



Quality Control Micro Biologist

VERSION 1

CURRICULUM / SYLLABUS

SHRM Version	1.0
Date	14.05.2026
Course code	SHRM/LS/03/2026
Mapped to QP Codes	





Preamble

Quality control is an important element for all consumer centric products. Companies invest heavily on this. But there are two dimensions to it - (1) QC from statutory, compliance and audit (2) ensuring that quality is always ensured as commitment to customers, beating competition, and avoiding any customer issues arising out quality strain.

Key industry / product segments are - Food and Beverages , water industry, Pharmaceuticals, Herbal products, Dairy, Cosmetics, Nutraceuticals, Biotechnology, Healthcare, and various other consumer-centric industries where quality and safety define brand success.

Here comes the need for Quality Control – Microbiologist. In industries where consumers are the primary stakeholders, a QC Microbiologist plays a mission-critical role in ensuring product safety, regulatory compliance, contamination control, and brand integrity on regular basis. Unlike general scientists who may focus on research and development, a QC Microbiologist safeguards the final product before it reaches the market—protecting public health, preventing recalls, minimising financial loss, and strengthening consumer trust. They can support on regular basis in the entire value chain and it would help such manufacturing units so that statutory compliance and QC audits are well managed. Thus they are different from a QC audit professionals but professionals who facilitates QC so that there are no shocks and surprises.

Accordingly we have designed a course on Quality Control - Microbiologist who can bridge the gap and support real-time industrial quality assurance demands. The course is for graduates and post graduates in Bio Technology/ Microbiology/ Biochemistry/ Food technology.

The course ensures that by implementing stringent microbial monitoring systems, validation protocols, environmental surveillance, and risk assessment strategies, QC professionals can directly contribute to enhanced product reliability and market credibility—ultimately driving customer confidence and increasing sales.

Eligibility

B.Sc in any field of life science and chemistry postgraduates in these fields
The course can be taken up as upskilling program too
Those engaged in relevant industries can also join to upskill themselves



Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills

1. Understand QC Microbiologist role, regulatory perspective, industry landscape
2. Refresh yourself on Microbiology relevant to QC Labs connected to Culture media basics (types & applications, Sterilization principles (moist/dry/filtration), Contamination routes in QC labs
3. Get thorough exposure to QC Laboratory Setup, Instruments & Workflow including Equipment qualification (IQ/OQ/PQ – theory), Good laboratory practices (GLP), QC lab zoning, workflow design, daily checklist & workflow etc.
4. Will be able to Media, Reagents & Culture Handling in QC Labs with particular reference to Media performance testing (GPT), Reagent preparation & control, Media failure & OOS concepts etc.
5. Thorough hands on understanding of Microbiological Testing – Core QC Tests including Water microbiology (PW, WFI, potable), Product-wise testing logic etc.
6. Environmental Monitoring & Contamination Control with proficiency in Air, surface & personnel monitoring, Trending & interpretation of EM data, Common EM failures & corrective actions
7. Work level Proficiency in Documentation, Data Integrity & Compliance aligned to GDP principles & ALCOA+, Batch records & logbooks, Audit readiness & inspection mindset
8. Quality Management Systems, Risk & CAPA lifecycle,
9. EHS, Biosafety & Waste Management, Chemical & biological hazards, Incident reporting & emergency response etc.
10. Industry Readiness & Internship Orientation

Relevant Industry

QC Microbiologists are typically required by following industries

1. Cosmetics, personal care, ayurvedic products
2. Pharma, In-house QC labs, pharma microbiology (QC Lab)
3. Food microbiology, safety testing, food & cosmetic testing, GLP, ISO, audit exposure
4. Dairy & beverages, Strong need for routine microbiology
5. Brewery & food processing
6. Beverage QC, Water & contamination control
7. Govt PSU, Structured QC microbiology
8. Formulations + QC labs
9. Water, waste water, food, hygiene microbiology,
10. Environmental microbiology



Course Anatomy

Total duration of the course 120 hours (of theory and practical sessions) PLUS Capstone Project 20 hours

Theory - 67 hours

Practical, Project assignments - 53 + 20 hours

Course structure Extensive demo and exercise
Several projects on use of various tools
Capstone project

Training Delivery In Hybrid Mode with offline classes from campus with remote access through smart classroom
Managed through a LMS platform with separate web page for each batch

Training Input All digital content available through web page of the batch

Lesson Planning Flexible structure customised each week while making the weekly roster.

Course Delivery

Program Delivery Pedagogy

- Interactive theoretical sessions to cover fundamental and advanced concepts.
- Practical sessions in a controlled environment to apply theoretical knowledge.
- Real-world scenarios to enhance problem-solving skills.
- A comprehensive project to apply learning in a practical, real-world context.
- Regular quizzes, assignments, and exams to evaluate understanding and progress.

Hands on training

- Media preparation and sterilization techniques (autoclaving, filtration)
- Aseptic handling and microbial culture techniques (streaking, spread plate)
- Isolation and identification of microorganisms using staining and biochemical tests
- Operation of laboratory instruments (laminar airflow, incubator, autoclave)
- Environmental monitoring (air, surface, and personnel sampling methods)
- Water microbiological testing (membrane filtration and MPN methods)
- Antibiotic sensitivity testing (Kirby-Bauer method)



Broad Coverage and Lesson Structure

	Topic	Total Hours	Theory hours	Lab hours	Industry Focus / Remarks
SECTION A : Introduction, Orientation and Refresher (18 hrs)					
Module 1 : Orientation to QC Microbiology & Industry Landscape (6 hrs)					
	Role of QC Microbiologist in pharma, food, water, cosmetics	1	1		Cross-sector exposure
	Regulatory overview: CDSCO, FSSAI, BIS, WHO-GMP, ISO	2	2		Audit & compliance mindset
	Differences in QC approach across industries	2	2		Industry comparison
	Lab hierarchy, QC vs QA, career pathways	1	1		Career clarity
Module 2 : Basic Microbiology Refresher for QC Labs (12 hrs)					
	Microbial classification relevant to QC	1	1		QC-specific microbes
	Cell structure, spores, fungi, yeast	1	1		Contamination relevance
	Growth kinetics & control measures	2	2		Preservation & control
	Culture media basics (types & applications)	3	1	2	Industry media usage
	Sterilization principles (moist/dry/filtration)	4	2	2	Process control
	Contamination routes in QC labs	1	1		Failure prevention
SECTION B : QC Labs, Media handling, Testing (61 hrs)					
Module 3 : QC Laboratory Setup, Instruments & Workflow (10 hrs)					
	QC lab zoning & workflow design	1	1		GMP layout
	Equipment overview: incubators, autoclaves, LAF, BSC	3	2	1	Daily QC operations
	Equipment qualification (IQ/OQ/PQ – theory)	2	1	1	Regulatory requirement
	Cleaning, sanitation & disinfection strategy	1	-	1	Contamination control
	Good laboratory practices (GLP)	2	2		Audit focus
	QC lab daily checklist & workflow	1	1		Industry readiness
Module 4 : Media, Reagents & Culture Handling (15 hrs)					



	Types of media used in QC labs	1	1		Product-based selection
	Media preparation theory & controls	5	2	3	Error prevention
	Media sterilization & storage principles	1		1	Compliance
	Media performance testing (GPT)	4	1	3	Audit critical
	Reagent preparation & control	3		3	Traceability
	Media failure & OOS concepts	1	1		Deviation handling
Module 5 : Microbiological Testing – Core QC Tests (24 hrs)					
	Total viable count (TVC)	2	1	1	Routine QC testing
	Pathogen testing concepts	7	1	6	Food & pharma safety
	Sterility testing – principles & failures	7	1	6	High-risk testing
	Environmental monitoring theory	2	2		Cleanroom QC
	Water microbiology (PW, WFI, potable)	4	1	3	Utilities QC
	Product-wise testing logic	2	1	1	Industry adaptation
Module 6 : Using HPLC Machines in QC LAB (12 hrs)					
	Exposure to HPLC Machine	2	1	1	High end machine exposure
	introduction to basic and advanced chromatography techniques	5	1	4	Quality industry output
	Demo on use of HPLC Machine	5	1	4	Real life exposure
SECTION C : Monitoring, Documentation, Quality Management (24 hrs)					
Module 7 : Environmental Monitoring & Contamination Control (8 hrs)					
	Cleanroom classification (ISO, EU GMP)	2	2		Regulatory compliance
	Air, surface & personnel monitoring	4	1	3	Contamination tracking
	Trending & interpretation of EM data	1		1	Data-driven QC
	Common EM failures & corrective actions	1	1		CAPA linkage
Module 8 : Documentation, Data Integrity & Compliance (10 hrs)					
	GDP principles & ALCOA+	2	2		Audit readiness
	SOP structure & control	2	2		Document lifecycle
	Batch records & logbooks	2	2		Traceability
	Deviations, OOS & OOT	2	2		Investigation mindset



	Audit readiness & inspection mindset	2	2		Regulatory success
Module 9 : Quality Systems, Risk & CAPA (6 hrs)					
	Basics of Quality Management Systems	2	2		QMS foundation
	Risk assessment tools (theory)	1	1		Preventive QC
	CAPA lifecycle	2	2		Corrective systems
	Change control & impact assessment	1	1		Controlled change
SECTION D : Bio safety and Industry readiness (17 hrs)					
Module 10 : EHS, Biosafety & Waste Management (4 hrs)					
	Biosafety levels & lab safety	1	1		Placement requirement
	Chemical & biological hazards	1	1		Risk mitigation
	Biomedical & microbial waste management	1	1		Compliance
	Incident reporting & emergency response	1	1		Safety culture
Module 11 : Application of QC Microbiology in industry (4 hrs)					
	Application in Food and Water Industry	1	1		
	Application in Pharma	1	1		
	Application in Cosmetics & Nutraceutical	1	1		
	Skills that industry required from QC MB	1	1		
Module 12 : Industry Readiness, soft skills & Internship Orientation (9 hrs)					
	Communication and soft skill	2	1	1	Soft skill
	QC interview expectations, Resume & documentation readiness	2	1	1	Placement prep
	Lab ethics & professional behavior	1	1		Workplace conduct
	Internship dos & don'ts				On-site survival
	Real QC case discussions	4		4	Industry thinking
	TOTAL	120	67	53	
Module 12 : Industry Readiness, soft skills & Internship Orientation (6 hrs)					
	Capstone Project	20		20	Real life project experience
	TOTAL	140	68	73	



Lesson Modules

Module 1 : Orientation to QC Microbiology & Industry Landscape

1. An introduction to the industrial ecosystem of Quality Control Microbiology, highlighting the responsibilities of QC professionals in pharmaceutical, food, water, cosmetics, dairy, biotechnology, and allied manufacturing sectors.
2. Overview of national and international regulatory frameworks, including CDSCO, FSSAI, BIS, WHO-GMP, and ISO standards,
3. Exposure to regulatory compliance, audit preparedness, and quality expectations.
4. Differences in quality control practices across industries, organizational structure, laboratory hierarchy, and
5. Lab hierarchy, QC vs QA
6. Career pathways to provide a comprehensive understanding of industrial quality management.

Module 2 : Basic Microbiology Refresher for QC Labs

1. Fundamental microbiological concepts essential for Quality Control laboratories.
2. Understanding of microbial classification, bacterial and fungal cell structure, spores, yeast, and microorganisms commonly encountered in industrial environments.
3. Coverage extends to microbial growth kinetics, contamination sources, contamination control strategies, preservation techniques, culture media selection
4. Applications, sterilization methods including moist heat, dry heat, and membrane filtration, and laboratory contamination prevention practices.
5. The module establishes the scientific foundation required for reliable microbiological testing and quality assurance

Module 3 : QC Laboratory Setup, Instruments & Workflow

1. Comprehensive understanding of Quality Control laboratory design, infrastructure, workflow, laboratory zoning, incubators, autoclaves, biosafety cabinets,
2. Equipment qualification (IQ, OQ and PQ), laminar airflow units,
3. Good Laboratory Practices (GLP), cleaning and disinfection procedures, sanitation



strategies, laboratory documentation, and

4. QC lab daily checklist, Routine operational workflows in accordance with GMP requirements.

Module 4 : Media, Reagents & Culture Handling

1. Detailed coverage of media types, preparation, sterilization, storage,
2. Culture handling techniques,
3. Growth Promotion Testing (GPT), reagent preparation and control
4. Traceability, aseptic practices, media quality assessment,
5. Out-of-Specification (OOS) concepts required for reliable microbiological testing.

Module 5 : Microbiological Testing – Core QC Tests

1. Industrial microbiological testing procedures including Total Viable Count (TVC), pathogen testing, sterility testing principles,
2. Environmental monitoring, water microbiology for potable water, purified water and WFI
3. Product-specific testing strategies used across pharmaceutical, food, cosmetics and allied industries.

Module 6 : Using HPLC Machines in QC LAB

1. Exposure to HPLC Machine
2. introduction to basic and advanced chromatography techniques
3. Intensive Demo on use of HPLC Machine

Module 7 : Environmental Monitoring & Contamination Control

4. Principles of cleanroom classifications, air, surface and personnel monitoring,
5. Contamination tracking, environmental monitoring data trending,
6. Interpretation of monitoring results, investigation of contamination events,
7. Corrective and preventive measures for maintaining controlled manufacturing environments.

Module 8 : Documentation, Data Integrity & Compliance



1. Coverage of Good Documentation Practices (GDP),
2. ALCOA+ principles,
3. SOP preparation and control, batch records, laboratory logbooks, deviations,
4. OOS and OOT investigations, data integrity requirements, documentation lifecycle,
5. Audit and inspection readiness.

Module 9 : Quality Systems, Risk & CAPA

1. Fundamental concepts of Quality Management Systems (QMS),
2. Quality risk assessment tools,
3. Corrective and Preventive Action (CAPA), change control,
4. Impact assessment, deviation management,
5. Continuous quality improvement practices followed in regulated industries.

Module 10 : EHS, Biosafety & Waste Management

1. Comprehensive understanding of biosafety levels, laboratory safety practices,
2. Chemical and biological hazards,
3. Biomedical and microbial waste management,
4. Emergency response procedures, incident reporting, and regulatory compliance for safe laboratory operations.

Module 11 : Application of QC-Microbiology in some select industries

Emphasis will be on microbial quality, contamination control, product safety and regulatory compliance. The module provides an understanding of industry-specific microbiological quality requirements, hygienic manufacturing practices, microbial risk assessment, contamination prevention, environmental hygiene, raw material and finished product quality considerations, and the role of microbiological quality control in product release and quality assurance.

1. Application in Food and Water Industry
2. Application in Pharma
3. Application in Cosmetics & Neutraceutical
4. The application of GMP principles, quality risk management and microbiological



control strategies across different industrial sectors is also discussed, with consideration of product characteristics, manufacturing environments and applicable industry standards

Module 12 : Industry Readiness & Internship Orientation

1. Communication skills, soft skills
2. Professional preparation covering interview expectations, laboratory ethics, workplace behaviour,
3. Internship guidelines, resume and documentation readiness,
4. Industrial communication, and real-life Quality Control case discussions to enhance employability.

Module 13 : Capstone Project

1. Capstone Project on application of QC in three industry segment