	Implementation schedule	Physically /remotely	Workload (hours) On site or remotely	Learning outcomes
Activity 1 Bioinformatic tools for antibody selection	To provide an overview of bioinformatic techniques of importance in marine biotechnology. Marine Bioinformatic tools can be utilized towards developing a biosensor, both in laboratory and networking technology fields to also achieve the goal of finding natural bioactive compounds from marine organisms as potential drugs, antifouling compounds, biomaterials etc. An introduction to databases of sequence patterns and protein families will be given, databases with biological information are reviewed with emphasis on databases with protein sequence and function repositories.	Physically/ remotely	35	Introduce the students to databases of sequence patterns and protein families, databases with biological information with emphasis on databases with protein sequence and function repositories.
Activity 2 Antibody-Based Affinity Tools for aquatic pathogens Biosensing	Antibody-based detection systems have long been chosen to facilitate on-site monitoring of environmental markers. Antibodies were the first detection molecules to be seen as effective replacements to mouse bioassays, high-performance liquid chromatography (HPLC) and mass-spectrometry (MS)-based systems. Antibodies have progressed significantly in their capabilities over the past 70 years, with much investigative research being	Physically/ remotely	33	Introduce the students to antibododies' immobilization techniques, optical and electrochemical biosensor assays.

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	carried out with regard to their production, purification, sensitivity enhancement and their incorporation into sensor platforms for the detection of pollutants.			
Activity 3 Paper-Based Devices for Pathogens Detection in Water	Although conventional methods, e.g., polymerase chain reaction (PCR), can provide reliable and robust detection results, they are often time- and cost-consuming, limiting their application in resource-poor settings. Recently, paper-based devices, as a new biosensing technique, have emerged as promising tools to conventional methods for pathogen detection. A comprehensive introduction and insights on the development of paper-based devices for the pathogen detection in water will be given. Firstly, the substrate materials and fabrication methods for paper-based devices are introduced. Engineering assay onto paper-based devices for pathogens detection will be explained for the rapid and on-site monitoring. We will also compare the strengths and drawbacks between paper-based devices and the conventional analytical methods, including culture method, biochemical test, immune assay, and molecular method.	Physically	33	Introduce the students to the development of paper-based biosensor assays, substrate materials and fabrication methods.

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Activity 4 Electrochemical MIP Sensors for Environmental Analysis	Both voltametric and potentiometric electrochemical sensors allow the sensitive online measurement by simple instrumentation; however, they are restricted to electroactive substances, and their specificity is frequently not sufficient. The combination of electrochemical sensors with biomimetic recognition elements, e.g., molecularly imprinted polymers (MIPs), has the potential for highly sensitive and specific analysis. In the MIP synthesis, functional monomers interact with the target analyte (so-called template) to the pre-polymerization complex. It is “frozen” by the formation of a polymer network around the template. Subsequently, the template is removed, and binding cavities are formed in the polymer: they mirror the size, shape, and functionality of the template, which is preferentially bound from complex media. Electrochemical MIP sensors unify the potentials of synthetic binders with simple electrochemical instrumentation.	Physically	33	Introduce the students to the development of molecularly imprinted polymers electrochemicall sensors, biomimetic recognition elements and fabrication methods.
Activity 5 **Report**	Report on the abovementioned activities.	Physically/ remotely	33	Deep understanding of the content of the abovementioned activities.

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Activity 6 **Presentation**	Presentation of the abovementioned activities.	Physically/ remotely	33	Deep understanding of the content of the abovementioned activities.

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