

# **Techno India NJR Institute of Technology**



## **Course File**

### **Building Material and Construction**

**(3CE4-07)**

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**Department of CE**



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

### 3CE4-07: BUILDING MATERIALS AND CONSTRUCTION

Credit: 3  
3L+0T+0P

Max. Marks: 150 (IA:30, ETE:120)  
End Term Exam: 3 Hours

SN	Contents	Hrs.
1	<b>Introduction to objective, scope and outcome of the course.</b>	1
2	<b>Basic Civil Engineering Materials (Properties, Types and Uses):</b> Stone: Compressive strength, Water absorption, Durability, Impact value, Tensile strength; Bricks: Water absorption, Compressive strength, Effloresces, Dimension and Tolerance; Tiles: Water absorption, Tolerance, Impact value and Glazing; Light weight concrete blocks. <b>Lime:</b> classification as per IS, properties, standard tests and uses in construction. <b>Fly-ash:</b> Properties and Use in manufacturing of bricks & cement; <b>Miscellaneous:</b> Gypsum, Plaster of Paris, PVC materials, Paints, Varnish and Distemper.	8
3	<b>Timber &amp; Steel:</b> Timber: Definitions of related terms, Classifications and Properties, Defects in Conversion of wood, Seasoning wood, Preservation, Fire proofing, Ply woods, Fibre boards; Steel: Mild steel and HYSD steel, Properties and their use, common tests on steel.	3
4	<b>Mortar and Plaster:</b> Mortar preparation methods: Functions and tests & their uses in various types of pointing & plastering	2
5	<b>Brick and Stone Masonry:</b> Basic principle of masonry work, different types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond. Comparison between stone and brick masonry. General principles, classification of stone masonry and their relative merits and demerits.	4
6	<b>Building Requirements &amp; Construction System:</b> Building components, their functions and requirements. Types of construction: load bearing and framed structure construction, RCC beam, column and slab construction, Precast and In-situ construction, Relative merits and demerits. Fire resistance construction, FRC. <b>Ground &amp; Upper floors:</b> Floor components and their functions, Floor types and Selection of flooring, construction details of ground and upper floors, merits and demerits.	7
7	<b>Foundation &amp; Site Preparation:</b> Purpose, types of foundation: like shallow, deep, pile, raft, grillage foundation and their suitability. Depth of foundation, Sequence of construction activity and coordination with site clearance, layout of foundation plan.	5



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

### II Year - III Semester: B.Tech. (Civil Engineering)

	<b>Temporary structures:</b> Types & methods of shoring, underpinning and scaffolding.	
<b>8</b>	<b>Damp Proofing:</b> Causes and Effects of dampness, Methods and materials for damp proofing, Methods and materials for anti-termite treatment. <b>Construction and Expansion Joints:</b> Requirements, Types material used, Construction details.	<b>3</b>
<b>9</b>	<b>Arches and Lintels:</b> Terms used, types of arches and their construction detail, types of lintels and constructions. <b>Partition Wall:</b> Types, purpose and use of partition wall.	<b>3</b>
<b>10</b>	<b>Stairs:</b> Terms used, requirements of good staircase, classification, construction details and suitability of different types of stairs, Lifts and Ramps.	<b>2</b>
<b>11</b>	<b>Roof and Roof Covering:</b> Purposes, classification of roofs, terms used. Introduction to Solid slab, Flat slab, Shell Roofs and Pitched roofs, and their constructional features. Types of pitched roofs and Trusses, typical constructional details; Roof covering materials, types and typical constructional details.	<b>4</b>
	<b>Total</b>	<b>42</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota

## Course Overview:

Student will learn basics of “Building Material and Construction” from these 42 hours course. Building Material and Construction covers information of important civil engineering materials, importance and information of Indian standard codes applicable to civil engineering material also cover the concrete production, mix design, and properties of concrete.

BMC plays a significant role in ensuring that all Company’s projects are aligned with strategic vision and objectives, and meet operational. Student should learn of identifying abilities of different material and construction activities in for multipurpose construction projects to get a good job in top civil engineering company India or abroad.

## Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Comprehension	Define different materials especially eco-friendly materials and safety measures to be adopted at any construction site.
2	Synthesis	Describe the various types of building materials and its Engineering application.
3	Comprehension	Memorize the knowledge of modern equipment’s and the recent techniques to be used.
4	knowledge	Understanding the use of non-conventional Civil Engineering materials
5	Analysis	Understand use of arches, lintels and partition wall. And learn about stairs and damp-proof course and joints in construction.

## Prerequisites:

- ✓ Students will able to extend the knowledge about the characteristics, sources and defects in various materials
- ✓ Students will able to Understand the manufacturing process of bricks and cement
- ✓ Students will able to design and test the materials in laboratory and field as per IS standards.
- ✓ Students will be able to understand the types and functions of main building services to be provided and the defects in the buildings along with the remedial measures for proper maintenance of the buildings.

## Course Outcome Mapping with Program Outcome:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO236.1	3	1	1	2	2	1	3	3	2	2	2	1	2	1	1
CO236.2	3	1	2	2	1	2	3	1	1	1	1	1	2	1	1
CO236.3	3	2	2	2	3	1	1	2	1	1	1	1	2	1	1
CO236.4	2	1	3	2	2	2	2	1	1	1	1	1	2	1	1
CO236.5	2	1	1	2	2	1	2	1	1	1	1	2	2	1	0
CO236(AVG)	2.6	1.2	1.8	2	2	1.4	2.2	1.6	1.2	1.2	1.2	1.2	2	1	0.8

Lecture No.	Unit	Topic
1	1	<b>INTRODUCTION:</b> Objective, scope and outcome of the course
2	2	<b>BASIC CIVIL ENGINEERING MATERIALS (PROPERTIES, TYPES AND USES):</b> <b>Stone:</b> Students should be able to understand Compressive strength, Water absorption, Durability, students will able to compute Impact value, Tensile strength
3	2	<b>Bricks:</b> Students will able to compute Water absorption, compressive strength of bricks
4	2	Students should be able to compute Compressive strength, Effloresces, Dimension and Tolerance
5	2	<b>Tiles:</b> Students will able to compute Impact value, Tensile strength compute Compressive strength Water absorption, Tolerance, Impact value Students should be able to identify Light weight concrete blocks
6	2	<b>Lime:</b> Students should be able to understand of classification as per IS, properties, standard tests and uses in construction
7	2	Fly-ash: Students should be able to understand Properties and Use in manufacturing of bricks & cement
8	2	Miscellaneous: Students should be able to identify Gypsum, Plaster of Paris
9	2	Students should be able to understand PVC materials, Paints, Varnish and Distemper
10	3	<b>TIMBER &amp; STEEL:</b> Timber: Students should be able to understand definitions of related terms, Classifications and Properties, defects in Conversion of wood
11	3	Students should be able to understand Seasoning wood, Preservation, Fire proofing, Ply woods, Fiber boards
12	3	Steel: Students should be able to identify Mild steel and HYSD steel, relate Properties and their use, Students should be able to perform common tests on steel
13	4	<b>MORTAR AND PLASTER:</b> Students should able to attain knowledge of Mortar preparation methods
14	4	Students should be able to identify Functions and their uses in various types of pointing & plastering, also able to perform tests
15	5	<b>BRICK AND STONE MASONRY:</b> Students should be able to understand Basic principle of masonry work and different types of bonds
16	5	Students should be able to compare merits and demerits of English, Single Flemish and Double Flemish bond
17	5	Students should be able to select stone and brick masonry for construction project
18	5	Students should be able to classify of stone masonry and relate their merits and demerits
19	6	<b>BUILDING REQUIREMENTS &amp; CONSTRUCTION SYSTEM:</b> Students should be able to understand Building components, their functions and requirements
20	6	Types of construction: Students should be able to understand load bearing and framed structure construction

21	6	Students should be able to identify RCC beam, column and slab construction
22	6	Precast and In-situ construction, Relative merits and demerits. Fire resistance construction, FRC
23	6	<b>GROUND &amp; UPPER FLOORS:</b> Students should be able to understand Floor components and their functions
24	6	Students should be able to understand floor types and Selection of flooring
25	6	Construction details of ground and upper floors, merits and demerits
26	7	<b>FOUNDATION &amp; SITE PREPARATION:</b> Students should be able to understand Purpose, types of foundation: like shallow, deep
27	7	Students should be able to identify Pile, raft, grillage foundation and their suitability
28	7	Students should be able to compute depth of foundation, sequence of construction activity and co-ordination, and prepare layout of foundation plan
29	7	<b>TEMPORARY STRUCTURES:</b> Students should be able to classify methods of shoring
30	7	Students should be able to attain knowledge of Underpinning and scaffolding
31	8	<b>DAMP PROOFING:</b> Students should be able to identify Causes and Effects of dampness, and should be able to classify Methods and materials for damp proofing
32	8	Methods and materials for anti-termite treatment
33	8	<b>CONSTRUCTION AND EXPANSION JOINTS:</b> Students should be able to select Type's material used and Construction details
34	9	<b>ARCHES AND LINTELS:</b> Students should be able to understand terms used for arch construction
35	9	Students should be able to identify Arch construction detail,
36	9	Students should be able to classify types of lintels and constructions.
37	10	<b>STAIRS:</b> Students should be able to understand terms used, requirements of good staircase
38	10	Students should be able to prepare construction details and suitability of different types of stairs
39	11	<b>ROOF AND ROOF COVERING:</b> Students should be able to understand Purposes, of covered roofs and related terms
40	11	Students should be able to understand of Solid slab, Flat slab, Shell Roofs and Pitched roofs
41	11	Students should be able to compare in pitched roofs and Trusses,
42	11	Students should be able to identify Roof covering materials, and typical constructional details

**TEXT/REFERENCE BOOKS**

1. Building Material and Construction, Saurabh kumarsoni, S.K. Kataria& Sons.
2. Building Materials: Products, Properties and Systems by ML Ghambir, Tata Mc Graw Hill
3. Engineering Materials by S. C. Rangwala,Charotar Publishing House Pvt. Limited

**Course Level Problems (Test Items):**

CO.NO.	Problem description
1	A. Write General Principles of good bond in brick masonry. B. Classify the types of stone masonry? Explain Rubble and ashlar masonry. C. Describe the various methods of damp proofing.
2	A. Classify various types of lintels and discuss their relative use. B. Explain the types of joints in construction with their neat sketch. C. Write about various the components of building and their functions.
3	A. Classification of partition wall, Enumerate purpose of partition wall. B. Explain in brief the following: (Any two) a) RCC Lintel b) Brick Lintel c) Steel Lintel. C. Describe the term scaffolding? Explain timber and steel scaffolding.
4	A. Classify pitched type roof, Explain any two. B. Explain the following: a) Lean to roof b) Mansard roof truss, c) AC Sheet roofing d) Mud pukka roofing.
5	A. What do you understand by shoring? Describe in brief various types of shores. B. Write about the grillage foundation and its suitability in construction.

**Assessment Methodology:**

1. Assignments one from each unit.
2. Online Quiz at Google classroom.
3. Midterm subjective paper based on topics as mentioned in the modules(Twice during thesemester).
4. Final paper at the end of the semester subjective.

## **TEACHING AND LEARNING RESOURCES UNIT-WISE**

### **1. BASIC CIVIL ENGINEERING MATERIALS (PROPERTIES, TYPES AND USES)**

#### **Video Tutorials:**

<https://www.youtube.com/watch?v=ULt4aEst4mM&t=1288s>

<https://www.youtube.com/watch?v=SLPPFykORjA&t=1133s>

<https://www.youtube.com/watch?v=NVibXq8hGnU>

<https://www.youtube.com/watch?v=w3CXwcBIHX4&list=RDCMUCJX7j7HYXROO6jCAUmHIw&index=2>

#### **Theory concepts:**

[https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3\\_K8hxvXwNleqiF-B](https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3_K8hxvXwNleqiF-B)

[https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU\\_ZW77o-GRqw5cjlwef](https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU_ZW77o-GRqw5cjlwef)

#### **Sample Quiz:**

<https://engineeringinterviewquestions.com/building-materials-and-construction-interview-questions-civil-engineering-objective-type-questions-and-answers/>

<https://www.civilsutras.com/civil-quiz-construction-materials-1/>

### **2. CONSTRUCTION MATERIAL TIMBER, STEEL, BRICK AND STONE MASONRY**

#### **Video Tutorials:**

<https://www.youtube.com/watch?v=hJkuBhCr0Us>

[https://www.youtube.com/watch?v=8cw96\\_WLqCo](https://www.youtube.com/watch?v=8cw96_WLqCo)

<https://www.youtube.com/watch?v=g4jGOPSphW8&list=PLmRuqPJhrsb43g9Rr2d0bT1emrKyAkx4M&index=10>

<https://www.youtube.com/watch?v=T3v71a00Xjg&list=PLmRuqPJhrsb43g9Rr2d0bT1emrKyAkx4M&index=11>

<http://www.nptelvideos.com/lecture.php?id=3722>

<http://www.nptelvideos.com/lecture.php?id=3717>

#### **Theory concepts:**

[https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3\\_K8hxvXwNleqiF-B](https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3_K8hxvXwNleqiF-B)

[https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU\\_ZW77o-GRqw5cjlwef](https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU_ZW77o-GRqw5cjlwef)

#### **Sample Quiz:**

[https://edurev.in/course/quiz/attempt/-1\\_Test-Bricks-Brick-Masonry-1/655c1a5e-698d-4792-9362-6263803adc5d](https://edurev.in/course/quiz/attempt/-1_Test-Bricks-Brick-Masonry-1/655c1a5e-698d-4792-9362-6263803adc5d)



[https://edurev.in/course/quiz/attempt/-1\\_Test-Bricks-Brick-Masonry-2/f0f1a944-76d0-415d-a8be-8744262c8b76](https://edurev.in/course/quiz/attempt/-1_Test-Bricks-Brick-Masonry-2/f0f1a944-76d0-415d-a8be-8744262c8b76)

<https://www.examveda.com/civil-engineering/practice-mcq-question-on-design-of-masonry-structures/>

### **3. BUILDING COMPONENTS AND DAMP PROOFING**

#### **Video Tutorials:**

<https://www.youtube.com/watch?v=DPMZ9e8j8qQ&t=370s>

<https://www.youtube.com/watch?v=5d10jRejNYI>

<https://www.youtube.com/watch?v=IY7IA7PRclQ>

#### **Theory concepts:**

[https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3\\_K8hxvXwNleqiF-B](https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3_K8hxvXwNleqiF-B)

[https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU\\_ZW77o-GRqw5cjlwef](https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU_ZW77o-GRqw5cjlwef)

#### **Sample Quiz:**

<https://amigoz.app/mcq/s/building-maintenance-mcq-questions/5fbf5735de490d50fa738e3c/?page=4>

### **4. CONSTRUCTION AND EXPANSION JOINTS**

#### **Video Tutorials:**

<https://www.youtube.com/watch?v=1MZc3EBLDcI>

<https://www.youtube.com/watch?v=X8xqs7q43jk>

#### **Theory concepts:**

<https://www.yourownarchitect.com/building-joints/>

<https://www.civilconcept.com/construction-joints/>

[https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3\\_K8hxvXwNleqiF-B](https://drive.google.com/drive/folders/13Q3VmuLAIGkQKxA3_K8hxvXwNleqiF-B)

[https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU\\_ZW77o-GRqw5cjlwef](https://drive.google.com/drive/folders/1hfe7KiBFOCxYxU_ZW77o-GRqw5cjlwef)

#### **Sample Quiz:**

[https://edurev.in/course/quiz/attempt/-1\\_Test-Bricks-Brick-Masonry-1/655c1a5e-698d-4792-9362-6263803adc5d](https://edurev.in/course/quiz/attempt/-1_Test-Bricks-Brick-Masonry-1/655c1a5e-698d-4792-9362-6263803adc5d)

## **5. ROOF AND ROOF COVERING**

### **Video Tutorials:**

<http://www.nptelvideos.com/lecture.php?id=3723>

### **Theory concepts:**

<https://sjce.ac.in/wp-content/uploads/2018/01/Roofs.pdf>

### **Sample Quiz:**

<https://www.proprofs.com/quiz-school/story.php?title=roofing-system>

[https://edurev.in/course/quiz/attempt/-1\\_Test-Industrial-Roofs-2/894b8fad-eb50-42b7-b2c0-f44f0bd9fdb4](https://edurev.in/course/quiz/attempt/-1_Test-Industrial-Roofs-2/894b8fad-eb50-42b7-b2c0-f44f0bd9fdb4)

**TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR**

**ASSIGNMENT -1**

**Building Material and Construction (3CE4-07)**

1. What is the role of gypsum in manufacturing cement.
2. Classifications of steel and its properties.
3. Write the types of rocks and explain its texture.
4. Explain in Brief about “Dressing of Stones”.
5. Properties of ceramic tiles and its importance.
6. What is the Fly ash Brick? Explain various tests to be conducted on Bricks.
7. What is the ‘quick lime’? Explain various tests to be conducted on lime.
8. Explain the good quality of a building stones.
9. What is the gypsum plaster? Write down the advantages and disadvantages of it.
10. What is the role of fly ash in concrete? Discuss the uses of fly ash in constructions.
11. Explain the Intermittent kilns and Continuous kilns for burning process of bricks.
12. Explain the Tensile strength test of mild steel in laboratory with its neat sketch.
13. What do you understand by seasoning of timber? Explain the various methods of Seasoning.

# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

## ASSIGNMENT -2

### Building Material and Construction (3CE4-07)

1. What are the purposes of different foundations?
2. Write down the Causes and effects of Dampness.
3. Write a note of “termites and their attack” on buildings.
4. Classify various types of lintels and discuss their relative use.
5. State briefly the requirement of a good stair case.
6. Classification of partition wall, Enumerate purpose of partition wall.
7. Compare merits and demerits of flat and pitched roof.
8. Write about various the components of building and their functions.
9. Describe the various methods of damp proofing.
10. Explain the types of joints in construction with their neat sketch.
11. Explain in brief the following: (Any two)
  - a) RCC Lintel
  - b) Brick Lintel c) Steel Lintel.
12. Write a short note on following:
  - a) Dog legged stair b) Open newel Stair,
  - b) c) Spiral Stair d) Half turn geometrical stair
13. What the classification of pitched type roof, Explain any two.
14. Write about the grillage foundation and its suitability in construction.
15. What do you understand by scaffolding? Explain timber and steel scaffolding.
16. What do you understand by Under-pining? When do you require it? Explain the pit method of Under-pining
17. What do you understand by shoring? Describe in brief various types of shores.
18. Enumerate, with the help of sketches, various types of arches based on its shapes.
19. Explain the following:
  - a) Lean to roof b) Mansard roof truss,
  - c) AC Sheet roofing d) Mud pukka roofing

## **Building Materials and Construction Objective Questions**

1. In a mortar, the binding material is
  - a) Cement
  - b) sand
  - c) surkhi
  - d) cinder
2. Wrought iron contains carbon upto:
  - a) 0.25%
  - b) 1 %
  - c) 1.5 %
  - d) 2%
3. Which of the following provides ultimate strength to the cement?
  - b) Pure Gypsum
  - b) Quartz Sand
  - c) Magnetite
  - d) Granite
4. Crushing strength of a first class brick should not be less than
  - a) 3.5 N/mm<sup>2</sup>
  - c) 7.0 N/mm<sup>2</sup>
  - b) 10.5 N/mm<sup>2</sup>
  - d) 14.0 N/mm<sup>2</sup>
5. Gypsum is a
  - a) Mechanically formed sedimentary rock
  - b) Igneous rock
  - c) Chemically precipitated sedimentary rock
  - d) Metamorphic rock
6. In brick masonry the bond produced by laying alternate headers and stretchers in each course is known as
  - a) English bond
  - b) Double Flemish bond
  - c) Zigzag bond
  - d) Single Flemish bond
7. In the cement the compound quickest to react with water, is
  - a) Tri-calcium aluminates
  - b) Tetra-calcium alumino-ferrite
  - c) Tri-calcium silicate
  - d) Di-calcium silicate
8. Excess of silica in brick earth results in
  - a) Cracking and warping of bricks
  - b) Loss of cohesion
  - c) Enhancing the impermeability of bricks
  - d) None of the above

**PREVIOUS YEAR QUESTION PAPERS**

<b>3E1134</b>	Roll No. _____	Total No of Pages: <b>3</b>
<b>3E1134</b> <b>B. Tech. III - Sem. (Main / Back) Exam, Dec. 2019</b> <b>PCC Civil Engineering</b> <b>3CE4-07 Building Material &amp; Construction</b>		

**Time: 3 Hours**

**Maximum Marks: 120**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART - A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What is the role of fly ash in concrete?
- Q.2 What do you understand by seasoning of timber?
- Q.3 Differentiate between mild steel and HYSD bars.
- Q.4 Write the name of different types of bond use in brick work.
- Q.5 Write any two comparison between stone and brick masonry.

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- Q.6 Explain relative merits and demerits of Flemish bond.
- Q.7 Differentiate between arches and lintels.
- Q.8 Write down causes of dampness.
- Q.9 What is load bearing structure use in building construction?
- Q.10 What do you understand by light weight concrete blocks?

### **PART – B**

**(Analytical/Problem solving questions)**

**[5×8=40]**

**Attempt any five questions**

- Q.1 Enlist of various laboratory tests performed on stone. Explain any four in detail.
- Q.2 Explain the role of fly ash in manufacturing of bricks and cement.
- Q.3 State and discuss different methods of seasoning of timber.
- Q.4 Explain causes of failure of foundation and their remedial measures.
- Q.5 Describe the various construction features of shell roof.
- Q.6 Explain types and methods of shoring and underpinning.
- Q.7 Explain various types of paints and varnish and their application in detail.

### **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[4×15=60]**

**Attempt any four questions**

- Q.1 What are various standard test performed on bricks? Explain any four with their procedure. <http://www.rtuonline.com>

Q.2 What is mortar? Briefly describe lime and cement mortar. State the role of sand in mortar.

Q.3 Explain different types of stone masonry. Also describe their relative merits and demerits

Q.4 Explain the requirements of good staircase. Describe the constructions details and suitability of different types of stairs.

Q.5 Explain the following-

(a) Flat slab and their application

(b) Methods and material for damp proofing

(c) Purpose and use of partition wall

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