

### Courses (Semester wise Breakdown)

#### *Year I, Semester I*

Course Code	Course Title	Type	Credit
MSAN511	Introduction to Sanitation, Systems and Services	Core	3
MSAN512	Sanitation Technology	Core	3
MSAN513	Public Health and Sanitation	Core	3
	Elective I	Elective I	3
	Elective II	Elective II	3
	Total Credit Hours		15

#### Electives (Year I, Semester I)

Course Code	Course Title	Type	Credit
MSAN514	Faecal Sludge Treatment and Non-Sewered Sanitation Technologies	Elective I	3
MSAN515	Governance in Sanitation	Elective	3
MSAN516	Engineering Design for Sanitation Structures	Elective	3
MSAN517	Water Pollution Control	Elective	3

#### **\*Elective Courses**

- Students are allowed to take electives in semesters I and II
- One Course will be offered for each Elective subject in first two semesters and the prescribed courses will be offered and taken under the project supervisor.

#### *Year I, Semester II*

Course Code	Course Title	Type	Credit
MSAN521	Emergency Sanitation	Core	3
MSAN522	Research Methodology in Sanitation	Core	3
MSAN523	Project Management	Core	3
	Elective III	Elective	3
	Elective IV	Elective	3
	Total Credit Hours		15

#### Electives (Year I, Semester II)

Course Code	Course Title	Type	Credit
MSAN524	Sanitation Financing	Core	3
MSAN525	Behavior Change and Advocacy	Elective	3
MSAN526	Design of FSTP/ DEWATS system	Elective	3

***Year II, Semester I***

Course Code	Course Title	Type	Credit
	Prescribed 1	Core	3
	Prescribed 2	Core	3
MSAN613	Project	Core	9
	Total Credit Hours		15

**Prescribed Courses**

Course Code	Course Title	Type	Credit
MSAN611	Mini Project on Sanitation Innovation Technology	Prescribed	3
MSAN612	Seminar	Prescribed	3

***Year II, Semester II***

Course Code	Course Title	Type	Credit
MSAN621	Research Thesis	Core	15
	Total Credit Hours		15

**Note:** Students will write a thesis in the fourth semester. However, the thesis work must start from the beginning of third semester, which is in the form of Project.

**10. Detailed Description of Courses**

**1. [MSAN 511] Introduction to Sanitation, Systems and Services: Core**

Introduction to the Program; Introduction to Sanitation; SDG Target and Indicators; Urban Development Trends; Differentiate Solid waste Management, Faecal Sludge Management and Waste-water Management; Sanitation Flow (laboratory works); Sanitation Service Delivery Chain; Sanitation of the Future; Urban Sanitation Case Studies; Introduction to Compendium Exercise.

**2. [MSAN 512] Sanitation Technology: Core**

Introduction to Sanitation Technology, Urban Drainage; Carbon, Nitrogen and Phosphorus Removal; Slum Drainage; Existing and Innovative Sanitation Technologies; ISO Standards; Technology Integrating Group-work.

**3. [MSAN 513] Public Health and Sanitation: Core**

Introduction to Public Health; Human Health Hazards and Human Excreta; Review and Assessment of Transmission Routes; Biological characteristics and lifecycles of sanitation-relevant pathogens; Non-infectious Public Health Issues Related to Sanitation; Control

Measures; Risk Evaluation Tools

**4. [MSAN 514] Faecal Sludge Treatment and Non-Sewered Sanitation Technologies: Elective**

FS Characteristics; Pathogen Inactivation; Storage, Collection, Transportation and Treatment; On-site treatment technologies; Design Approach and Quantification; Settling-Thickening Tank; Planted & Unplanted Drying Bed; Anaerobic Digestion of FS and Co-composting, Effluent Treatment.

**5. [MSAN 515] Governance in Sanitation: Elective**

Sanitation Governance Definition; Different Actors and Decision Makers; Power Relations; Contextualizing Sanitation; Formal & Informal Regulations; Case Studies; Sanitation History; Shifting Sanitation Governance; Everyday Sanitation; Governance Alternatives.

**6. [MSAN 516] Engineering Design for Sanitation Structures: Elective**

Basic RCC design, drawing and estimates for sanitation structures; codal provisions; quality assurance.

**7. [MSAN 517] Water Pollution Control: Elective**

Linkage of Faecal sludge discharge and water pollution; Mass balances, Reaction kinetics, continuous flow reactors; Removal of particles from waste water: Particle treatment process, Flocculation, Gravity separation, Granular media filtration, filtration dynamics; Membrane based waste-water treatment.

**8. [MSAN 521] Emergency Sanitation: Core**

Humanitarian Action and Principles; Key Actors & Legal Framework; SPERE Handbook and WASH Cluster; M&E needs assessment; Sanitation Related Diseases in emergency; Excreta Management; Solid Waste Management in emergency; Development of a Sanitation Plan.

**9. [MSAN 522] Research Methodology in Sanitation: Core**

Introduction to Research Methodology; Research Design and Sampling Strategies; Critical Reading and Academic Writing; Statistics; Ethics in Research and Consent; Developing a Research Proposal; Referencing Guideline; Acquiring and disseminating knowledge in science and engineering.

**10. [MSAN 523] Project Management: Core**

Introduction to project management; Planning Strategies of Sanitation project; Key Elements of Project Planning; Result Based Project Management – The Theory of Change; Project Implementation Planning; Monitoring, Evaluation and Learning (MEL); Project planning software MS Project; Stakeholder Engagement.

**11. [MSAN 524)] Sanitation Financing: Elective**

Preparatory Course on Sanitation Financing; Sanitation Financing Options; Business models and PPP in sanitation; Service & value chain; Business models; Financial flow; Business canvas; PPP (Public, Private Partnership), Financial viability, Sanitation Financing - modalities & challenges; Saniplan exercise.

**12. [MSAN 525] Behaviour Change and Advocacy: Elective**

Introduction to Behaviour Change and Advocacy; Frameworks of Behaviour Change; Design of behavioural change interventions; Monitoring of behavioural change interventions; Behaviour Change Guideline; RANAS handout; Case studies; Policy Advocacy – WASH policy; Regulatory Instruments.

**13. [MSAN 526] Design of FSTP/ DEWATS system: Elective**

Introduction to Decentralized Waste-water Treatment System (DEWATS); Detail of Faecal Sludge Treatment Plant; Design Aspects of FSTP and DEWATS; Case study of successful and failed designs; Field visit; Practical workout on a selected site.

**14. [MSAN 611] Mini Project on Sanitation Technology Innovation: Prescribed**

Exploration of new sanitation technology; Use of toolkits in FSM technology selection and planning; Teamwork development; Supervisor gives the course for specific subject of study with common code; Students can do the design, drawing, analysis or laboratory works based on their subject of study; The individual students are required to present in front of the faculties and students and evaluated.

**15. [MSAN 612] Seminar: Prescribed**

Various seminars, presentations are to be attended and delivered related to Sanitation technology topics. These seminars are to be helpful for the thesis related activities. Besides, the students will take part in leadership workshop and team building exercises.

**16. [MSAN 613] Project: Core**

The project component theme could be one of the following:

- Industrial/organizational problem assessment (mainly done at industry/organization)
- Community based problem assessment (mainly done at community)
- Literature based problem assessment (mainly done at institution)
- Analytical or experimental or prototype based problem assessment (mainly done at institution)
- Case study based problem assessment (mainly done at case specific site)
- Field work based problem assessment (mainly done at specific site)
- Any other relevant and deemed suitable by department.
- The project component will be of approximately 3 month (full – time) duration

**17. [MSAN 621] Research Thesis: Core**

Students will carry out the research thesis with one or more supervisors. For students targeting M.E degree, the research work should consist of substantial engineering work and for M.S degree, science related work should be done.

**Text books shall be prescribed as per the faculties' opinion.**