

SANKALCHAND PATEL UNIVERSITY, VISNAGAR

Faculty of Science and Humanities



Structure, Teaching Scheme and Syllabus of

M.Sc. Microbiology

Program Code: SC202

With effect from:2026-27

Graduate attributes (Generic learning outcomes)

Program Out Comes:

PO1: *Complex problem-solving*: The graduates should be able to demonstrate the capability to solve different kinds of problems in familiar and non-familiar contexts and apply the learning to real-life situations.

PO2: *Critical thinking*: The graduates should be able to demonstrate the capability to:

- apply analytic thought to a body of knowledge, including the analysis and evaluation of policies, and practices, as well as evidence, arguments, claims, beliefs, and the reliability and relevance of evidence,
- identify relevant assumptions or implications; and formulate coherent arguments,
- identify logical flaws and holes in the arguments of others,
- analyze and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.

PO3: *Creativity*: The graduates should be able to demonstrate the ability to:

- create, perform, or think in different and diverse ways about the same objects or scenarios,
- deal with problems and situations that do not have simple solutions,
- innovate and perform tasks in a better manner,
- view a problem or a situation from multiple perspectives,
- think ‘out of the box’ and generate solutions to complex problems in unfamiliar contexts,
- adopt innovative, imaginative, lateral thinking, interpersonal skills and emotional intelligence.

PO4: *Communication Skills*: The graduates should be able to demonstrate the skills that enable them to:

- listen carefully, read texts and research papers analytically and present complex information in a clear and concise manner to different groups/audiences,
- express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media,
- confidently share views and express herself/himself,
- construct logical arguments using correct technical language related to a field of learning, work/vocation, or an area of professional practice, and convey ideas, thoughts, and arguments using language that is respectful and sensitive to gender and other minority groups.

PO5: *Analytical reasoning/thinking*: The graduates should be able to demonstrate the capability to:

- evaluate the reliability and relevance of evidence;
- identify logical flaws in the arguments of others;
- analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and address opposing viewpoints.

PO6: *Research-related skills*: The graduates should be able to demonstrate:

- a keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions,
- the ability to problematize, synthesize, and articulate issues and design research proposals,

- the ability to define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships,
- the capacity to develop appropriate methodology and tools for data collection,
- the appropriate use of statistical and other analytical tools and techniques,
- the ability to plan, execute and report the results of an experiment or investigation.

PO7: *Coordinating/collaborating with others*: The graduates should be able to demonstrate the ability to:

- work effectively and respectfully with diverse teams,
- facilitate cooperative or coordinated effort on the part of a group,
- act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

PO8: *Leadership readiness/qualities*: The graduates should be able to demonstrate the capability for:

- mapping out the tasks of a team or an organization and setting direction.
- formulating an inspiring vision and building a team that can help achieve the vision, motivating and inspiring team members to engage with that vision.
- using management skills to guide people to the right destination.

PO9: *Learning how to learn skills*: The graduates should be able to demonstrate the ability to:

- acquire new knowledge and skills, including ‘learning how to learn skills, that are necessary for pursuing learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social, and cultural objectives, and adapting to changing trades and demands of the workplace, including adapting to the changes in work processes in the context of the fourth industrial revolution, through knowledge/ skill development/reskilling,
- work independently, identify appropriate resources required for further learning,
- acquire organizational skills and time management to set self-defined goals and targets with timelines.
- inculcate a healthy attitude to be a lifelong learner

PO10: *Digital and technological skills*: The graduates should be able to demonstrate the capability to:

- use ICT in a variety of learning and work situations,
- access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data

PO11: *Multicultural competence and inclusive spirit*: The graduates should be able to demonstrate:

- the acquisition of knowledge of the values and beliefs of multiple cultures and a global perspective to honour diversity,
- capability to effectively engage in a multicultural group/society and interact respectfully with diverse groups,
- capability to lead a diverse team to accomplish common group tasks and goals.
- gender sensitivity and adopting a gender-neutral approach, as also empathy for the less advantaged and the differently-abled including those with learning disabilities.

PO12: *Value inculcation*: The graduates should be able to demonstrate the acquisition of knowledge and attitude that are required to:

- embrace and practice constitutional, humanistic, ethical, and moral values in life, including universal human values of truth, righteous conduct, peace, love, nonviolence, scientific temper, citizenship values,
- practice responsible global citizenship required for responding to contemporary global challenges, enabling learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies,
- formulate a position/argument about an ethical issue from multiple perspectives
- identify ethical issues related to work, and follow ethical practices, including avoiding unethical behavior such as fabrication, falsification or misrepresentation of data, or committing plagiarism, and adhering to intellectual property rights,
- recognize environmental and sustainability issues, and participate in actions to promote sustainable development.
- adopt an objective, unbiased, and truthful actions in all aspects of work,
- instill integrity and identify ethical issues related to work, and follow ethical practices.

PO13: *Autonomy, responsibility, and accountability:* The graduates should be able to demonstrate the ability to:

- apply knowledge, understanding, and/or skills with an appropriate degree of independence relevant to the level of the qualification,
- work independently, identify appropriate resources required for a project, and manage a project through to completion,
- exercise responsibility and demonstrate accountability in applying knowledge and/or skills in work and/or learning contexts appropriate for the level of the qualification, including ensuring safety and security at workplaces.

PO14: *Environmental awareness and action:* The graduates should be able to demonstrate and required to take appropriate actions for:

- mitigating the effects of environmental degradation, climate change, and pollution
- effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

PO15: *Community engagement and service:* The graduates should be able to demonstrate the capability to participate in community-engaged services/ activities for promoting the well-being of society.

PO16: *Empathy:* The graduates should be able to demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions.

Program Specification Outcomes(PSOs):

PSO1:

Students will develop advanced technical proficiency in the observation, isolation, characterization, identification, and cultivation of microorganisms using classical and contemporary microbiological methodologies.

PSO2:

Students will demonstrate robust theoretical acumen and technical competence in advanced microbiological tools and methodologies, facilitating their application in applied sciences and interdisciplinary research frameworks.



Faculty of Science & Humanities

Effective from Academic Year 2026-27

Program Name: Master of Science (Microbiology)

Program Code: SC202

Abbreviation Name: M.Sc. (Microbiology)

Semester: I

With effect from:2026-27

Subject code	Subject Name	Credit	Hours per week				Theory (Marks)				Practical (Marks)				Total (Marks)
			L	T	P	Total	University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
							Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3SC2000101	Regulatory Framework in Biosafety	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000102	Regulatory Control of Metabolic Pathways	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000103	Principles of Bioinformatics	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000104	Applied Ecology and Sustainable Development	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000105	Practical Module I	8	--	--	16	16	--	--	--	--	40	100	40	100	200
Total		24	16	--	16	32									600

L=Lecture, T=Tutorial, P=Practical



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Program Name: Master of Science (Microbiology)

Program Code: SC202

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Semester: II

With effect from:2026-27

Subject code	Subject Name	Credit	Hours per week				Theory (Marks)				Practical (Marks)				Total (Marks)
			L	T	P	Total	University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
							Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3SC2000201	Advance Research Methodology & Design	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000202	Contemporary Developments in Biological Sciences	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000203	Pharmaceutical Bioprocesses and Quality system	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000204	Microbiology Beyond Earth & Extremophiles	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2000205	Practical Module II	8	--	--	16	16	--	--	--	--	40	100	40	100	200
Total		24	16	--	16	32									600

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Program Name: Master of Science (Microbiology)

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Semester: III

With effect from:2026-27

Subject code	Subject Name	Credit	Hours per week				Theory (Marks)				Practical (Marks)				Total (Marks)
			L	T	P	Total	University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
							Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3SC2020301	Microbial diseases of Humans and Plants	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2020302	Fundamentals of Omics Technologies	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2020303	Integrative Omics Approaches	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2020304	Applied Microbiology	4	4	--	--	4	20	50	20	50	--	--	--	--	100
3SC2020305	Microbiology Practical	8	--	--	16	16	--	--	--	--	40	100	40	100	200
Total		24	16	--	16	32									600

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Effective from Academic Year 2026-27

Program Name: Master of Science (Microbiology)

Program Code: SC202

Abbreviation Name: M.Sc. (Microbiology)

Semester: IV

With effect from:2026-27

Subject code	Subject Name	Credit	Hours per week				Theory (Marks)				Practical (Marks)				Total (Marks)
			L	T	P	Total	University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
							Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3SC2020401	Scientific Presentation or Literature Review writing	8	--	--	16	16	--	--	--	--	40	100	40	100	200
3SC2020402	Dissertation Work (Thesis writing and presentation of work in ppt. & Viva)/Monograph	16	--	--	32	32	--	--	--	--	80	200	80	200	400
Total		24	--	--	48	48	--								600

L=Lecture, T=Tutorial, P=Practical