IKG Punjab Technical University
B.Sc. (Hons) Microbiology Batch 2020 onwards

Semester -1

Course Code	Course Title	Course Type	Load Distribution			Marks Distribution		Total Marks	Credits
			L	T	P	Int.	Ext.		
BSMB101-19	Introduction to Microbiology	Core	3	1	-	40	60	100	4
BSMB102-19	Introduction to Microbiology (Lab)	Core Practical	0	0	3	60	40	100	2
BSMB103-19	Chemistry-I	Core	3	1	-	40	60	100	4
BSMB104-19	Chemistry-I (Lab)	Core Practical	0	0	3	60	40	100	2
BSMB105-19	Cell Biology	Core	3	1	-	40	60	100	4
BSMB106-19	Cell Biology (Lab)	Core Practical	0	0	3	60	40	100	2
BSMB107-19	Basics of Biosciences *	Foundation Course *	2	0	0	20	30	50	0
BSMB108-19	Basics of Biosciences Lab *	Foundation Course *	0	0	2	20	30	50	0
BTHU103-18	English	(AECC)	2	0	0	40	60	100	2
BTHU104-18	English Lab	(AECC) Lab	0	0	2	30	20	50	1
HVPE101-18	Human Values, De-addiction and Traffic Rules	(AECC)	3	0	0	40	60	100	3
HVPE102-18	Human Values, De-addiction and Traffic Rules (Lab-seminar)	(AECC) Lab	0	0	1	25	-	25	1
BMPD102-18	Mentoring & Professional Development		0	0	2	25	-	25	1
TOTAL			**16**	**3**	**16**	500	500	1000	**26**

***** Basics of biosciences and Basics of Biosciences Lab - For students having passed 10+2 with Mathematics to take compulsory deficiency course and to be awarded Satisfactory and Non- Satisfactory during their final results by PTU. This course is a deficiency course for a specific section of students so no credits have been allotted.

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BSMB101-19 Introduction to Microbiology

Unit 1

History of Microbiology: A. Leeuwenhoek, L.Pasteur, R.Koch, J.Lister, J.Tyndall, etc. Biogenesis v/s Abiogenesis, Koch Postulates, Discovery of antibiotics. Principle of Microscopy: Bright field, Dark field, Phase contrast, Fluorescent, Electron Microscopy.

Unit 2

Microbial classification: Bacteria, Fungi and Algae. Morphology of bacteria, viruses, algae and fungi with major emphasis on bacterial structure specially cell wall. Gram positive and Gram negative bacteria. Microbial spores, Sporulation and germination process. Nitrogen fixing microbes in agriculture.

Unit 3

Microbial growth, nutritional biodiversity, phases of growth, generation time, growth rates, monoauxic, diauxic and synchronous growth, chemostat, Microbes in extreme environment like high temperature and high/ low pH Physical and chemical agents to kill microbes, sterilization and pasteurization processes.

Unit 4

Normal micro flora in humans, Types of microbial pathogens and diseases caused by them. Microbial interactions like symbiosis and antibiosis etc. Aerobic and Anaerobic fermentation, production of heterologous proteins in microbes.

Suggested Readings / Books

1. Davis, B.D Dulbecco, R., Eiser, H.N. and Ginsberg, H.S. (1990). Microbiology, 4th edition, Harper and Row, Publishers, Singapore.
2. Tortora, G.J., Funke, B.R., and Case, C.L. (1994). Microbiology: an introduction, 5th edition, the Benjamin/Cummings Publishing Company, Inc.
3. Stanier, R.Y. (1995). General Microbiology, MacMillian Press London.
4. Pelczar, M.T. (1995). Microbiology, Tata McGraw Hill Publication, New Delhi.
5. Schegel, H.G., (1995). General microbiology 7th ed. Cambridge University Press.
6. Prescot and Dunn (1999). Industrial Microbiology, 4th ed. By S.K Jain for CBS Publishers and Distributors.
7. Purohit, S.S. (2000). Microbiology: Fundamentals and Applications (6th edition), Agrobios (India)
8. Postgate, J. (2000). Microbes and Man : 4th ed, Cambridge University Press.

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BSMB102-19 Introduction to Microbiology Lab

List of Practical

1. Aseptic techniques
2. Cleaning of glass wares, Preparation of media, Cotton plugging and sterilization
3. Isolation of bacteria from air, water and soil
4. Personal hygiene- Microbes from hands, Tooth-Scum and other body parts.
5. Dilution and pour plating techniques.
6. Growth curve of microorganisms.
7. Culture from body fluids (Stools, Urine, Blood).
8. Alcoholic and mixed acid fermentation.
9. Simple staining.
10. Differential staining- Gram staining
11. Identification of bacteria by Biochemical analysis of bacteria: Oxidase test, catalase test, MR-VP test.
12. Slide identification from permanent slides.

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BSMB103-19 Chemistry-I

Unit-1

Atomic Structure : Bohr's atomic model & limitation. Idea of de Broglie matter weaves. Hisenberg's uncertainty principle. Schrödinger's wave equation. Significance of wave function. Quantum numbers. Multielectron system-Pauli's exclusion principal, Hunds rules of maximum multiplicity. Stability of half filled full field orbitals, Afbau principal & its limitation. Electronic configuration of atoms.

Unit-2

Bonding in organic compounds: Classification, trivial names and IUPAC system of nomenclature of organic compounds. Nature of covalent bond and its orbital representation. Hybridization, bond energy, polarity of bond & dipole moment of molecules, inductive effect, hydrogen bond, conjugation, resonance. Hemolytic & heterolytic fission of bonds electrophiles & nucleophiles, carbonation, carbon ions and radicals- there stability, geometry & generation.

Unit-3

Stereochemistry: Dissymmetric Molecules: Different types of Isomerism, Structural Isomers, Geometrical, Stereoisomerism, Configurational Isomers, Conformational Isomers, Concept of asymmetric carbon atom, Enantiomers, Diastereiosmers, Stereogenic atom / center, Chirotopic / Achirotopic Centre, Protereoisomerism, Concept of Topicity of Ligands and Faces (Homotopic, Enantiotopic, Diastereotopic atoms and groups; Prochiral, Homotopic, Enantiotopic, Diastereotopic Faces), Projection Structures of Streoisomers (Fischer, Swahorse, Newman, Flying-Wedge projection and Interconversion of these projections formulas) of simple molecules containing one or two asymmetric carbon atom,

Unit-4

Optical isomerism, Optical activity, Element of symmetry and chirality, Meso compounds, Chiral centers and the number of stereoisomers, Racemic modifications, Racemic mixture or (+/-)-Conglomerate, Racemic Compounds or racenate, Stereochemical nomenclature of Stereoisomers containing chiral centers(R/S and E/Z or cis-trans or sec cis- sec trans of C=C system);D,L system of designation; Pro-R, Pro-S, Re, Si, Erythro, threo, Pref and Praf designation of enantiotopic groups and atoms; Chirality of Organic molecules without chiral center and concept of chiral axis.

Suggested Readings / Books

1. J.D. Lee, Inorganic Chemistry, 5th edition chapman & Hall, London.
2. Inorganic Chemistry by Puri, Sharma and Kalia
3. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry
4. F. Basalo and R.C. Johson, Co-ordination Chemistry,1964.
5. Organic Chemistry – FINAR IL
6. Organic Chemistry _ Morrison and Boyd
7. Voge's text book of Organic Chemistry – Furniss
8. Organic Chemistry – Ege Sezham
9. Atkin's Physical Chemistry by Peter Atkins and Julio de Paulk. Publisher Oxford University Press • Textbook of Physical chemistry by Samuel Glasston. MacMillan India Ltd
10. Kalyani Physical Chemistry by K.L. Chug and S.L. Agnish. Kalyani Publisher

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BSMB104-19 Chemistry -1 Lab

List of practical's

1. Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in Rf values to be provided.
2. Preparation of any one of the following compounds
(i). Acetanilide
(ii). Asprin
(iii). p-Nitroacetanilide
(iv). Aniline yellow or 2 - Naphthol Aniline dye.
3. Qualitative analysis
Determination of one cation and one anion in a given salt.
Cation:- Pb^{2+}, Cu^{2+} As^{3+}, Al^{3+}, Fe^{3+}, Mn^{2+} , Zn^{2+}, Cu^{2+}, Co^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+
Anions:- CO_3^{2-}, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_2^-, NO_3^-, Cl^-, Br^-, I^-, PO_4^{3-}, $C_2O_4^{2-}$, CH_3COO^-
(Note: Insoluble salts included)
4. Tests for the functional groups present in organic compounds:
Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.
5. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given food stuffs.
6. Detection of adulteration in various samples like oil, milk, pulses, spices etc

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BSMB105-19 Cell Biology

Unit I Cell as a basic unit of living systems: Cell structure and the cell theory, Broad and detailed classification of cell types within an organism. Different levels of organization of cells.

Unit -2 Cell division and Cell cycle: Cell interaction; Cell locomotion, Muscle and Nerve cells, Cell senescence and death, Cell differentiation.

Unit -3 Structure and function of cell organelles: Ultrastructure of cell membrane, cytosol, golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes, Cytoskeletal structures (actin, microtubules etc.), Mitochondria, chloroplasts, lysosomes, peroxisomes. Nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin).

Unit -4 Fixation and Staning; Freeze drying and freeze substitution, Microtome and Embedding, Chemical basis of staining, Cytophotometric Methods.

Suggested Readings / Books

1. Cell and molecular Biology: De Roberties
2. Cell Biology: Bruce Albert's
3. Cell Biology: Dowben

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BSMB106-19 Cell Biology Lab

List of Practicals

1. Sub Cellular Fractionation and marker enzymes
2. Mitosis and Meiosis
3. Vital staining for visualizing cell organelles
4. Histochemical Techniques
5. Centrifugation
6. Chromatogarphy-Paper and Thin Layer chromatography
7. Microscopy: Bright field

BSMB107-19 Basics of Biosciences

Unit 1

Diversity in the living world; The living world, Biological classification, Kingdom Monera, Kingdom Protista, Kingdom Fungi, Plant kingdom; Classification of animals in general.

Unit 2

Structural organization in plants; Morphology of flowering plants, Anatomy of plants.

Unit 3

Structural organization in animals; Structural organization in animals: animal tissues, morphology and anatomy of animals.

Unit 4

Cell- Basic unit of life; Cell theory, Cell structure and functions; Cell cycle and cell division; Bio-molecules.

BSMB108-19 Basics of Bioscience Lab

List of Practicals

1. General guidelines for Good lab Practices
2. Description of flowers including floral diagram, floral formula, V.S. of flower of the representative genera of families mentioned in syllabus.
3. Simple staining
4. Tissue sectioning and microscopic analysis
5. Bright field microscopy
6. Each student required to submit a family wise herbarium consisting of at least 20 properly pressed and mounted plants.
7. Identification of animal specimens (chordates and non chordates).

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BTHU103-18 English

Unit-1 (Introduction)
Theory of Communication, Types and modes of Communication, Communication at Workplace.

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 (Reading and Understanding)
Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation (from Hindi/Punjabi to English and vice-versa), Literary/Knowledge Texts, Common Everyday Situations: Conversations and Dialogues.

Unit-4 (Writing Skills)
Documenting, Report Writing, Making notes, Letter writing-Formal and Informal.

Suggested 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 • On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

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BTHU104-18 English Lab

Interactive practice sessions in Language Lab on Oral Communication
•Listening Comprehension
•Self Introduction, Group Discussion and Role Play
•Common Everyday Situations: Conversations and Dialogues
•Communication at Workplace
•Interviews
•Formal Presentations
•Monologue
•Effective Communication/ Mis-Communication
•Public Speaking

Suggested Readings:

1. Fluency in English -Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

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HVPE101-18 Human Values, De-addiction and Traffic Rules
Ability enhancement Compulsory Course (AECC)

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4.Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5.Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels

Module 2: Understanding Harmony in the Human Being - Harmony in Myself

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10.Understanding the characteristics and activities of 'I'and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail.
12. Programs to ensure Sanyam and Swasthya - Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship.

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
15.Understanding the meaning of Vishwas; Difference between intention and competence
16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence.

19.Understanding the harmony in the Nature
20.Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature
21.Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics.

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25.Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations

Reference Books

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human IK Gujral Punjab Technical University Jalandhar B.Sc. Biotechnology Batch 2018 Onwards Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://uhv.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story

HVPE102-18 Human Values, De-addiction and Traffic Rules Lab
Ability enhancement Compulsory Course (AECC)

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar atleast once during the semester. It will be binding for all the students to attend the seminar.