



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Integrated Master of Science (Biotechnology)**

**Semester: 8**

**Subject Name: Aquatic Pharmacology**

**Subject Code: 1380414**

**Prerequisite:**

Basic knowledge of biochemistry, physiology, and microbiology is required. Understanding drug interactions, pharmacokinetics, and aquatic toxicology will help students explore the effects of drugs on aquatic organisms, their metabolism, and the development of therapeutics for disease management in aquaculture.

**Rationale:**

This course focuses on drug action, pharmacodynamics, and therapeutic applications in aquatic organisms. It equips students with knowledge of antimicrobial agents, immunostimulants, vaccine development, and regulatory guidelines, ensuring effective disease management, biosecurity, and sustainable aquaculture practices.

**Course Scheme:**

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Practical	
			ESE (E)		PA(M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

**Course Content:**

Unit No.	Content	No. of Hours	Weightage (%)
1	<b>Introduction to marine pharmacology</b> Terms and definitions. Medicinal compounds from marine flora (seaweeds, seagrass, mangroves); Medicinal compounds from marine fauna (sponges, coelenterates, bryozoans, tunicates, dinoflagellates, marine bacteria); Pharmacological activities-antitumor, antiviral, antihelminthic, antiparasitic, anti-inflammatory.	12	20
2	<b>Biomedical potential of marine natural products</b> Isolation, structural elucidation – Pharmacologically important novel marine metabolites (Loihichelins A-F, Palmerolide A, Bryostatins, Dolastatin-10, Discodermolide); Mode of action – Clinical Applications.	12	20
3	<b>Applied fish pharmacology</b> Fish disease control – antibacterial drugs, chemotherapeutic agents; Pharmacodynamic agents – Anaesthetics, breeding induction agents, sex control, immunostimulants, vaccines, disinfectants, osmoregulators.	12	20
4	<b>Introduction to nanoparticles</b>	12	20



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	Biological synthesis of nanoparticles from Marine flora and fauna; Characterization using UV-Vis, XRD, EDX, HRTEM, FTIR analysis; Biomedical applications like antimicrobial agents, medical therapeutics and diagnosis, cell labelling, cancer therapy; Role of Nanoparticles in the Drug delivery system.		
<b>5</b>	<b>Introduction to Pharmacogenetics</b> High throughput screening for drug discovery, Identification of drug targets; Drug development – Pharmacogenomic based therapeutic applications; Recent advances in Pharmacology, Role of Biostatics; Pharmaceutical Industry, Drugs used in fish transportation.	12	20
	<b>Total Hours:</b>	60	100

**Textbook:**

1. Aquaculture Pharmacology, 1st Edition, 2020 – Frederick Kibenge, Bernardo Baldisserotto, Roger Chong, Academic Press.
2. Applied Fish Pharmacology, 2000 – Treves-Brown, K. M, Kluwer Academic Publishers, The Netherlands.
3. Marine Biotechnology, Vol I: Pharmaceutical and Bioactive Natural Products, 1993 – D.H. Attaway, O.R. Zaborsky, Plenum Press, USA.
4. Marine Bioactive Compounds: Sources, Characterization and Applications, 2012 – Maria Hayes, Springer.
5. Biosynthesis of Marine Natural Products: Microorganisms and Macroalgae, 1999 – B.S. Moore, RSC (Royal Society of Chemistry).

**Reference Books:**

1. Marine Pharmacology, 2000 – Faulkner, D.J., Antonie van Leeuwenhoek, Springer.
2. Pharmacogenomics and Proteomics Enabling the Practice of Personalized Medicine, 2006 – H.Y. Wong, American Association for Clinical Chemistry.
3. Pharmacogenomics: Applications to Patient Care, 2004 – Julie A. Johnson, Vicki L. Ellingrod, Deanna L. Kroetz, Grace M. Kuo, American College of Clinical Pharmacy.
4. Bio-Nanoparticles: Biosynthesis and Sustainable Biotechnological Implications, 2015 – Om. V. Singh, Wiley-Blackwell.
5. Safety of Nanoparticles: Biomedical Applications of Nanoparticles, 2008 – G.L. Prasad, Springer, New York.
6. Nanoparticulate Drug Delivery Systems, 2021 – Raj Keservani, Anil K. Sharma, Apple Academic Press.

**Course Outcomes:**

No.	Course Outcomes	RBT Level*
1	Describe the fundamental principles of pharmacology, including drug classification, mechanisms, and metabolism in aquatic organisms.	RM, UN
2	Explain the pharmacokinetics and pharmacodynamics of drugs used in aquaculture for disease prevention and treatment.	UN, AP



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3	Analyze the effects of antibiotics, immunostimulants, probiotics, and other therapeutic agents on aquatic health and ecosystems.	AN, EL
4	Evaluate the regulatory guidelines, withdrawal periods, and environmental impacts of drugs used in aquaculture.	EL, CR
5	Apply pharmacological principles to develop and optimize disease management strategies, including vaccines and biocontrol agents for sustainable aquaculture.	AP, CR

\*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

**Suggested Course Practical List:**

Not Applicable

**List of Laboratory/Learning Resources Required**

Not Applicable

