VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE WITH BOTANY

(MULTIDISCIPLINARY STUDIES)

3-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023 & NEP, 2020

VIDYASAGAR UNIVERSITY

BACHELOR OF SCIENCE IN LIFE SCIENCES with BOTANY

(*Under CCFUP, 2023*)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. in Life Sc. with Botany	3rd	V	**SEMESTER-V**							
			Major-A4	BOTPMJ04	T: Economic Botany and Pharmacognosy; P: Practical *(To be studied by students taken Botany as Discipline- A)*	4	3-0-1	15	60	75
			Major-A5	BOTPMJ05	T: Biochemistry and Metabolism; P: Practical *(To be studied by students taken Botany as Discipline- A)*	4	3-0-1	15	60	75
			Major-A6	BOTPMJ06	T: Plant Pathology and Plant Health Science; P: Practical *(To be studied by students taken Botany. as Discipline- A)*	4	3-0-1	15	60	75
			Major (Elective) -1	BOTMJE-02	Ecology, Ethology, and Wildlife Biology *(To be studied by students taken Botany as Discipline- A)*	4	3-1-0/ 3-0-1	15	60	75
			Minor-5 (Disc.-C5)	BOTMIN05	T: Plant Science-V; P: Practical *(To be studied by students taken Botany as Discipline- C)*	4	3-0-1	15	60	75
					Semester-V Total	20				375
		VI	**SEMESTER-VI**							
			Major-B4		*To be decided (Same as MajorA4 for Botany taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B5		*To be decided (Same as Major–A5 for Botany taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B6		*To be decided (Same as Major–A6 for Botany taken as Discipline-B)*	4	3-0-1	15	60	75
			Major (Elective) -2	BOTMJE-02	T: Nursery and Gardening; P: Practical *(To be studied by students taken Botany as Discipline- A)*	4	3-0-1	15	60	75
			Minor -6 (Disc.-C6)	BOTMIN06	T: Plant Science-VI; P: Practical *(To be studied by students taken Botany as Discipline- C)*	4	3-0-1	15	60	75
					Semester-VI Total	20				375
					TOTAL of YEAR-3	40	-	-	-	700
			Eligible to be awarded Bachelor of Science in Multidisciplinary Studies with *Botany on Exit*			126	**Marks (Year: I+II+III)**			2325

MJP = Major Programme (Multidisciplinary), MI = Minor, A/B = Choice of Major Discipline; C= Choice of Minor Discipline; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical

MAJOR (MJ)

Paper-MJ A4/B4: Economic Botany and Pharmacognosy **Credits 04 (FM: 75)**

MJ-A4T/B4T: Economic Botany and Pharmacognosy (Theory) **Credits 03 (45L)**

Course contents:

UNIT	Topic	Lectures
1	**Origin of Cultivated Plants-** Concept of centres of origin, their importance with reference to Vavilov's work. Crop domestication and loss of genetic diversity.	15
2	**Botanical name, family, part used, morphology and uses** **Cereals-**Wheat -Origin, morphology, uses. **Legumes-** General account with special reference to Gram and soybean. **Spices-** General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses). **Beverages-**Tea (morphology, processing, uses). **Oils and Fats-** General description with special reference to groundnut. **Medicinal Plant:** Serpentine root (Rauvolfia), Creat (Andrographis), Ipecac, Margosa. **Fibre Yielding Plants-** General description with special reference to Cotton	15
3	**Pharmacognosy:** Definition, Importance, Classification of drug - Chemical and Phannacological, Drug evaluation. Organoleptic and microscopic studies with reference to nature of active principles and common adulterants of *Alstonia* (bark), *Adhatoda*(leaf), *Strychnos*(seed), *Rauvolfia* (root), and *Zinziber* (rhizome). Secondary Metabolites: Definition of primary and secondary metabolites and their differences, major types - terpenes, phenolics and alkaloids. A brief idea about extraction of alkaloids.	15

MJ-A4P/B4P: Economic Botany and Pharmacognosy (Practical) **Credits 01 (30Hr.)**

Course Outline:

1. Study of economically important plant: Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests.
2. Organoleptic and powder microscopy of *Alstonia*bark, *Adhatoda* leaf, *Strychnos* seed and *Zinziber* rhizome.
3. Chemical tests for Tannin (*Terminalia chebula*) and Alkaloid (*Catharanthus roseus*).
4. A project on medicinal plants and their formulations.

Suggested Readings

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

MJ A5/B5: Biochemistry and Metabolism **Credits 04 (FM: 75)**

MJ-A5T/B5T: Biochemistry and Metabolism (Theory) **Credits 03(45L)**

Course Content:

Unit	Topic	No. of Lectures
1.	**Bioenergetics:** Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as an energy currency molecule.	7
2.	**Forces stabilizing atomic and molecular interactions:** Formation, properties and biological significance of Van der Waals force, hydrogen bond, ionic bond, covalent bond and hydrophobic interaction, free radicals. pH and buffer: biological significance of pH, Characteristics of buffer.	8
3.	**Carbohydrate chemistry:** Classification and properties ofcarbohydrates with emphasis on glycosidic bond,	5
4.	**Protein chemistry:** Classification of proteins, primary, secondary, tertiary and quaternary structure of proteins; Properties of proteins.	6
5.	**Lipid Chemistry:** Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides.	7
6.	**Nucleic acid chemistry:** Elementary concept of nucleoside, nucleotide, polynucleotide, elementary concept of DNA and RNA.	5
7.	**Enzymes:**Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; isoenzymes; Features of active site, substrate specificity, mechanism of action (activation energy), Michaelis – Menten equation.	7

MJ-A5P/B5P: Biochemistry and Metabolism (Practical) **Credits 01(30H)**

1. **Qualitative tests for-carbohydrates** of reducing and non-reducing sugars, glucose, fructose, sucrose, starch and **-lipids**.
2. Qualitative tests for detection of proteins, amino acids and organic acids (citric, oxalic). Qualitative tests for carbohydrate, protein and lipid.
3. Preliminary Phytochemical study of medicinal plant extracts.

Suggested Readings

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company

MJ A6/B6: Plant Pathology and Plant Health Science **Credits 04 (FM: 75)**

MJ A6/B6 T: Plant Pathology and Plant Health Science (Theory) **Credits 03 (45L)**

Course contents:

Unit	Topic	No. of Lectures
1.	**Definitions:** disease, pathogen, inoculum, infection, resistance, incubation period, Disease cycle, Koch's postulates. Symptoms- necrotic, hypoplastic and hyperplastic.	7
2.	**Plant Pathogens and Diseases:** Types of plant pathogens (viruses, bacteria, fungi, nematodes); Life cycle of pathogens; Mode of transmission. Phytoalexins in defense mechanism; Systemic and Local acquired resistance.	8
3.	**Common plant diseases and their symptoms:** Late blight of potato, Stem rot of jute, Brown spot of rice. Black Stem rust of wheat.	8
4.	**Plant Disease and Health Management:** Principles of integrated pest management; Cultural practices of disease prevention, biological and chemical control methods.	7
5.	**Plant Health in Agriculture:** Disease management in the agricultural system; Role of plant health in sustainable agriculture; Food safety.	8
6.	**Plant Health and the Environment:** Impacts of plant health in ecosystems; Plant health and climate change; Plant quarantine. Plant Variety Protection (PVP) rights, Plant Breeder's rights.	7

MJ A6/B6 P: Plant Pathology and Plant Health Science (Practical) **Credits 01(30Hr)**

1. Visual diagnosis of common diseased plant symptoms and signs–Fungal leaf spots, Bacterial leaf spots, Mosaic and ring spot, Leaf distortion, Powdery mildew, Cankers, Fruit discoloration, Wilts, Blights.
2. Laboratory testing of plant pathogens by microscopy and pathogen-selective media plates.
3. A field visit and assessment of plant disease incidence and severity.

Suggested Readings:

1. Agrios, G. N. 1997. Introductory Plant Pathology. 4th ed. Academic Press, New York, NY.
2. Hansen, M. A. and R. L. Wick. 1993. Plant disease diagnosis: present and future prospects. Advances in Plant Pathology 10:65-126
3. Hansen, M. A. and R. L. Wick. 1993. Plant disease diagnosis: present and future prospects. Advances in Plant Pathology 10:65-126.

Major Elective

(To be studied by students taken Botany as Discipline- A)

Major Elective -2: Ecology, Ethology, and Wildlife Biology Credits 04 (Full Marks: 75)

MJE-2T: Ecology, Ethology, and Wildlife Biology (Theory) Credits 03 (45L)

Course Contents	Hours
Unit 1: Introduction to Ecology, Ecosystem, and Biome Definition of ecology and ecosystem: Types, components, and function of ecosystem; Concept of food chain, food web, ecological pyramids & energy flow, concept of Biome; Concept of habitat & Niche.	8hrs
Unit 2: Population Ecology Unique and group attributes of population: Density, natality, mortality, life tables, fecundity schedule, survivorship curves; age distribution, Exponential and logistic growth; biotic potential; dispersal & dispersion. Population regulation: density-dependent and independent factors.	10 hrs
Unit 3: Biotic Community: Community characteristics: stratification; dominance, diversity, species richness, abundance; Ecotone and edge effect; Ecological succession; Gause's Principle with laboratory and field examples.	9 hrs
Unit 4: Animal Behavior Patterns of behavior: Instinct Behavior, Learned Behavior - Habituation, sensitization & imprinting; Sexual behavior: Intra-sexual selection (male rivalry in Red Deer) and inter-sexual selection (female choice in peacock); Social behavior: Eusociality; Altruism; Reciprocal altruism; Types and characteristics of biological rhythms.	10 hrs
Unit 5: Wildlife Biology Definition and categories of wildlife; Values of wildlife; Causes of extinction of wildlife; Fundamental process of wildlife management; The Wildlife Protection Act (1972); Wildlife corridors; Human-wildlife conflict.	8 hrs

MJE-2P: Ecology, Ethology, and Wildlife Biology (Practical) Credits 01 (30Hrs)

1. Estimation of free carbon dioxide, dissolved oxygen & transparency of any water body
2. Estimation of any terrestrial ecosystem/biome through ecological methods like quadrat sampling, determination of the minimum size of the quadrat. Calculation of density, abundance & frequency of any suitable population/community/ecosystem through field work or a hypothetical community.
3. Demonstration of nests and nesting behavior of the bird through photographs (Pigeon, Crow, Tailor bird, Weaver Bird) and social insects through photographs (Termite, Ant, and Honey bee).
4. To study circadian functions in humans (daily eating, sleep, and temperature patterns).
5. Identification and study of selective wild flora and wild fauna from the field.
6. Identification of animals through pug marks, hoof marks, scats, pellet groups, nests, antlers, etc.
7. Submission of a field report after studying any ecosystem/zoological garden/National Park/Sanctuary/Biosphere Reserve.

Recommended Readings

1. Odum, E.P. (1983) Basic Ecology. Saunders College Publishing.
2. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole.
3. Ricklefs, R.E. (2000) Ecology (5th edition) Chiron Press.
4. Kormondy, E.J. (2000) Concepts of Ecology (4th edition) Prentice Hall of India Pvt. Ltd.
5. Chapman, J.L. and Reiss, M. J. (2002) Ecology Principles & Applications (2nd edition) Cambridge University Press.
6. Sharma, P.D. (2011) Ecology and Environment. Rastogi Publication.
7. Cain M L, Bowman W D and Hacker S D. 2013. Ecology. 3rd ed. Sinauer associates.
8. Smith TM, Smith R L. 2006. Elements of Ecology. 6th Ed. Pearson Education.
9. Odum EP, Barret GW. 2017. Fundamentals of Ecology. 15th Indian reprint. Cengage learning India Pvt. Ltd.
10. Alcock J. 2013. Animal Behavior, Sinauer Associate Inc., USA.
11. Drickamer LC, Vessey SH. 2001. Animal Behavior. McGraw-Hill.
12. Dujatkin LA. 2014. Principles of Animal Behavior. 3rd Edn. W.W.Norton and Co.
13. Macfarland, D. 1999. Animal Behavior (3rd Edition), Addission Wesley Longman Ltd. England.
14. Mandal F. 2010. A Text Book of Animal Behavior. Pentice Hall India.
15. Mathur R. 2005. Animal Behavior. Rastogi Pub.
16. Caughley, G., and Sinclair, A.R.E. (1994) Wildlife Ecology and Management. Blackwell Science.
17. Saha, G. and Mazumar S. (2017). Wildlife Biology: An Indian Perspective. PHI. Learning Pvt. Ltd. Delhi.

Major Elective -3: Nursery and Gardening **Credits 04(Full Marks: 75)**

MJE-3T: Nursery and Gardening (Theory) **Credits 03 (45 L)**

Course contents:

Course Contents	Hours
Unit 1: Nursery: definition, objectives and scope and building up of infrastructure fornursery, planning and seasonal activities - Planting - direct seeding and transplants.	8 hrs
Unit 2: Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion – Seed production technology - seed testing and certification.	10 hrs
Unit 3: Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants – green house - mist chamber, shed root, shade house and glass house.	9 hrs
Unit 4: Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.	10 hrs
Unit 5: Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.	8 hrs.

MJE-3P: Field work (Practical) **Credits 01 (30Hrs)**

4. Methods of preparation of nursery beds and sowing of seeds. Media for propagation of plants in Nursery Beds, Pots and Mist chamber.
5. Study and practice of different propagation methods viz., cutting, layering, division, grafting and budding.
6. Introduction and practicing Bonsai training, pruning and wiring.
7. Demonstration of different types of gardens (indoor and outdoor).
8. Visit to local Nursery and Report preparation

Recommended Readings

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH PublishingCo., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co.,New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture andCooperation, National _Seed Corporation Ltd., NewDelhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., SanFrancisco, USA.

MINOR (MI)

(To be studied by students taken Botany as Discipline- C)

MI-5/C5: Same as Minor-5 (BOTMIN05) of Botany (Hons.) programme — **Credits 04, Full Marks: 75**

MI-6/C6: Same as Minor-6 (BOTMIN06) of Botany (Hons.) programme — **Credits 04, Full Marks: 75**