**Title:** Microplastics Quantification

**Course Description:**
Microplastics Quantification is a hands-on, field-to-lab training course designed for industry professionals, early-career scientists, government researchers, academic specialists, nonprofit organizations, and analytical laboratory personnel who seek to deepen their expertise in microplastic sampling, processing, and analysis. This course covers a comprehensive range of methods—from initial field collection and laboratory protocols to advanced analytical techniques like FTIR, Raman, and Py-GC/MS. Participants will learn from experts while engaging in real-world sampling activities along Oahu's coasts, gaining valuable insight into marine debris challenges and exploring cutting-edge research shaping the future of microplastic quantification.

**Key Learning Outcomes:**

- Understand and apply various microplastic sampling methods to different environmental media (water, sand, sediment).
- Acquire hands-on experience with established processing techniques and analytical protocols Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, and pyrolysis gas chromatography and mass spectroscopy (py-GC/MS).
- Explore the complementary nature of multiple analytical approaches and their pros and cons.
- Compare various standardized methods (ISO, GLP, ASTM) for accurate and reproducible quantification.
- Gain familiarity with the broader context of marine pollution prevention, mitigation, and policy implications in the Pacific region.

**Instructional Approach:**
This course combines practical fieldwork with laboratory demonstrations, short focused lectures, and expert-led discussions. Participants will collect samples via buoyancy separation device (BSD) and manta trawl net, process collected materials using various standard techniques, and perform in-depth analyses using state-of-the-art instrumentation. Facility tours, guest lectures, and references to international methods (CSIRO, ASTM) will supplement the core curriculum, providing a global perspective. Students will interact with instrument specialists and research leaders, ensuring comprehensive exposure to current best practices and emerging trends in microplastic analysis.

**Sample Course Activities & Topics**

| Activity Type | Sample Topics & Exercises | Learning Objectives |
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| **Foundational Learning** | - Participant introductions and course goals<br>- Overview of microplastic issues<br>- Laboratory safety training & instrument orientation | Establish a contextual understanding of microplastic pollution, clarify course expectations, and ensure participant safety |
| **Field Sampling Techniques** | - Manta trawl sampling in water<br>- BSD sampling<br>- Initial sample handling and documentation | Gain hands-on experience with real-world sampling methods, understand sample integrity, and prepare samples for analysis |
| **Sample Processing Methods** | - Trash Time Machine (TTM)<br>- Sieving and DSD (Density Separation Device) techniques<br>- Extraction demonstrations | Learn and apply standardized protocols for isolating and preparing microplastics from various environmental matrices |
| **Advanced Sampling & Methodologies** | - NOAA 100m transect method<br>- CSIRO timed hand-picking method<br>- Intro to analytical methods (µFTIR, µRaman, py-GC/MS)<br>- Review of State of CA accredited methods for WWTP samples | Explore a range of complementary approaches and methods, understand their pros/cons, and become familiar with cutting-edge industry standards |

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| **Analytical Instrumentation & Techniques** | - In-depth FTIR, Raman, Py-GC/MS training<br>- Technique comparison and suitability for different sample types<br>- Data interpretation and method optimization | Develop competency in selecting and using appropriate analytical tools for microplastic identification and characterization |
| **Facility Tours & Applied Context** | - Tour of the Plastic Recycling Research Facility (PRRF)<br>- Hands-on sorting exercises<br>- Discussion of real-world implications of data | Connect laboratory methods to large-scale operations, observe real-world recycling practices, and consider how data informs environmental decision-making |
| **Quantification, Interpretation & Conclusion** | - Quantitative vs. qualitative analyses<br>- Addressing sample matrix challenges and contamination issues<br>- Method comparison, result interpretation, and best practices<br>- Final discussions, certificate distribution, and networking | Refine analytical reasoning, build confidence in data interpretation, understand the complexities of quantifying microplastics, and plan for future applications |