOMEN'S RIGHTS			
Batch 2021-2022	**Semester** IV	**Hours/Week** 2	**Total Hours** 30	**Credits** 2

COURSE OBJECTIVES

- To know about the laws enacted to protect Women against violence.
- To impart awareness about the hurdles faced by Women.
- To develop a knowledge about the status of all forms of Women to access to justice.
- To create awareness about Women‟s rights.
- To know about laws and norms pertaining to protection of Women.
- To understand the articles which enables the Women‟s rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against Women puts an undue burden on healthcare services.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 ↕ K5	CO1	Appraise the importance of Women‟s Studies and incorporate Women‟s Studies with other fields
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication
	CO3	Interpret the laws pertaining to violence against Women and legal consequences
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women
	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women

SYLLABUS

Unit I **(6 Hours)**

Women's Studies: Basic concepts of Women‟s studies in Higher education, Women‟s studies perspectives- Socialization- Patriarchy- Women‟s studies as an academic discipline- Growth and development of Women‟s studies as a discipline internationally and in India.

Unit II **(6 Hours)**

Socio-Economic Development of Women: Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

Unit III **(6 Hours)**

Women's Rights – Access to Justice: Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

Unit IV **(6 Hours)**

Women Protective acts: Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Unit V **(6 Hours)**

Women and Child welfare: Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

Teaching Methods:

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:

1. **Women's Rights** (2021), Published by Kongunadu Arts & Science College, Coimbatore – 641 029.

Reference Books:

1. **"Rights of Indian Women"** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
2. **"Women's security and Indian law"** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
3. **"Women's Property Rights in India"** by Kalpaz publications, 2016.

Question Paper Pattern

Duration :3 hrs Max: 75 marks

Section A (5 X 5=25 Marks)

Short notes
Either – Or/ Type - Question from each unit.

Section B (5 X 10=50 Marks)

Essay type
Either – Or/ Type - Question from each unit.

UBO87

Programme Code : 05	Title: B.Sc., BOTANY		
	Non- Major Elective III – Consumer Affairs		
Batch	**Hours/Week**	**Total Hours**	**Credits**
2021-2022	**2**	**30**	**2**

Course Objectives

- To familiarize the students with their rights and responsibilities as a consumer.
- To understand the procedure of redress of consumer complaints.
- To know more about decisions on Leading Cases by Consumer Protection Act.
- To get more knowledge about Organizational set-up under the Consumer Protection Act
- To impart awareness about the Role of Industry Regulators in Consumer Protection
- To understand Contemporary Issues in Consumer Affairs

COURSE OUTCOMES (CO)

K1 ↕ **K5**	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms‟ interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

SYLLABUS

UNIT I **(6 Hours)**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

UNIT II **(6 Hours)**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III **(6 Hours)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV **(6 Hours)**

Role of Industry Regulators in Consumer Protection

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

UNIT V **(6 Hours)**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

Teaching Methods:

Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

SUGGESTED READINGS:

Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, UniversitiesPress.

Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications PvtLtd.

G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, RegalPublications

Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi

Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company

Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.

E-books :-www.consumereducation.in

Empowering Consumers e-book,www.consumeraffairs.nic.in

ebook,www.bis.org

The Consumer Protection Act, 2086 and its later versions.

UBO90

Question paper pattern (External Only)

Duration: 3 hrs Max: 75Marks

Section A (5 x 5=25)

Short notes

Either – or / type – question from each unit.

Section B (5 x 10=50)

Essay type

Either – or / type – question from each unit.