



Programme Specifications

M. Tech. Programme

Programme:
Environmental Sanitation and Waste
Management

Department:
Civil Engineering

Faculty of Engineering & Technology
M.S. Ramaiah University of Applied Sciences

University House, New BEL Road, MSR Nagar, Bangalore – 560 054

www.msruas.ac.in

Programme specifications: Sanitation Engineering and Waste Management

Faculty	Engineering and Technology
Department	Civil Engineering
Programme	Sanitation Engineering and Waste Management
Dean of Faculty	Prof.Arulanantham
HOD	Prof. H. M. Rajashekhar Swamy

1. Title of the Award

M. Tech. in Sanitation Engineering and Waste Management

2. Modes of Study

Full-Time ☒ Part-Time

3. Awarding Institution /Body

M.S. Ramaiah University of Applied Sciences – Bangalore, India

4. Joint Award

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5. Teaching Institution

Faculty of Engineering and Technology (FET)

M S Ramaiah University of Applied Sciences - Bangalore, India

6. Date of Programme Specifications

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7. Date of Programme Approval by the Academic Council of MSRUAS

NOV2018

8. Next Review Date

May 2020

9. Programme Approving Regulatory Body and Date of Approval

May 2020

10. Programme Accrediting Body and Date of Accreditation

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11. Grade Awarded by the Accreditation Body

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12. Programme Accreditation Validity

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13. Programme Benchmark

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14. Rationale for the Programme

Civil Engineering is primarily infrastructure development involving planning, design, construction, and operation of facilities essential to modern life, ranging from transit systems to offshore structures to space satellites. Major disciplines within civil engineering that are closely interrelated are Structural, Environmental, Geotechnical, Water Resources, Transportation, Construction and Urban Planning.

Until recently Civil Engineering teaching was limited to Planning, Analysis, Design and Execution of different types of infrastructure like buildings, roads, bridges, dams and power plants. However, increasing technological sophistication and demand for higher living standards fuelled by economic growth and concerns about environmental impact have changed the scope of Civil Engineering curriculum.

Sanitation generally refers to hygiene and deals with the provision of facilities for the safe disposal of human waste. Sanitary engineering is a sub branch of environmental engineering dealing with matters affecting public health and methods to improve sanitation of human communities, primarily by providing the removal and disposal of human waste, and in addition to the supply of safe potable water.

Rate of urbanisation in the developing countries as elsewhere has increased in the recent decades. This has resulted in mega cities in these countries having a staggering share of 80% in world's megacities in recent decades. Population is expected to double in next two decades resulting in high concentration of people in urban areas. This will place enormous pressure on local environment and resources, requiring high demands on clean water and sanitation.

The explosive growth in urbanization and the massive rural to urban migration necessitated the requirement of rational approaches towards sustainable management of urban drainage, sanitation provision to urban poor, waste collection and its treatment for proper disposal or reclamation / reuse. Services and programmes that include proper waste disposal methods for management of hazardous biological and chemical wastes, minimisation and recycling will be needed.

Developing countries are still in the transition towards better waste management but they currently have insufficient collection and improper disposal of wastes. The authorities in the developing countries are crippled by the lack of proper and scientific approach towards the waste management mainly due to the increasing generation of waste. In this scenario, most acute and relevant issues related to sanitation and waste management require special attention so that innovative and sustainable solutions can be formulated.

With a lot of stress on reducing carbon emission and interdependencies between resources, an Engineer needs world-class skill base coupled with flair for innovation and understanding of the interdependencies between resources and infrastructural demands. This can be done only by inculcating multidisciplinary skills in water supply, sanitary, environmental and public health aspects.

Even though there are a large number of institutions in India producing Engineers, there is a shortage of quality multidisciplinary Engineering graduates. The FET at MSRUAS would like to offer interdisciplinary postgraduate Engineering programmes to produce imaginative, creative and innovative Engineers.

MSRUAS is offering sanitation engineering and waste management programme at the post graduate level. The graduates will get opportunities in water supply and waste-water companies, municipal assemblies, government ministries and consulting companies dealing with water supply, sanitation and municipal infrastructure. They will be effective and efficient problem solvers providing economical and sustainable infrastructure solutions in India and abroad.

15. Programme Aim

The aim of the programme is to produce postgraduates with advanced knowledge and understanding of Sanitation Engineering and Waste Management; higher order critical, analytical, problem solving and transferable skills; ability to think rigorously and independently to meet higher level expectations of industry, academics, research or take up entrepreneurial route.

16. Programme Objectives

Students will be able to apply the knowledge, understanding and skills acquired to carry sustainable Solid Waste and Wastewater Management through Research and Technological Inputs. Students also will be capable to carry out engineering design, simulation, analysis, synthesis and evaluation of Waste treatment processes and equipment. Curriculum also Emphasises on adopting imaginative and creative approach in resource conservation and resource efficiency through waste prevention and by recovering valuable material and/or energy from waste.

The objectives of the programme are to train and educate the students on the following:

1. Explain the role of sanitation in the urban water cycle and its relation to public health and environment
2. Critically analyse, assess and evaluate various urban drainage and sewerage schemes, and wastewater, sludge and solid waste treatment process technologies
3. Suggest options for waste reduction at source so as to reduce quantities of waste generated
4. Develop rational approaches towards sustainable wastewater management via pollution prevention
5. Design Sewage and solid waste treatment plant
6. Choose from an array of options to turn waste into economic goods
7. Develop a solid waste management scheme for an urban area
8. Planning and controlling a waste treatment project cost including cost estimating, risk analysis, determination of contingencies, progress reporting and value engineering
9. Knowledge of IT tools and Apply modern tools for technology selection and to model sanitation components
10. Teamwork, lifelong learning and continuous improvement

17. Intended Learning Outcomes

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding, 2. Cognitive Skills, 3. Practical Skills and
4. Capability/Transferable Skills.

17.1 Knowledge and Understanding

After undergoing this programme, a student will be able to:

- KU1: Understand and explain the role of sanitation in the urban water cycle and its relation to public health and environment; Understand the relevant physical, chemical and biological processes and their mutual relationships within various sanitation components
- KU2: Describe the factors critical in planning and designing a Sanitation and waste management system to achieve needed safety, quality, durability, sustainability, and economic objectives
- KU3: Explain formulation, planning, scheduling, cost and quality control, safety, environmental factors, services, maintenance and safety systems in Sanitation Engineering and Waste Management
- KU4: Discuss advantages, disadvantages and limitations of various treatment, disposal and energy recovery technologies

17.2 Cognitive Skills

After undergoing this programme, a student will be able to:

- CS1: Design and develop rational approaches towards sustainable wastewater management via pollution prevention and processes of sub systems/components of a project to meet the overall specifications of the project
- CS2: Analyse and propose Holistic approach to waste management changes essential for solving a broad set of engineering problems in sanitation considering societal and economic impacts to achieve needed safety, quality, sustainability, and economic objectives
- CS3: Critically analyse, assess and evaluate various waste treatment and disposal processes, systems, services and schemes
- CS4: Apply modern tools for technology selection and to model sanitation components.

17.3 Practical Skills

After undergoing this programme, a student will be able to:

- PS1: Produce tender and contract documents along with the ability to carry out estimation of costs and expenditures during all stages of a sanitation project
- PS2: Use appropriate software packages relevant to Sanitation Engineering and Waste Management

PS3: Conduct physical tests to evaluate performance of materials and equipment

PS4: Conduct independent research including field work, and laboratory research;

17.4 Capability/Transferable Skills

After undergoing the programme, a student will be able to

TS1: Evaluate and appraise the context within which waste management activities operate

TS2: Adopt a reflective approach to personal development and embrace the philosophy of continual professional development

TS3: Present information concisely in narrative and verbal form

TS4: Work effectively in groups and lead the group

18. Programme Structure

A student is required to successfully complete the following modules for the award of the degree. The programme is delivered as per the Time-Table for every batch.

Programme: Sanitation Engineering and Waste Management			
Module Code	Modules	Credits	Duration (Weeks)
	Programme Specialisation Modules		
SWM510	1. Engineering for Public Health	5	5
SWM502	2. Modern Methods of Waste Characterisation	5	5
SWM504	3. Waste Water Treatment Plant Design	5	5
SWM511	4. Solid Waste Management and Air Pollution Control	5	5
SWM506	5. Solid Waste Treatment and Plant Design	5	5
SWM507	6. Hazardous Waste Management and Treatment Plant Design	5	5
SWM508	7. Treatment Plants Operations and Maintenance	5	5
SWM512	8. Environmental Biotechnology	5	5
SWM513	9. Entrepreneurship in Waste Management	5	5
	Faculty-Common Modules		
FET501	1. Principles of Management and Soft Skills Development	3	3
FET502	2. Research Methodology	3	3
	Elective Module (Any One of 6)	5	5
FET503	1. Industry Internship		
FET504	2. Seminar		
FET505	3. Training		
FET506	4. Student Competition		
FET507	5. Visit to Industries and Exhibitions		
FET508	6. Teaching and Training		
SWM599	Group Work-Project	10	10
SWM600	Dissertation	30	26
	Mandatory Module (Any One)	4	4
FET509	1. Conference Publication		
FET510	2. Journal Publication		
		100	96

Note:

1. The Vacations and other activities shall be as per the Time-Table for the corresponding batch.

19. Module Delivery Structure- Full-Time

A module is delivered from Monday to Friday of the week. The lecture classes will be normally held from 9.30 AM to 1.00 PM with 30 minutes of break. The laboratory classes will be held in the afternoon from 2.00PM to 5.00 PM during the first two weeks of the module.

Week-1	Week-2	Week-3	Week-4	Week-5
Module Delivery	Module Delivery	Study Work	Study Work Examination	Assignment submission & Presentation

For Part-Time, the classes are normally held on Saturday and Sunday and the module delivery is for 8 weeks.

20. Teaching and Learning Methods

The module delivery comprises of a combination of few or all of the following:

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory/Field work/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Exhibitions
10. Technical Festivals

21. Elective Module

Elective module can be any one of the following -

FET503 Industry Internship

Internship is to be done with a company or any business or research organization for the module duration. The student is required to submit a report for assessment and also make a presentation to a team of examiners. The internship should be in the company related to the programme. A student is required to find internship on his/her own but the student placement office may assist in getting internship.

- FET504 Seminar**
A student can deliver a seminar of one hour duration of his/her original study on a contemporary topic after personal visits/survey/collection data. It should not be a collection of information from books/web resources and delivering a presentation/ preparing a report. Topic of seminar should be registered at the beginning of the elective module. At the end, seminar must be delivered to a team of examiners and also a word processed report must be submitted for assessment.
- FET505 Training**
A student can undergo training in any institution or any other organization in a specific subject area that falls under the broad category of his/her specialization. He/she need to submit a complete report on the training undergone and also make a presentation to a team of examiners for assessment.
- FET506 Student Competition**

A student can take part in a technical competition approved by the department; a Report shall be submitted followed by a presentation to a team of examiners for assessment.
- FET507 Visit to Industries and Exhibitions**
A student is required to make industry visits and international exhibitions as per the recommendations of the department and submit a report; and make a presentation to a team of examiners for assessment.
- FET508 Teaching and Training**
A student can teach a module in his / her area of specialization in any institute approved by the department. The student must submit the teaching notes and also make a presentation to a team of examiners for assessment.
- FET509 Conference Publication**
A student can submit a paper and make a presentation in a conference which is approved by the department. The same paper shall be presented for assessment and the student is required to make a presentation to a team of examiners for assessment.
- FET510 Journal Publication**
A student can publish a paper in a technical journal. The proof of submission and a copy of the paper shall be submitted to the department. It will be assessed based on a presentation to a team of examiners.

22. Group Project

SWM599 A group shall have up to 5 students. The purpose of group project is that the group should be able to design a product in their area of specialization and develop it. The students are required to develop a report for assessment and also need to demonstrate the working of the product. The IPR rights of all such work lies with the University only. The students are required to sign an agreement before the

commencement of the project. The project should be approved by a committee of examiners before the start of the project. Students can choose a project from the database of projects available with the concerned department. The detailed procedure and evaluation procedure will be provided in Operation Manual / Student Handbook

23. Dissertation

SWM600 A student chooses a topic for the Dissertation based on relevance and need. The detailed procedure of executing and assessing dissertation is available as standard template in i-portal

24. Assessment and Grading

A module assessment will have two components:

Component - 1

Assignment 50% weight

Component -2

Examination 50% weight

(Note: For more details on the break-ups, please refer to the Module Specifications)

A student is required to score a minimum of 40% in each of the components and an overall of 40% for successful completion of a module and earning the credits.

Note: Final marks awarded in each of the modules will be confirmed only after SAB/PAB as explained in Academic Regulations of M.Tech. Programme.

25. Failure and Readmissions

If a student fails in a module, he/she is required to re-attend the module when offered next time by re-registering to the module.

26. Attendance

A student is required to have a minimum of 85% attendance to be eligible to write the examination. Less than 85% attendance is considered FAIL; such a student is required to follow the same procedure as that of a failed student.

Any condoning of shortfall of the attendance is as per the Academic Regulations for M Tech. Programme.

27. Award of Class

As per the Academic Regulations for M.Tech. Programme.

28. Student Support for Learning

Students are given the following support:

1. Module notes
2. Reference books in the library
3. Magazines and Journals
4. Internet facility
5. Computing facility
6. Laboratory facility
7. Workshop facility
8. Staff support
9. Lounges for discussions
10. Any other support that enhances their learning

29. Quality Control Measures

Following are the Quality Control Measures:

1. Review of module notes
2. Review of question papers and assignment questions
3. Student feedback
4. Moderation of assessed work
5. Opportunities for the students to see their assessed work
6. Review by external examiners and external examiners reports

7. Staff student consultative committee meetings
8. Student exit feedback
9. Subject Assessment Board
10. Programme Assessment Board

30. Curriculum Map

Module Code	Intended Learning Outcomes											
	Knowledge and Understanding				Cognitive (Thinking) Skills (Critical, Analytical, Problem Solving, Innovation)				Practical Skills			
	KU1	KU2	KU3	KU4	CS1	CS2	CS3	CS4	PS1	PS2	PS3	PS4
SWM510	X	X	X	X	X	X	X	X	X	X	X	X
SWM502	X	X	X	X							X	X
SWM504		X	X	X	X	X	X	X	X	x		
SWM511		X	X	X		X	X	X				
SWM506				X		X	X	X	X	X		
SWM507		X	X	X		X	X	X	X	X		
SWM508		X	X					X			X	X
SWM512		X		X		X	X	X	X	X	X	X
SWM513		X				X	X	X			X	X
FET501												
FET502	X	X	X	X								
FET503	X	X		X	X			X	X		X	X
FET504	X	X	X	X	X	X	X	X	X	X	X	X
FET505	X	X	X	X	X			X	X			X
FET506	X	X		X	X			X	X	X		X
FET507	X	X	X	X								
FET508	X	X	X	X	X	X	X	X	X			X
FET509	X	X	X	X	X	X	X	X	X	X	X	X
FET510	X	X	X	X	X	X	X	X	X	X	X	X
SWM599	X	X	X	X					X	X	X	X
SWM600	X	X	X	X	X	X	X	X	X	X	X	X

31. Capability / Transferable Skills Map

Module Code	Group work	Self learning	Research Skills	Written Communication Skills	Verbal Communication Skills	Presentation Skills	Behavioral Skills	Information Management	Personal management/ Leadership Skills
SWM510		X		X	X	X			X
SWM502		X		X	X	X			X
SWM503		X		X	X	X			X
SWM504		X		X	X	X			X
SWM511		X		X	X	X			X
SWM506		X		X	X	X			X
SWM507		X		X	X	X			X
SWM508		X		X	X	X			X
SWM512		X		X	X	X			X
SWM513		X		X	X	X			X
FET501	X			X	X	X	X		X
FET502			X	X	X	X		X	
FET503		X		X	X	X	X		
FET504		X	X	X	X	X		X	
FET505				X	X	X			
FET506	X	X	X	X	X	X	X	X	X
FET507		X		X	X	X		X	
FET508		X		X	X	X	X	X	X
FET509		X	X	X	X	X			
FET510		X	X	X	X	X			
SWM599	X	X		X	X	X	X	X	X
SWM600		X	X	X	X	X	X	X	X

32. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities to enhance their knowledge and network.

33. Cultural and Literary Activities

To remind and ignite the creative endeavours annual cultural festival is held and the students are made to plan and organize the activities.

34. Sports and Athletics

Students are encouraged to develop a habit of taking part in outdoor and indoor games on regular basis.

