VIDYASAGAR UNIVERSITY

Curriculum for 3 -Year B Sc (HONOURS)
in
Botany

Under Choice Based Credit System (CBCS)
w.e.f 2017-2018

VIDYASAGAR UNIVERSITY

B Sc (Honours) in Botany

[Choice Based Credit System]

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							CA	ESE	TOTAL
	Semester-I								
1	I	Core-1		CT1: Algae and Microbiology	6	4-0-0	15	60	75
				CP1: Algae and Microbiology-**Lab**		0-0-4			
		Core-2		CT2: Biomolecule and Cell Biology	6	4-0-0	15	60	75
				CP2: Biomolecule and Cell Biology-**Lab**		0-0-4			
		GE-1		TBD	6	4/5	15	60	75
				TBD		2/1			
		AECC-1		English/MIL	2	1-1-0	10	40	50
	Semester –I: total				**20**				**275**
	Semester-II								
	II	Core-3		CT3: Mycology and Phytopathology	6	4-0-0	15	60	75
				CP3: Mycology and Phytopathology -**Lab**		0-0-4			
		Core-4		CT4: Archegoniate	6	4-0-0	15	60	75
				CP4: Archegoniate-**Lab**		0-0-4			
		GE-2		TBD	6	4/5	15	60	75
				TBD		2/1			
		AECC-2		ENVS	4		20	80	100
	Semester-II : total				**22**				**325**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							CA	ESE	TOTAL
2	**Semester-III**								
	III	Core-5		CT5: Morphology and Anatomy	6	4-0-0	15	60	75
				CP5: Morphology and Anatomy - **Lab**		0-0-4			
		Core-6		CT6: Economic Botany	6	4-0-0	15	60	75
				CP6: Economic Botany-**Lab**		0-0-4			
		Core-7		CT7: Genetics	6	4-0-0	15	60	75
				CP7: Genetics -**Lab**		0-0-4			
		GE-3		TBD	6	4/5	15	60	75
						2/1			
		SEC-1		TBD	2		10	40	50
		Semester – III : total			**26**				**350**
	Semester-IV								
	IV	Core-8		CT8: Molecular Biology	6	4-0-0	15	60	75
				CP8: Molecular Biology -**Lab**		0-0-4			
		Core-9		CT9: Plant Ecology and Phytogeography	6	4-0-0	15	60	75
				CP9: Plant Ecology and Phytogeography **-Lab**		0-0-4			
		Core-10		CT10: Plant Systematics	6	4-0-0	15	60	75
				CP10: Plant Systematics-**Lab**		0-0-4			
		GE-4		TBD	6	4/5	15	60	75
						2/1			
		SEC-2		TBD	2		10	40	50
		Semester – IV : total			**26**				**350**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							CA	ESE	TOTAL
3	V	**Semester-V**							
		Core-11		CT11: Reproductive Biology Angiosperms	6	4-0-0	15	60	75
				CP11: Reproductive Biology Angiosperms -**Lab**		0-0-4			
		Core-12		CT12: Plant Physiology	6	4-0-0	15	60	75
				CP12: Plant Physiology -**Lab**		0-0-4			
		DSE-1		TBD	6	4-0-0	15	60	75
						0-0-4			
		DSE-2		TBD	6	4-0-0	15	60	75
						0-0-4			
		Semester –V : total			**24**				**300**
		Semester-VI							
	VI	Core-13		CT13: Plant Metabolism	6	4-0-0	15	60	75
				CP13: Plant Metabolism -**Lab**		0-0-4			
		Core-14		CT14: Plant Biotechnology	6	4-0-0	15	60	75
				CP14: Plant Biotechnology-**Lab**		0-0-4			
		DSE-3		TBD	6	4-0-0	15	60	75
						0-0-4			
		DSE-4		TBD	6	4-0-0	15	60	75
						0-0-4			
		Semester – VI : total			**24**				**300**
Total in all semester:					**142**				**1900**

CC = Core Course , **AECC** = Ability Enhancement Compulsory Course , **GE** = Generic Elective , **SEC** = Skill Enhancement Course , **DSE** = Discipline Specific Elective , **CA**= Continuous Assessment , **ESE**= End Semester Examination , **TBD**=To be decided , **CT** = Core Theory, **CP**=Core Practical , **L** = Lecture, **T** = Tutorial ,**P** = Practical , **MI**L = Modern Indian Language , **ENV**S = Environmental Studies ,

List of Core Course (CC)

CC-1: Phycology and Microbiology
CC-2: Bio-molecules and Cell Biology
CC-3: Mycology and Phytopathology
CC-4: Archegoniate
CC-5: Anatomy of Angiosperms
CC-6: Economic Botany
CC-7: Genetics
CC-8: Molecular Biology
CC-9: Plant Ecology and Phytogeography
CC-10: Plant Systematics
CC-11: Reproductive Biology of Angiosperms
CC-12: Plant Physiology
CC-13: Plant Metabolism
CC-14: Plant Biotechnology

Discipline Specific Electives (DSE)

DSE-1: Natural Resource Management
Or
DSE-1: Biostatistics
DSE-2: Plant Breeding
Or
DSE-2: Stress Biology
DSE-3: Industrial and Environmental Microbiology
Or
DSE-3: Bioinformatics
DSE-4: Analytical Techniques in Plant Sciences
Or
DSE- 4: Research Methodology

Skill Enhancement Course (SEC)

SEC-1: Biofertilizers
Or
SEC- 1: Floriculture

SEC-2: Medicinal Botany
Or
SEC-2: Mushroom Culture Technology

Generic Electives (GE)

GE-1: Biodiversity (Microbes, Algae, Fungi and Archegoniate)
GE-2 : Plant Ecology and Taxonomy
GE-3: Economic Botany and Plant Biotechnology
GE-4: Plant Anatomy and Embryology
Or
GE-4: Plant Physiology and Metabolism

Unit 3:
Storage and nutrition: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.

Unit 4:
Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings:

- Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
- Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

Generic Elective (GE)
[Interdisciplinary for other department]

GE-1: Biodiversity (Microbes, Algae, Fungi and Archegoniate) Credits 06

GE1T: Biodiversity (Microbes, Algae, Fungi and Archegoniate) Credits 04

Course Contents:

Unit 1: Microbes
Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit 2: Algae
General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Fucus*, *Polysiphonia*. Economic importance of algae.

Unit 3: Fungi
Introduction- General characteristics, ecology and significance, range of thallus organization,cell wall composition, nutrition, reproduction and classification; True Fungi-General characteristics, ecology and significance, life cycle of *Rhizopus* (Zygomycota) *Penicillium*,*Alternaria* (Ascomycota), *Puccinia, Agaricus* (Basidiomycota); Symbiotic

Associations-Lichens:General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.

Unit 4: Introduction to Archegoniate
Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Unit 5: Bryophytes
General characteristics, adaptations to land habit, Classification, Range of thallus organization.Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*.(Developmental details not to be included).Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

Unit 6: Pteridophytes
General characteristics, classification, Early land plants (*Cooksonia* and *Rhynia*). Classification (up to family), morphology, anatomy and reproduction of *Selaginella, Equisetum* and *Pteris*.(Developmental details not to be included).Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.

Unit 4: Gymnosperms
General characteristics; Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus* (Developmental details not to be included). Ecological and economical importance.

GE1P: Biodiversity (Microbes, Algae, Fungi and Archegoniate) (Practical) Credits 02

Practical:

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.

1. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.

2. Gram staining.

3. Study of vegetative and reproductive structures of *Nostoc, Chlamydomonas* (electron micrographs), *Oedogonium, Vaucheria, Fucus* and Polysiphonia* through temporary preparations and permanent slides. (* *Fucus* - Specimen and permanent slides).

4. *Rhizopus and Penicillium*: Asexual stage from temporary mounts and sexual Structures through permanent slides.

5. *Alternaria:* Specimens/photographs and tease mounts.

6. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.

7. *Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.
8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)

9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)

10. *Marchantia*- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).

11. *Funaria*- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
12. *Selaginella*- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m.microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
14. *Equisetum*- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore,w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
13. Pteris- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
14. *Cycas*- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet,v.s. micro sporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).

15. *Pinus*- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m.dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. &r.l.s. stem (permanent slide).

Suggested Readings:

- Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
- Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
- Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
- Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
- Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
- Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
- Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

GE-2: Plant Ecology and Taxonomy **Credits 06**

GE2T: Plant Ecology and Taxonomy **Credits 04**

Course Contents:

Unit- 1: Introduction

Unit- 2: Ecological factors

Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes

Unit -3: Plant communities

Characters; Ecotone and edge effect; Succession; Processes and types

Unit- 4: Ecosystem

Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous

Unit- 5: Phytogeography

Principle of Biogeographical zone; Endemism.

Unit- 6: Introduction to plant taxonomy

Identification, Classification, Nomenclature.

Unit- 7 : Identification

Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access

Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.

Unit 9 : Taxonomic hierarchy
Ranks, categories and taxonomic groups

Unit 10: Botanical nomenclature
Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Unit 11: Classification

Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

Unit 12: Biometrics, numerical taxonomy and cladistics
Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).

GE2P: Practical **Credit 02**

Practical:

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.
2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.
3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (*Cuscuta),* Root parasite (*Orobanche*), Epiphytes, Predation (Insectivorous plants).
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)
6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):Brassicaceae - *Brassica,Alyssum / Iberis;* Asteraceae -*Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax;* Solanaceae -*Solanum nigrum, Withania;* Lamiaceae -*Salvia, Ocimum*; Liliaceae - *Asphodelus / Lilium / Allium.*
8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition

GE-3: Economic Botany and Plant Biotechnology **Credits 06**

GE3T: Economic Botany and Plant Biotechnology **Credits 04**

Course Contents: