

Assignment Manual for

**Indian Knowledge System
for Engineering (BE03000241)**

B.E. Semester 3 (All branches)

Institute logo



**Directorate of Technical Education, Gandhinagar,
Gujarat**

Indian Knowledge System for Engineering (BE03000241)

Assignment Manual is prepared by

Dr Sanghamitra Bhatt
Assistant Professor (English),
Government Engineering College, Rajkot

&

Dr Vaseemahmed G Qureshi
Assistant Professor (English),
Vishwakarma Government Engineering College,
Chandkheda, Ahmedabad

Branch Coordinator

Dr Himanshu Srivastava
Assistant Professor in English,
Government Engineering College, Bhavnagar

Committee Chairman

Dr N M Bhatt
Professor of Mechanical Engineering
L E College, Morbi

College Name: _____

Certificate

This is to certify that Mr./Ms. _____
_____ Enrollment No. _____ of B.E. Semester _____
_____ Engineering of this Institute (GTU Code: _____) has
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System for Engineering (BE03000241)** for the academic year ____.

Place: _____

Date: _____

Name and Sign of Faculty member

Head of the Department

Preface

Main motto of any assignment work is for enhancing required skills as well as creating ability amongst students to solve real time problems by developing relevant competencies in the cognitive domain. By keeping in view, GTU has designed competency focused outcome-based curriculum for engineering degree programs where sufficient weightage is given to both theory as well as practical work. It shows the importance of enhancement of skills amongst the students and it pays attention to utilize every second of time allotted for learning amongst students, instructors and faculty members. It is essential for effective implementation of competency focused outcome-based curriculum that every assignment is keenly designed to serve as a tool to develop and enhance relevant competency required by the various industries among every student. Accordingly, this assignment manual is designed to focus on the industry-defined relevant outcomes, rather than old practice of conducting practical and solving questions to prove concepts and theory.

Utmost care has been taken while preparing this assignment manual however there are chances of improvement. Therefore, we welcome constructive suggestions for improvement and removal of errors if any.

Course Outcome matrix

Course Outcomes (COs):

At the end of the course students will be able to:

- Describe the evolution of engineering practices in India from ancient to modern times.
- Explain major engineering innovations and technological developments in various historical periods of India.
- Analyze the influence of socio-political and economic factors on the development of engineering and infrastructure across dynasties and regimes.
- Evaluate the role of engineering in India's industrialization, modernization, and nation-building efforts.
- Assess contemporary engineering advancements and propose sustainable solutions for future challenges.

Sr. No.	Assignments	CO1	CO2	CO3	CO4	CO5	
1.	Introduction to the Indian History of Engineering	√					
2.	Ancient Engineering Innovations		√				
3.	Classical and Early Medieval Engineering			√			
4.	Engineering and Technology in the Late Medieval and Mughal Periods				√		
5.	Early Colonial Period and Transformation of Indian Engineering					√	
6.	Rise of Modern Engineering Post-Independence					√	

**Index (Progressive
Assessment Sheet)**

Sr. No.	List of Assignments	Page No.	Date of assignment	Date of submission	Assessment Marks	Sign. of Teacher with date	Remarks
1.	Introduction to the Indian History of Engineering						
2.	Ancient Engineering Innovations						
3.	Classical and Early Medieval Engineering						
4.	Engineering and Technology in the Late Medieval and Mughal Periods						
5.	Early Colonial Period and Transformation of Indian Engineering						
6.	Rise of Modern Engineering Post-Independence						
Total							

Assignment 1

Introduction to the Indian History of Engineering

(CO1) [5 marks]

Short Answer Questions

1. What is a stepwell, and how was it an engineering solution in ancient India?
2. Define "Vedic Mathematics" and explain how it influenced the development of engineering in ancient India.
3. How does the Konark Sun Temple relate to both architecture and timekeeping? Describe its function beyond religious symbolism.
4. How did ancient Indian cities such as Mohenjo-Daro demonstrate early urban planning and civil engineering?

Long Answer Questions

1. Describe the engineering feats of the Indus Valley Civilization, focusing on drainage systems and urban planning.
2. Explain how ancient Indian stepwell design is an example of sustainable engineering practices. How could modern architects benefit from this design today?
3. Discuss the contributions of Indian mathematicians like Aryabhata and Brahmagupta to modern engineering, especially in the field of trigonometry.
4. Explore the relationship between architecture, astronomy, and engineering in the context of the Konark Sun Temple. How did the temple serve as an astronomical tool?

Assignment 2

Ancient Engineering Innovations

(CO2) [5 marks]

Short Answer Questions

1. Describe the drainage system of the Indus Valley Civilization. Why was it considered ahead of its time?
2. How did the urban layout of Mohenjo-Daro and Harappa demonstrate advanced city planning techniques?
3. Describe how the principles from the Sulba Sutras influenced Vedic temple architecture.
4. What are the differences between the early and later fortifications built during the Vedic and Post-Vedic periods?

Long Answer Questions

1. Explain how the urban planning, drainage systems, and water management of the Indus Valley Civilization can influence modern urban design. Provide examples from today's cities where similar principles could be applied.
2. Discuss the significance of metallurgy and craftsmanship in the Indus Valley Civilization, with examples from their bead-making, pottery, and seal designs. How did these reflect the technological advancements of the civilization?
3. Analyze the application of Vedic geometry in the construction of fire altars. How do these principles compare with the way modern architects use geometry in their designs?
4. How did the Arthashastra influence the development of engineering and infrastructure in ancient India? Discuss its relevance to modern-day urban planning.

Assignment 3

Classical and Early Medieval Engineering

(CO3) [5 marks]

Short Answer Questions:

1. What were some of the key engineering principles used in the construction of the Dashavatara Temple?
2. What role did the Chola dynasty play in the development of water management techniques for agriculture?
3. What types of construction materials and techniques were commonly used in early rock-cut architecture in India?

Long Answer Question:

1. Discuss the engineering innovations in construction, metallurgy, and architecture during the Gupta period. How did these innovations contribute to the legacy of Gupta architecture.
2. Discuss the importance of water management in ancient India, especially in the context of the Chola irrigation systems and stepwells. How did these systems ensure sustainable agriculture and water supply in arid regions?

Assignment 4

Engineering and Technology in the Late Medieval and Mughal Periods (CO4) [5 marks]

Short Answer Questions:

1. Explain the architectural significance of Golconda Fort's whispering gallery.
2. How did the Mughal palaces use water for cooling and comfort?
3. What was the importance of stepwells in medieval India's water management systems?
4. Explain how ancient water management systems like the Delhi Sultanate canal systems could be adapted for modern use.
5. Describe the water management systems employed by the Mughals in their forts and cities.

Long Answer Question:

1. Describe the key elements of Mughal fort architecture and their impact on defence and daily life. How did Mughal engineers integrate functionality and aesthetics in their designs?
2. Urban planning during the Mughal period was quite advanced. Compare the urban planning features of Shahjahanabad with modern-day city planning. Focus on aspects such as drainage, road networks, and water supply.
3. Analyze the advances in construction materials used by the Mughals. How did the use of materials like sandstone, marble, and lime mortar contribute to the longevity of Mughal monuments?

Assignment 5

Early Colonial Period and Transformation of Indian Engineering (CO5) [5 marks]

Short Answer Questions:

1. What role did Thomason College play in shaping India's civil engineering education during the British period?
2. Explain the significance of the introduction of systematic mapping and surveys by the British. How did it affect the Indian landscape?
3. What were the main challenges faced by indigenous engineers during the British colonial period?
4. How did the introduction of Western surveying and mapping change the engineering landscape in India?
5. What was the British rationale for constructing the railway system in India?
6. Explain the impact of the Indian Railways on the Indian economy during the colonial period.

Long Answer Question:

7. Evaluate the establishment of Thomason College of Civil Engineering in Roorkee. Discuss its long-term effects on engineering education in India and how it contributed to shaping modern Indian engineering.
8. Discuss the transformation of Indian engineering during the colonial period, focusing on the impact of British architectural and infrastructural models. How did they affect local traditions, and what was the response of Indian engineers?
9. Discuss the growth of infrastructure under British colonial rule in India. Evaluate the economic and social impacts of British-engineered infrastructure projects, such as railways, ports, and telegraph networks.

Assignment 6

Rise of Modern Engineering Post-Independence

(CO5) [5 marks]

Short Answer Questions:

1. What were some of the key problems faced during the implementation of the Ganges Canal project?
2. Describe the contributions of Sir M. Visvesvaraya to Indian engineering.
3. What challenges did Indian engineers face while working on British-engineered projects?
4. How has software engineering contributed to India's economic growth?
5. Analyse India's policy efforts like "Make in India" and "Atmanirbhar Bharat".
6. Evaluate India's role in global technology collaborations.

Long Answer Question:

1. Analyze the role of canal and irrigation projects like the Ganges Canal in British colonial strategy. How did they impact both the British economy and local Indian agricultural practices?
2. Study the life and contributions of Dr. A.P.J. Abdul Kalam or Vikram Sarabhai and create a presentation or report.
3. Choose a small town or city and draft a conceptual smart city plan integrating AI, IoT, and renewable energy.

Final weightage: $(5+5+5+5)/2=10$ Marks

Any 4 to be assigned to the students, preferably from the COs those were not covered in Mid Term exam.

Reference Books:

1. *Engineering in India Through the Ages*, INSA, INSA New Delhi, 2004
2. *Science and Technology in Ancient India* by Debiprasad Chattopadhyaya, People's Publishing House, 2022
3. *India's Ancient Past* by R. S. Sharma, Oxford University Press, 2020
4. *History of Science, Philosophy and Culture in Indian Civilization* edited by D. P. Chattopadhyaya, Centre for Studies in Civilizations, 2000–2010
5. *From Temples to Dams: Engineering and Civilizations in India* by R. Balasubramaniam, Aryan Books International, 2021
6. *Sir M. Visvesvaraya: The Builder of Modern India* by N. K. Dikshit, National Book Trust, 2018
7. *India After Gandhi* by Ramachandra Guha, HarperCollins India, 2017