UPL University of Sustainable Technology

SRICT Institute of Science & Research

Department of Microbiology

B.Sc. Sem. I

Teaching/Exam Scheme

W.e.f.: June'2023

Sr. No.	Course Code	Category of course	Course title	Hours Per week			Tot. con. hrs	Credits	E	M	I	V	Total Marks
				L	T	P							
1	BC2101	Foundation Compulsory	English-I	2	-	-	2	2	70	30	-		100
2	BC2102	Core Course	Chemistry-I	4	-	4	8	6	70	30	30	70	200
3	BM2101	Core Course	Microbiology-I	4	-	4	8	6	70	30	30	70	200
4	BM2102	Core Course	Plant Anatomy and Physiology	4	-	4	8	6	70	30	30	70	200
5	BC2106	Generic Elective	To be selected	2	-	-	2	2	70	30	-		100
6	BC2107	Foundation - Elective	To be selected	-	-	-	-	-	-	-	-		-
			Total	16	-	12	28	22	350	150	90	210	800

Generic Elective	1. Disaster Management 2. Environmental Studies 3. Forensic Science
Foundation Elective	1. NCC 2. NSS 3. Yoga

UPL University of Sustainable Technology

SRICT Institute of Science & Research

Bachelor of Science
Course Code: BC2101
Course Name: English-I

Semester: I

Type of course: Foundation Compulsory

Prerequisite: Zeal to learn the subject.

Rationale: At the end of the course, students will have knowledge of English language. It also targets the understanding of grammar, focusing on comprehension, and reading, speaking and writing skills

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	-	-	2	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Parts of Speech:** Recognition and review of Nouns, Pronouns, Verbs, Adverbs, Adjectives, Prepositions. Conjunctions & Interjections, Knowledge of Subject, Object and Compliment of the Verb, Verbal's – Infinitive, Gerund and Preposition	**8**
2	**Prepositions of Time and Place:** Contextual teaching of prepositions of time - on, in , at, since, for, ago, before, to, past, to, from, till/until, by Prepositions of place: in, at, on, by, next to, beside, near, between, behind, in front of, under, below, over, above, across, though, to, into, towards, onto, from	**6**
3	**Phrases and Clauses**: Basic definitions of clauses and phrases, Focus onRelative Pronouns , Use in sentences as relative clauses	**10**
	SECTION-B	
4	**Sentence types and Transformation of sentences**: Assertive sentences, Exclamatory sentences, Interrogative sentences, Negative sentences, Compound sentences, Complex sentences, Simple sentences, Degrees of Comparison	**8**
5	**Word formations:** Affixes- Prefixes and Suffixes**,** Change of one part of speech to the other: from Verbs to Nouns, Nouns to Verbs, Adjectives to Nouns, Nouns to Adjectives, Verbs to adverbs, Adverbs to Verbs	**10**
6	**Paragraph Writing** & **Punctuation:** Descriptive Paragraph on related topic Use of the comma, full stop, Semi-colon, colon, apostrophe, exclamation mark, question mark and quotation marks	**6**

Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Essential English Grammar with Answers by Raymond Murphy
2. Communication Skills by Pushplatha & Sanjay Kumar
3. English Grammar by Annie Brinda (Cambridge University Press)

Course Outcomes:

After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Present basic sentences in English.	20%
CO-2	Construct grammatically correct sentences in English	15%
CO-3	Grammatically correct English sentences in everyday situations.	15%
CO-4	Connect with varied English vocabulary in everyday situations confidently	20%
CO-5	Relate themselves orally using simple English.	10%
CO-6	Assess reading and validate lifelong learning in English	20%

List of Open Source Software/learning website:

- http://www.free-english-study.com/
- http://www.english-online.org.uk/course.htm
- https://www.grammar-quizzes.com/noun-forms.html

Bachelor of Science
Course Code: BC2102
Course Name: Chemistry-I
Semester: I

Type of course: Core course

Prerequisite: Should have fundamental knowledge of physical, organic and inorganic chemistry and its relevant Properties.

Rationale: At the end of the course, students will have knowledge about bonding, various formulas, Stereochemistry of compounds, Solid state properties, Kinetics, Periodicity and hydrocarbons.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Chemical Bonding:** Molecular Orbital theory ; LCAO method, Bonding molecular orbital, anti-Bonding molecular orbital and nonbonding molecular orbital, bond order, magnetic properties and molecular orbital energy level diagram of Heterodiatomic molecules : CO and NO, VSEPR theory	**6**
2	**(A) Empirical formula. Molecular formula, and Structural formula:** Determination of empirical formula and its relation with molecular formula determination of molecular weight of (a) organic acid by titrationand silver salt method and (b) organic base by chioroplatinate method and its limitations. Determination of molecular formula of gaseous hydrocarbons by Explosion method , Numerical example **(B) Alkanes and Cycloalkanes:** Alkanes: nomenclature, sources, Methods of formation with special reference to Wurtz reaction, Kolbe reaction and decarboxylation of carboxylic acids. Physical properties and chemical reactions. Cycloalkanes: nomenclature, methods of formation chemical reactions, Baeyer's strain theory and its limitations, Theory of stainless ring.	**12**
3	**Solid State**: Definition of space lattice, unit cell, Laws of crystallography - Law of constancy of interfacial angles Types of crystal, packing and voids. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCI and CSCI (Laue's method and powder method).	**6**
	SECTION-B	

4	**Periodic properties**: Definition of atomic and ionic radii, ionization energy, electron affinity and electron negativity, S block elements, Comparative study, diagonal relationship, silent features of hydrides, solvation and complexation and tendencies including their function in bio systems.	**6**
5	**Stereochemistry of Organic Compounds:** Isomerism, Optical activity, Chiral and achiral molecules, Optical isomerism of tartaric acid, Enantiomers, diastereomers (Threo & Erythro), Meso compounds Resolution of Enantiomers, inversion retention and racemization, Geometrical Isomerism: Alkene derivative & oximes E & Z system of nomenclature, Relative and absolute configuration, sequence rules. D & Land R & S system of nomenclature.	**8**
6	**Chemical Kinetics:** Chemical kinetics and its scope, rate of reaction, factors affecting rate of reaction: temperature, concentration, pressure, solvent, light and catalyst, Molecularity of reaction, Classification of chemical reaction, Order of reaction with illustration (first order, second, Order, third order, zero order, pseudo first order) reaction,: Second order (a=b), half-life and mean life., Methods of determining the reaction rate: differential method- integration method- half-life period method- isolation method- graphical method, Radioactive decay as first order phenomenon; Conductometry method for determination of reaction rate constant(with example of saponification of ethyl acetate) , Numericals.	**10**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Physical chemistry by Peter Atkins
2. Essentials of physical chemistry by A. S. Bhal and G. D. Tuli,
3. Principles of Physical chemistry by Puri, Sharma and Madan
4. Inorganic chemistry by Wahid Malik, G. D. Tuli, R. D. Madan;
5. Textbook of Organic Chemistry Rakesh K. Parashar, V.K. Ahluwalia
6. "Stereochemistry Of Organic Compound " by Tyagi
7. A Textbook of Inorganic Chemistry by Anil Kumar de.

List of Practical/ tutorials: (Practical's – 10)

A. Organic Qualitative Analysis

B. Volumetric Exercise

1. Volumetric titration between H_2SO_4, $NaHCO_3$ and HNO_3
2. Volumetric titration between $KMnO_4$, $H_2C_2O_4$ and KOH
3. Volumetric titration between $KMnO_4$, $FeSO_4$ and $K_2Cr_2O_7$
4. Volumetric titration between $K_2Cr_2O_7$, $Fe(NH_4)_2SO_4$ and $KMnO_4$
5. Volumetric titration between $H_2C_2O_4$, $KMnO_4$ and $FeSO_4$

Course Outcomes:

After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Examine the synthesis of different compounds by help of stereochemistry	20%
CO-2	Construct the way of a reaction proceeds and kinetics in details.	15%
CO-3	Calculate the empirical, Structural formula to gain the information of molecule.	15%
CO-4	Classify the elements by their properties to categories their character.	20%
CO-5	Construct the Physical properties and chemical reactions of alkanes and cycloalkanes.	10%
CO-6	Explain the various theory on basis of chemical and physical properties.	20%

List of Open Source Software/learning website:

- https://www.library.qmul.ac.uk/subject-guides/chemistry/useful-websites/
- https://blog.feedspot.com/chemistry_websites/
- https://www.rsc.org/periodic-table

Bachelor of Science

Course Code: BM2101

Course Name: Microbiology-I

Semester: I

Type of course: Core Course

Prerequisite: Should have fundamental knowledge of history and scope of microbiology, microorganisms and their importance.

Rationale: At the end of the course, students will have knowledge about Microbiology, Microscope, Staining Techniques and methods to control microorganisms.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**History & Scope of microbiology:** Development of microbiology as a discipline; spontaneous generation vs biogenesis, Spontaneous generation controversy, Contribution of scientists in the field of microbiology: Anton van Leeuwenhoek, Robert Koch, Iwanowsky, Winogradsky, Alexander Fleming, Paul Ehrlich, Elie Metchnikoff and Edward Jenner, Louis Pasteur, Joseph Lister, Beijerinck.	8
2	**Introduction to microbial world:** Major groups of Microorganisms, Distribution of Microorganisms in nature, Concept of classification and position of microorganisms in the Living world, Applied areas of Microbiology: Medical, Agricultural, Soil, Veterinary, Food, Dairy, Industrial, Space microbiology.	8
3	**Ultrastructure of Bacteria-I**: Major cell morphologies, Cell size and significance of smallness, Surface area to volume ratio and its significance, Basic structure of bacterial cell, Cytoplasmic membrane in Bacteria and Archaea, Chemical composition and its functions, Cytoplasm, Mesosomes, Plasmid, Nucleoid, Cell inclusions, Gas vesicles, Ribosomes, volutin granules, PHB, magnetosomes.	8

SECTION-B		
4	**Ultrastructure of Bacteria-II:** The cell wall of bacteria: Composition of Gram positive and Gram negative cell walls, peptidoglycan, The outer membrane of gram negative bacteria, cell walls of Archaea, Lipopolysaccharide (LPS), spaeroplasts, protoplasts, Endospore: Structure, formation and stages of sporulation, Components external to the cell wall: Capsule, Slime layers, Pilli, fimbrae, Flagella.	**8**
5	**Microscopy:** Introduction to principle, working, applications and limitations of Microscopy and discovery of microorganisms, Bright field microscope and microscope resolution, Dark field microscope, Phase contrast microscope, Differential interference contrast microscope, Fluorescence microscope, Electron microscopy, TEM & SEM, Limitations of electron microscopy.	**8**
6	**Stains and staining Techniques :** Introduction to stains and staining techniques, Chemistry of dyes and stains, Types of dyes, Principles of staining techniques, Steps in staining process, Role of intensifier, mordant and decoloriser, Types of staining: Simple Staining, Negative Staining, Differential Staining(Gram staining and Acid fast staining).	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Microbiology 5th ed. by Pelzar, Chan & Kreig (Tata McGraw-Hill)
2. Textbook of Microbiology, Authors- Dubey and Maheshwari.
3. Modi HA, Handbook of Elementary Microbiology, Shanti Prakashan
4. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)
5. Encyclopedia of Microbiology by Joshua Lederberg , William C. Summers; Martin Alexander, Barry R. Bloom
6. Willey J.M., Sherwood L.M. and Woolverton C.J. , (2017) Prescott's Microbiology, 10th Edition McGraw – Hill Education, (ISBN: 978-981-3151-26-0)

List of Practical/ tutorials: (Practicals)

1. Introduction to microscope.
2. Microscopic examination of living microorganisms: Hay infusion by Wet mount technique.
3. Simple staining (Positive staining).
4. Observation of spirochaete by fontana method.
5. Gram staining.

6. Cell wall staining by Dyar's method
7. Capsule staining
8. Metachromatic granule staining.
9. Endospore staining.
10. Contribution of various scientists: Robert Koch, Louis Pasteur, Edward Jenner, Antony Van Leeuwenhoek, Joseph Lister, Alexander Fleming.
11. Demonstration of Winodgradsky column experiment

Course Outcomes:

After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the historical developments in microbiology.	20%
CO-2	Be aware of the scope and relevance of microbiology.	15%
CO-3	Know about the morphology of bacteria.	15%
CO-4	Understand the structure and functions of various cell organelles.	15%
CO-5	Develop fundamental knowledge of microscope and role of microorganisms in causing of diseases.	20%
CO-6	Explain various stains and staining techniques.	15%

List of Open Source Software/learning website:

https://academic.oup.com/bioscience

http://www.biosciencenotes.com/

Bachelor of Science

Course Code: BM2102

Course Name: Plant Anatomy and Physiology

Semester: I

Type of course: Core Course

Prerequisite: Should have fundamental knowledge of classification of biodiversity, plant cells structure, basics of Biochemistry**.**

Rationale: At the end of the course, students will have knowledge about Cell, Genetics, Microbiology, biochemistry and plant biotechnology.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to plant anatomy:** Meristem and Permanent tissue, Meristem tissue: apical, lateral, intercalary, simple and complex tissues, Shoot and root apical meristem, Primary structure of shoot and root, secondary growth, growth rings, leaf anatomy.	**8**
2	**Plant Morphology**: Phyllotaxy and its types. Alternate, opposite and whorled, Leaf Morphology: Parts of simple leaf, Compound leaf and its types: Pinnate and Palmate compound leaf, Inflorescence and its types.	**8**
3	**Plant water relations**: Importance of water to plant life, Diffusion, osmosis, plasmolysis, imbibition, transpiration, stomata and their mechanism of opening and closing, Micro & macro nutrients, Roles and deficiency of nutrients, mechanism of uptake of nutrients, mechanism of food transport.	**8**
	SECTION-B	

4	**Photosynthesis** : Photosynthetic pigments, Concept of two photosystems Phosphorylation, Calvin cycle, CAM plants, Kranz anatomy, Anaerobic respiration, Glycolysis, Krebs cycle, Oxidative phosphorylation and photorespiration.	**8**
5	**Plant Physiology and growth:** Inorganic and molecular nitrogen fixation, Nitrate reduction and ammonium assimilation in plants, Growth and development: Definitions, phases of growth, growth curve, plant hormones (auxins, cytokinin, gibberellins, abscisic acid, ethylene).	**8**
6	**Reproduction in plants:** Modes of reproduction, Asexual and vegetative, Pre-fertilization: structures and events, stamen, structure of microsporangium, pollen grain, pistil, megasporangium, post-fertilization, embryo, seed.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. P. S. Verma and V.K. Agrawal, 2016. 'Cell biology, Genetics, Molecular Biology, Evolution and Ecology' S. Chand.
2. Nelson, D.L., Cox, M.M. 2004 Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA.
3. H. S. Chawla, Introduction to plant Biotechnology, CRC publishers, 3 rd edition (2009).
4. R. C. Dubey, Text Book of Biotechnology, S. Chand Publisher, 3 rd edition (2001).
5. Satyanarayana U., Biotechnology, Books and allied P. Limited publisher, 1 st edition (2013)
6. Cell and Molecular Biology: Concepts and Experiments – Gerald Karp

List of Practical/ tutorials: (Practicals)

1. To study the process of imbibition using raisins.
2. To demonstrate the process of osmosis with varying solution concentration.
3. To separate photosynthetic pigments by paper chromatography.
4. To study the arrangement and distribution of stomata in isobilateral and dorsi ventral leaves.
5. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
6. Effect of light intensity on rate of photosynthesis.
7. Mounting and staining of root nodules from a leguminous plant.
8. To demonstrate unequal transpiration from the two surfaces of a leaf.
9. To induce callus from explant.
10. Study of various types of leaf.

Course Outcomes: After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Summarize the role of each cell structure in plant development.	15%
CO-2	Analyze various types of leaf and its morphology.	15%
CO-3	Understand the role of micronutrients in plant growth and development.	20%
CO-4	Focus on the plant nutrient uptake and translocation, photosynthesis	15%
CO-5	Understand growth, development and reproduction in plants.	15%
CO-6	Describe the main techniques of genetic manipulation of plant.	20%

List of Open Source Software/learning website:

https://academic.oup.com/bioscience

http://www.biosciencenotes.com/

Bachelor of Science
Course Code: BC2106
Course Name: Disaster Management
Semester: - I

Type of course: Generic Elective

Prerequisite: Should have Fundamental knowledge of natural calamities like floods, earthquakes, storms etc.

Rationale: At the end of the course, students will have knowledge about conceptual applications of principles of management to mitigate various disasters

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
2	-	-	2	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Understanding Disasters:** Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability and disaster management	2
2	**Types, Trends, Causes, Consequences and Control of Disasters:** Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters)	6
3	**Introduction to Industrial Safety and Hazards**: Describe importance of safety in Industry, Classification of hazards: (a) Chemical hazard (b) Thermal hazard (c) Electrical hazard (d) Mechanical hazard (e) Vibrational hazard (f) Biological hazard (g) Radioactive hazard	4
	SECTION-B	

4	**Disaster Management Cycle and Framework:** Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, Prevention and Mitigation of Disasters, Early Warning System; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation	**6**
	Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment	
5	**Disaster Management in India:** Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, Role of Government (local, state and national),Non-Government and Inter-Governmental Agencies. Applications of Science and Technology for Disaster Management & Mitigation Geo-informatics in Disaster Management (RS, GIS, GPS and RS)	**4**
6	**Safe Handling of Hazardous Chemicals:** Discuss characteristics of and chemical reaction of hazardous chemicals like (a) Chlorine (b) Nitric Acid (c) Ammonia (d) Carbon Monoxide (e) Caustic Soda (f) Phosphoric Acid	**2**

SuggestedSpecification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
3. An overview on natural & man-made disasters and their reduction, R K Bhandari, CSIR, New Delhi
4. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
5. Encyclopedia of disaster management, Vol I, II and IIIL Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006
6. Disasters in India Studies of grim reality, Anu Kapoor & others, 2005, 283 pages, Rawat Publishers, Jaipur
7. Manual of Chemical Technology, Chemtech-I , D.Venkateswarlu, K.R.Upadrashta, K.D. Chandrasekaran

8. Industrial safety management, L M Deshmukh
9. Chemical Process Safety: Fundamentals with application, Daniel A. Crowl, Joshef F. Louvar

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Course Outcomes:

After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Examine the concepts of disaster	20%
CO-2	Classify the type, trends of disasters and hazards	15%
CO-3	Apply the knowledge of industrial safety at working place	15%
CO-4	Take actions to reduce their vulnerability to disasters.	20%
CO-5	Appraise disaster management in India	10%
CO-6	Explain the characteristic of hazardous chemicals	20%

List of Open Source Software/learning website:

- www.GIS. Development.net
- www.iirs.nrsa.org
- http://quake.usgs.gov
- www.nidmindia.nic.in

UPL University of Sustainable Technology

SRICT Institute of Science & Research

Department of Microbiology
B.Sc. Sem. II

Teaching/Exam Scheme

W.e.f.:

Sr. No.	Course Code	Category of course	Course title	Hours Per week			Tot. con. hrs	Credits	E	M	I	V	Total Marks
				L	T	P							
1	BC2108	Foundation Compulsory	English-II	2	-	-	2	2	70	30	-		100
2	BC2109	Core Course	Chemistry-II	4	-	4	8	6	70	30	30	70	200
3	BM2103	Core Course	Microbiology-II	4	-	4	8	6	70	30	30	70	200
4	BM2104	Core Course	Genetics and Evolutionary Biology	4	0	4	8	6	70	30	30	70	200
5	BC2113	Generic Elective	To be selected	2	-	-	2	2	70	30	-		100
6	BC2114	Foundation - Elective	To be selected	-	-	-	-	-	-	-	-		-
			Total	16	0	12	28	22	350	150	90	210	800

Generic Elective	1.Disaster Management 2.Environmental Studies 3.Forensic Science
Foundation Elective	1. NCC 2. NSS 3. Yoga

UPL University of Sustainable Technology

SRICT Institute of Science & Research

Bachelor of Science
Course Code: BC2108
Course Name: English-II
Semester: II

Type of course: Foundation Compulsory

Prerequisite: Zeal to learn the subject

Rationale: At the end of the course, students will have knowledge of English language. It also targets the understanding of grammar, focusing on comprehension, and reading, speaking and writing skills. This would be developed through balanced and integrated tasks

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	-	-	2	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Vocabulary building:** Introduction to Word Formation Types of word formation processes: compounding, clipping, blending, derivation, creative respelling, coining and borrowing ,Acquaintance with prefixes and suffixes Synonyms, antonyms, and standard abbreviations	8
2	**Phonetics:** IPA, Transcription **,**Introduction to different accents	8
3	**Identifying Common Errors in Writing:** Tenses, Subject-verb agreement Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions Modal Auxiliaries ,Redundancies	8
	SECTION-B	
4	**Basic Writing Skills:** Sentence Structures **,**Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence Organizing principles of paragraphs in documents.	6
5	**Nature and Style of Writing:** Describing, Defining, Classifying,Writing introduction and conclusion	8
6	**Writing Practices:** Comprehension, Précis Writing, Letter Writing,Email etiquettes, Abstract, Memo writing	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Technical English, Dr. M. Hemamalini, Wiley. 2014
2. Practical English Usage, Michael Swan, OUP. 1995
3. Remedial English Grammar, F.T. Wood, Macmillan. 2007
4. Oxford Language Reference, (Indian Edition) OUP
5. On Writing Well, William Zinsser, Harper Resource Book. 2001
6. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006
7. A course in English Phonetics-TR Kansakar, Orient Longman,1998

Course Outcomes:

After completing this course, students will be able to;

Sr. No.	CO statement	Marks % weightage
CO-1	Present ideas using various forms of vocabulary in varied situations in oral and written communication.	20%
CO-2	Identify the phonetic symbols and the transcription pattern to learn correct pronunciation.	15%
CO-3	Apply the dynamics of various rules of grammar and check its validation while they speak and write language correctly.	15%
CO-4	Analyze grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations.	20%
CO-5	Relate to various formal and informal documents of day to day life and professional set up.	10%
CO-6	Revise the qualities of writing in diverse situation by using the nuances such as conciseness, clarity, accuracy, organization, and coherence.	20%

List of Open Source Software/learning website:

- http://www.english-online.org.uk/
- http://www.learnenglish.de/

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SRICT Institute of Science & Research

Bachelor of Science
Course Code: BC2109
Course Name: Chemistry-II
Semester: II

Type of course: Core Course

Prerequisite: Should have fundamental knowledge of Organic, Inorganic and physical chemistry and its relevance properties

Rationale: At the end of the course, students will have knowledge about Atomic structure, Reaction mechanism of Organic compounds, Thermodynamic, Conductance and Coordination compounds

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Atomic Structure:** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals. Schrodinger wave equation, significance of and 2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s., p. d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge.	8
2	**Reaction Mechanism:** Hemolytic and Heterolytic fission, reactive intermediates: free radicals, carbonium ions (carbocations), carbanions carbenes, arynes and nitrenes. Types of reagents, electrophiles nucleophiles, Eletromeric, inductive, conjugative effect, Types of reactions: Addition, substitution, elimination, rearrangements. Addition, and substitution with respect to electrophilic and nucleophilic reaction-SN^1 SN^2, Mechanism of (i) addition reaction to alkenes and dienes (ii) substitution in benzene ring: nitration, sulfonation, alkylation, acylation, halogenation. Cyanohydrin formation and acetal formation, Mechanism of Perkin reaction, Hoffman and Cannizzaro reaction.	8
3	**Conductance and Ionic Equilibria:** Electrical conductance, specific conductance, equivalent conductance and molar conductance, effect of dilution on concentration, cell constant and its determination, Ostwald's dilution law and its limitations, buffer solutions, acid and basic buffer actions, buffer capacity, relation between pH of acid and basic buffer and concentration of their component, Numericals.	8

	SECTION-B	
4	**Coordination Compounds:** Definition, Nomenclature of Complex. Werner's theory and its experimental verification. Concept of Effective Atomic Numbers (E.A.N.) for Coordination Compounds. Limitations of Valence bond theory of transition metal complexes. An Elementary idea of (C.F.T.) Crystal field splitting of d-orbital in Octahedral and Tetrahedral. Factors affecting to the crystal field splitting. Application of common complexes & chelates.	**6**
5	**Structure and Bonding:** Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyper conjugation, aromaticity, inductive and field effects, hydrogen bonding, Alkenes : Nomenclature, method of preparation, properties and uses of ethylene and propylene Markovnikov rule and Saytzeff rule, polymerization of ethylene styrene and vinyl chloride, Dienes : nomenclature, classification of dienes methods of formation of Butadiene chemical reactions 1,2 and 1,4 additions, Diels – Aider reaction, Alkynes : nomenclature , methods of formation, chemical reactions, electrophilic and nucleophilic addition reactions if acetylene.	**10**
6	**Thermodynamics:** Thermodynamics (only introduction) System and surrounding- work & heat, state function, thermodynamic Process, internal energy, enthalpy, free energy, maximum work function. First law of thermodynamics, Heat capacity, specific and molar heat capacity, heat capacity at constant Volume and pressure and their relationship workdone in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics Carnot cycle and its efficiency Concept of entropy; entropy change for an ideal gas under different Conditions, entropy change for mixture of ideal gases Gibbs-Helmholtz equationWant-Hoff isotherm and isochore, Numericals	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Physical Chemistry by Arun Bahl, B. S. Bahl and G. D. Tuli; Pub. S. Chand
2. Advance physical chemistry by D. N. Bajpai; Pub : S. Chand
3. Vogel's qualitative Inorganic analysis
4. Inorganic chemistry by Wahid Malik, G. D. Tuli, R. D. Madan; Pub. S. Chand
5. Basic Inorganic Chemistry by Cotton & Wilkinson.
6. Advance physical chemistry by D. N. Bajpai, Pub : S. Chand
7. Physical Chemistry by G. M. Barrow

List of Practical/ tutorials: (Practical's – 10)

A. Inorganic Qualitative Analysis

B. Standardization of following solution;

1.0.1 N succinic acid
2.0.1 N KHP
3.0.01 N $Na_2S_2O_3$
4.0.1 N $H_2C_2O_4$ $2H_2O$
5.0.1 N $K_2Cr_2O_7$

Course Outcomes:

After completing this course, students will be able to;

Sr. No.	CO statement	Marks % weightage
CO-1	Describe the various theories proposed on atomic structure of elements.	20%
CO-2	Discuss the Mechanism of various reaction and their application.	15%
CO-3	Construct the physical properties based on electrochemistry	15%
CO-4	Categories the properties of metal complexes	20%
CO-5	Ascertain the bonding properties of various molecule.	10%
CO-6	Explain the law of thermodynamics.	20%

List of Open Source Software/learning website:

- https://www.library.qmul.ac.uk/subject-guides/chemistry/useful-websites/
- https://blog.feedspot.com/chemistry_websites/
- https://www.rsc.org/periodic-table

UPL University of Sustainable Technology

SRICT Institute of Science & Research

Bachelor of Science
Course Code: BM2104
Course Name: Microbiology-II

Semester: II

Type of course: Core Course

Prerequisite: Should have Fundamental knowledge of prokaryotic cell structures, organization of cellular structure and bacterial systematics.

Rationale: At the end of the course, students will have knowledge about cell morphology, microbial growth, nutrition and control via different methods.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Microbial Nutrition**: Elements of life, Nutritional Requirements: Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Sulphur, Nutritional Types of Microorganisms, Growth factors, mechanism of nutrient uptake. **Introduction to lab apparatus**: Autoclave, laminar air flow, centrifuge, hot air oven, pH meter, Incubator.	**8**
2	**Microbial Growth**: Bacterial cell cycle, Mathematical expression of Growth, Growth curve, Measurement of microbial growth, Continuous Culture of Microorganisms, Diauxic growth, Synchronous culture, Influence of various environmental factors on Growth.	**8**
3	**Cultivation Techniques and Isolation**: Introduction to culture media, Components of Media, Natural and Synthetic Media, chemically defined Media, Enriched and Enrichment media, Isolation of microorganisms and pure culture techniques, Preservation of micro-organisms.	**8**
	SECTION- B	
4	**Control of Microorganisms by Physical Agents:** Definitions and General Considerations of Microbial Control to measure efficacy ,definition of death, death rate, death curve, thermal death time, LD50,	**8**

	LC50, Methods of Microbial Control, Physical agents: High temperature, Low temperature, Desiccation, Osmotic pressure, Radiation, Filtration.	
5	**Control of Microorganism by Chemical agents:** Characteristics of an ideal antimicrobial chemical agents, Selection of chemical agent for practical applications, Major groups of chemical antimicrobial agents, Phenol, alcohol, halogen, heavy metals, dyes, detergents, quaternary ammonium compounds, aldehydes, and gaseous agents, Condition influencing antimicrobial action.	**8**
6	**Evaluation of antimicrobial chemical agents:** Antibiotics: Mode of action of Penicillin, Streptomycin, Tetracycline, Nystatins & AZT. Mode of action of antimicrobial agents, Agar Diffusion technique, tube dilution, Phenol co-efficient technique, Dilution technique, Culture collection centres.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Microbiology 5th ed. by Pelzar, Chan & Kreig (Tata McGraw-Hill)
2. Dubey and Maheshwari, General Microbiology, S. Chand, New Delhi.
3. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)
4. Encyclopedia of Microbiology by Joshua Lederberg , William C. Summers; Martin Alexander, Barry R. Bloom
5. Madigan et al., General Microbiology, Prince Hall of India Pvt. Ltd., New Delhi.

List of Practical/ tutorials: (Practicals)

1. Introduction to lab apparatus (Autoclave, Incubator, centrifuge, hot air oven, pH meter, laminar air flow).
2. Preparation of Reagents – Preparation of normal, molar & % solutions.
3. Study of motility using hanging drop preparation.
4. Methods of preparation of glassware for sterilization.
5. Inoculation techniques and study of growth.
6. Preparation of media – Nutrient broth / agar.
7. Vital staining of yeast.
8. Streak plate method for isolation of bacteria.
9. Spread plate technique for isolation of bacteria.
10. Use of differential and selective media

11. To study effect of antibiotics on growth of bacteria.

12. To study effect of antimicrobial agents on bacteria (phenol, antibiotic, crystal violet).

Course Outcomes: After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Classify the bacteria on the basis of various parameters.	15%
CO-2	Understand the growth rate of bacteria.	20%
CO-3	Prepare various nutrients media for cultivating microbes in laboratory.	20%
CO-4	Understand various methods for control of microorganisms.	15%
CO-5	Learn about various chemical agents for microbial control.	20%
CO-6	Determine the sensitivity of specific bacteria to given antibiotics.	10%

List of Open Source Software/learning website:
https://academic.oup.com/bioscience
http://www.biosciencenotes.com/

Bachelor of Science
Course Code:
BM2104
Course Name: Genetics and Evolutionary Biology
Semester: II

Type of course: Core Course

Prerequisite: Should have fundamental knowledge of animal cells structure, basics of Biology, human genetics.

Rationale At the end of the course, students will have knowledge about Cell, Genetics, concept of gene and various disorders.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	-	4	6	70	30	70	30	200

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Genetics**: Mendel's work on transmission of traits, Genetic variation, Molecular basis of Genetic information, Principles of inheritance, Chromosomal theory of inheritance, major events in history of life.	**8**
2	**Mendelian genetics and its extension**: Mendel's Law, Law of dominance, law of segregation, law of independent assortment, Monohybrid and di-hybrid ratio, Mendel's deviation laws: Incomplete dominance, Co-dominance.	**8**
3	**Linkage, crossing over and chromosomal mapping :** Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, interference and coincidence, concept of gene, Morgan classical concept, modern concept of gene.	**8**
	SECTION-B	
4	**Mutations:** Introduction to gene mutation, concept of gene, Chromosomal mutations, Deletion, Duplication, Inversion, Translocation, Aneuploidy and Ploidy, monosomy, trisomy, down syndrome, turner syndrome, klinefilter syndrome.	**8**

5	**Multiple Alleles:** Concept of blood group inheritance, ABO blood grouping, sex linked inheritance: Hemophilia and color blindness, muscular dystrophy, sickle cell anemia.	**8**
6	**Evolutionary Biology**: Origin of life, Evolution of life forms, Miller's experiment, Evidence for evolution, adaptive radiation, Mechanism of evolution, Hardy-weinberg principle, mechanism of evolution.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Beale, G. Knowels. J. 1978. Extranuclear Genetics. Oxford & IBH Publ. New Delhi.
2. Dobzhanski, T. H. 1951. Genetics and Origin of Species, 3rd edn. Columbia Univ. Press, New York.
3. Bruce Alberts; Dennis Bray; Karen Hopkin; Alexander Johnson; Julian Lewis; Martin Raff; Keith Roberts; Peter Walter (2013). Essential Cell Biology, 4th Edition. Garland Science.
4. Griffiths, Anthony J. F.; Miller, Jeffrey H.; Suzuki, David T.; Lewontin, Richard C.; Gelbart, eds. (2000). An Introduction to Genetic Analysis (7th ed.). New York: W. H. Freeman. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. IX Edition. Introduction to Genetic Analysis, W. H. Freeman & Co.
5. Singh, B. D. 1997. Fundamentals of Genetics. B-1/1292, Rajinder Nagar, Ludhiana. Singh V. and Jain D. K. 2001. Nootan Biology. Nageen Prakashan Pvt. Ltd. Nehru Place New Delhi.
6. Arora, B. B. and Sabharwal A. K. 2000. ABC Biology. Modern Publishers, New delhi. Rastogi, V. W. 2005. A Text Book of Genetics. Kedar Nath and Ram Nath Publication, Meerut.

List of Practical/ tutorials: (Practicals – 10)

1. Karyotyping with the help of photographs.
2. Pedigree charts of some common characters like blood group, color blindness.
3. Demonstration of AMES test.
4. Mendelian deviations in dihybrid crosses.
5. Production of Polyploidy in Onion root using colchicine treatment.
6. ABO blood grouping.
7. Differential leukocyte count.
8. Widal test
9. Study of Mendelian laws.
10. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross.

Course Outcomes:

After completing this course, students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Summarize about molecular biology and inheritance at the molecular, cellular and phenotypic levels.	15%
CO-2	Understand various laws given by Mendel.	15%
CO-3	Explain the concept of gene, linkage and recombination.	20%
CO-4	Analyze various types of mutations and disorders.	15%
CO-5	Explain blood grouping and Immunity.	15%
CO-6	Learn about various inborn errors.	20%

List of Open Source Software/learning website:

- https://academic.oup.com/bioscience
- http://www.biosciencenotes.com/

Bachelor of Science
Course Code: BC2113
Course Name: Environmental Studies
Semester: II

Type of course: Generic Elective

Prerequisite: Should have Fundamental knowledge of basic science such as biology, geology, geography, chemistry etc.

Rationale: At the end of the course, students will have knowledge about Biodiversity, Ecosystem, Environmental pollution and relation between Human and Environment

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
2	-	-	2	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Environmental studies:** Definition, scope and importance, Natural resources: Renewable and Non-renewable resources. Role of an individual in the conservation of natural resources, Concept of sustainability and sustainable development	3
2	**Biodiversity and its conservation:** Introduction- definition, Types of diversity, Value of biodiversity, Threats to biodiversity, Biodiversity Index, Conservation of biodiversity: In- situ and Ex-situ conservation of biodiversity.	3
3	**Ecosystems**: Concept of ecosystem, Structure and function of ecosystem, Producers, consumers and decomposers. Energy flow in an ecosystem: food chain, food web and ecological succession Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	6
	SECTION-B	
4	**Environmental Pollution**: Definition, causes, effects and control measures. Of Air pollution, Water pollution, Soil pollution and Noise pollution, Global warming: Depletion of ozone layer, greenhouse effect. Solid waste management: Causes, effects and control measures of urban and industrial wastes	6
5	**Human Population and the Environment:** Population explosion: Family welfare program, methods of sterilization, urbanization, environment and human health, infectious diseases, water-related	3

	diseases, risks due to chemicals in food, cancer. HIV/AIDS, Woman and child welfare.	
6	**Society, Government and Environment:** Environment protection Act. Air (Prevention and control of pollution) Act. Water (Prevention and control of pollution) Act. Wild life protection Act. Forest conservation and Biodiversity protection Act in brief. Public awareness and human rights. Case studies on environmental molestation and peoples triumph (silent valley, chipko andolan) Global Earth summits.	**3**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Agarwal, K.C.(2001) Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach (2003), The Biodiversity of India of India, Mapin PublishingPvt. Ltd., Ahmedabad- 380013, India, Email: mapin@ivenet,net (R)
3. Gadgil, Madhav (2001) Ecological Journeys, The Science and Politics of conservation in India. Permanent Black.
4. Cunningham, W.P.Cooper, T.H. Gorhani, E & Hepworth, M.T.(2001). Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
5. Dcc A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment (R)

Course Outcomes:
After completing this course, students will be able to;

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Examine an integrative approach to environmental issueswith a focus on sustainability	20%
CO-2	Identify the global scale of environmental problems	15%
CO-3	Illustrate the Biodiversity, threats to Biodiversity and its value	15%
CO-4	Analyze the environmental pollution and their effect on environment	20%
CO-5	Understand the relationship between humans and their environment	10%
CO-6	Recognize the physical, chemical, and biological componentsof the earth's systems and show how they function	20%

List of Open Source Software/learning website:

- https://www.edx.org/learn/environmental-science

- https://academicearth.org/environmental-studies

UPL University of Sustainable Technology

Bachelor of Science

Course Code: BC2106
Course Name: Forensic Science
Semester: I

Type of course: Elective Course

Prerequisite: Should have fundamental knowledge of forensic biology and some specific areas such as forensic botany, wild life forensics and forensic microbiology.

Rationale: At the end of the course students will understand the importance of biological fluids, several tests used in blood analysis, grouping of blood stains and importance of DNA fingerprinting.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	-	-	2	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Biological Evidence:** Introduction, Nature, Preservation, Handling and Importance of Biological Evidences. Hair: Structure of Human Hair, Significance, Nature, Location and Collection. Transfer, Persistence and Recovery of Hair Evidence. Evaluation and Tests for their Identification. Comparison of Human and Animal Hair. Fiber: Types, Classification, Characteristics of Different Fibers, Tests for their Identification.	8
2	**Forensic Botany Botanical Evidences**: Introduction, Types, Location, Collection, Evaluation and Forensic Significance. 1. Wood: Types of Wood and their identification and comparison. 2. Leaves: Identification of various types of leaves and their anatomy, methods of comparison.	8
3	**Wild Life Forensics:** Introduction and Significance of Wild Life Forensics and Wild Life Protection Act. Protected and Endangered Species of Animals and Plants. Identification and Examination of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants, by conventional and modern methods	8
	SECTION-B	

4	**Introduction to Fingerprints**: Pattern Biological Development of Fingerprints, Biological Significance of Skin Pattern, Ridge Formation, Fingerprint Patterns, Pattern Areas, General and Individual Characteristics of Fingerprints.	**8**
5	**Recording and Examination of Fingerprints**: Ridge Counting and Tracing, Filling and Searching. Method for Making an Inked Specimen of Fingerprint. Taking of Fingerprint from Living and Dead Person. Comparison Protocols: Class and Individual Characteristics (Galton's Details), Different Ridge Characteristics.	**8**
6	**Forensic Microbiology**: Definition, Types and Identification of Bacteria and Viruses of Forensic Importance, Microbial profile as Identification tool and role of Microorganism in Bioterrorism.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy

Reference Books:

1. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001).

2. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).

3. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall Inc: USA; (1995).

4. Aitken, C.G.G.and Stoney,D.A. The Use of Statistics in Forensic Science. Ellis Harwood Limited: England; (1991).

5. Hess, A.K. and Weiner, I.B. Handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons: (1999).

6. Arrigo, B.A. Introduction to Forensic Psychology. Academic Press: London; (2000).

7. Shapiro, D.L. Forensic Psychology Assessment an Investigative Approach:Allyn and Bacon Publisher: (1991).

8. Nicharrs, J. Investigative Forensic Hypnosis: CRC Press LLC; (1999).

9. Kleiner, M. Handbook of Polygraph Testing: Academic Press: San Diego; (2002).

10. Bennett W.W.and Hass K.M. Criminal Investigation 6th ed. Wordsworth Thompson Learning: (2001).

Course Outcomes: After completing this course, student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Define the importance of biological evidence and its identification.	20%
CO-2	Understand various aspects of forensic botany.	15%
CO-3	Develop the fundamental knowledge of wildlife forensics aid in conserving natural resources.	15%
CO-4	Discuss the importance of DNA fingerprinting in forensic science.	20%
CO-5	Measure the various parameters of fingerprinting and characteristics of ridges.	20%
CO-6	Explain the significance of forensic microbiology.	10%

List of Open Source Software/learning website:

https://academic.oup.com/bioscience
http://www.biosciencenotes.com/