

SRI VENKATESWARA UNIVERSITY :: TIRUPATI
PROGRAMME: B.Sc. (Honours) in Biotechnology (**Minor**)
w. e. f. AY 2025-2026
Semester V

Course: V-1: Marine Biotechnology
Maximum Marks Theory: 100 + Practical: 50

I. Learning outcomes:

Students will be able to

1. Explain the fundamentals of marine ecosystem
2. Identify commercially important marine organism and their feed
3. Have insight into the techniques of disease identification in marine organisms
4. Understand the concept of biofouling and antifouling and its effects

UNIT – I - The marine ecosystem and its functioning

Intertidal, estuarine, salt marsh, mangrove, coral reef, coastal & deep sea ecosystems. Hydrothermal vents - biodiversity of organisms. Marine microbes - unculturable bacteria, occurrence, characteristics and exploitation

UNIT – II - Bioactive compounds from marine organisms

GFP, RFP characteristics and their applications, Green mussel adhesive protein, Marine hydrocolloids - Agar, Agarose, Chitosan, Chitin, Alginate, Carrageen and its applications, Marine enzymes and their applications in food processing, Marine Pharmaceuticals – Zinconotide, Dolostain, Bryostain.

UNIT – III - Aquaculture

Culturing of shrimp, edible mollusks, oysters, pearl oysters. Culture of live feed organisms - brine shrimp, marine algae. Techniques for identification of bacterial & viral pathogens in aquaculture Methods of diagnosis of SEMBV, MBV and Vibrio diagnosis, Probiotic and Prebiotic bacteria and their importance in aquaculture; Vaccines in aquaculture: Fish, shrimps & prawns

UNIT – IV - Chromosome manipulation in aquaculture

Hybridization; Ploidy induction; Gynogenesis, Androgenesis and sex reversal in commercially important fishes; Cryopreservation of fish gametes and embryo; Transgenic fishes - Antifreeze and metallothioneine gene.

UNIT – V- Bioremediation

Biofouling, biofilms, corrosion and antifouling treatment. Ballast water, consequences & management. Red tides: causative organisms and control. Control of oil spills and bioremediation.

Practical syllabus: V-1: Marine Biotechnology

III. Skill outcomes:

On successful completion of the practical course, student shall be able to

1. Learn to apply Biochemical tests for identification of Marine bacteria
2. Discuss the various steps involved in conducting research
3. Acquire hands on training on Plankton analysis
4. Learn to know disease identification in shrimps and fishes

IV. Practical syllabus:

1. Biochemical tests for identification of Marine bacteria.
2. Measurement of growth of microorganisms.
3. Plankton analysis.
4. Isolation, characterization and antagonistic effects of probiotic bacteria against fish pathogens.
5. Identification of Shrimp/Oysters/Fishes (Spotters)
6. Estimation of Ammonia from shrimp pond
7. Disease identification in shrimps and fishes.
8. Isolation of chitin and chitosan from shrimp waste.

V. References:

1. Milton Fingerman, Nagabhushanam. R, Recent Advances in Marine Biotechnology, Vol. 8: January 1, Science Publisher, (2003).
2. Kim, Se-Kwon, Springer Handbook of Marine Biotechnology, Springer Handbooks, (2014) Pillay T V R; Kutty M N, Aquaculture: Principles and practices, 2nd edition, Blackwell Pub.,(2005).
3. Ronald M. Atlas , Richard Bartha, Microbial Ecology: Fundamentals and
4. Applications (4th edition), Benjamin Cummings, (1997).
5. Marco Saroglia, Zhanjiang Liu, Functional Genomics in Aquaculture, Wiley Blackwell (2012).
6. Laboratory manual on methodologies for assessing Biodiversity in estuaries,
7. Mangroves and coastal waters – Annamalai University.

Course: V-2: Organic farming & Biofertilizers

Maximum Marks Theory: 100 + Practical: 50

I. Learning outcomes:

Students after successful completion of the course will be able to

1. Understand the soil profile and nutrients in soil
2. Appreciate the importance of organic manure and bio fertilizers
3. Produce vermi compost, farmyard manure from bio waste
4. Acquire skill on isolation and maintenance of bio fertilizers

II. Syllabus:

UNIT -1: Soil

Definition, soil formation, composition and characteristics. Types of soils. Distribution of soil groups in India. Acidic, Alkaline and heavy metal contaminated soil. Methods of reclamation. Effects of chemical dependant farming on yield and soil health.

UNIT-2: Plant Nutrition

Macro and micro nutrients, functions of nutrients in plant growth and development. Nutrient uptake and utilization by plant. Types of fertilizers. Organic, inorganic and bio fertilizers. Chemical fertilizer. Advantages & disadvantages of their use. Importance of organic and bio fertilizers.

UNIT-3: Organic Farming

Definition, concept, benefits. Integrated farming system (combination of organic and inorganic). Mixed farming system. Concept of different cropping systems in relation to organic farming, Inter cropping, crop rotation. Organic farming process. Organic fertilizers, crop nutrients and effective microorganisms in Organic farming.

UNIT-4: Organic Compost

Definition, types of compost, farm yard compost, green leaf compost, animal husbandry, animal housing, animal feeding, animal health, breeding goals. Vermicompost: Introduction, vermi composting material, species of earthworms, small scale, large scale composting process. Vermicastings, harvesting, processing and drying. Nutrient content of Vermicompost. Field application methods.

UNIT-5: Biofertilizers

Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers: *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*. Cyanobacterial Biofertilizers: *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal Biofertilizers: AM mycorrhiza and ectomycorrhiza. Mechanism of nitrogen fixation and phosphorus solubilization.

Practical syllabus: V-2: Organic farming & Biofertilizers

III. Skill outcomes:

On successful completion of the practical course, student shall be able to

1. Estimate NPK levels in the soil
2. Demonstrate the collection and processing of raw material
3. Develop skill of vermicompost production
4. Learn the technique of establishing organic farms
5. Equip with the skill of preparation of microbial media

IV. Practical syllabus:

1. Collection of different soil samples
2. Qualitative estimation of nitrogen, phosphorus and potassium in soil samples
3. Collection of fruit, vegetable and other domestic waste
4. Preparation of compost beds and introducing earthworms
5. Collection of vermi castings
6. Sieving, drying and packing of vermi compost
7. Visit to animal shed and observing farm yard manure production
8. Preparation of media and isolation of bio fertilizers

V. References:

1. *Principles of Organic Farming::* by E Somasundaram,D Udhaya Nandhini,M Meyyappan ;**2021**
2. *Organic farming in India:* by Arpita Mukherjee; 2017
3. *Biofertilizer and biocontrol agents for agriculture;* by AM Pirttilä · 2021
4. *Trends in Organic Farming in India;;* by S. S. Purohit, 2006
5. *Biofertilizers for Sustainable Agriculture and Environment;;* by Bhoopander Giri Ram Prasad, Qiang-Sheng Wu, Ajit Varma; 2019