1. **Title**: Environmental Monitoring for the Food, Beverage, and Natural Product Industry
2. **Form contents last revised date**: 11/03/2020
3. **Catalog/ website course description**: To assist the food, beverage and natural product manufacturing industry in understanding, developing, and implementing impactful and appropriate Environmental Monitoring Plans (EMPs).
4. **Course length**:
	1. 3 Lecture hours (includes 2 15-20 minute breaks)
	2. 1 Activity hour
	3. 4 total contact hours
5. **Student to Instructor/Technician ratio**: TBD
6. **Learning objectives**:
	1. Understand the purpose of an environmental monitoring program.
	2. Determine if an environmental monitoring program is necessary for your facility and, if so, how to develop and implement one.
	3. Recognize the importance of sanitation, sanitary facility design, and good personnel training and hygiene and how it all relates to a successful environmental monitoring program.
	4. Understand the importance of microbes, food-borne pathogens, allergens, and ATP in a manufacturing setting.
	5. Understand how environmental monitoring relates to public health and product quality and how it benefits your business.
	6. Identify different types of environmental monitoring tests and sampling.
	7. Interpret and organize data and monitor results.
7. **Target industry**: Food and beverage; Commercial and regulatory settings; wet or dry food production
8. **Primary audience**: Production associates, supervisors, quality team, management
9. **Portability?**: Class is mobile, location to be determined by BioNetwork FBNP Director and Customized Training Director
10. **Prerequisites, if applicable**: Participants should have a basic understanding of Food Safety, Biological and chemical hazards, FDA regulations and Quality Control Concepts
11. **Instructor credentials or qualification requirements, if applicable**: N/A
12. **Is there an industry standard, state, or national certification for this course**?: N/A
	1. **If yes to Q12 above, list certification entity & website URL**: N/A
	2. **Learning outcomes/requirements**: N/A
13. **Standards and reference material**: N/A
14. **Suggested key terms**:
	1. Microorganisms, foodborne pathogens, indicator organisms, transient and resident organisms
	2. SOP (Standard Operating Procedure)
	3. Validation, verification
	4. Sanitary design, hygienic zoning, harborage sites
	5. Adenosine triphosphate (ATP), luminometer, ELISA, lateral flow devices, polymerase chain reaction (PCR)
	6. Corrections, corrective actions, record keeping, data analysis
15. **Description and objectives of student hands-on exercises**:
	1. Activity 1: Rank These Facilities
		1. Participants will be given a list of manufacturing facilities with short descriptions regarding what the companies make and some of their practices. They will then be asked to rank the facilities in order of who needs an environmental monitoring program the most to who needs one the least. This will help participants retain the information they’ve learned so far about why it’s important to have an EMP and which aspects of your product and/or facility are important to consider when determining whether or not their company needs an EMP.
	2. Activity 2: Glo-Germ (This activity can be modified if class is to be taught in a virtual setting)
		1. Participants will be given instructions on how to apply glo-germ to a specific piece of equipment and then will be asked to move the object around the room and among people. We will then use a blacklight to track the movement of the “germs”. This will build interest for the upcoming information about sanitation, hygiene, and microbes and will demonstrate their importance. It will also demonstrate how important these concepts are and how easily things spread, even when we can’t see them.
	3. Activity 3: Using a Luminometer (This activity can be modified if class is to be taught in a virtual setting)
		1. Participants will be given detailed instructions on how to swab and use the Hygiena luminometer. They will then be allowed to choose a location in the training room to swab and test for ATP residues. We will also execute a test before and after their company’s sanitation procedure to determine whether or not the process and application was successful. This activity will demonstrate the importance of an effective sanitation program and will help participants learn proper swabbing technique.
	4. Activity 4: Data Interpretation
		1. Participants will be given a spreadsheet containing different types of environmental monitoring data. Using what they’ve learned so far, they will be asked to identify potentially concerning data, will learn about problems commonly associated with records, and will help them learn how to identify trends as well as how to interpret data.
16. **Text and supplies needed**:
	1. Powerpoint slides (with notes section) workbook for each participant
	2. Activity Workbook for each participant
	3. Glo-Germ Kit
	4. Hygiena Luminometer
		1. Hygiena swabs
		2. Cooler for housing swabs
17. **Recommended images used for course promotion**:
18. **Outline**:
19. Introduction
	1. Agenda, schedule, ice breaker
	2. Objectives & introduction to the topic of environmental monitoring
20. Why should food manufacturing facilities have an environmental monitoring program?
	1. Validation of sanitation plan, food safety
	2. Pathogen control
	3. Is an environmental monitoring program necessary for your facility?
	4. Activity 1: Rank These Facilities
21. Developing an environmental monitoring program
22. Implementing an environmental monitoring program
	1. Create a team
	2. Evaluate your facility and products
	3. Establish a baseline
	4. Establish a verification program
	5. Reevaluate as necessary
23. Sanitary facility design
	1. Activity 2: Glo-Germ (This activity can be modified if class is to be taught in a virtual setting)
24. Personnel & Training
	1. Hygiene
	2. Swabbing technique
25. What are we testing for?
	1. Pathogens
		1. Introduction
		2. Indicator organisms
			1. E. coli
			2. Listeria monocytogenes
		3. Transient & Resident organisms
	2. ATP
		1. Introduction
		2. How to test for it and how does it work?
		3. Activity 3: Using a Luminometer (This activity can be modified if class is to be taught in a virtual setting)
	3. Allergens
		1. ELISA tests
	4. Spoilage Organisms
		1. Testing methods
26. Tracking and trending data
	1. Tracking data
	2. Mapping
	3. Analysis
	4. Activity 4: Data Interpretation
27. Benefits of a good EMP
	1. Outbreak Prevention
	2. Verification of sanitation program
	3. Early warning system and hot spot identification
28. Facility Considerations
	1. Infrastructure
	2. Design
	3. Traffic Flow
		1. Mapping
		2. Hygienic Zoning
	4. Air & Water Flow
29. Tools & Timing Considerations
	1. Equipment and tools
	2. Timing recommendations
30. Results and Record Keeping
	1. Results and record keeping
	2. Corrections and corrective actions
	3. Reportable food registry
31. Validation
	1. Validation and validation of sanitation program
	2. Verification
32. Reviewing your Environmental Monitoring Program
33. Summary and Conclusion