

GUJARAT TECHNOLOGICAL UNIVERSITY

BIO-TECHNOLOGY(04) BASIC TAXONOMY AND TECHNIQUES SUBJECT CODE: 2140402 B.E. 4th SEMESTER

Type of course: B.E. (Biotechnology)

Prerequisite: Basic Concepts of Classification of Organisms

Rationale: For the better understanding of Biotechnology, it is important to understand the key features and classification of various organisms. It encompasses characterization, nomenclature and classification of different microorganisms, plants and animals including humans. By understanding of various techniques used as taxonomical tools, the students will be equipped to characterize and discover new organisms for industrial exploitation.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
2	0	2	4	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Topics	Teaching Hrs.	% Module Weightage
1	UNIT I: History & Terminologies Historical background of taxonomy-contributions of Aristotle, Theophrastus, Linnaeus, Whittaker, etc. Meaning of taxonomy, classification, nomenclature, Scientific nomenclature, species, genus, family, class, phylum, kingdom, etc.	4 hrs	12.5%
2	UNIT II : Taxonomical Techniques Morphological, anatomical and biochemical characterization of the organisms, techniques of genetical and molecular characterization of the organisms – GC%, sequencing, homology, conserved sequences and 16S rRNA analysis.	4 hrs	12.5%
3	UNIT III: Plant Taxonomy Introduction to plant taxonomy, diversity in plants, early attempts of plant classification, present status of plant taxonomy, scientific nomenclature of plants, important methods of plant classification, important plant families, scope and importance of plant classification, recent developments in plant taxonomy.	8 hrs	25%
4	Unit IV : Animal Taxonomy Introduction to animal taxonomy, diversity in animals, early attempts of animal classification, present status of animal taxonomy, scientific nomenclature of animals, important methods of animal classification, important phyla of animals, scope and importance of animal classification, recent developments in animal taxonomy.	8 hrs	25%

5	Unit V : Microbial Taxonomy Introduction to microbial taxonomy, microbial diversity, early attempts of microbial classification, present status of microbial taxonomy, scientific nomenclature of microorganisms, important methods of microbial classification, categories of microorganisms, scope and importance of microbial classification, recent developments in microbial taxonomy.	8 hrs	25%
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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
16	18	22	7	7

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Animal Physiology and biochemistry by R. A. Agarwal,, Anil Shrivastav, Kaushakumar.
2. A text book of Animal Physiology by Sambasivah, Rao and S. Augustine
3. Cell Biology, Genetics.... By P.S. Verma
4. General Microbiology by Pawar and Daginevala
5. General Microbiology by Pleczar and Chain
6. Botany by R.C. Dutta

Course Outcomes:

After successful completion of the course students should be able to:

1. Know the history of taxonomical developments
2. Develop understanding of taxonomical terminologies.
3. Develop understanding and applications of plant taxonomy.
4. Develop understanding and applications of animal taxonomy.
5. Develop understanding and applications of microbial taxonomy

List of Practicals:

1. To study the taxonomical characteristics of plants
2. To study the T.S. of Dicot Root
3. To study the T.S. of Dicot Stem
4. To study the T.S. of Monocot root
5. To study the T.S. of Monocot Stem
6. To study various tissues and organs of plants in permanent slides
7. To study various tissues and organs of animals in permanent slides
8. To study the mitosis in onion root tips
9. To study the effect of metal on growth of bacteria
10. To study the effect of pH on bacterial growth
11. To isolate and cultivate fungi from soil sample
12. Special studies related to taxonomy

Open Ended Problems:

The students are free to select any area of **basic taxonomy** and **techniques** based on biotechnological applications to define projects. Some suggested projects are listed below:

Characterization of living organisms for taxonomical classification:

- (1) **Lower plants**
- (2) **Higher plants**
- (3) **Lower animals**
- (4) **Higher animals**
- (5) **Bacteria**
- (6) **Fungi**

Major Equipment:

- **Laminar Air flow**
- **Auto clave**
- **Spectrophotometer/Colorimeter**
- **Centrifuge**
- **Rotatory Shaker**
- **Microscope**

List of Open Source Software/learning website:

Students can refer to video lectures available on the websites including NPTEL. Students can refer to the CDs which are available with some reference books. Students can prepare charts for better understanding and demonstration of different classification systems and taxonomical groupings of the organisms

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.