Ramgarhia Polytechnic College, Phagwara

Civil Engineering Department

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

RATIONALE

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

Learning Outcomes

After undergoing the subject, students will be able to:

- CO1. Define the different components and classification of building
- CO2. Select a foundation for particular type of building
- CO3. Explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology
- CO4. Carry out the construction of brick wall.
- CO5. Supervise rubble and ashlar types of stone masonry construction
- CO6. Demonstrate the construction details of lintels and arches at appropriate level in building
- CO7. Select different types of doors, windows, floors and stairs cases in building
- CO8. Recognise different parts of roof trusses and drainage system of roofs
- CO9. Identify and select application procedure for different types of surfaces finishes in building i.e. plastering, pointing, painting, white washing and distempering
- CO10. Evaluate the possible reason of dampness at various level in building and remedial means
- CO11. Demonstrate how to carry out different types of possible anti termite treatments in building

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

CO9							
C10							
C11							

Syllabus

Units	Details	Hours
1.	Introduction: 1.1 Definition of a building, classification of buildings based on occupancy 1.2 Different parts of a building	(1 hrs)
2.	Foundations: 2.1 Concept of foundation and its purpose 2.2 Types of foundation-shallow and deep **2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns 2.2.2 Introduction to deep foundation and their types 2.3 Earthwork 2.3.1 Layout/setting out for surface excavation, cutting and filling 2.3.2 Excavation of foundation, trenches, shoring, timbering and dewatering	(7 hrs)
3.	Walls: 3.1 Purpose of walls 3.2 Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls 3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls 3.4 Partition walls: Constructional details, suitability and uses of brick and wooden partition walls	(8 hrs)

	3.5 Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning	
4.	Masonry 4.1 Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters 4.1.1 Bond – meaning and necessity; English, flemish bond and other types of bonds 4.1.2 Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints 4.1.3 Mortars: types, selection of mortar and its preparation 4.2 Stone Masonry 4.2.1 Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress 4.2.2 Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls	(9 hrs)

5.	Arches and Lintels: 5.1 Meaning and use of arches and lintels: 5.2 Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span 5.3 Arches: 5.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving 5.3.2 Stone arches and their construction 5.3.3 Brick arches and their construction 5.4 Lintels 5.4.1 Purpose of lintel 5.4.2 Materials used for lintels 5.4.3 Cast-in-situ and pre-cast lintels 5.4.4 Lintel along with sun-shade or chhajja	(8 hrs)
6.	Doors, Windows and Ventilators: 6.1 Glossary of terms with neat sketches	(08 hrs)

	6.2 Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, glazed door, rolling shutter, steel door, sliding door, plastic and alumininium doors 6.3 Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows. 6.4 Door and window frames – materials and sections, fixtures and fasteners, hold fasts	
7.	Damp Proofing and Water Proofing 7.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health 7.2 Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture. Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc. 7.3 Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals	(10 hrs)
8	Floors 8.1 Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose 8.2 Types of floor finishes - concrete flooring, tile flooring, stone (marble and kota) flooring. Timber flooring, timber floor finish and their brief description 8.3 Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase	(9hrs)
9	Roofs 9.1 Types of roofs, concept of flat, pitched and arched roofs 9.2 Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts 9.3 False ceilings using gypsum, plaster boards, cellotex, fibre boards	(7 hrs)
10	Stairs 10.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing 10.2 Classification of staircase on the basis of material – RCC, timber, steel, Aluminium 10.3 Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc	(7 hrs)

	10.4 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair	
11	Surface Finishes 11.1 Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing 11.2 Pointing - different types of pointing and their methods 11.3 Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces 11.4 Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints 11.5 Selection of appropriate paints/finishes for interior and exterior surfaces 11.6 Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes	(8hrs)

Reference Books:

- Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.
- Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.
- Rangwala, SC: "Building Construction"; Anand, Charotar Book Stall
- Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot
- Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.
- Sharma,SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.
- Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi
- Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.
- SP – 62 Hand Book of BIS
- B.I.S. – 6313 Part 1, 2, 3
- National Building Code
- Handbook of Civil Engineering by PN Khanna
- Video films on Damp proofing, water proofing, surface finishes

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

Week	Theory		Practical	
	Lecture Day		Practical Day	
1st	1st	Introduction: Definition of a building, classification of buildings based on occupancy , Different parts of a building	1.	Demonstration of tools and plants used in building construction
	2nd	Concept of foundation and its purpose		
	3rd	Types of foundation- shallow and deep		
	4th	Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block		
	5th	stepped foundation for masonry pillars and concrete columns		
2nd	6th	Introduction to deep foundation and their types	2.	To prepare Layout of a building: two rooms building with front verandah
	7th	Earthwork : Layout/setting out for surface excavation, cutting and filling		
	8th	Excavation of foundation, trenches, shoring, timbering and dewatering		
	9th	Walls: Purpose of walls		
	10th	Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls		
3rd	11th	Classification of walls as per materials of construction: brick, stone	3.	To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
	12th	reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls		
	13th	Partition walls: Constructional details, suitability and uses of		

		brick and wooden partition walls		
	14th	Scaffolding, construction details and suitability of mason's brick layers scaffolding		
	15th	suitability of mason's brick layers and tubular scaffolding, shoring, underpinning		
4th	16th	tubular scaffolding, shoring, underpinning	4.	Demonstration of following items of work at construction site by: a) Timbering of excavated trenching b) Laying damp proof courses c) Construction of masonry walls d) Laying of tile flooring on an already prepared lime concrete base e) Plastering and pointing exercise f) Constructing RCC work g) Pre-construction and post construction termite treatment of building and woodwork h) Interlocking tiles
	17th	Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin		
	18th	frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters		
	19th	Bond – meaning and necessity; English bond		
	20th	flemish bond and other types of bonds		
5th	21st	Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls	5.	Demonstration of tools and plants used in building construction
	22nd	methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints		

	23rd	Mortars: types, selection of mortar and its preparation		
	24th	Stone Masonry : Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress		
	25th	Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls		
6th	26th	Meaning and use of arches and lintels	6.	To prepare Layout of a building: two rooms building with front verandah
	27th	Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span		
	28th	Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span		
	29th	Types of Arches - Semi circular, segmental,		

		elliptical and parabolic, flat, inverted and relieving		
	30th	Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving		
7th	31st	Stone arches and their construction	7.	To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
	32nd	Brick arches and their construction		
	33rd	Purpose of lintel , Materials used for lintels , Cast-in-situ and pre-cast lintels Lintel along with sun-shade or chhajja		
	34th	Doors,windows,ventilators :Glossary of terms with neat sketches		
	35th	Classification based on materials i.e. wood, metal and plastic and their suitability for different situations		
8th	36th	Different type of doors- panel door, flush door, glazed door, rolling shutter	8.	Demonstration of following items of work at construction site by: a) Timbering of excavated trenching b) Laying damp proof courses c) Construction of masonry walls d) Laying of tile flooring on an already prepared lime concrete base e) Plastering and pointing exercise f) Constructing RCC work g) Pre-construction and post construction termite treatment of building and woodwork h) Interlocking tiles
	37th	steel door, sliding door, plastic and aluminium doors		
	38th	Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows.		
	39th	Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows.		
	40th	Door and window frames – materials and sections, fixtures and fasteners, hold fasts		

9th	41st	Door and window frames – materials and sections, fixtures and fasteners, hold fasts	9.	Demonstration of tools and plants used in building construction
	42nd	Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health		
	43rd	Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health		
	44th	damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health		
	45th	Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture		
10th	46th	Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture	10.	To prepare Layout of a building: two rooms building with front verandah
	47th	Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc.	.	
	48th	Moisture entrapped during construction i.e.		

		moisture in concrete, masonry construction and plastering work etc.		
	49th	Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc		
	50th	Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals		
11th	51st	Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals	11	To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
	52nd	Glossary of terms of floors-floor finish, topping, under layer, base course, rubble filling and their purpose		
	53rd	Glossary of terms of floors-floor finish, topping, under layer, base course, rubble filling and their purpose		
	54th	Glossary of terms of floors-floor finish, topping, under layer, base course, rubble filling and their purpose		
	55th	Types of floor finishes - concrete flooring, tile flooring, stone (marble and kota) flooring.		
12th	56th	Types of floor finishes - concrete flooring, tile flooring, stone (marble and kota) flooring.	12.	Demonstration of following items of work at construction site by: a) Timbering of excavated trenching b) Laying damp proof courses c)
	57th	Timber flooring, timber floor finish and their brief description		

	58th	Timber flooring, timber floor finish and their brief description		Construction of masonry walls d) Laying of tile flooring on an already prepared lime concrete base e) Plastering and pointing exercise f) Constructing RCC work g) Pre-construction and post construction termite treatment of building and woodwork h) Interlocking tiles
	59th	Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase		
	60th	Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase		
13th	61st	Types of roofs	13.	Demonstration of tools and plants used in building construction
	62nd	concept of flat, pitched roofs		
	63rd	concept of flat, pitched and arched roofs		
	64th	Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts		
	65th	Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts		
14th	66th	False ceilings using gypsum, plaster boards, cellotex, fibre boards		To prepare Layout of a building: two rooms building with front verandah

	67th	False ceilings using gypsum, plaster boards, cellotex, fibre boards	14.	
	68th	Glossary of terms of stairs: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing		
	69th	Glossary of terms of stairs: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing		
	70th	Classification of staircase on the basis of material – RCC, timber, steel, Aluminium		
15th	71st	Classification of staircase on the basis of material – RCC, timber, steel, Aluminium	15.	To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
	72nd	Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc		
	73rd	Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc		
	74th	Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs),		

		bifurcated stair, spiral stair		
	75th	Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing		
16th	76th	Pointing - different types of pointing and their methods	16.	Demonstration of following items of work at construction site by: a) Timbering of excavated trenching b) Laying damp proof courses c) Construction of masonry walls d) Laying of tile flooring on an already prepared lime concrete base e) Plastering and pointing exercise f) Constructing RCC work g) Pre-construction and post construction termite treatment of building and woodwork h) Interlocking tiles
	77th	Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces		
	78th	Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints		
	79th	Selection of appropriate paints/finishes for interior and exterior surfaces		
	80th	Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes		

Web Source References

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

Lesson Plan

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.