

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

B. Sc. BIOTECHNOLOGY SEMESTER –I (2016-17)

**Paper I: Core Course1 (BICT01BOT01): Botany I
Biodiversity (Microbes, Algae, Fungi and Archegoniate) (Theory)
(Credits: Theory-4, Practicals-2)
Credit hours: 60**

Unit 1: Microbes

10 Credit hours

Viruses – Discovery, general structure, replication (general account), Economic importance; Bacteriophage, Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit 2: Algae

10 Credit hours

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

Unit 3: Fungi

10 Credit hours

Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; life cycle of *Rhizopus* (Zygomycota) *Penicillium*, *Alternaria* (Ascomycota), *Puccinia*, *Agaricus* (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

Unit 4: Bryophytes

10 Credit hours

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

Unit 5: Pteridophytes and Gymnosperms

20 Credit hours

General characteristics, classification, Early land plants (*Rhynia*). Classification (up to family), morphology, anatomy and reproduction of *Selaginella* and *Equisetum* (Developmental details not to be included). Heterospory and seed habit, stelar evolution.

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

Suggested Readings

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

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

B. Sc. BIOTECHNOLOGY SEMESTER –I (2016-17)

Paper II: *Core Course 2 (BICT02BT01): Biotechnology I*

Introduction to Microbiology (Theory)

(Credits: Theory-4, Practicals-2)

Credit hours: 60

UNIT-I

15 Credit hours

Bacteriology: Modern systems of classification of bacteria. General features, distribution, cell size, shape and arrangement, structure of bacterial cell capsule, flagella, pilli, cell wall – chemical composition and wall characteristics, plasma membrane, mesosomes, cytoplasm, nucleoids.

Unit-II**15 Credit hours**

Virology – virus classification, phylogeny, general features, structure, replication in bacteriophages. Transmission of plant and animal viruses and diseases caused by them. Viroids, virusoids and prions: general features and diseases caused by them.

Unit-III**10 Credit hours**

Mycoplasma – history, ultrastructure, nutrition, classification, phylogeny, reproduction and methods of cultivation. Elementary account of most common human /animals diseases (Pulmonary pneumonia, urethritis) caused by mycoplasma.

Brief account of phytoplasma and important diseases caused by them (Sesame phyllody, little leaf of brinjal, grassy shoot of sugarcane).

Unit-IV**10 Credit hours**

Methods in microbiology – microbial cultures, physical conditions for growth , methods for culturing aerobic and anaerobic bacteria. Culture media – selective and differential media nutrient agar, nutrient Broth, enrichment media and other media.

Unit-V**10 Credit hours**

Plant-microbe interaction: bacterial (associative symbiont, PGPR, *Rhizobium*, fungal symbiosis-mycorrhiza), symbiotic association (bacteria and fungi, microbe-microbe interactions-symbiosis between algae and fungi : lichens) : Antagonistic interactions – amensalism, competition, parasitic and predation.

Recommended Books

1. Pelczar and Krieg. Microbiology. McGraw Hill.
2. Prescott, H. and Klein. 2000. Microbiology. McGraw Hill.
3. Tortora. Microbiology : An Introduction. Pearson Education.
4. Stainer, R.Y., Ingrahm, J.L., Wheelis, M.L. and Painter, P.R. General Microbiology. The MacMillian Press Ltd.

5. Madigan, M.T., Martinko, J.M. and Parker, J. B. Biology of Microorganism. Prentice-Hall.
6. Dubey, R.C. and Maheshwari, D.K. A Text Book of Microbiology. S. Chand and Company.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

B. Sc. BIOTECHNOLOGY SEMESTER –I (2016-17)

Paper III: Core Course 3(B1CT03CHE01): Chemistry I

Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons (Theory)

(CREDITS: THEORY-4, PRACTICALS-2)

Credit hours: 60

UNIT I

15 Credit hours

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de- Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of *s*, *p* and *d* atomic orbitals, nodal planes. Discovery of spin, spin quantum number (*s*) and magnetic spin quantum number (m_s).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT II
Chemical Bonding and Molecular Structure

10 Credit hours

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Concept of resonance and resonating structures in various inorganic and organic compounds.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd Credit hours (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+ . Comparison of VB and MO approaches.

UNIT III

15 Credit hours

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

UNIT IV

10 Credit hours

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L;

cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

UNIT V

10 Credit hours

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); *cis* alkenes (Partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions:* *cis*-addition (alk. KMnO₄) and *trans*-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.

Alkynes : (Upto 5 Carbons) *Preparation:* Acetylene from CaC₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO₄, ozonolysis and oxidation with hot alk. KMnO₄.

Reference Books:

- J. D. Lee: *A new Concise Inorganic Chemistry*, E L. B.
- F. A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley.
- Douglas, McDaniel and Alexader: *Concepts and Models in Inorganic Chemistry*, John Wiley.
- James E. Huheey, Ellen Keiter and Richard Keiter: *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication.
- T. W. Graham Solomon: *Organic Chemistry, John Wiley and Sons*.
- Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry*, Orient Longman.
- E. L. Eliel: *Stereochemistry of Carbon Compounds*, Tata McGraw Hill.
- I. L. Finar: *Organic Chemistry* (Vol. I & II), E. L. B. S.
- R. T. Morrison & R. N. Boyd: *Organic Chemistry*, Prentice Hall.
- Arun Bahl and B. S. Bahl: *Advanced Organic Chemistry*, S. Chand

- Vogel's Qualitative Inorganic Analysis, A.I. Vogel, Prentice Hall, 7th Edition.
- Vogel's Quantitative Chemical Analysis, A.I. Vogel, Prentice Hall, 6th Edition.
- Textbook of Practical Organic Chemistry, A.I. Vogel, Prentice Hall, 5th edition.
- Practical Organic Chemistry, F. G. Mann. & B. C. Saunders, Orient Longman, 1960.

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Ability Enhancement Compulsory Courses

AECC: BIAECC01EC: English Communication

English Communication Credits: 2

Preamble:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning process and by focusing on various dimensions of communication skills. Some of these are: Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, notetaking etc.

While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Unit-1. Introduction: Theory of Communication, Types and modes of Communication

Unit -2. Language of Communication:

Verbal and Non-verbal

(Spoken and Written)

Personal, Social and Business

Barriers and Strategies

Intra-personal, Inter-personal and Group communication

Unit-3. Speaking Skills:

Monologue

Dialogue

Group Discussion

Effective Communication/ Mis- Communication

Interview

Public Speech

Unit 4. Reading and Understanding

Close Reading

Comprehension

Summary Paraphrasing

Analysis and Interpretation

Translation(from Indian language to English and vice-versa)

Literary/Knowledge Texts

Unit-5. Writing Skills

Documenting

Report Writing

Making notes

Letter writing

Recommended Readings:

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