

Ramgarhia Polytechnic College, Phagwara



Civil Engineering Department

Head of Department:	Er. Gurcharan Singh
Name of the Faculty:	Er. Sukhdeep Singh
Discipline:	Civil Engineering Department
Semester:	3 rd
Subject:	Construction Material
Lesson Plan Duration:	16 Weeks

RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills

in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control

Learning Outcomes

After undergoing the subject, students will be able to:

- CO1 Classify rocks and identify particular type of stones Calculate
- CO2 Classify different types of bricks and tiles
- CO3 Perform laboratory tests of cement to determine properties of cement
- CO4 Identify types of defects of timber
- CO5 Select paints/varnishes for various types of surfaces
- CO6 Identify and use different types of metals/alloys
- CO7 Select different materials used for wall paneling and false ceiling, such PVC, POP etc.
- CO8 Select other materials commonly used for contemporary buildings.

PO 	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 							
CO1							
CO2							
CO3							
CO4							
CO5							
CO6							
CO7							
CO8							

Syllabus

Units	Details	Hours
1.	<p>1. Building Stones:</p> <p>1.1 Classification of Rocks: (General Review)</p> <p>1.1.1 Geological classification: Igneous, sedimentary and metamorphic rocks</p> <p>1.1.2 Chemical classification; Calcareous, argillaceous and siliceous rocks</p> <p>1.1.3 Physical classification: Unstratified, stratified and foliated rocks</p> <p>1.2 General characteristics of stones – Marble, Kota stone, Granite, Sand, Trap, Basalt stone, Lime stone and Slate</p> <p>1.3 Requirements of good building stones</p> <p>1.4 Identification of common building stones</p> <p>1.5 Various uses of stones in construction</p> <p>1.6 Quarrying of stones by blasting and its effect on environment</p>	(6 hrs)
2	<p>2. Bricks and Tiles:</p> <p>2.1 Introduction to bricks</p> <p>2.2 Raw materials for brick manufacturing and properties of good brick making earth</p> <p>2.3 Manufacturing of bricks</p> <p>2.3.1 Preparation of clay (manual/mechanically) **</p> <p>2.3.2 Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional</p>	(13 hrs)

	<p>brick, refractory brick, clay-flyash bricks, sun dried bricks, only line diagram of kilns</p> <p>2.4 Classification and specifications of bricks as per BIS: 1077</p> <p>2.5 Testing of common building bricks as per BIS: 3495 Compressive strength, water absorption – hot and cold water test, efflorescence, Dimensional tolerance, soundness</p> <p>2.6 Tiles</p> <p>2.6.1 Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles</p> <p>2.6.2 Ceramic, terrazo and PVC tiles, : their properties and uses,</p> <p>2.6.3 Vitrified tiles, Paver blocks, interlocking tiles</p> <p>2.7 Stacking of bricks and tiles at site</p>	
4.	<p>3. Cement</p> <p>*3.1 Introduction, raw materials, flow diagram of manufacturing of cement</p> <p>3.2 Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement, low heat cement, white and coloured cement, portland pozzolana cement</p> <p>3.3 Properties of cement</p>	(10 hrs)
5.	<p>4 Timber and Wood Based Products:</p> <p>4.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ</p> <p>4.2 Market forms of converted timber as per BIS Code</p> <p>4.3 Seasoning of timber: Purpose, methods of seasoning as per BIS Code</p> <p>4.4 Properties of timber and specifications of structural timber</p> <p>4.5 Defects in timber, decay in timber</p> <p>4.6 Preservation of timber and methods of treatment as per BIS</p> <p>4.7 Other wood based products, their brief description of manufacture and uses: laminated board, gypsum board, block board, fibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost</p>	(12hrs)

	of the wood based products available in the market, Cement Panel Board, Moulded Doors.	
6.	<p>5. Paints and Varnishes:</p> <p>5.1 Introduction, purpose and use of paints</p> <p>5.2 Types, ingredients, properties and uses of oil paints, water paints and cement paints</p> <p>5.3 Covering capacity of various paints</p> <p>5.4 Types, properties and uses of varnishes</p> <p>5.5 Trade name of different products</p>	(07 hrs)
7.	<p>6. Metals:</p> <p>6.1 Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.</p> <p>6.2 Commercial forms of ferrous, metals.</p> <p>6.3 Aluminium & Stainless Steel</p>	(04 hrs)
8	<p>7. Miscellaneous Materials</p> <p>7.1 Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes</p> <p>7.2 Fibre Sheets and their size and uses</p> <p>7.3 Types and uses of insulating materials for sound and thermal insulation</p> <p>7.4 Construction chemicals like water proofing compound, epoxies, polymers</p> <p>7.5 Water proofing, termite proofing and fire resistance materials – types and uses</p> <p>7.6 Materials used in interior decoration works like POP, methods of doing POP, PVC panellin</p>	(12hrs)

Reference Books:

- Sharma, SK; and Mathur, GC; "Engineering Materials;" Delhi-Jalandhar, S. Chand and Co.
- Surendra Singh; "Engineering Materials;" New Delhi, Vikas Publishing House Pvt. Ltd.
- Chowdhuri, N; "Engineering Materials;" Calcutta, Technical Publishers of India.
- Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
- TTTI, Chandigarh "Civil Engineering Materials:" New Delhi Tata McGraw Hill Publication
- Kulkarni, GJ; "Engineering Materials;" Ahmedabad, Ahmedabad Book Depot.
- Shahane; "Engineering Materials"; Poona, Allied Book Stall.
- Gurcharan Singh; "Engineering materials", Delhi Standard Publishers Distributors
- SC Rangawala, "Construction Materials", Charotar Publishers
- Alam Singh, "Construction Materials"
- Dr. Hemant Sood "Lab Manual in Testing of Engineering Materials", New Age International (P) Ltd., New Delhi
- Handbook of Civil Engineering by PN Khanna.

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct

3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	

1 st	1 st	Classification of Rocks: Geological classification: Igneous, sedimentary and metamorphic rocks	1.	i) To identify the stones used in building works by visual examination
	2 nd	Chemical classification; Calcareous, argillaceous and siliceous rocks		
	3 rd	Physical classification: Unstratified		
	4 th	Stratified and foliated rocks		
	5 th	General characteristics of stones – Marble, Kota stone, Granite, Sand		
2 nd	6 th	Trap, Basalt stone, Lime stone and Slate	2.	i) To identify the stones used in building works by visual examination
	7 th	Requirements of good building stones		
	8 th	Identification of common building stones		
	9 th	Various uses of stones in construction		
	10 th	Quarrying of stones by blasting and its effect on environment		
3 rd	11 th	Introduction to bricks	3.	ii) To determine the crushing strength of bricks
	12 th	Raw materials for brick manufacturing		
	13 th	Properties of good brick making earth		

	14 th	Manufacturing of bricks		
	15 th	Preparation of clay (manual/mechanically)		
4 th	16 th	Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks,	4.	ii) To determine the crushing strength of bricks
	17 th	Types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning,		
	18 th	Size and weight of standard brick; traditional brick, refractory brick,		
	19 th	Clay-flyash bricks, sun dried bricks, only line diagram of kilns		
	20 th	Classification and specifications of bricks as per BIS: 1077		
	21 st	Testing of common building bricks as per BIS: 3495		
5 th	22 nd	Compressive strength, water absorption – hot and cold water test	5.	iii) To determine the water absorption of bricks and efflorescence of bricks
	23 rd	Efflorescence, Dimensional tolerance, soundness		
	24 th	Building tiles; Types of tiles-wall, ceiling,		
	25 th	Roofing and flooring tiles		

6 th	26 th	Ceramic, terrazo and PVC tiles, : their properties and uses,	6.	iii) To determine the water absorption of bricks and efflorescence of bricks
	27 th	Vitrified tiles, Paver blocks, interlocking tiles		
	28 th	Stacking of bricks and tiles at site		
	29 th	Introduction, raw materials,		
	30 th	Flow diagram of manufacturing of cement		
7 th	31 st	Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement	7.	iv) To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail & Hollock by visual examination only
	32 nd	Low heat cement, white and coloured cement, portland pozzolana cement		
	33 rd	Properties of cement		
	34 th	Identification and uses of different types of timber:		
	35 th	Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ		
8 th	36 th	Market forms of converted timber as per BIS Code	8.	iv) To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail & Hollock by
	37 th	Seasoning of timber: Purpose, methods of seasoning as per BIS Code		

	38 th	Properties of timber and specifications of structural timber		visual examination only
	39 th	Defects in timber, decay in timber		
	40 th	Preservation of timber and methods of treatment as per BIS		
9 th	41 st	Other wood based products, their brief description of manufacture and uses: laminated board, gypsum board, block board	9.	v) The students should submit a report work on the construction materials, covering water proofing material, cements, steel, paints and timber products available in the local market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.
	42 nd	Fibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Doors		
	43 rd	Introduction, purpose and use of paints		
	44 th	Types, ingredients, properties and uses of oil paints,		
	45 th	water paints and cement paints		
10 th	46 th	Covering capacity of various paints	10.	v) The students should submit a report work on the construction materials, covering
	47 th	Types, properties and uses of varnishes		
	48 th	Trade name of different products.		

	49 th	Ferrous metals: Composition, properties and uses of cast iron	.	water proofing material, cements, steel, paints and timber products available in the local market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.
	50 th	Mild steel, HYSD steel, high tension steel as per BIS.		
11 th	51 st	Commercial forms of ferrous, metals.	11	Revision
	52 nd	Aluminium & Stainless Steel.		
	53 rd	Plastics – Introduction and uses of various plastic products in buildings such as doors,		
	54 th	Water tanks and PVC pipes		
	55 th	Fibre Sheets and their size and uses		
12 th	56 th	Types and uses of insulating materials for sound and thermal insulation	12.	Revision
	57 th	Construction chemicals like water proofing compound		
	58 th	Epoxies, polymers		
	59 th	Water proofing, termite proofing		

	60 th	fire resistance materials – types and uses		
13 th	61 st	Materials used in interior decoration works like POP	13.	Revision
	62 nd	Methods of doing POP, PVC paneling		
	63 rd	RevisionMethods of doing POP, PVC paneling		
	64 th	RevisionTypes and uses of insulating materials for sound and thermal insulation		
	65 th	Revision Types and uses of insulating materials for sound and thermal insulation		
14 th	66 th	RevisionTypes and uses of insulating materials for sound and thermal insulation	14.	Revision
	67 th	RevisionFerrous metals: Composition, properties and uses of cast iron		
	68 th	RevisionFerrous metals: Composition, properties and uses of cast iron		
	69 th	RevisionPlastics – Introduction and uses of various plastic		

		products in buildings such as doors		
	70 th	RevisionPlastics – Introduction and uses of various plastic products in buildings such as doors		
15 th	71 st	RevisionFibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Doors	15.	Revision
	72 nd	RevisionFibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Doors		
	73 rd	RevisionFibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Doors		

	74 th	Seasoning of timber: Purpose, methods of seasoning as per BIS Code		
	75 th	Seasoning of timber: Purpose, methods of seasoning as per BIS Code		
16 th	76 th	Seasoning of timber: Purpose, methods of seasoning as per BIS Code	16.	Revision
	77 th	RevisionTypes and uses of insulating materials for sound and thermal insulation		
	78 th	RevisionTypes and uses of insulating materials for sound		

NBA has defined the following seven POs for an Engineering diploma graduate:

- i) **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
- ii) **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.
- iii) **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
- iv) **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

- v) **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
- vi) **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
- vii) **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSOs are a statement that describes what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program. Program may specify 2-4 program specific outcomes, if required.

These are the statements, which are specific to the particular 11 program. They are beyond POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.