



GU/Acad –PG/BoS- CDT /2025-26/616

Date: 08.12.2025

CIRCULAR

The syllabus of the Change of Discipline Test (CDT) for **Master of Science in Marine Microbiology** Programme, approved by the Academic Council in its meeting held on 7th November 2025 is attached.

The Dean/Vice-Dean (Academic) of the School of Earth, Ocean and Atmospheric Sciences and the Principals of all the affiliated Colleges are requested to take note of the above and bring the contents of this Circular to the notice of all concerned, including students aspiring to pursue the Master's Programmes.

(Ashwin V. Lawande)
Deputy Registrar – Academic

To,

1. The Dean, School of Earth, Ocean and Atmospheric Sciences, Goa University.
2. The Vice-Dean (Academic), School of Earth, Ocean and Atmospheric Sciences, Goa University.
3. Principals of all the affiliated Colleges.

Copy to:

1. Controller of Examinations, Goa University.
2. Assistant Registrar (Admissions), Goa University.
3. Assistant Registrar Examinations (UG/PG), Goa University.
4. Director, Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.



GOA UNIVERSITY

SYLLABUS FOR CHANGE OF DISCIPLINE TEST (CDT) **FOR MASTER OF SCIENCE IN MARINE MICROBIOLOGY PROGRAMME**

Effective from AY: 2026-2027

Modules	Content
Module 1:	Microbiology Diversity and distribution of various microbial groups, classification schemes; Germ theory of diseases; Role of microorganisms and their applications; types of associations; Structure of prokaryotes (Archaea and Eubacteria) and eukaryotes, and differences, Organization and ultrastructure of prokaryotic cell (Bacterial cell). Endospore: structure, sporulation and germination; Eukaryotic cell organelles; Nutritional types; Prebiotics, Probiotics,
Module 2:	Biochemistry Biomolecules; qualitative and quantitative tests for carbohydrates, proteins, nucleic acids, lipids; L & D forms; Aerobic and anaerobic respiration; major pathways in heterotrophs & regulation: EMP, HMP, ED pathway, TCA pathway; Pasteur effect; mixed acid fermentations; enzymes, coenzyme, cofactors, prosthetic group; classification and nomenclature; specific activity of enzymes; mechanism of action; activation energy, multienzyme complex, enzyme inhibition; isozyme; mechanisms of solute transport.
Module 3:	Microbial growth and Bio-energetics Bacterial growth, measurement, batch and continuous culture, generation time and specific growth rate; environmental factors affecting growth and types of microorganisms. Different nutritional types; Bioenergetics: Gibb's Free Energy, standard free energy change and equilibrium constant, Coupled reactions and additive nature of standard free energy change; ATP as a high energy system; ETC and oxidative phosphorylation, substrate level phosphorylation.
Module 4:	Cell Biology Cell to cell interactions: eukaryotic cell membrane, extra cellular matrix and cell matrix interactions, cell surface protrusions, types of cellular junctions - adhesion, tight, gap and plasma-desmata. Protein sorting and transport: Ribosomes, Endoplasmic Reticulum – targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, smooth ER, export of proteins and lipids. Golgi apparatus - organization, protein

	glycosylation, protein sorting and export. Mitosis and meiosis, cell death and apoptosis; Stem cells and their applications.
Module 5:	Microbial Genetics DNA, purines, pyrimidines, nucleosides, nucleotides, Watson-Crick model; prokaryotic DNA; eukaryotic DNA, mitochondrial and chloroplast DNA; modes of replication; transcription in prokaryotes and eukaryotes; post-transcriptional modification; ribozyme, ribosomes; translation; inhibitors of protein synthesis; protein organization, glycosylation, protein sorting and export from Golgi Apparatus; Operons, induction and repression; conjugation, transformation, transduction; mutations – types, mutagenesis, dna damage and repair; recombination – Holliday model; Lytic and lysogenic cycles; Mutations; Auxotrophs, Complementation Test. Types of mutations; Molecular recombination; Molecular taxonomy
Module 6:	Techniques Isolation: cultivation, maintenance and preservation of pure microbial cultures; cultivation of anaerobic bacteria. Sterilization; Culture media; Physical methods of microbial control; Chemical methods of microbial control; Staining principles: mordants, fixatives and decolorisers, definition of dyes, types of staining – Gram staining, monochrome staining and negative staining; Microscopy; Micrometry; Spectroscopy; pH and Buffers; pH Meter; Chromatography; Electrophoresis: polyacrylamide gel electrophoresis, and Agarose gel electrophoresis; Centrifugation; DNA amplification and sequencing: PCR, Sanger's method, Maxam and Gilbert's method
Module 7:	Microbial Ecology and the Environment Ecosystems - structure and functions, producers, consumers and decomposers, energy flow, ecological pyramids, food chains and webs. Community structure: ecological succession, trophic structure-zonation and stratification. Habitats: aquatic, terrestrial - soil, atmospheric, plants – endophytes, extreme environments; application of microbes in environment - solid waste treatment, liquid waste treatment; BOD, COD; Microbial interactions – mutualism, commensalism, synergism, syntrophism, competition, antagonism, amensalism, parasitism, predation; bioluminescent bacteria; microbial bioremediation, biomagnification, eutrophication, water analyses & water potability; biofilms; biofertilisers, nitrogen fixation, phosphate solubilization, biopesticide; Biogeochemical cycles: C, N and role of microorganisms.
References/ Readings:	1. Atlas, R. M., & Bartha, R. (1998). <i>Microbial ecology: Fundamentals and applications</i> (4th ed.). Benjamin/Cummings Science Publishing, Menlo Park, CA. 2. Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). <i>Biochemistry</i> (9th ed.). Macmillan Learning, New York. 3. Campbell, R. E. (1983). <i>Microbial ecology</i> (2nd ed.). Blackwell Scientific Publications, Oxford.

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