



# GUJARAT TECHNOLOGICAL UNIVERSITY

## Bachelor of Civil and Infrastructure Engineering Subject Code:

Course Code:31540012 Semester – V  
Subject Name: Infrastructure Utilities

Type of course: Open Elective Course

Prerequisite: Nil

**Rationale:** Utilities for Civil Infrastructure is providing conceptual understanding and applications of variety of utilities required for infrastructure projects. With the help of this knowledge students may be able:

1. To impart basic understanding and knowledge on various utility requirements of civil infrastructure.
2. To provide the knowledge on the various utility systems and practices used in civil infrastructure including MEP and IT systems
3. To aware of the methodology involved in costing the utility requirements

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs
1	<b>Electrical Utilities:</b> <b>Electrical System:</b> General overview of electricity demand & supply. Different types of electrical wiring system. AC & DC power supply, power modulator, and open loop and closed loop system, UPS and emergency lighting. <b>Power requirement calculation for typical civil infrastructure:</b> residential building, industrial building, commercial and social infrastructures. <b>Power Distribution Systems for Township:</b> Township power distribution system, substations, underground power distribution, overhead power distribution and electrical maintenance. <b>Power Distribution Systems for Industrial Plant:</b> Internal power distribution system, protection system and safety. <b>Cost Estimate for Electrical System:</b> Elements of Cost Estimation, cost estimate for typical residential building and township. <b>Renewable Energy System for civil infrastructure:</b> Introduction, Classification, Suitability of energy system.	10
2	<b>Mechanical</b> <b>Fire Fighting Systems:</b> Installation requirements, components of Firefighting systems. Basics of Types of systems like Fire extinguishers, Fire hose reels, Fire hydrant systems & Automatic sprinkler systems. Cost Estimation of all firefighting system.	12



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	<b>HVAC (Heating, Ventilation and Air Conditioning):</b> Basics of HVAC, Types of HVAC, Various types of conditioning systems for buildings <b>Ventilation system in building:</b> Mechanical ventilation system in building. Types of Ducts, Duct Profiling. <b>Building Lifts:</b> Various types of lifts, Escalation system. Case study of mall escalator aspects like space design, capacity, material assembly, safety aspects and cost estimation. Safety precautionary Standards for lift and escalator standard.(To be covered in lab)	
3	<b>Water and Waste Water System</b> <b>Water Distribution system:</b> Design of Water Supply, Evaluation of water demand, water supply pressure, scope of water authority for permission for multi-story building, system for boosting water pressure. Pipe and fitting materials, pipe supports and hangers. Plumbing fixtures, appliances and equipment. Fixing and jointing pipes and accessories. <b>Drainage System:</b> Considerations, Classification, Vacuum drainage system, Traps. <b>Sanitary system:</b> Methods of sewage collection, , Sewer section, Sewer joint, Manhole, Flushing tank, catch basin, laying of sewer, appurtenances and its locations, Sanitary fittings, Hydraulic testing of sewer pipe, Robotics application in sewer cleaning.	10
4	<b>IT infrastructure</b> Introduction to IT Infrastructure, Network Devices and hardware (Hub, Routers, Switches, Modems), Network Switching, Network Cables & Cable Types, Basics of Wireless Communication, Tracking systems - RFID and GPS, Securing Information Systems, Introduction to Home Automation System	10

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	30	15	15	10

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1. N. Jenkins, J.B. Ekanayake, G. Strbac, Distributed Generation, IET, Renewable Energy Series, 2010
2. Gilbert M. Masters, Renewable and Efficient Electric Power Systems, Wiley, 2004.
3. J. J. Grainger and W.D. Stevenson Jr., Power System Analysis, Tata McGraw-Hill, (1994)
4. D. P. Kothari and I.J. Nagrath, Modern Power System Analysis, Tata McGraw-Hill, Third Edition, (2003)



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5. A. J. Wood and B.F. Wollenberg, Power Generation Operation and Control, Wiley India Edition, Second Edition, (2003)
6. M. A. Pai, Computer Techniques in Power System Analysis, Tata McGraw-Hill, Second Edition, (2006)
7. Frank Harris, Modern construction and ground engineering equipment and methods, Longman Scientific & Technical, 1994.
8. R.J.Dossat, Principles of Refrigeration, Pearson Education (Singapore) Pte. Ltd. , 2008.
9. A. Ameen, Refrigeration and Air Conditioning, Prentice Hall of India Private Limited, New Delhi. 2006
10. Punmia B.C., Jain Ashok kumar, Jain Arun K., “WaterSupply Engineering”, Laxmi Publications(P) Ltd.,1995

### Course Outcomes:

After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand various utility requirements (primarily MEP) in civil infrastructure	40
CO-2	Propose suitable utility systems required for infrastructure projects	30
CO-3	Estimate quantity requirements for various items of utility systems	30

### List of Open Source Software/learning website:

[www.nptel.iitm.ac.in/courses/](http://www.nptel.iitm.ac.in/courses/)