

COURSE STRUCTURE

(Choice Based Credit System)

B. Sc. LIFE SCIENCES (ENVIRONMENTAL SCIENCE AND TECHNOLOGY, MICROBIOLOGY, BIOTECHNOLOGY)

Effective from Academic Year: 2023-2024

	Faculty Name:	SCIENCE
	Programme Name:	B. Sc. LIFE SCIENCES (Environmental Science & Technology/Microbiology/Biotechnology)
Argle Cherris Wiley Mandel Estil 1942	Semester:	I Academic Batch: 2023-24

Course Group	Board of Studies / Faculty	Course Code	Course Name	Cr	Teaching Scheme				Assessment /Evaluation Type		External Exam Duration (Hrs.)		INT(T) Max./ Passing	EXT(T) Max./ Passin	INT(P) Max./ Passin	EXT(P) Max./ Passin	Grand Total Max./
	Ownership				Т	Р	Tu	Cont. Hrs	Т	Р	Т	Р	Passing	g	g	g	Passing
Discipline Specific Course-1	Biological Sciences		Ecology & Ecosystems	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-2	Biological Sciences		General Microbiology	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-3	Biological Sciences		Cell Biology	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Generic Elective	Chemical Sciences		Chemistry-I	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Ability Enhancement Course	Humanities		English	2	2			2	~		2		50/18	50/17			100/35
Skill Enhancement Course	Biological Sciences		Microbial Techniques	2		2		2		~		2			50/18	50/17	100/35
Value Addition	Arts		National Service Scheme (NSS)	2		2		2		~		2			50/18	50/17	100/35
Course			National Cadet Corps (NCC)	2		2		2		~		2			50/18	50/17	100/35
(Anyone)			Sports	2		2		2		~		2			50/18	50/17	100/35
				22													

T = Theory, P = Practical, Tu = Tutorial

Name & Sign [Chairman - Board of Studies]:

DR. SHILPA GUPTE

Name & Sign [Dean / Director]:



Faculty Name:	SCIENCE
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Programme Name: B. Sc. LIFE SCIENCES (Environmental Science & Technology/Microbiology/Biotechnology)

Semester:

Academic Batch:

2023-24

Course Group	Board of Studies / Faculty	Course Code	Course Name	Cr	Teaching Scheme				Assess /Evalu Ty	sment lation pe	External Exam Duration (Hrs.)		INT(T) Max./ Passing	EXT(T) Max./ Passing	INT(P) Max./ Passing	EXT(P) Max./ Passing	Grand Total Max./
	Ownership				Т	Р	Tu	Cont. Hrs	Т	Р	Т	Р	1 assing	1 assing	i assiiig	8	Passing
Discipline Specific Course-1	Interdiscipli nary Sci.		Biodiversity and Conservation	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-2	Biological Sciences		Microbial Physiology	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-3	Biological Sciences		Plant and Animal Sciences	4	3	1		5	✓	✓	2	2	50/18	50/17	25/9	25/9	150/53
Generic Elective	Chemical Sciences		Chemistry II	4	3	1		5	~	✓	2	2	50/18	50/17	25/9	25/9	150/53
Ability Enhancement Course	Interdiscipli nary Sci.		Environmental Studies	2	2			2	~		2		50/18	50/17			100/35
Skill Enhancement Course	Biological Sciences		Organic Farming	2	2			2	~		2				50/18	50/17	100/35
Value Addition Course	FCML		Liberal Arts	2		2		2		~		2			50/18	50/17	100/35
				22													

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III

Programme B. Sc. LIFE SCIENCES (Environmental Science & Technology/Microbiology/Biotechnology)

Name: Semester:

Academic Batch:

2023-24

External Assessment Board of Exam Grand **Teaching Scheme** EXT(T) EXT(P) /Evaluation INT(T) INT(P) Studies / Course Duration Total Max./ **Course Group Course Name** Max./ Cr Type Max./ Max./ Max./ Faculty Code (Hrs.) Passing Passing Passing Passing Passing Cont. Ownership Т Р Tu Т Р Т Р Hrs Discipline Specific Interdiscipli **Environmental Chemistry** 4 3 1 5 ✓ \checkmark 2 2 50/18 50/17 25/9 25/9 150/53 Course -1 nary Sci. **Discipline Specific** Biological Microbial Ecology & Diversity 4 3 1 5 ✓ \checkmark 2 50/18 50/17 25/9 2 25/9 150/53 Course -2 Sciences **Discipline Specific** Biological **Developmental Biology** 4 3 1 5 ✓ \checkmark 2 2 50/18 50/17 25/9 25/9 150/53 Course -3 Sciences Chemical ✓ **Generic Elective** DNA Structure Function and Repair 4 3 3 2 50/18 50/17 100/35 Sciences Ability Interdiscipli Enhancement **Environmental Pollution** 2 2 2 ✓ 2 50/18 50/17 100/35 nary Sci. Course **Skill Enhancement** Biological 50/18 50/17 100/35 **Bioinstrumentation-I** 2 2 2 ✓ 2 Course Sciences Value Addition FCML 2 2 \checkmark 2 50/18 50/17 100/35 **Constitution of India** 2 Course 22

T = Theory, P = Practical, Tu = Tutorial

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Age: Chartman Weys Mandel (Essel 1943)

Faculty Name:	
Programme Name:	

B. Sc. LIFE SCIENCES (Environmental Science & Technology/Microbiology/Biotechnology)

Semester: IV

SCIENCE

Academic Batch:

2023-24

Course Group	Board of Studies / Faculty	Course Code	Course Name		Teaching Scheme				Assess /Evalı Ty	sment lation pe	External Exam Duration (Hrs.)		INT(T) Max./ Passing	EXT(T) Max./ Passing	INT(P) Max./ Passing	EXT(P) Max./ Passing	Grand Total Max./
	Ownership				Т	Р	Tu	Cont. Hrs	Т	Р	Т	Р		8			Passing
Discipline Specific Course - 1	Interdiscipli nary Sci.		Environmental Toxicology	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course -2	Biological Sciences		Microbial Genetics	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course -3	Biological Sciences		Plant Tissue Culture	4	3	1		5	✓	~	2	2	50/18	50/17	25/9	25/9	150/53
Generic Elective	Biological Sciences		Gene Expression and Regulation	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Ability Enhancement Course	Biological Sciences		Fundamentals of Biostatistics	2	2			2	~		2		50/18	50/17			100/35
Skill Enhancement Course	Biological Sciences		Bioinstrumentation-II	2	2			2	~		2		50/18	50/17			100/35
Value Addition Course	Interdiscipli nary Sci.		Wildlife Conservation	2	2			2	~		2				50/18	50/17	100/35
				22													

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Name & Sign [Dean / Director]:



Faculty Name:	SCIENCE		
Programme Name:	B. Sc. LIFE SCIENCES	(Environmental Science & Technology/Microbiology/Biotechnolog	y)
Semester:	V	Academic Batch:	2023-24

Course Group	Board of Studies / Faculty	Course Code	Course Name (Teaching Scheme			Assessment /Evaluation Type		External Exam Duration (Hrs.)		INT(T) Max./ Passing	EXT(T) Max./ Passinį	INT(P) Max./ Passing	EXT(P) Max./ Passing	Grand Total Max./	
	Ownership				Т	Р	Tu	Hrs	Т	Р	Т	Р			0		Passing
Discipline Specific Course - 1	Interdiscipli nary Sci.		Occupational Health & Safety	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course -2	Biological Sciences		Environmental Microbiology	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course - 3	Interdiscipli nary Sci.		Environment Management	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Elective	Biological Sciences		Remote Sensing & GIS	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Generic Elective	Biological Sciences		Genetic Engineering	4	3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Skill Enhancement Course	Biological Sciences		Introduction to Bioinformatics	2		2		2		~		2	50/18	50/17			100/35
				22													

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Name & Sign [Dean / Director]:

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Faculty Name:	SCIENCE
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VI

Programme B. Sc. LIFE SCIENCES (Environmental Science & Technology/Microbiology/Biotechnology)

Name: Semester:

Academic Batch:

2023-24

Course Group	Board ofStudies /Course GroupFacultyCode		Course Name		Teaching Scheme				Assessment /Evaluation Type		External Exam Duration (Hrs.)		INT(T) Max./ Passing	EXT(T) Max./ Passing	INT(P) Max./ Passing	EXT(P) Max./ Passing	Grand Total Max./
	Ownership				Т	Р	Tu	Cont. Hrs	Т	Р	Т	Р	1 4331115	1 assing	1 4351116	1 assing	Passing
Discipline Specific Course-1	Interdiscipli nary Sci.		Wastewater Treatment Technologies		3	1		5	✓	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-2	Interdiscipli nary Sci.		Biodegradation & Bioremediation	4	3	1		5	✓	✓	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Course-3	Biological Sciences		Animal Biotechnology		3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Discipline Specific Elective	Interdiscipli nary Sci.		Environmental Impact Assessment		3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Generic Elective	Biological Sciences		Basic Immunology		3	1		5	~	~	2	2	50/18	50/17	25/9	25/9	150/53
Skill Enhancement Course	Biological Sciences		Entrepreneurship Development	2	2			2	~		2		50/18	50/17			100/35
				22													

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Name & Sign [Chairman - Board of Studies]:

DR. SHILPA GUPTE

Name & Sign [Dean / Director]:

	Faculty Name:	SCIENCE		
	Programme Name:	B. Sc. LIFE SCIENCES ((HONOURS/HONOURS with RESEARCH) (Environmental Science &	Technology)
UNIVERSITY Argle: Charuna Waya Mandal (Esst. 1945)	Semester:	VII	Academic Batch:	2023-24

Course Group	Board of Studies / Faculty Ownership	Course Code	Course Name	Cr	Te T	achin P	g Sch Tu	eme Cont. Hrs	Asses /Eval Ty T	sment uation pe P	Exte Ex Dura (H T	ernal am ation rs.) P	INT(T) Max./ Passing	EXT(T) Max./ Passing	INT(P) Max./ Passing	EXT(P) Max./ Passing	Grand Total Max./ Passing
Discipline Specific Course - 1	Interdiscip linary Sci.		Industrial Waste Management	4	3		1	4	~	~	2	2	50/18	50/17			100/35
Discipline Specific Elective - 1	Interdiscip linary Sci.		Environmental Legislation & Policy	4	3		1	4	~	~	2	2	50/18	50/17			100/35
Discipline Specific Elective -2	Interdiscip linary Sci.		Air Pollution Control Technologies		3		1	4	~	~	2	2	50/18	50/17			100/35
Discipline Specific Elective - 3	Biological Sciences		Biology of Omics	4	3		1	4	>	~	2	2	50/18	50/17			100/35
	Biological Sciences		Dissertation/Practical			6		6		~							300/105
				22													

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DR. SHILPA GUPTE

Name & Sign [Dean / Director]:



Faculty Name:	SCIENCE
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VIII

B. Sc. LIFE SCIENCES (HONOURS/HONOURS with RESEARCH) (Environmental Science & Technology)

Name: Semester:

Programme

Academic Batch:

2023-24

Course Group	Board of Studies / Faculty	Course Code	Course Name		Course Name		Тє	achin	g Sch	eme	Asses /Eval Ty	sment uation pe	Exte Exa Dura (Hi	ernal am ation rs.)	INT(T) Max./	EXT(T) Max./	INT(P) Max./	EXT(P) Max./	Grand Total Max./
	Ownership				Т	Р	Tu	Cont. Hrs	Т	Р	Т	Р		r assing	rassing	rassing	Passing		
Discipline Specific	Biological		Sominar and Project Proposal	1			1	Q		1		2					100/25		
Course - 1	Sciences		Seminar and Project Proposal	4			1	0		•		2					100/33		
Discipline Specific	Biological		Rio fortilizors and Rioposticidos	4	2		1	1	1	1	2	2	50/19	50/17			100/25		
Elective -1	Sciences		bio fei unzers and biopesticides	4	5		1	4	•	•	2	2	30/10	30/17			100/33		
Discipline Specific	Interdiscipli		Environmental Engineering	1	2		1	1	1	1	2	2	50/19	50/17			100/25		
Elective - 2	nary Sci.			4	5		1	4	•	•	2	2	30/10	30/17			100/33		
Discipline Specific	Biological		Biofuels and Biopolymer	4	2		1	4		1	2	2	50/18	50/17			100/35		
Elective -3	Sciences			т	5		Ţ	т		•	2	2	50/10	30/17			100/33		
	Biological		Dissortation /Practical	6		6		6		~							300/105		
	Sciences			0		0		0									500/105		
				22															

T = Theory, P = Practical, Tu = Tutorial

Name & Sign [Chairman - Board of Studies]:

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Name & Sign [Dean / Director]:



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	Ι
Course Code:	To be given by university
Course Title:	Ecology and Ecosystems
Course Group:	Discipline Specific Course - 1

Course Objectives:

The objectives of this course are to enable students to...

- a) Educate students to develop fundamental knowledge of principles of chemistry.
- **b)** Understand the nomenclature, structural, isomerism, stereochemistry of organic compounds.
- c) Learn acid-bas concept and chemical solution behaviour.
- d) Provide knowledge of the properties of transition metals and basics of coordination chemistry.

Teaching & Examination Scheme:

Conta	ct hours pe	er week	Course	Exam	ination Ma	arks (Maxi	mum / Pas	sing)
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	Total	
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

1 General Concept of Ecology

Introduction to Ecology & environmental sciences; Principles and Scope of Ecology, Basic concepts, and definitions: ecology, ecosystems, resistance, and resilience. Structure and Functions of Ecosystems- Abiotic and Biotic components, and cycling of materials; water, carbon, nitrogen, and phosphorus.

Autecology; synecology; major terrestrial biomes, and sedimentary cycles, role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.

Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; thermoregulation; strategies of adaptation in plants and animals.

Page **79** of **87**

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Hours



2 Ecology of populations

Concept of population and meta-population; r- and K-selection; characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age structure; population growth: geometric, exponential, logistic, density dependent; limits to population growth; deterministic and stochastic models of population dynamics; ruderal, competitive and stress-tolerance strategies.

3 Ecology of communities

Discrete versus continuum community view; community structure and organization: physiognomy, sociability, species associations, periodicity, biomass, stability, keystone species, ecotone and edge effect; species interactions: mutualism, symbiotic relationships, commensalism, amensalism, protocooperation, predation, competition, parasitism, mimicry, herbivory; ecological succession: primary and secondary successions, models and types of successions, climax community concepts, examples of succession. ecological niche; types of niches: Eltonian niche, Hutchinsonian niche, fundamental niche, realized niche; impacts of biological invasion on ecosystem and communities, case studies.

4 Ecosystem ecology

Types of ecosystems: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem function; ecosystem metabolism. Energy flow in an ecosystem – productivity - trophic levels; Study of pond and crop land ecosystems; homeostasis and feedback mechanisms, primary production, and models of energy flow; secondary production and trophic efficiency; ecosystem connections.

13

Food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy, ecosystem input of nutrients. Biotic accumulation; ecosystem losses; nutrient supply and uptake.

Reference Books:

- **1** Smith, T. M. and Smith, R. L. (2007). Elements of Ecology. Pearson Education.
- **2** Smith, TM and Smith RL 2015. Elements of Ecology, Pearson Education, India.
- **3** Cain, ML, Bowman, WD and Hacker SD 2011. Ecology, 2nd Edition, Sinauer Associates Inc.
- **4** Odum, E. P. (2004). Fundamentals of Ecology, Oxford and IBH Publishing Co. Pvt. Ltd.
- **5** Mamta Rawat, Sumit Dookia and Chandrakasan Sivaperuman. (2015). Aquatic Ecosystem: Biodiversity, Ecology and Conservation. Springer publication.

List of Practicals / Tutorials:

- **1** Determination of Electrical Conductance Conductivity meter method
- 2 Estimation of Turbidity Nephelometric method
- **3** Sampling technique of phytoplankton
- **4** Sampling technique of zooplankton.
- **5** Quantitative estimation of phytoplankton Sedgwick-Rafter method.

Page **80** of **87**

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13

30

Hours



- **6** Quantitative estimation of zooplankton Sedgwick-Rafter method.
- 7 Determination of organic pollution Palmer's Algal Pollution index.
- 8 Identification of ecological indicators.

Reference Books/Audio-visual Course (Practical):

- 1 Standard Method for Examination of Water and Wastewater. (2017). APHA WEF.
- **2** Michael, P. (1986). Ecological Methods for Field and Laboratory Investigations. Tata Mc Graw-Hill Publishing Co. Ltd.
- **3** Trivedi, P. K. and Goel, P. K. (1984). Chemical and Biological Methods of Water Pollution Studies. Environmental Publications.

Supplementary learning Material:						
1	SWAYAM (https://swayam.gov.in/)					
2	NPTEL (https://nptel.ac.in/)					
3	e-PATHSHALA (https://epathshala.nic.in/)					
4	DIKSHA (https://diksha.gov.in/)					

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

D	istribu	tion of	Theory I	Marks ir	n %	R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	Ε	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

dourbe									
Sr.	Course Outcome Statements	Course Outcome Statements %weightage							
CO-1	Students will develop competence in understanding the ecological	25							
	dynamics and their influence on humans and anthropogenic endeavours.								
CO-2	Students will be able to understand will explore the interconnectedness 25								
	among all the biotic and abiotic components of environment.								
CO-3	Students will develop basic understanding of ecosystem and it structural 25								
	and functional aspects.								
CO-4	Students will get the knowledge of ecology and ecosystem dynamics in 25								
	specific habitats/agroecosystems.								

Page **81** of **87**



Curriculum Revision:							
Version:	1.0						
Drafted on (Month-Year):	May - 2023						
Last Reviewed on (Month-Year):	June - 2023						
Next Review on (Month-Year):	April - 2024						

Page **82** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences						
Semester:	I						
Course Code:	To be given by university						
Course Title:	General Microbiology						
Course Group:	Discipline Specific Course - 2						

Course Objectives:

The objectives of this course are to enable students to...

- **a)** Give comprehensive knowledge of the historical aspects and development of Microbiology.
- **b)** Understand the different aspects to the classification of Prokaryotes.
- c) Learn in-depth knowledge on the structure and functions of prokaryotic and eukaryotic cells.
- d) Understand virus taxonomy and cultivation & reproduction of viruses.
- e) Gain knowledge of ecological significance, distribution and reproduction of fungi.

Teaching & Examination Scheme:

Contact hours per week		Course	Examination Marks (Maximum / Passing)					
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

Hours

10

1 Historical foundation of Microbiology

Establishment of microbiology as a discipline: Spontaneous generation *vs* biogenesis, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology. Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman. Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner.

Page **83** of **87**



2 Classification and Prokaryotic cell structure

Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Classification in brief as per Bergey's Manual of Systematic Bacteriology.

Overview of prokaryotic cell structure, prokaryotic cell membranes, prokaryotic cytoplasm, cytoplasmic inclusion bodies, cell wall, ribosome, and capsule. Bacterial endospores, exospores, and cyst. Bacterial motility. Bacterial chromosome, nuclear material, plasmid and episomes.

3 Eukaryotic cell structure and function

Overview of eukaryotic cell structure, Eukaryotic membranes, Cytoplasmic matrix,
Organelles of the biosynthetic-secretory and endocytic pathways, Ribosomes, 11
Mitochondria, Chloroplast, Nucleus, Structures external to the plasma membrane,
Comparison of prokaryotic and eukaryotic cells.

4 Viruses, Other Acellular Agents, and Fungi

Introduction to viruses, General properties of viruses, Viral reproduction, Cultivation of viruses, Virus purification and assays, Principles of virus taxonomy, Viroid and Virusoids, Prions. Lytic and lysogenic cycles.

11

13

Introduction of fungi, Distribution, Structure, Nutrition and metabolism, Reproduction, Characteristics of fungal divisions and Economic significance.

Reference Books:

- 1 Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley, and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
- **2** Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings.
- **3** Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
- **4** Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
- 5 Atlas RM. (1997). Principles of Microbiology. 2nd edition. W. M. T. Brown Publishers.
- 6 Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.

List of Practicals / Tutorials:

- **1** Preparation and sterilization of culture media for bacterial cultivation.
- 2 Study of different shapes of bacteria using permanent slides/ pictographs.
- **3** Simple staining: Monochrome staining and Differential: Gram's staining.
- 4 Perform endospore staining.
- **5** Perform Capsule staining of capsulated bacteria.
- **6** Determination of motility of bacteria by (i) hanging drop method (ii) Agar stab method
- 7 Isolation of bacteria [Streak plate, spread plate, pour plate, serial dilution]

Page **84** of **87**

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Hours

30



-			
Sunn	lementary	learning	Material
Jupp	icincintar y	icai ming	material.

- **1** SWAYAM (https://swayam.gov.in/)
- 2 NPTEL (https://nptel.ac.in/)
- **3** e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	E	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will acquire knowledge about history and scope of Microbiology.	25
CO-2	Students will be able to understand various methods of microbial	25
	classification.	
CO-3	Students will differentiate prokaryotic and eukaryotic cell structure and	25
	functions.	
CO-4	Students will be able to learn about viruses and nutritional requirements	25
	and modes of reproduction in fungi.	

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	May - 2023
Last Reviewed on (Month-Year):	June - 2023
Next Review on (Month-Year):	April - 2024

Page **85** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	I
Course Code:	To be given by university
Course Title:	Cell Biology
Course Group:	Discipline Specific Course - 3

Course Objectives:

The objectives of this course are to enable students to...

- a) Understand structure and function of prokaryotic and eukaryotic cells.
- **b)** Learn structure and functions of cell and its organelles.
- c) Gain knowledge of synthesis and function of proteins, membrane structure and functions of cell.
- **d)** Provide knowledge of cellular communication, division of cell and chromosomal separation in different stages of cell cycle.

Teaching & Examination Scheme:

Lontact n	Contact hours per week		Course	Exam	ination Ma	arks (Maxi	mum / Pas	sing)
Lostuno Tu	torial	Dreatical	Credits	The	eory	J/V	/P*	Total
Lecture Iu	torial	Practical		Internal	External	Internal	External	Total
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.

1 Cell Structure and Function:

Discovery, Origin of Cell and Cell theory, Cell as basic unit of life (Plant and Animal Cell structure, Comparison between plant and animal cells), Difference between Prokaryotic and Eukaryotic cells.

Structure and its function of Plasma membrane (Three dimensional), Chemical composition of biological membranes, Membrane models, Fluid mosaic membrane model.

Cell wall, distribution, chemical composition, functions, and variations in prokaryotic and eukaryotic cells (primary and secondary wall), Glycocalyx, Cell-cell interactions/ Junctions, pit connections in plants and animals.

Page **86** of **87**

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Contents

Hours



2 Cytoskeleton structure and functions:

Overview of the Major Functions of Cytoskeleton. Microtubules: Structure, Composition and functions, Composition, Assembly and Disassembly, Structure, composition and functions of Centrioles and Basal bodies, Microtubules in Cilia and Flagella.

Microfilaments and Intermediate filaments: Structure and Composition; Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

3 Structure of Nucleus

Nuclear membrane, nuclear pore, nucleolus, chromatin, structure of nucleic acids. Mitochondria – Ultra structure and function; Biogenesis of mitochondrial Genomes, Chloroplast – Ultra structure and function, Genome biogenesis. Ribosomes detailed structure and its function with involvement in protein synthesis. Vacuoles, Lysosomes structure and functions.

4 Cell cycle and Cell division

The key roles of mitosis and meiosis during the life cycle. Types of cell divisions. Different Stages of mitosis and meiosis, highlighting similarities and differences. Significance of Mitosis and Meiosis.

Overview of the Cell cycle and its control. Programmed Cell Death: Apoptosisintrinsic and extrinsic apoptotic pathways, necrosis, necroptosis, and autophagy.

Reference Books:

- 1 Cell Biology by C.B. Powar. (Reprinted-2004) Himalaya Publishing House, Mumbai.
- **2** Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma and V.K. Agarwal (Reprinted -2007) Pub. S. Chand& Company Ltd. Ram Nagar, New Delhi-110055.
- **3** De Roberts E. D. P. and De Roberts E. M. F. 2010. Cell and Molecular Biology. Walters Kluwer, 8th edition.
- **4** Albert B., Johnson A., Lewis J., Raff M., Roberts K. and Walter P. 2014. Molecular biology of the cell. 6th edition, Garland Science, Taylor & Francis Group. ISBN: 0-8153-3218-1.
- **5** Geoffrey M. Cooper and Robert E. Hassman. 2018. The Cell: A molecular approach. Sinauer Associates Inc, 8th edition, ISBN:0-87893-214-3.

List of Practicals / Tutorials:

- 1 Structure of cell organelles adopting preparations/charts/models Mitochondria; Chloroplast; Ribosomes; Endoplasmic reticulum; Nucleus
- 2 Squash preparation of onion flower buds for the study of meiosis stages.
- **3** Squash preparation of onion root tip for the study of mitosis stages.
- **4** Vital staining of mitochondria.
- **5** Trypan blue exclusion test for cell viability.
- **6** Measurement of the size of cells using micrometry.
- 7 Preparation of Buccal smear and Identification of Barr Body.
- **8** Localization of chloroplast.

Page **87** of **87**

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11

11

11

Hours

30



-			
Sunn	lementary	learning	Material
Jupp	i cincintar y	icai ming	material.

- **1** SWAYAM (https://swayam.gov.in/)
- 2 NPTEL (https://nptel.ac.in/)
- **3** e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	E	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will understand the structure and function of various cellular	25
	organelles and its significance.	
CO-2	Students will learn how cellular components work together to carry out life	25
	functions.	
CO-3	Students will be acquiring a better understating on how cellular processes	25
	enable organism to meet their basic needs.	
CO-4	Students will get knowledge of program cell death and the cellular	25
	components underlying mitotic cell division.	

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	May - 2023
Last Reviewed on (Month-Year):	June - 2023
Next Review on (Month-Year):	April - 2024

Page **88** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	I
Course Code:	To be given by university
Course Title:	Chemistry I
Course Group:	Generic Elective

Course Objectives:

The objectives of this course are to enable students to...

- a) Educate students to develop fundamental knowledge of principles of chemistry.
- **b)** Understand the nomenclature, structural, isomerism, stereochemistry of organic compounds.
- **c)** Learn acid-bas concept and chemical solution behaviour.
- d) Provide knowledge of the properties of transition metals and basics of coordination chemistry.

Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Passing)				
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

Hours

11

1 IUPAC nomenclature

Introduction of organic compound and their classification. Physical Properties and systemic IUPAC nomenclature of different class of organic compounds including alkanes, alkenes, alkynes, cycloalkanes, bicyclic, spiro, aromatic and heterocyclic compounds.

2 Stereochemistry

Elements of symmetry center, plane, and axis of symmetry. Isomers and classification of isomers. Configuration, conformational isomers. Separation of enantiomers. Absolute configuration (R and S). Conversion of projection formulas.

Stereochemistry of compounds containing two asymmetric carbon atoms. Conformations around a C-C bond in acyclic compounds.

Structure of cycloalkanes, Cyclohexane conformations. Stereochemistry of disubstituted cyclohexenes.

Page **89** of **87**



3 Ionic equilibrium in aqueous solutions

Acids & Bases, Arrhenius theory of Acids and Bases, The Lowry – Bronsted Concept, Strength of Acids and Bases.

The Lewis concept, pH Scale, pH and Buffers Structure and physical properties of **11** water, Self-Ionization of water, Hydrolysis, Buffer Solutions.

Indicator, Sparingly Soluble Salts, Common ion effect, Selective Precipitation, acidbase titration and use of indicators, mathematical treatment of acid-base titrations.

4 Fundamental concept of coordination chemistry

Position of d-block elements in the periodic table, electronic configuration, and Classification of d-block elements in 3d, 4d, 5d and 6d series.

Definition of coordination compounds Werner's theory, Co-ordination number, Classification of ligands, Nomenclature of co-ordination compounds, Chelate, chelating ligand and Chelation, Uses of Chelates.

Reference Books:

- **1** Morrison R. T. & Boyd R. N., *Organic chemistry* (6th edition).
- 2 IUPAC nomenclature by Robert M. Silverstein.
- **3** Stereochemistry by P. S. Kalsi.
- 4 A textbook of organic chemistry by Arun Bahl& B. S. Bahl, 16th Edition
- **5** Principles of Physical chemistry by B. R. Puri, L. R. Sharma and M. S. Pathania, 41th Ed.
- **6** Biophysical chemistry, Principles and Techniques by Upadhyay, Upadhyay and Nath.
- 7 Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley
- 8 Elements of Physical Chemistry by S. Glasstone and D. Lewis

List of Practicals / Tutorials:

- **1** Volumetric analysis: Determination of concentration of Strong acid [HCl] and weak acids [oxalic acid/Acetic acid] by titrating against strong base [NaOH].
- **2** Determination of concentration of copper by titrating against EDTA.
- **3** Determination of Nickel by titrimetric analysis.
- **4** Analysis of Zinc using EDTA complexometric analysis.
- 5 Qualitative analysis of Salicylic acid, Cinnamic acid, Benzoic acid, α -Naphthol, and β -Naphthol.
- **6** Qualitative analysis of o-nitroaniline, m-nitroaniline, p-nitroaniline, Naphthalene, m-dinitrobenzene, Anthracene.

Supplementary learning Material:

1 SWAYAM (https://swayam.gov.in/)

- 2 NPTEL (https://nptel.ac.in/)
- **3** e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

1. Audio -visual aids, power point presentation, videos, animation, models etc.

Page **90** of **87**

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Hours

30

12



- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Dist	tributio	on of T	heory N	larks i	n %	R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	Ε	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the fundamental principles of organic chemistry that	25
	include chemical bonding	
CO-2	Learn nomenclature, structural of various classes of compounds	25
CO-3	Develop concept of isomerism, stereochemistry, Chirality	25
CO-4	Acquire concept of Acidity, Alkalinity, applications of indicator	25

Curriculum Revision:				
Version:	1.0			
Drafted on (Month-Year):	May – 2023			
Last Reviewed on (Month-Year):	June – 2023			
Next Review on (Month-Year):	April – 2024			

Page **91** of **87**



Effective from Academic Batch: 2023-24

Programme: Bachelor of Life Sciences

Semester:

Course Code: To be given by university

Ι

Course Title: English

Course Group: Ability Enhancement Course

Course Objectives:

The objectives of this course are to enable students to...

- **a)** Communicate with other scientists anywhere in the world.
- **b)** Adapt de facto universal language of science which has major impact on scientific communication.
- c) Learn about various scientific terms and will be able to enhance communication skills.
- d) Improve verbal and non-verbal communication, writing skills.

Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Passing)				
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
2			2	50/18	50/17			100/35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Vocabulary and Presentation Skill Development	
	Listening Skills, Speaking Skills, Reading Skills, and Writing Skills (LSRW)	
	Defining the Purpose & how to make an effective presentation (MS PowerPoint)	15
	Outline preparation	
	Review / Content / Précis writing.	
2	Introduction and Language of Communication	
	Theory of Communication, Types and Modes of Communication	
	Verbal and Non-verbal (Spoken and Written)	15
	Personal, Social and Business Barriers and Strategies; Intra-personal, Inter-personal	
	and Group communication, Expressing opinions	

Page **92** of **87**



Reference Books:

- 1 Fluency in English Part II, Oxford University Press, 2006.
- **2** Business English, Pearson, 2008.
- **3** Language, Literature and Creativity, Orient Blackswan, 2013.
- 4 Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas

Supplementary learning Material:

1 SWAYAM (https://swayam.gov.in/)

- 2 NPTEL (https://nptel.ac.in/)
- 3 e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Dist	tributio	on of T	heory M	larks i	n %	R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	Ε	C	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will be able to convey their ideas in English using simple and	50
	acceptable English in writing	
CO-2	Students will find a difference in their personal and professional	50
	interactions.	

Curriculum Revision:				
Version:	1.0			
Drafted on (Month-Year):	May – 2023			
Last Reviewed on (Month-Year):	June – 2023			
Next Review on (Month-Year):	April – 2024			

Page **93** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	I
Course Code:	To be given by university
Course Title:	Microbial Techniques
Course Group:	Skill Enhancement Course

Course Objectives:

The objectives of this course are to enable students to...

- **a)** Ability to apply the tools and techniques of Microbiology in conducting research.
- **b)** Acquire basic skills in aseptic techniques, microscopy.
- c) Learn different staining techniques, microbial cultivation, and enumeration techniques.
- **d)** Prepare the student for advance studies in the subject of Microbiology.

Teaching & Examination Scheme:

Contact hours per week			Course	Exam	ination Ma	mum / Pas	sing)	
Locturo	Tutorial Drastical		Dreatical Credits		eory	J/V/P*		Total
Lecture	Tutorial	Fractical		Internal	External	Internal	External	Total
-	-	2	2			50/18	50/17	100/35

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

1 Introduction to laboratory equipment: (Principle and Applications)

Microscope, Autoclave, Hot air oven, Incubator, pH meter, biological safety cabinet. Cleaning and sterilization of glassware.

Sterilization techniques – Chemical, UV, autoclaving, and membrane filtration. Basic microbe handling techniques.

Cryo-stock and glycerol stock preparation, maintenance, and Preservation of Bacteria.

Special Staining Techniques: Endospore staining, Acid fast staining, Capsule staining, Metachromatic granules staining, cell wall staining.

Page **94** of **87**

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Hours

15



2 Media preparation and cultivation of microbes

Liquid media- Peptone water, Nutrient broth; Solid media- Nutrient agar (Agar slant, Agar plate); Enriched Medium- Blood agar; Differential medium - Mac Conkey agar; Enrichment Medium - Selenite F broth; Selective medium- EMB, MSA. Isolation and cultivation of bacteria. Preparation of culture media for cultivation of yeast and fungi (spoiled

15

bread/fruits/vegetable).

Isolation of bacterial flora of skin by swab method.

Determination of microbiological quality of milk sample by MBRT.

Reference Books:

- **1** James G Cappuccino and Natalie Sherman (2004). Microbiology: A laboratory manual. Sixth edition, Published by Pearson Education.
- **2** Reddy, S.M. and Reddy, S.R. (1998). Microbiology. Practical Manual, 3rd Edition, Sri Padmavathi Publications, Hyderabad.
- **3** Dubey RC and Maheswari DK (2004). Practical Microbiology 1st Edition, S. Chand& Company Ltd., New Delhi.
- **4** The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai.

Sup	plementary learning Material:
1	SWAYAM (https://swayam.gov.in/)
2	NPTEL (https://nptel.ac.in/)
3	e-PATHSHALA (https://epathshala.nic.in/)
4	DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	Ε	C	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Page **95** of **87**



Course	Outcomes (CO):	
Sr.	Course Outcome Statements	%weightage
CO-1	Students will familiarize themselves with various lab equipment relevant to microbiological work. They will learn different types of staining to observe microbes and their cell components.	50
CO-2	Students will learn to prepare different media, cultivation methods and their applications.	50

Curriculum Revision:					
Version:	1.0				
Drafted on (Month-Year):	May 2023				
Last Reviewed on (Month-Year):	June 2023				
Next Review on (Month-Year):	April 2024				

Page **96** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	II
Course Code:	To be given by university
Course Title:	Biodiversity and Conservation
Course Group:	Discipline Specific Course – 1

Course Objectives:

The objectives of this course are to enable students to...

- e) Understand status of the earth's biological diversity.
- f) Learn significance of biodiversity and drivers of its loss.
- **g)** Know basic concepts and scientific principles of conservation and global patterns in biodiversity.
- **h)** Understand current efforts to conserve biodiversity on global, national, and local scales.

Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Passing)				
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

Hours

1 Biodiversity:

Definition, importance, Magnitude, and global accumulation of biodiversity; diversification through geological time scale; Levels of biodiversity. Species diversity (i) tree diversity in tropical forest (ii) Diversity and ecology of lianas, (iii) Litter arthropods: sampling methods and role in nutrient cycling and (iii) small mammals in tropical forests: diversity and role in ecosystem functioning. Genetic diversity – measurement of genetic diversity, transgenic organisms, Agro-biodiversity.

Page **97** of **87**



2 Measurement of biodiversity:

Species richness & abundances, diversity indices – Shannon, Simpson & Fisher's Alpha. Biodiversity and various ecosystem services; Valuation of ecosystems and species: Biodiversity prospecting and indigenous knowledge systems, community biodiversity registers. Biodiversity as bio resources – use and values (consumptive and productive use values) of biodiversity as sources of food, fodder, timber, medicinal and ornamental plants.

3 Threats to biodiversity

Natural and anthropogenic disturbances; habitat loss, habitat degradation, and habitat fragmentation; climate change; pollution; hunting; over-exploitation; deforestation; hydropower development; invasive species; land use changes; overgrazing; man-wildlife conflicts; consequences of biodiversity loss; Intermediate Disturbance Hypothesis.

Causes for extinction: habitat loss, Extinction through geological time scale: mass extinction. Current extinction trends. The theory of island biogeography; edge effect. SLOSS.

4 Conservation strategies:

In-situ and *ex-situ* conservation, biodiversity hot spots, hottest hot spots, mega diversity countries, centres of plant diversity and endemism. India – Biospheres, National parks and Wildlife sanctuaries, Wildlife conservation projects: Crocodile Conservation, GOI-UNDP Sea Turtle project.

12

Hours

30

11

Overview of Conservation efforts: global protected area network. Protected areas and functions; UNESCO biosphere reserves; IUCN conservation categoriesendangered, threatened, vulnerable, Red Data Books. Regulation of biodiversity: Convention on Biological Diversity, National Biodiversity Authority, WCMC, CITES.

Reference Books:

- **1** Gary G. Mittelbach (2012) Community Ecology. Sinauer Associates, Inc.; 1 edition. ISBN: 978-0878935093.
- **2** Berlatsky (2013) Biodiversity Global Viewpoints. Gale Cengage Publishers. ISBN: 9780737769050.
- **3** Jase Fitzgerald 2017. Biodiversity: An Introduction. Larsen and Keller Education. ISBN: 978-1635490428.
- **4** Primack, Richard B., and Anna Sher (2016). Introduction To Conservation Biology. Sinauer Associates, Incorporated, Publishers.
- **5** Singh JS, Singh SP and Gupta SR (2014) Ecology, Environmental Science and Conservation. 4th Edition. S. Chand & Company Pvt. Ltd.
- **6** Anne E. Magurran, Brian J. McGill (2011) Biological Diversity: Frontiers in Measurement and Assessment. Oxford University Press. ISBN: 978-0199580675.

List of Practicals / Tutorials:

Analyse of the vegetation by quadrat method.

1 i. Line transect method.

ii. Belt transect method.

Page **98** of **87**



- **2** Quantitative inventory of Liana abundance and diversity in relation to host trees.
- **3** Biodiversity assessment of forest tree community.
- **4** Forest Biomass calculation by allometric method.
- **5** Determination of carbon stock of woody plant species.
- **6** Belowground vegetation: Find root biomass determination.
- 7 Plant functional trait analysis: Vegetative features.

Supplementary learning Material:

- **1** SWAYAM (https://swayam.gov.in/)
- 2 NPTEL (https://nptel.ac.in/)
- **3** e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %					n %	R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	Ε	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will understand basics of different types of biodiversity.	25
CO-2	Students will cite the scientific evidence for biodiversity change in the	25
	modern era and detail the contemporary causes of diversity loss	
CO-3	Students will understand and convey the ecological, social, and economic	25
	impacts of diversity loss,	
CO-4	Students will be able to understand management principles and tools that	25
	are used to conserve diversity at levels from genes to landscapes.	

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	May – 2023
Last Reviewed on (Month-Year):	June – 2023
Next Review on (Month-Year):	April – 2024

Page **99** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	II
Course Code:	To be given by university
Course Title:	Microbial Physiology
Course Group:	Discipline Specific Course – 2

Course Objectives:

The objectives of this course are to enable students to...

- a) Learn nutritional classification and mode of nutrient transport in microbes.
- **b)** Gain knowledge about preparation and types of culturing media for microbes.
- **c)** Understand pure culture techniques and methods of culturing, preservation, and maintenance of microorganisms.
- d) Provide knowledge of different types of microbial photosynthesis.

Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Passing)				
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Flattical		Internal	External	Internal	External	TOLAI
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

Hours

1 Microbial Nutrition

Nutritional types: Requirement of nutrients for microbes and classification of microorganisms based on carbon, energy, and electron sources viz.

Autotroph/Phototroph,heterotrophy,Chemolithoautotrophy,Chemolithoheterotroph,Chemolithotroph,photolithoautotroph,11Photoorganoheterotroph.11

Primary and secondary active transport; Passive and facilitated diffusion. Effect of oxygen on growth, classification based on oxygen requirement and tolerance (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe).

Page **100** of **87**



2 Media type, control, and Preservation

Role of macro and micro-nutrients. Components of media: Natural, Synthetic, Complex, Selective media, Differential Media, Enriched and enrichment media. Methods for culturing aerobic and anaerobic bacteria; Colony and broth culture characteristics.

Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation. Chemical methods of microbial control: disinfectants, types and mode of action. Maintenance and preservation techniques for microorganisms (Sub culturing, Oil overlay, Sand cultures, Storage at low temperature, Lyophilisation, Liquid Nitrogen).

3 Microbial Growth

Growth in Microbes (growth phases, generation time, growth curve and specific growth rate). Measurement of cell mass and cell number.

Factors affecting microbial growth; Continuous and batch cultures; details of synchronous and Diauxic growth curve.

12

12

Physical factors influencing growth: Temperature; pH; Atmospheric Pressure; Salt Concentration. Chemical factors: heavy metal (copper), surfactants. Control of Microorganisms: patterns of microbial death, control of microorganism growth by antiseptics.

4 Microbial Photosynthesis

Concept of photosynthesis and associated pigments in microbes; photosynthetic apparatus in pro and eukaryotes; anoxygenic and oxygenic photosynthesis; light and dark reaction; photorespiration and its significance; Effect of light, temperature; pH and CO₂ concentration on photosynthesis; measurement of net photosynthetic yield. Electron transport chain in photosynthetic bacteria.

Reference Books:

- 1 Wiley JM, Sherwood LM and Woolverton CJ. Prescott's Microbiology. McGraw Hill International
- 2 Gerald Karp. Cell Biology (3rd Ed.) (2003). McGraw Hill Book Company, New York.
- **3** Stanier R. Y, Ingrahm J. I, Wheelis M. L and Painter P. R. General Microbiology. (5th Ed.) (1987). McMillan Press. UK.
- **4** Madigan MT, Martinko JM, Dunlap PV and Clark DP. Brock Biology of Microorganisms. Pearson International Edition.
- **5** Tortora GJ, Funke BR and Case CL. Microbiology: An Introduction. Pearson Education.

List of Practicals / Tutorials:

- **1** Introduction of media and its constituents for microbial growth.
- 2 Different methods for isolation and maintenance of microorganisms.
- **3** Preparation of culture media for bacterial isolation and cultivation; synthetic media, Complex media, Nutrient agar, MacConkey agar.
- **4** To study and plot the growth curve of *E. coli* using spectrophotometric method and to calculate specific growth rate and generation time.
- 30
- **5** To study and plot the growth curve of *Aspergillus niger* by radial growth measurements.
- **6** To study the effect of temperature of *Aspergillus n*iger by dry weight method.
- 7 Demonstration of the thermal death time and decimal reduction time of *E. coli*.
- 8 Isolation of Photosynthetic bacteria.

Page **101** of **87**

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Hours



9 Preservation of bacterial cultures.

Reference Books/Audio-visual Course (Practical):

- **1** Cappucino J and Sherman N. Microbiology: A Laboratory Manual. Pearson Education Limited.
- **2** Tiwari& Hoondal, 2009, Laboratory techniques in Microbiology and Biotechnology-, ABHISHEK PUBLICATIONS CHANDIGARH (INDIA)

Sup	Supplementary learning Material:					
1	SWAYAM (https://swayam.gov.in/)					
2	NPTEL (https://nptel.ac.in/)					
3	e-PATHSHALA (https://epathshala.nic.in/)					
4	DIKSHA (https://diksha.gov.in/)					

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

						· · · · · · · · · · · · · · · · · · ·
Distribution of Theory Marks in %						R : Remembering; U : Understanding; A : Applying.
R	U	Α	N	Е	С	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Course							
Sr.	Course Outcome Statements	%weightage					
CO-1	Students will be able to understand classification of prokaryotes based on	25					
	nutritional requirement.						
CO-2	Students will be able to learn various microbial growth pattern. 25						
CO-3	Students will gain knowledge of microbial cultivation, preservation, and 25						
	control methods.						
CO-4	Students will be able to describe the microbial photosynthesis and depict	25					
	the role of pigments associated with microbes.						

Curriculum Revision:					
Version:	1.0				
Drafted on (Month-Year):	May – 2023				
Last Reviewed on (Month-Year):	June – 2023				
Next Review on (Month-Year):	April – 2024				

Page **102** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences			
Semester:	II			
Course Code:	To be given by university			
Course Title:	Plant and Animal Sciences			
Course Group:	Discipline Specific Course -3			

Course Objectives:

The objectives of this course are to enable students to...

- a) Identify plant and animal species based on classification.
- **b)** Understand importance of medicinal plants and plant diversity.
- c) Learn animal diversity and histology.
- **d)** Know significance of plants and animals by understanding the similarities in survival needs among all living things.

Teaching & Examination Scheme:

Contact hours per week			Course	Exam	ination Ma	Marks (Maximum / Passing)			
Locturo	Tytorial Drastia		Credits	The	eory	J/V	//P*	Total	
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total	
3	-	1	4	50/18	50/17	25/09	25/09	150/53	

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

1 Cryptogams

Eichler's system of Classification. Algae: Introduction, Distribution and habitat, Morphology, Reproduction and Life Cycle of Spirogyra and Economic importance of Algae. Fungi: Introduction, Distribution and habitat, Morphology, Reproduction and Life cycle in Mucor.

Contents

Lichens: Introduction and General account of Lichens. Bryophyta: Introduction, Distribution and habitat, Morphology, Reproduction and Life cycle in *Riccia*. Pteridophyte: Introduction, Distribution and habitat, Morphology, Reproduction and Life Cycle in Fern.

Page **103** of **87**

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Hours

11



2 Phaenerogams

Gymnosperms: Introduction, Distribution and habitat, Morphology, Reproduction and Life cycle in *Cycas*. Introduction, Classification (Bentham & Hooker), Morphology and Life Cycle of Maize and Sunflower.

Study of the families and their Economic importance: Malvaceae, Cucurbitaceae, Solanaceae and Apocynaceae. Medicinal Plants: *Ocimum sanctum, Adhatodavasica, Azadirachta indica, Calotropis procera,* and *Withaniasomnifera*.

3 Animal Diversity – Systematics (Non-chordates)

Salient features and outline classification up-to classes with suitable examples (excluding minor Phyla). Phylum – Protozoa, Porifera, Coelenterata, Platyhelminthes, Nemathelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, and Hemichordata Animal Diversity – Systematics **11** (Protochordates and Chordates).

Salient features and outline classification up to classes with suitable examples. *Protochordates – Urochordata, Cephalochordata. Chordates – Cyclostomata*, Pisces, Amphibia, Reptilia, Aves, Mammalia.

4 Histology

Structure and functions of animal tissues (in detail with types and suitable examples). Epithelial tissue: Simple (Squamous, Columnar, Ciliated, Glandular, Sensory, Germinal, Psuedo-stratified) and Compound (Stratified, Transitional).

Connective tissue: Connective tissue proper (Areolar, White fibrous, Yellow fibrous, Adipose), Skeletal (Cartilage – Hyaline, Fibrocartilage, Elastic cartilage, Calcified cartilage, Mammalian bone), Fluid (Blood, Lymph).

Muscular tissue: Smooth, Striated, Cardiac Nervous tissue: Structure and types of neuron and nerve fibres.

Reference Books:

- **1** Botany for degree students by A. C. Dutta, (18th Ed. 2005), Oxford University Press. ISBN: 13:978-0-19-563748-9, ISBN: 10:0-19-563748-8.
- **2** University Botany-I, Algae, Fungi, Bryophyta and Pteridophyta by S. M. Reddy, Publishers: New Age International (P) Limited, Mumbai. ISBN: 81-224-0840-0.
- **3** University Botany- II- Gymnosperm, Angiosperms by S. M. Reddy, Publishers: New Age International (P) Limited, Mumbai.
- **4** A Textbook of Zoology by PN Pandey & RD Vidyarthi, S Chand Publications, New Delhi.
- **5** Modern textbook of zoology: Invertebrates: animal diversity- I. Author: R L Kotpal Publisher: Meerut: Rastogi Publications, 2014-15. ISBN/ISSN: 9789350780404 9350780402
- 6 Vertebrates by RL Kotpal, Rastogi Publications, Meerut

List of Practicals / Tutorials:

- **1** Study of algae, fungi (mount preparations) and Lichen.
- **2** T.S. of Cycas leaf and fern rachis.
- **3** Study of the families Malvaceae, Cucurbitaceae, Solanaceae & Apocynaceae.
- **4** Study of grafting techniques.
- Study of gratting techniques.
 Study of specimens of protozoa, Porifera, Coelenterata, Platyhelminthes, Nemathelminthes, Annelida, Arthropoda, Mollusca, and Echinodermata.
- **6** Study of specimens of Protochordata and Vertebrata (Pisces, Amphibia, Reptilia, Aves and Mammalia)

Page **104** of **87**

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120 (O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

Hours



7 Study of Histological slides of Mammalian tissues / Organs (Permanent): T.S. of Stomach, Small Intestine, Liver, Pancreas, Lung, Kidney, Testis, Ovary, Spinal cord, and V.S. of Skin.

Sup	Supplementary learning Material:					
1	SWAYAM (https://swayam.gov.in/)					
2	NPTEL (https://nptel.ac.in/)					
3	e-PATHSHALA (https://epathshala.nic.in/)					
4	DIKSHA (https://diksha.gov.in/)					

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %					n %	R : Remembering; U : Understanding; A : Applying.
R	U	Α	Ν	E	C	N: Analysing; E: Evaluating; C: Creating
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will be able to identify the major groups of organisms with an	25
	emphasis on plants and be able to classify them.	
CO-2	Students will be able to understand the importance of the traditionally	25
	useful medicinal plants.	
CO-3	Students will get a concrete idea of the evolution, hierarchy, and	25
	classification of fascinating world of Animal kingdom.	
CO-4	Students will be able to predict and understand organ behavior and	25
	function of various tissues.	

Curriculum Revision:					
Version:	1.0				
Drafted on (Month-Year):	May – 2023				
Last Reviewed on (Month-Year):	June – 2023				
Next Review on (Month-Year):	April – 2024				

Page **105** of **87**



Effective from Academic Batch: 2023-24

Bachelor of Life Sciences
II
To be given by university
Chemistry II
Generic Elective

Course Objectives:

The objectives of this course are to enable students to...

- **a)** Gain knowledge of analytical chemistry.
- **b)** Understand the standardization of chemical solutions.
- c) Understand reaction kinetics and thermodynamic parameters of chemical reactions.
- **d)** Know the application of chemical reactions & kinetics in biological system.

Teaching & Examination Scheme:

Contact hours per week			Course	Exam	sing)			
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	TULAI
3	-	1	4	50/18	50/17	25/09	25/09	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

1 General Introduction of analytical chemistry

Introduction, Qualitative and Quantitative analysis, Types of titrations. Requirements for titrimetric analysis. Concentration systems: molarity, formality, normality, wt.%, ppm, milli equivalence and millimoles-problems. Primary and Secondary standards, criteria for primary standards. Preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint, and equivalence point.

Introduction, Instrumental and Chemical Methods of analysis, Applications of Chemical Analytical Chemistry, Sampling of Solid, Liquid and Gas, Stages of Analysis, Interferences, Selection of Methods, limitations of Analytical Methods.

Page **106** of **87**

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Hours

12



2 Thermodynamics

Terminology of thermodynamics, First law of thermodynamics, internal energy, enthalpy of a system, heat capacity, spontaneous process, Second law of thermodynamics, concept of entropy, entropy of mixing, standard entropies, criteria for reversible and irreversible process, Gibbs-Helmholtz equation. Third law of thermodynamics, determination of absolute entropies of elements and compounds. Applications of first and second law of thermodynamics in living cells.

3 Chemical Kinetics

Introduction, Rate of reaction, Rate constant, Half lifetime, Determination of Half lifetime of reaction, Order of reaction Derivation of First law, second order rate reaction constant for (a=b) and (a≠b). Derivation of third order. Mathematical problems. Catalysis characteristics of catalysis, Types of catalysis, homogeneous and heterogeneous catalysis, enzyme catalysed reaction and derivation mechanism.

4 Physical properties of liquids

Surface tension: surface energy, factors affecting surface tension, interfacial tension, surface active agents, measurements of surface tensions.

11

11

Viscosity: units of viscosity, factors affecting viscosity, measurement of viscosity, application of viscometer, significance of viscosity in biological system.

Reference Books:

- **1** Quantitative analysis by R. A Day, Jr. & A. L. Underwood 6th Edition, Printice Hall of India Private Limited New Delhi. 2005. ISBN: 61-203-0793-3, 9788120307933.
- **2** Basic concept of Analytical Chemistry by S. M. Khopkar, New age International Publishers, 2004. ISBN 81-224-2092-3.
- **3** Vogel's Textbook of Quantitative Chemical Analysis by J. Mendhan, R. C. Denney, M. Thomas, B. Sivasankar. 6th Ed. Pearson 2009. ISBN: 978-81-317-2325-8.
- **4** Biophysical chemistry, Principles and Techniques by Upadhyay, Upadhyay and Nath, Himalaya Publishing House, 2019. ISBN978-98-5142-227-3
- **5** Principles of Physical chemistry by B. R. Puri, L. R. Sharma, and M. S. Pathania, 41st Ed. Vishal Publishing Co. 2012. ISBN: 81-88646-00-8
- **6** Leininger's principles of biochemistry by David Nelson and Michel Cox. 5th Ed. W. H. Freeman Company, New York. 2005. ISBN: 978-0-23022699-9.
- 7 An advance course in practical Chemistry by Ghoshal, Mahapatra, Nad. New central book agency, Kolkata, 2004. ISBN: 81-7381-302-7.

List of Practicals / Tutorials:

- **1** Preparation of normal/molar solutions of acids and bases.
- **2** Preparation and standardization of primary and secondary standard solution.
- **3** Volumetric analysis of Weak Acid/ Strong Base.
- **4** To determine the amount of carbonate and bicarbonate in each mixture by titrating it against sulfuric acid/ hydrochloric acid.
- **5** To determine the concentration of a solution for the given liquid by determination of surface-tension of a liquid by drop-volume method at various concentration.
- **6** To determine the viscosity of the given liquid with the help of Ostwald's viscometer.

Page **107** of **87**

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Hours

30



- 7 To determine the molecular weight of given polymer using Ostwald's viscometer.
- **8** Determination of Pka value of amino acid (glycine).
- **9** Potentiometric titration of Acid / Base.

Supj	Supplementary learning Material:				
1	SWAYAM (https://swayam.gov.in/)				
2	NPTEL (https://nptel.ac.in/)				
3	e-PATHSHALA (https://epathshala.nic.in/)				
4	DIKSHA (https://diksha.gov.in/)				

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

	<u> </u>						
Distribution of Theory Marks in %					larks i	n %	R : Remembering; U : Understanding; A : Applying.
	R	U	Α	Ν	Ε	C	N: Analysing; E: Evaluating; C: Creating
	20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will gain knowledge to prepare chemical solutions and to learn	25
	concentration units.	
CO-2	Students will understand some of the basics of analytical chemistry.	25
CO-3	Students will be able to learn fundamentals of thermodynamic	25
	chemistry and chemical kinetics.	
CO-4	Students will develop the concept of physical properties of solutions.	25

Curriculum Revision:						
Version:	1.0					
Drafted on (Month-Year):	May - 2023					
Last Reviewed on (Month-Year):	June - 2023					
Next Review on (Month-Year):	April - 2024					

Page **108** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	II
Course Code:	To be given by university
Course Title:	Environmental Studies
Course Group:	Ability Enhancement Course

Course Objectives:

The objectives of this course are to enable students to...

- **a)** Gain of in-depth knowledge on natural processes and resources that sustain life and govern economy.
- **b)** Develop critical thinking for environmental protection, and sustainable development.
- **c)** Acquire values and attitudes towards active participation in solving current environmental problems and preventing the future ones.
- **d)** Adopt sustainability as a practice in life, society, and industry.

Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Pa				sing)
Lecture Tutorial	Dreastical	Credits	The	eory	J/V	/P*	Total	
	Tutorial	Practical		Internal	External	Internal	External	Total
2			2	50/18	50/17			100/35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.

1 Introduction to environmental studies:

Hours

2

Multidisciplinary nature of environmental studies; components of environment:

atmosphere, hydrosphere, lithosphere, and biosphere. Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism.

Contents

Page **109** of **87**



2 Natural Resources:

Land resources: Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification; Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities.

Water resources: Natural and man-made sources; Uses of water; Over exploitation of surface and ground water resources; Floods, droughts, and international &interstate conflicts over water.

Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and biogas; Agro residues as a biomass energy source.

Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc (e.g., National Solar Mission, Cauvery River water conflict, Sardar Sarovar dam, Chipko movement, Appiko movement, Tarun Bharat Sangh, etc)

3 Global Environmental Issues and Policies

Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain, Impacts on human communities, biodiversity, global economy, and agriculture.

International agreements and programmes: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity (CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc.

Sustainable Development Goals: India's National Action Plan on Climate Change **10** and its major missions.

Environment legislation in India: Wildlife Protection Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; Forest (Conservation) Act 1980; Air (Prevention & Control of Pollution) Act, 1981; Environment Protection Act, 1986; Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

4 Human Communities and the Environment:

Human population growth: Impacts on environment, human health, and welfare; Carbon footprint.

Resettlement and rehabilitation of developmental projects affected persons and communities, relevant case studies.

Environmental movements: Chipko movement, Appiko movement, Silent valley movement, Bishnois of Rajasthan, Narmada Bachao Andolan, etc.

Environmental justice: National Green Tribunal and its importance.

Environmental philosophy: Environmental ethics; Role of various religions and cultural practices in environmental conservation.

Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi, Swachh Bharat Abhiyan, National Environment Awareness Campaign (NEAC), National Green Corps (NGC) "Eco-club" programme, etc.)

Reference Books:

Page **110** of **87**



- 1 Singh, J.S., Singh, S.P. and Gupta, S.R. (2014). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- **2** Business English, Pearson, 2008.
- **3** Language, Literature and Creativity, Orient Blackswan, 2013.
- **4** Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas

Supplementary learning Material:

- **1** SWAYAM (https://swayam.gov.in/)
- 2 NPTEL (https://nptel.ac.in/)
- **3** e-PATHSHALA (https://epathshala.nic.in/)
- 4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %					n %	R : Remembering; U : Understanding; A : Applying.
R	R U A N E C		C	N: Analysing; E: Evaluating; C: Creating		
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will gain of in-depth knowledge on natural processes and	10
	resources that sustain life and govern economy.	
CO-2	Students will acquire critical thinking for environmental protection, and	30
	sustainable development.	
CO-3	Students will develop attitude for active participation in solving current	30
	environmental problems and preventing the future ones.	
CO-4	Students will adopt sustainability as a practice in life, society, and	30
	industry.	

Curriculum Revision:						
Version:	1.0					
Drafted on (Month-Year):	May 2023					
Last Reviewed on (Month-Year):	June 2023					
Next Review on (Month-Year):	April 2024					

Page **111** of **87**



Effective from Academic Batch: 2023-24

Programme:	Bachelor of Life Sciences
Semester:	II
Course Code:	To be given by university
Course Title:	Organic Farming
Course Group:	Skill Enhancement Course

Course Objectives:

The objectives of this course are to enable students to...

- a) Learn significance of the holistic concept organic farming
- **b)** Acquaint students with cultural production practices typically employed in organic farming.
- **c)** Examine challenges and trends in the production, processing, and marketing of organic farm products.
- **d)** Introduce students to the large body of literature relating to organic agriculture practices.

Teaching & Examination Scheme:

Contact hours per week			Course	Exam	nination Ma	arks (Maxi	mum / Pas	sing)
Lecture Tutorial	Drastical	Credits	The	eory J/V		/P*	Total	
	Tutorial	Practical		Internal	External	Internal	External	Total
2	0	0	2	50/18	50/17			100/35

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.

Contents

1 Overview of Organic Farming:

History of alternative agricultural Development, Effects of Green revolution organic farming. Need, concepts, definition, characteristics, and components of organic farming. Relevance to modern agriculture, different eco-friendly farming system, biological farming Natural farming, biodynamic farming, permaculture, 15 regenerative agriculture, and Zero Budget farming.,

Organic nutrient sources and their fortification, organic manures, methods of composting. Green manures: bio fertiliser types, methods of application, benefits, and limitations.

Page **112** of **87**

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Hours



2 Organic Crop Production:

Nutrient use in organic farming-scope and limitations. Nutrient management in organic farming. Organic ecosystem and their concepts. Choice of crops and varieties in organic farming, crop rotations, need and benefits, multiple cropping. Fundamentals of insect, disease and weed management under organic mode of production-cultural-biological methods-nonchemical pest & disease management. Initiatives taken by the central and state governments, NGOs, and other organizations for promotion of organic agriculture in India.

Reference Books:

- **1** Tiwari, V.N., Gupta, D.K., Maloo, S.R and Somani, L.L. 2010. Natural, organic, biological, ecological, and biodynamic farming. Agrotech Publishing Academy, Udaipur. 420p.
- **2** Mukund Joshi and Prabhakarasetty, T.K. 2006. Sustainability through organic farming. Kalyani publishers, New Delhi. 349p.
- **3** Balasubramanian, R., Balakishnan, K and Siva Subramanian, K. 2013. Principles and practices of organic farming. Satish Serial Publishing House. 453p.
- **4** Arun K. Sharma. 2002. A Handbook of organic farming. Agrobios, India. 627p.

Supplementary learning Material:

1 SWAYAM (https://swayam.gov.in/)

2 NPTEL (https://nptel.ac.in/)

3 e-PATHSHALA (https://epathshala.nic.in/)

4 DIKSHA (https://diksha.gov.in/)

Pedagogy:

- 1. Audio -visual aids, power point presentation, videos, animation, models etc.
- 2. Continuous assessment based on quiz, assignment, seminar.
- 3. Industrial visit
- 4. Laboratory experiments
- 5. Demonstration
- 6. Student feed back
- 7. Peer led learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %					n %	R : Remembering; U : Understanding; A : Applying;
R	U	U A N E C		С	N: Analysing; E: Evaluating; C: Creating	
20	20	20	10	10	20	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will get knowledge of the historical, biological, and ecological	25
	basis for organic farming including crop and livestock management.	25

Page **113** of **87**



CO-2	Students will develop critical thinking with a systems approach to agriculture using case studies as working examples of farming systems.	25
CO-3	Students will apply the knowledge of fertilizers and pesticides usage as per the requirement at different stages of crop growth.	25
CO-4	Students will understand the social, economic, political, and environmental context for current and future organic agriculture production and sales.	25

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	May - 2023
Last Reviewed on (Month-Year):	June - 2023
Next Review on (Month-Year):	April - 2024

Page **114** of **87**