

15 ARC 1.1 – ARCHITECTURAL DESIGN -I

CONTACT PERIODS : 8 (Studio) per week

PROGRESSIVE MARKS : 100

TERM WORK MARKS : 200

OBJECTIVES:

To develop the ability to translate abstract principles of design into architectural solutions for simple problems

OUTLILNE:

What architectural education entails? What being an architect involves? and Architecture's connection with other forms of knowledge: Science, Mathematics, Philosophy, Religion, etc.

Local stories on architecture.

Listing of important local buildings and explain why they are important.

Listing and Drawing silhouettes of favourite buildings or places.

Observing the built environment around and experiencing enclosures (field trips)

Learning basics of architectural representation.

Measured drawing exercise of familiar objects & spaces- a table (object), a classroom and a staircase (static/transition spaces), pavilion, open/ enclosed spaces etc.

Collection and documentation of all building materials within 5 km radius.

Introduction to basic development of forms: additive form, deductive form, rhythm, contrast, balance and symmetry.

Concepts of volume and scale, width to height ratio.

Study models to explore the design principles. Multiple sectional drawings of study models
Introduction to anthropometry; relationship of architecture with human body.

Introduction to furniture; relationship of objects with human body.

Portfolio of study and design through drawing/representation.

Human functions and their implications for space requirements. Minimum and optimum areas for mono functions. User's data, movement and circulation diagrams. Spatial interpretations – various activities and their relationship with spaces.

Design of functional furniture layout, circulation, lighting and ventilation for spaces such as living/dining, bedrooms, Architect's office, Doctor's clinic etc.,.

Note:

The portfolio covering all the assignments shall be presented for term work.

REFERENCES:

1. "Time Saver Standards for Architectural Design Data" by John Hanock
2. "Architectural Graphic Standards" by Ramsay and Sleeper
3. Indian Anthropometric Dimensions for Ergonomic Design Practice by Debkumar Chakrabarti

15ARC 1.2: MATERIALS AND METHODS IN BUILDING CONSTRUCTION-I

CONTACT PERIODS: 6 Hours (1 Lecture +5 studio) per week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 4 HRS

OBJECTIVE: *To introduce building materials and building elements and their intrinsic relationship to basic Building Systems.*

OUTLINE:

MODULE 1

1. **Making Buildings 1:** Materials, Building Systems Overview (know-how of building materials and construction).
2. **Making Buildings 2:** Various conventions used for drawing plan, sections and elevations.
3. **Introduction to Brick Masonry Construction:** Brick as a building material: Types, properties, uses and manufacturing methods.

MODULE 2

4. **Brick masonry load bearing wall construction:** Types of brick masonry walls and bonds, foundations, mortar type, plasters, buttresses, arches and lintels.
5. **Field visit:** Brick kiln, Sawmill, stone quarry, etc –Report on site visit.
6. **Stone Masonry Construction:** Stone as a building material: Types, properties and uses, quarrying, Stone masonry load bearing wall construction: Types of walls, bonds, arches and lintels.

MODULE 3

7. **Wall construction:** Introduction to wall construction and detailing with building materials: Hollow and solid Concrete Blocks, Hollow and solid clay Blocks, Fly ash Blocks, Aerated Concrete Block, stabilized mud blocks, Glass Blocks, etc. Properties, uses and manufacturing methods.

MODULE 4

8. **Masonry Foundation:** Simple load bearing foundations in brick and stone.
9. **Introduction to Wood as a Building Material:** Types – Natural, hard and softwood. Quality of timber used in buildings, defects, seasoning and preservation of timber.

MODULE 5

10. **Wooden door assembly and production:** Types of wooden Doors, i.e., Battened, ledged, braced, paneled, flush and glazed doors. Study of joinery details.
11. **Wooden windows assembly and production:** Types of wooden glazed windows, study of joinery details.

Note:

Minimum one plate on each topic, site visits to be arranged by studio teacher. Study of material application in the form of portfolio. All the plates on construction and portfolio on material application shall be assessed for progressive marks.

REFERENCES:

- 1) Building Construction” by W.B. Mackay
- 2) Construction Technology” by Chudley
- 3) “Construction of Buildings” by Barry
- 4) ‘Building construction’ by Francis K Ching

15ARC 1.3: ARCHITECTURAL GRAPHICS-1

CONTACT PERIODS: 4 (Studio) per week

TERM WORK MARKS: 100

PROGRESSIVE MARKS : 50

OBJECTIVE: *To introduce students to the fundamental concepts and techniques of graphical drawings, and multi-angle representations of built elements and built forms with applicable renderings.*

OUTLINE:

1. **Introduction to visual representation and scales:** The basic principles of drawing and sign conventions; the concept of scales and application in architecture.
2. **Practice in lettering:** Lettering used in architectural drawings, including different fonts.
3. **Introduction to Euclidian Geometry:** Exercises in lines and angles, construction of triangles, quadrilaterals and regular polygons. Introduction to the development of simple surfaces – cubes, cuboids and pyramids.
4. **Introduction to curves:** Construction of plane curves, ellipse, parabola, hyperbola and ovals. Exercise in physical modeling for parabola and hyperbola.
5. **Arches:** Typical arch forms and methods of drawing them.
6. **Orthographic projection (first angle projection):** Principles of orthographic projection; projections of points, lines, planes – explore all combinations.
7. **Orthographic projection of solids**
8. **Orthographic projection of architectural built elements and built forms:** (Simple to complex)
9. **3D Projections:** 3D representation in isometric projection of solids.
10. **3D Projections:** 3D representation in isometric projection of built elements and built forms (simple to complex).
11. **3D Projections:** 3D representation in axonometric projection of solids.
12. **3D Projections:** 3D representation in axonometric projection of built elements and built forms.
13. **Introduction to rendering:** Simple rendering of the 3D drawings of built elements and built forms – free-hand pencil rendering with shading and textures.

Note: A consolidated portfolio containing exercises related to each of the above modules to be presented for term work examination

REFERENCES:

1. *Geometrical Drawing for Arts Students* by IH Morris
2. *Perspective* by SH Mullik
3. *Architectural Graphics* by D.K Ching

15ARC 1.4: HISTORY OF ARCHITECTURE - I

CONTACT PERIODS: 3 (Lecture) Per Week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 HRS

OBJECTIVE: *To provide an introduction to the culture and architecture of early civilizations.*

OUTLINE:

MODULE 1

1. **Introduction** What History education entails? Architecture's connection with History.
2. **Introduction to Pre-Historic Civilization:** Primitive man - shelters, settlements, religious and burial systems E.g.: Oval hut, Nice, Dolmen tomb, gallery grave, passage grave, Houses at Catal Huyuk, Henge Monuments, StoneHenge.
3. **Introduction to River valley cultures:** generic forces shaping settlements and habitats:

MODULE 2

4. **Indus Valley Civilization:** Forces shaping settlements and habitats: Layout of Mohenjodaro, House plan, Community well, Great Bath, Granary.
5. **River valley cultures, Tigris and Euphrates:** Ziggurats at Warka, Ur and Tchoga Zanbil, Palace of Sargon.

MODULE 3

6. **River valley culture, Nile:** Mastaba Tombs, Pyramid of Cheops, Temple of Khons, Karnak.
7. **Introduction to Chinese Architecture:** Forces shaping settlements and habitats.
8. **Introduction to Mayan and Japanese Architecture:** Forces shaping settlements and habitats.

MODULE 4

9. **Introduction to Desert and Mountainous cultures:** Forces shaping settlements and habitats with examples.
10. **Introduction to Pre-Classical Civilization:** Mycenea, Persia, Etruscan. Pre-Classical Civilization Examples: Tiryns, the Temple of Juno Sospita, the Palace of Persepolis.

MODULE 5

11. **Pre-classical Aryan & Mauryan :** Vedic and Epic Age Salient features Vedic Village.
12. **Introduction to contemporary Tribal Cultures:** Forces shaping settlements and habitats in tribal cultures with examples.

REFERENCES:

1. History of Architecture in India" by Tadgell Christopher
2. Indian Architecture, Buddhist and Hindu period" by Brown Percy
3. Architecture of India, Buddhist and Hindu" by Grover, Satish

15 ENG 1.5: BUILDING STRUCTURES-1

CONTACT PERIODS: 3 (Lecture) Per Week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 HRS

OBJECTIVE: Introduction to principles of loads, structural materials and transmissibility of force with examples.

OUTLINE:

MODULE 1

1. **Evolution of Structures:** Historical perspective and definition of structure as a device for channeling loads that result from the use or presence of the building in relation to ground.
2. **Structural systems overview:** Vertical/lateral systems: wall, cantilever, moment frame, braced frame, horizontal one-way and two-way systems: truss, arch, vault, dome, shell, cable stayed, suspended, membrane.
3. **Experiment with Structures:** Example-1: Build a structure to house an un-boiled egg to be thrown from a building without breaking (avoid foam boxes and bulky structures). Example-2: Build a Structure of dimension 150x150x150mm using A4 size paper to withstand a load of 1 kilogram. Example-3: Build a beam or a truss using matchsticks to span a distance of 150mm, and test the maximum mid-span load the truss could carry. Example-4: Build a geodesic dome of 150mm dia using straws, ice cream sticks or matchsticks to span a distance of 150mm.

MODULE 2

4. **Structural Materials:** Mechanical properties of Structural materials: wood, masonry, steel, concrete, fabric; energy use and rupture length. Advantages and disadvantages of Structural Materials and choice of Structural Material for domestic buildings, Industrial buildings, Tall buildings and Long Span buildings.
5. **Loads on Structures:** Dead load (DL), live load (LL), static, dynamic, impact, and thermal loads.

MODULE 3

6. **Principle of transmissibility of forces:** Understanding load flow by tributary load and load path (slab, beam, and girder) and vertical members (post, wall, and footing); load path.
7. **Equilibrium of Forces:** Force, Reaction, Moment and Principle of Support conditions and their significance in resistance to forces and to maintain equilibrium.
8. **Basic principles of mechanics:** Tension, compression, shear, bending, torsion; symbols and notations; force and stress.

MODULE 4

9. **Stress/strain relations (Hooke's Law):** Modulus of Elasticity, linear and non-linear materials, elastic, plastic, and elastic-plastic materials; Poisson's Ratio; Thermal stress and strain.
10. **Graphic vector analysis:** Resultant and equilibrant of coplanar, concurrent and non-concurrent force systems. Parallelogram, force polygon, resultant, equilibrant, components; numeric method.

MODULE 5

11. **Truss:** Truss concept of triangulation, common truss configurations.
12. **Truss loads and reactions:** For a given configuration of the trusses and center to center spacing, calculations of the dead weight of the truss and the dead weight of the roof cover and support reaction loads.

REFERENCES:

- 1) STRUCTURES - Martin Bechthold, Daniel L Schodek, and PHI Learning Private limited, Sixth Edition,
- 2) Structure in Architecture, the building of buildings, by Mario Salvadori
- 3) Structure and Design, by G. G. Schierle, 4) Engg Mechanics – R K Bansal & Sanjay Bansal, Laxmi publications, New Delhi, 3rd ed, 5) Engg Mechanics, Ferdinand L Singer, Harper Collins publications, 3rd ed.

15HUM 1.6: COMMUNICATION SKILLS

CONTACT PERIODS: 3 (Lecture) per week

PROGRESSIVE MARKS : 50

OBJECTIVE: *To develop skills in effective communication – both written and verbal and to explore the potential of media technology and the Internet to enhance communication.*

OUTLINE:

1. **Introduction:** Introduction to course objective and framework of assignments and assessment. Discussion on exploratory topics.
2. **Reading and listening comprehension:** Reading of a passage from famous books (e.g. Samskara). Students to draw an image on A4 paper based on the read passage.
3. **Verbal presentations:** Understanding the differences among seminars, conferences, convention, congress, debates, extempore speeches, panel discussions etc. Students to write a brief synopsis on seminar topic to be submitted to seminar committee for acceptance.
4. **Introduction and discussion on exploratory topic for a survey questionnaire:** Need to document infrastructure (or lack of) on college campus and students to prepare a fifteen point questionnaire with info- graphics and conduct survey.
5. **Interpretation of materials:** such as questionnaires, application forms, analysis of materials such as texts, reports, technical literature.
6. **Notes taking:** From spoken and written English.
7. **Comprehension of lectures and speeches to locate key points**
8. **Analytical Writing:** To develop the ability to write concisely and correctly and present ideas in a logical manner.
9. **Introduction and discussion on exploratory topic for a letter:** Understanding the difference between formal and informal letters etc. Students to Write /draw a letter to fellow architects, clients, public authorities, contractors, enquiries to industries, dealers.
10. **Article writing:** on a Design or a Building, Introduction to Design Basis Report.
11. **Writing a term paper:** term paper is a research paper written by students over an academic term.
12. **Introduction and discussion on exploratory topic for a brief essay:** Observation based writing. Topic for assignment: PATTERNS (in nature, Architecture, art, mathematics, language, infrastructure, social systems etc.) and student to write and illustrate a 300 word essay on patterns.
13. **Using the Internet to enhance communication**

REFERENCES:

- 1) Working in English: Teachers Book, Jones Leo.
- 2) Communicative English for Professional Courses, Mudambadithaya G.S.
- 3) English Conversation Practice, Taylor, Grant.

15 ART 1.7: BASIC DESIGN & VISUAL ARTS

CONTACT PERIODS: 6 (Studio) per week
PROGRESSIVE MARKS : 50

OBJECTIVE: *To encourage a critical orientation to design thinking and action.*

- 1) **Observation & Study 1:** Selection of two outdoor objects/systems and observation of their natural occurrence, relationships with context, form & structure, colors & textures, and function
Sketching & visual representation in various media.
3 dimensional modeling in appropriate medium (clay/paper/wire/plaster/wax etc.).
- 2) **Observation & Study 2:** Selection of two indoor objects/systems and observation of their situation, relationships with context, form & structure, colors & textures, and functions.
Sketching & visual representation in various media.
3 dimensional modeling in appropriate medium
(Clay/paper/wire/plaster/wax etc.).
- 3) **Material Study-1:** Selection of two materials used in everyday life (textiles, Earthenware, terracotta, metals, stone, plastic, glass etc.) Study of properties, Strength, examples of use.
- 4) **Material Study-2:** Sketching & visual representation of material in various media, like Paper, clay, plaster, wood, wire, wax, photography.
- 5) **Material Study-3:** Hands-on making of object/joint/structure of own choice with one of the materials studied.
- 6) **Design of a non-enclosed object using the materials studied.** E.g. park Seat, bollard, push-cart, etc.
- 7) **Design of a semi-enclosed object/space using the materials studied.** E.g. gazebo, kiosk, bus stop, stage set, etc.
- 8) **Design of an enclosed object/space using the materials studied.**
e.g. Security cabin, grocery store, caravan etc.

REFERENCES:

- 1) 'The Art of Color and Design' by Maitland Graves
- 2) 'Ways of Seeing' by John Berger
- 3) 'Design of Everyday Things' by Donald Norman
- 4) "Rendering with Pen and Ink" by Robert Gill

15ARC 1.8: MODEL MAKING WORKSHOP

CONTACT PERIODS: 3 (Practical) per week
PROGRESSIVE MARKS : 50

OBJECTIVE: *To train the students to experiment and manipulate materials leading to creative exploration of forms.*

OUTLINE:

1. Carpentry: Introduction to the use of different types of woods available and tools used in carpentry.
2. Joints: Different types of joints, joinery details (which are commonly used in timber construction and interiors). Application of veneers/laminates on different types of timber surfaces i.e., Teak and commercial woods viz ply, block boards, particle boards. Engraving and carving. Polishing and painting.
3. Model generation: Pyramid, cube, cone, polygon using particle/block board and polishing, engraving, painting etc (which ever is possible) of the same.
4. Clay-I:- Generation of basic forms – cube, cone, dome and arch.
5. Clay-II:- Walls, corbel/free forms and surface finishes.
6. Bricks I:- Types of Joints, tools used & model generation - walls (types – linear, curved, zig-zag etc) corbel
7. Bricks II:- Form Generation-dome, arches, free forms
8. STONE-I:- Study/types of joints, tools used - wall and corbel form generation
9. STONE-II:- Generation of forms – arches, domes
10. Cob/Wattle and daub construction, earth construction
11. Composite Forms : Experimental form generation combining two/three materials eg: clay & brick, brick & wood, stone & brick, brick & metal (rods/pipes/wires, wood & metal etc)
12. Free Forms: Funicular shells, Tensile structures using Fabrics, canvas, plastic (tubes & sheets) etc

15 ARC 2.1 – ARCHITECTURAL DESIGN -II

CONTACT PERIODS : 9 (Studio) per week

PROGRESSIVE MARKS : 100

TERM WORK MARKS : 200

OBJECTIVE: To expose the students to the grammar of creating architectural space and form, including the study of variables like light, movement, transformation, scale, structure & skin

OUTLINE:

Nature of Space; PLACE: A “boundary”, a “center” and a “spirit” PATH: A “way” and a “goal”
DOMAIN: A conglomeration of paths and goals that forms a “whole” with its own “identity”

Materials Eg. Masonry (brick & stone), Steel/Glass with cladding infill, exposed Concrete

Enclosure, Ambiguity, Transparency in Plan, Section and Elevation, with concept sketches and diagrams so that presentation is self-explanatory ex. 1:50 plans, sections, and elevations.

Emphasis on work in studio by hand drawing and study model with lift off roof.

The One Room House

Lecture cum discussion on the Poetics of Space like light, movement, transformation, scale, structure and skin (case study based): keywords for discussion: contemplative / severe / dramatic / minimalist / natural / organic / contemporary / traditional.

Understanding the role of physical (terrain, climate, materials, etc.) and cultural factors (open, closed, transition spaces) that inform architecture.

Projects shall be explored with the help of models and sketches.

Any One Room enclosure could be taken to explore the implication of light, movement, transformation, scale, structure and skin.

Emphasis on freeing the expression of the poetic self, rather than on meeting external standards, and student development of self-explanatory presentations

Case study assignment (done in groups of four students per group): One from library/internet research and one from actual experience.

Project presented in the form of a portfolio.

Emphasis on studio work/participation and Hand drawings.

Formulate a process of testing the various elements of space making learnt earlier in the semester through a project on an actual site. The project examples could be: A House for myself, Guest House, Farm house, Villa, Container house, Courtyard house, Tree house, etc.

Note:

The portfolio covering all the assignments shall be presented for term work.

References:

1. Time Saver Standards for Architectural Design Data” by John Hanock
2. Architectural Graphic Standards” by Ramsay and Sleeper
3. Indian Anthropometric Dimensions for Ergonomic Design Practice by Debkumar Chakrabarti

15ARC 2.2: MATERIALS AND METHODS IN BUILDING CONSTRUCTION-II

CONTACT PERIODS: 6 Hours (1 hr Lecture +5 hrs studio) per week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 4 HRS

OBJECTIVE: To introduce Building materials especially RCC and building elements, and their intrinsic relationship to basic Building systems, which includes roofing for medium spans, Concrete columns, Concrete foundations and staircases.

OUTLINE:

MODULE: 1

- 1) **Introduction to Timber** : Timber, various parts, their purposes and method of construction. Use of tiling for roofing.
- 2) **Timber Roof** – Lean to roof, Collared Roof, King post roof, Queen Post Roof; Detailed Drawing of one roof system.
- 3) **Introduction to Steel Roof** – Steel trussed roof, their purposes and method of construction. Use of GI sheets and aluminum sheets for roofing.

MODULE: 2

- 4) **Introduction to Cement and Steel as a Building material:** Cement – Types of cement, their applications, laboratory and field tests. Properties and architectural uses of reinforced steel. Reinforced Cement Concrete as a building material: Concrete Ingredients, grades of concrete, admixtures, properties of concrete, production of concrete, mix, proportioning (Site visit to a Ready-mix concrete (RMC) batching plant)

MODULE: 3

- 5) **Reinforced Cement Concrete as a building material:** Form work, placing, and compaction, curing of concrete, sampling and testing of concrete. Construction joints, expansion joints, finishes in concrete, chemical admixtures. (Site visit to concreting construction site).
- 6) **RCC Foundations** (Isolated footing) and Columns (Square and Round) Raft foundations, Grillage foundations and combined footing.

MODULE: 4

- 7) **Introduction to Staircase:** Anthropometry of stairs, types of Staircases and construction methods of staircase in – Masonry, timber, RCC, Steel and Composite.
- 8) **Timber Stairs:** Single and Double Stringer stairs: Means and methods of Construction.
- 9) **RCC Stairs:** Waist slab, folded plate, Stringer stairs, precast stairs: Means and methods of Construction.

MODULE: 5

- 10) **Steel Stairs:** Stringer stairs, Folded Type, Spiral stairs, Fire escape stairs: Means and methods of Construction.
- 11) **Composite Stairs:** Brick/stone, Steel/Timber, Concrete/wood, steel/ glass: Means and methods of Construction.

Note: Minimum one plate on each topic, site visits to be arranged by studio teacher. All the plates on construction and portfolio on material application shall be presented for progressive marks.

REFERENCE:

- 1) "Building Construction" by W.B. Mackay
- 2) "Construction Technology" by Chudley
- 3) "Construction of Buildings" by Barry

15ARC2.3: ARCHITECTURAL GRAPHICS-II

CONTACT PERIODS: 4 (Studio) per week

TERM WORK MARKS: 100

PROGRESSIVE MARKS : 50

OBJECTIVE: *Development of visual representation and conceptual communication in the field of spatial design through 3D drawing techniques with applicable renderings that include shades and shadows.*

OUTLINE:

- 1. 3D Projections:** 3D representation in exploded axonometric projection of built elements and built forms.
- 2. Development of surfaces:** Advanced topics with application to built forms, Suggested examples: Domes, curved roofs, etc.
- 3. Section of solids, true shapes of sections**
- 4. Inter-penetration of geometric solids:** Combination of different forms.
examples: Cylinder with cube or regular polygons, dome with a cube, etc.
- 5. Perspective drawings:** History of perspective drawings with examples from international and Indian context. Principles of perspective drawings and examples of the visual effects of three dimensional objects when seen in perspective.
- 6. Studies in perspective drawing:** Picture plane, station point, vanishing point, eye level, ground level, their variation and their resultant effects. Examples of simple geometric objects.
- 7. One-point perspective drawings:** Perspective drawings of simple built form with simple built elements –Suggested example: Interior view of a single room and built elements in incremental steps. Technical steps with the object falling within the cone of vision, object going out of the cone of vision, and objects and elements closer. Analysis of the differences with previous technical images.

Perspective drawings of everyday objects like chair and table without many design features. Generate multiple perspective drawings by altering the VP and PP, and by keeping SP fixed for the same examples.
- 8. 2-point perspective drawings:** Perspective drawings of simple geometrical objects and their combinations. Examples: Perspective drawings of built forms with built elements.

Perspective drawings of simple everyday objects. Generate multiple views of the same objects.
- 9. Principles of shade and shadows:** Principles of drawing shade and shadow

Exercises exploring the principles of drawing shade and shadow in perspective drawings – drafting shade and shadows to examples from the perspective drawings.
- 10. Free-hand perspectives:** Exercises in free-hand techniques for generating perspective drawings with multiple views on site with simple rendering. Introduce simple street elements and simple trees for the buildings generated in the perspective drawing classes.

REFERENCES:

1. *Geometrical Drawing for Arts Students* by IH Morris
2. *Perspective* by SH Mullik
3. *Architectural Graphics* by D.K Ching
4. *Rendering with pen and ink* by Robert Gill

15ARC 2.4: HISTORY OF ARCHITECTURE - II

CONTACT PERIODS: 4 (Lecture) per week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 HRS

OBJECTIVE: To provide an understanding of the evolution of Hindu Architecture in India in its various stylistic modes, characterized by technology, ornamentation and planning practices.

OUTLINE:

MODULE: 1

1. **Introduction to Classical (Buddhist):** Mahayana phase, stupa and rock cut cave Architecture
2. **Buddhist Examples:** Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental; Great Stupa at Sanchi, Chaitya at Karli, Viharas at Ajanta, and Toranas at Sanchi b) Domestic (Built to inhabit) and c) Civic space
3. **Introduction to Jain Architecture:** Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental; b) Domestic (Built to inhabit) and c) Civic space.

MODULE: 2

4. **Evolution of Hindu temple:** Indo Aryan and Dravidian – Early temples at Udaigiri, Tigawa and Sanchi.
5. **Evolution of Hindu temple:** Dravidian Experiments at Aihole (Durga temple and Ladkhan temple), Deogarh, Bhitargaon and Badami.
6. **Beginnings of Dravidian architecture:** Pallavas, rathas at Mamallapuram, Shore temple, Kailsanatha and Vaikuntaperumal temples at Kancheepuram.

MODULE: 3

7. **The Cholas contribution:** Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental; Brihadeshwara temple at Thanjavur and Gangaikonda Cholapuram b) Domestic (Built to inhabit) and c) Civic space;
8. **The Pandyan & Madurai Dynasties contribution:** Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental; Gopurams Madurai (Meenakshi temple) and Srirangam. b) Domestic (Built to inhabit) and c) Civic space;

MODULE: 4

9. **The Hoysala contribution:** Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental; Eg: Channakesava temple, Belur, Hoysalesvara temple, Halebid, Kesava temple, Somnathpur b) Domestic (Built to inhabit) and c) Civic space;
10. **Indo Aryan Mode:** the beginnings in Orissa – the Lingaraja at Bhubaneshwar.

MODULE: 5

11. **Hindu architecture at Rajputana & Khajuraho group:** (Temple of Surya, Orisa, Marwar) and Gujarat (Temple of Surya, Modhera). The Khajuraho group: Khandariya Mahadev, Jain temples – Chaumukh temple at Ranpur
12. **Later Dravidian period:** the Vijayanagar and– Noted temples at Hampi (Vitthala temple and Hazara Rama temple),

NOTE: Site visit and documentation of a Temple may be made for part assessment of the progressive marks.

REFERENCES:

- 1) “Indian Architecture, Buddhist and Hindu Period” by Brown, Percy
- 2) “Architecture of India – Buddhist and Hindu” by Grover Satish

15 ENG 2.5: BUILDING STRUCTURES-II

CONTACT PERIODS: 3 (Lecture) Per Week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 HRS

OBJECTIVE: Introduction to transmissibility of forces & reactions and to basic structural system of beams and columns.

OUTLINE:

Module 1

- 1) **Geometric properties:** Centroid, Centroidal axes and Moments of Inertia for regular sections by Parallel Axis Theorem.
- 2) **Beams and support reactions:** Beams and supporting conditions - Types of supports - Implications for computational and structural performance.
- 3) **Bending and Shear force in beams:** Method of balancing moments and free-body diagrams.

Module 2

- 4) **Bending Moment and Shear Force Diagrams:** Concept of Shear force and Bending Moment diagrams. BMD and SFD for simple beams subjected to loads.
BMD and SFD for intermediate beams 2span, 3span and 4span beams (bending moment diagrams to be provided).
- 5) **Bending and Shear Stress in beams:** Theory of simple bending - Concept of bending and shear stress distribution at a cross section due to bending moment and shear for Rectangular, I and T sections.

Module 3

- 6) **General formula:** Moment of Inertia, Section Modulus, Bending and Shear Stress.
- 7) **Deflection:** Determination of deflection for simply supported, fixed, continuous and Cantilever beams subjected to loads using standard formulas.

Module 4

- 8) **Columns and Struts:** Introduction to Short and long columns.
- 9) **Theory of Columns:** Buckling; effective length, critical load, slenderness ratio; Euler formula; "Kern" and rule of inner third.

Module 5

- 10) **Steel Columns:** Axial stress and combined axial and bending stress design and analysis of steel columns.
- 11) **RCC columns:** Definition of short column as per IS 456 and design of short RCC columns (composite action, load taken by steel and load taken by concrete respectively).

REFERENCES:

- 1) STRUCTURES - Martin Bechthold, Daniel L Schodek, and PHI Learning Private limited, Sixth Edition
- 2) Structure in Architecture, the building of buildings, by Mario Salvadori
- 3) Structure and Design, by G. G. Schierle
- 4) Strength of Materials – R K Bansal, Laxmi Publications, New Delhi, 3rd ed'
- 5) Applied Mechanics & Strength of Materials – I B Prasad

15ARC 2.6: THEORY OF ARCHITECTURE-I

CONTACT PERIODS: 3 (Lecture) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 HRS

OBJECTIVE: *To acquaint the students with the basic aesthetic principles involved in architectural design and the grammar of architectural aesthetics.*

OUTLINE:

MODULE 1

1. **Definition of Art and role of Art in Society:** Role and meaning of art, various types of arts- fine arts, performing arts, commercial arts, industrial arts, folk arts, abstract art, visual arts, spatial arts, temporal arts, pop art etc., relationship of architecture with other arts like Painting and Sculpture.
2. **Principles of Aesthetics and Architectural Composition -1** – Unity, Balance, Proportion, Scale in Architectural composition. Illustrations and its application to the practice of design with historical as well as contemporary buildings:

MODULE 2

1. **Principles of Aesthetics and Architectural Composition -2:** Contrast, harmony, accentuation, restraint in Architectural composition. Illustrations and its application to the practice of design in historical as well as contemporary building.
2. **Principles of Aesthetics and Architectural Composition -3:** Repose, vitality, strength in Architectural composition. Illustrations and its application to the practice of design in historical as well as contemporary building.

MODULE 3

3. **Organizing principles of Aesthetics and Architectural Composition -1:** Symmetry, asymmetry, hierarchy, datum, axis, rhythm in Aesthetics and Architectural Composition and its application to the practice of design.
4. **Spatial organizations of Masses in Architecture -1:** Centralized and clustered; Illustrations of centralized and clustered massing in spatial organizations of masses in Architecture and its application to the practice of design with both historical as well as contemporary buildings.

MODULE 4

5. **Spatial organizations of Masses in Architecture -2:** linear, radial, grid organization. Illustrations of linear, radial, grid organization in spatial organizations of masses in Architecture and its application to the practice of design with both historical as well as contemporary buildings.
6. **Ornamentation in Architecture:** Historical perspective of the use of ornament in buildings and use of ornament as a decoration to embellish parts of a building. Use and need of ornament in architectural design – different types of ornamentation in buildings.
7. **Ornamentation in Architecture Criticism**–Argument against ornamentation. Ideas of architect Adolf Loos (Ornament and Crime); Ornaments as economically inefficient and morally degenerate, reduction of ornament or lack of decoration as the sign of an advanced society.

MODULE 5

8. **Materials, Materiality and Tectonics:** Aesthetic and structural potentials in Architecture of materials like brick, timber, stone, concrete, glass.
9. **Style in Architecture:** Basis for classification of styles including chronology of styles arrangement according to order that changes over time. Evolution of styles; reflecting the emergence of new ideas as reaction to earlier styles as a result of changing of fashions, beliefs, technology etc.

10. Perceptions in Architecture: Experience of architecture in basic psychological and physiological terms. Way in which human minds and bodies respond to space, light, texture, color, and other architectural elements.

REFERENCES:

1. Form, Space and Order” by Francis DK Ching
2. Design Fundamentals in Architecture” by Parmar VS
3. Theory of Architecture by Paul Alan Johnson
4. Creating Architectural Theory by John Lang

15 ENG 2.7: SITE SURVEYING & ANALYSIS

CONTACT PERIODS: 4 (2 Lecture + 2 Practical) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3HRS

OBJECTIVE: To develop the knowledge and skills related to surveying and levelling principles and practice and carrying out surveys of land of medium complexity and preparation of survey plans.

OUTLINE

MODULE 1

- 1) **Introduction to Surveying** – Definition, classification, principles of surveying, character of work, shrunk scale.
- 2) **Survey Theory-1:** Chain Survey: Instruments used, Types of chain, Instruments for ranging.

MODULE 2

- 3) **Survey Theory-2:** Chain Survey: Setting out angles, erecting perpendiculars. Plane table survey – Plane table and accessories.
- 4) **Survey Theory-3:** Introduction to Levelling; Definition, classification, booking and reduction of levels, longer levelling, errors.

MODULE 3

- 5) **Contouring:** Characteristics of contours, direct and indirect methods of contouring, interpolation, and uses of contours.
- 6) **Introduction to contemporary survey Instruments (Theodolite and Total station):** Theodolite; instrument for measuring angles in the horizontal and vertical planes. Total station; electronic theodolite integrated with an electronic distance measurement to measure slope distances.

MODULE 4

- 7) **Observations of a Site (Up to 1 acre):** Survey without instruments using geometry and one's own body. To learn to read the terrain by intuition and by measure, including photography as a surveying method.
- 8) **Analysis of a Site (Up to 1 acre):** On site factors; Analysis of natural factors, topography, hydrology, soils, landforms, vegetation, climate, microclimate.; influence of water bodies

MODULE 5

- 9) **Studying survey drawings:** Learning to read a land survey drawing; type of land survey drawing, Scale and North direction in drawing, legend or list of the symbols used on drawings, counter indications on a drawing, grid references for measurements etc.
- 10) **Field Work-1:** Setting out works such as center lines of a building(working drawings of a small residence to be provided)

REFERENCES:

- 1) Surveying Vol I by DR PC Punmia
- 2) Surveying and Levelling (Part-1) by Kanetkar TP and Kulkarni SV

15 ART 2.8: BASIC DESIGN & ART APPRECIATION

CONTACT PERIODS : 3 (Studio) per week

PROGRESSIVE MARKS : 50

OBJECTIVE: To explore the relationship between materiality & space, between building, the environment and culture and to initiate an understanding of abstraction and analysis of space and form.

OUTLINE:

- 1. Mapping-1:** Conceiving one's own map – from home to studio/of the campus/of a Neighborhood. Explore issues of movement, navigation, circulation, direction and discovery through exercises.
- 2. Mapping-2:** Drawing and Reading of maps – Explore issues of representation, scale, starting point, orientation, landmarks, imagery. Use of different methods of rendering.
- 3. Patterns-1:** Study of pattern-making in nature, (Such as trees, leaves, crystals, shells etc.) Observation & representation of 2-dimensional patterns in various visual media.eg. Charcoal/pencil/crayon/oils etc.
- 4. Patterns-2:** Study of pattern-making in technology. (Such as geodesics, nanotech, fractals etc.) Observation & representation of 2- & 3-dimensional patterns in various media. eg. Wire/soap bubble/ photographs/ digital models etc.
- 5. Patterns-3:** Use of patterns to synthesize and create form. Use of Both physical and material patterns as well as patterns of transformation and Integration. Appreciation of the difference between architecture and pattern.
- 6. Structure-1:** Understanding gravity, and the different ways we resist it. Study of Material & structure in nature, and how design brings them together. Sketch analysis of Structure and form in an example taken from Patterns-1.
- 7. Structure-2:** Hands-on Design exercise – creation of a simple design in which form is distinct from structure. Eg. Portal frames, tensile structures
- 8. Structure-3:** Hands-on Design exercise – creation of a simple design in which form is integral with structure. Eg. Shells, massive forms, pneumatics
- 9. Scale-1:** Dimensional understanding of the human body; in static and dynamic modes. Measured drawing of space needed for basic postures & movements.
- 10. Scale-2:** Study of the relationship between human body and the built environment understanding usage and comfort. Eg. Bazaar, doctor's clinic, train carriage etc.
- 11. Orientation & Climate:** Understanding of the significance of the Cardinal directions, and the role played by Sunlight, Wind and Rain in determining design response
- 12. Culture & Design:** Understanding social attitudes to Built-form: extroverted/introverted, formal/informal, typical/individual, simple/labyrinthine, contiguous/isolated etc.
- 13. Documentation:** Sketch/photographic documentation of a neighborhood or settlement street pattern, house form & community spaces a) Analysis-1: Sketched analysis of built form in terms of patterns, structure and scale b) Analysis-2: Sketched analysis of built form in terms of orientation & climate c) Analysis-3: Sketched analysis of built form in terms of culture & society

REFERENCES:

- 1)'The Concise Townscape' by Gordon Cullen
- 2)'The Image of the City' by Kevin Lynch
- 3)'Architecture: Form, Space & Order' by Francis Ching
- 4)'Cradle to Cradle: remaking the way we make things"' by Michael Braungart, William McDonough
- 5)'The Timeless way of Building' by Christopher Alexander
- 6)'Human Centered Design Toolkit' by IDEO

15ARC 3.1–ARCHITECTURAL DESIGN-III

CONTACT PERIODS: 9(Studio) per week

VIVA MARKS: 150

PROGRESSIVE MARKS: 150

OBJECTIVE: *To enable students to understand the processes involved in the transformation of space into place.*

OUTLINE:

The student after having familiarized with aspects like space, light, movement, scale and structure involved in formulating and articulation of spaces relating to health (Clinic), food (Restaurant), services (Bank, Post Office) and education (Primary / Nursery School) in the 2nd semester, needs to move on to tackle larger issues in 3rd Semester. The third Semester work relates to transforming “Space” into “Place”. The factors influencing this process like context, site, surroundings etc will have to be considered. Further, techniques of reading cultural and physical meaning leading to the built environment assume importance.

COURSE OF STUDY – Placemaking as an architectural goal

KEYWORDS – Need, function, activity and place

Mode of study: Place (i) Permanent (full time), (ii) Temporary (seasonal/periodic) (iii) Transient (few hours, days)

Elements promoting sense of “place” – colors, textures, shapes and forms, materials (e.g.: tents), enclosures (fences, walls, roofs, etc.), nodes (trees/platforms etc.), anthropometry and role of sensory aspects like sound, light, smell, texture etc. in creating “memory” of space

FIRST ASSIGNMENT – 3 weeks

Public spaces (bus shelter/station, streets etc.)

Semi-public spaces – college campus, institutional (hospital) etc.

Private spaces – Apartments, common spaces, lobby etc.

Any one of the above to be the assignment – to study any one set of factors promoting the idea/sense of space

NOTE: Nature of work and its mode to be explained before commencement

COURSE OF STUDY – To identify factors (contextual) influencing the design of built environment.

KEYWORDS – Physical, functional and social factors, streetscape, old areas, conflicting aspects, zoning, scale, hierarchy, compatibility, contrast.

Mode of study: (i) Physical factors (location, access, slope etc.) (ii) Functional (Dynamic, static, single/multiple) etc. (iii) Social (traditional, end users, age group etc.) (iv) Streetscape (v) zoning (based on activity, levels etc.) (vi) Scale/hierarchy/contrast (in terms of functions, structure etc.)

SECOND ASSIGNMENT – 3 weeks

Contextual configuration of above factors affecting “DESIGN” – one of the following:

- Exhibition pavilions (Open, partially covered)
- Museums (open air, partially covered)
- Yatri Niwas/Youth camp/youth hostel etc.
- Rural/urban weekly shandy /market (part open, partly enclosed) etc.

COURSE OF STUDY – To explore the meaning of built environment through physical and cultural contexts and techniques to read them.

KEYWORDS – Techniques, layered, comparative, historical, location, size, networks, visual layer, perception (scale, forms etc.), functional.

Mode of study:

- Techniques – layered, comparative, historical
- Physical layer – location, networks, size, hierarchy, temporal functions
- Perception: Density, volume, crowding, conflicting/conforming aspects
- Visual layer: scale, contrast, forms and spaces and their hierarchy
- Functional: core and auxiliary, formal/informal, incidental/intentional

THIRD ASSIGNMENT – 6 weeks

- A small/medium size resort/hotel in a given context e.g.: Nandi hills, Srirangapatna, Hampi etc.
- Residential facility cum training center in a slum.
- Museum (enclosed) in Belur, Banavasi, Udupi, Pattadakal, Gokarna etc.
- Nature cure/Health resort in Coorg/Chikamagalur, Dandeli etc.
- Application of one particular technique (preferably layered technique for its comprehensiveness).
- Analysis and ensuing strategy for the CONTEXT to be an outcome of physical and cultural parameters through the chosen technique. Any ONE of the suggested topics to be attempted.

COURSE OUTCOME

At the end of the third semester, the student through EXPOSURE and ANALYSIS is capable of converting SPACE into PLACE through functions and elements, converting and extending place into built environment through organizational factors contextually and finally enhance and carry to end the idea “contextualise”, culturally and physically to enable one to READ the context.

SHAPE OF THINGS TO COME – 4th Semester

This exposure would help the student in the next semester to create a context e.g.: Housing / neighbourhood etc. using the ‘MULTILAYERED’ and SCALED UP approach to tackle several parameters simultaneously.

REFERENCES:

1. De Chiara and Callender, Times Saver Standards for Building Types, McGraw-Hill Company, 1980
2. Neufert Architect’s Data, Rudolf Herg, Crosby Lockwood and sons Ltd, 1970

15ARC3.2-MATERIALS AND METHODS IN BUILDING CONSTRUCTION-III

CONTACT PERIODS: 6 (1 Lecture + 5 Studio) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 4 Hrs

***OBJECTIVE:** To acquaint the students with construction practices pertaining to RCC, floors, roofs and flooring alternatives, masonry plastering and paint finishes.*

OUTLINE:

MODULE 1

Introduction to RCC Slabs: one way, two-way slabs, cantilever slabs, sloping RCC roof, one way continuous, and two ways continuous.

1. **RCC one way slab and one-way continuous slabs :** Principles and methods of construction.
2. **RCC two way slab and two-way continuous slabs:** Principles and methods of construction.
3. **RCC cantilever slabs and sloping slab:** Principles and methods of construction.

MODULE 2

4. **Vaults & domes I:** Principles and methods of construction including techniques and details of form-work. Construction of Masonry Vaults and Domes – Concepts of Reinforced Concrete Domes and Vaults.
5. **Vaults & domes II:** Concepts and construction of Reinforced concrete domes and vaults with formwork design.

MODULE 3

6. **Introduction to Floor finishes including Toilet flooring:** Mud flooring, Murrum flooring, and Stone flooring in marble, granite, tandur/kota stone, other flooring in mosaic, terrazzo, ceramic tiles, wooden flooring and polished concrete: Laying, Fixing and Finishes.

7. **Introduction to Paving:** Cast in situ concrete including vacuum dewatered flooring, concrete tiles, interlocking blocks, clay tiles, brick and stone.

MODULE 4

8. **Introduction to internal and external masonry plastering and paint finishes:**

Materials – Paints, varnishes and distempers, emulsions, cement based paints. Constituents of oil paints, characteristics of good paints, types of paints and process of painting different surfaces. Types of varnish, methods of applying varnish and French polish and melamine finish.

MODULE 5

9. **Method of plastering (Internal and External):** smooth, rough, textured, grit plaster etc. Use of various finishes viz., lime, cement, plaster of Paris, buffing etc.
10. **Introduction to wet Cladding:** wet cladding in stone, marble, etc. including toilet cladding.
11. **Alternative roofing:** Jack Arch, Madras terrace, and stone slab roof.

Note – Minimum one plate on each construction topic. Site visits to be arranged by studio teachers. Study of material applications in the form of portfolio. This is for progressive marks.

REFERENCES:

- 1) Chudley , Construction Technology, ELBS, 1993
- 2) Barry, Construction of Buildings, East West Press, 1999

15ARC 3.3 – CLIMATOLOGY

CONTACT PERIODS: 3(Lecture) per week

DURATION OF EXAM: 3 Hrs

THEORY MARKS:100

PROGRESSIVE MARKS : 50

OBJECTIVE: *To develop the knowledge required for understanding the influence of Climate on architecture including the environmental processes which affect buildings, such as thermal, lighting, etc.*

OUTLINE:

MODULE 1

1. **Introduction to Climate-1:** The Climate-built form interaction; some examples. Elements of climate, measurement and representations of climatic data. Classifications and Characteristics of tropical climates.
2. **Introduction to Climate-2:** Major climatic zones of India. Site Climate: Effect of landscape elements on site/micro climate
3. **Thermal comfort-1:** Thermal balance of the human body, Thermal Comfort Indices (Effective temperature, corrected effective temperature, bioclimatic chart, tropical summer index by CBRI Roorkee). Measuring indoor air movement: Kata-thermometer, and measuring indoor radiation: Globe thermometer.

MODULE 2

4. **Thermal comfort-2:** Calculation of Overheated and Under heated period (based on air temperature only) for locations in Climatic zones and their optimization in terms of solar heating and Passive cooling desired.
5. **Sun-path diagram:** Solar geometry & design for orientation and use of solar charts in climatic design.
6. **Thermal performance of building elements:** Effect of thermo-physical properties of building materials and elements on indoor thermal environment. Convection, Radiation, concept of Sol-air temperature and Solar Gain factor.

MODULE 3

7. **Thermal Heat gain or loss:** Steady state and periodic heat flow concepts, Conductivity, resistivity, diffusivity, thermal capacity, time lag and 'U' value. Calculation of U value for multilayered walls and Roof, Temperature Gradient, Inference of time lags from Graphs for walls and Roof. Construction techniques for improving thermal performance of walls and roofs. (Effect of density, Insulation, and Cavity).

MODULE 4

8. **Shading devices:** Optimizing Design of Shading devices effective for overheated periods while allowing solar radiation for under heated periods for different wall orientations.
9. **Natural ventilation:** Functions of natural ventilation, Stack effect due to thermal force and wind velocity. Air movements around buildings, Design considerations and effects of openings and external features on internal air flow and Wind shadows.

MODULE 5

10. **Day Lighting:** Nature of natural light, its transmission, reflection, diffusion, glare. Advantages and limitations in different climatic zones, North light, Daylight factor, components of Daylight devices.
11. **Climatic Design considerations-1:** Literature study of relevant traditional and contemporary building examples.
12. **Climatic Design considerations-2:** Two Indian case studies and one international for each climatic zone.

REFERENCES:

1. Koenigsberger, Manual of Tropical Housing & Buildings (Part-II), Orient Longman, Bombay, 1996.
2. Arvind Kishan, Baker & Szokolay, Climate Responsive Architecture, Tata McGraw Hill, 2002.

15ARC 3.4 – HISTORY OF ARCHITECTURE – III

CONTACT PERIODS: 3 (Lecture) per week

DURATION OF EXAM: 3 Hrs

THEORY MARKS: 100

PROGRESSIVE MARKS: 50

***OBJECTIVE:** To provide an introduction to the culture and architecture of Islamic and Colonial periods in India and to provide an understanding of their evolution in various stylistic modes, characterized by technology, ornamentation, and planning practices.*

OUTLINE

MODULE 1

1. **Islamic Architecture** – Early phase; It's emergence in 11th century AD in India. General characteristics of Indian Islamic Style.
2. **Early Phase -I** :- Slave and Khilji phase – a) Monumental : Quawat.Ul.Islam, mosque and tomb of Iltumish , Qutb Minar , Alai Minar. b) Civic space: Enlargement of Quwaat Ul Islam Complex and Alai Darwaza.
3. **Early Phase -II** :- Tugluq , Sayyid & Lodi dynasties. – Architectural character-
a) Monumental arch : Tomb of Ghia – Suddin Tugluq, Tomb of Firoz shah Tugluq, Shish Gumbad & Mubarak shah Sayyid's tomb. b) Civic Space : Khirkhi masjid Delhi, Firoz Shah kotla – public and private space, madrassa design with Firoz shah's tomb.

MODULE 2

4. **Provincial style - I** – Jaunpur and Bengal – Architectural character
a) Monumental arch : Atala and Jami masjid Bengal – Adina masjid Pandua, Ek Lakhi Tomb b) Civic Space : Elements like entrance pylon : Jaunpur, Dakhil – Darwaza at Gaur, space within & outside of examples like Gunmount or Badasona Masjid.
5. **Provincial style - II** – Ahmedabad and Bijapur – Architectural characteristics-
a) Monumental arch: Ahmedabad, Vavs of Gujarat: Bijapur- Golgumbaz, Ibrahim Rauza, Jami masjid. B) Civic space: Ahmedabad-Sarkhej complex, Teen darwaza. Bijapur-Ibrahim Rauza, Bauli (Water tank). c) Domestic architecture.

MODULE 3

6. **Provincial style – III-** Bidar and Gulbarga-General Character. a) Monumental: Bidar-Jami masjid. Gulbarga-Jami masjid. B) Civic space: Treatment of space within mosque and enclosed space for gathering at both places. c) Domestic: Bidar-Madrassa of Mond, Gawan.
7. **Moghul Architecture-I** –Architectural Character. a) Monumental arch: Humayun’s tomb, Fatehpursikri layout, Jami masjid, Diwan-I-khas, Tomb of Salim chisti. B) Civic space- Buland darwaza, Garden(Humayun’s tomb). c) Domestic- Fatehpursikri, Birbal’s house, Jodhabai’s palace.

MODULE 4

8. **Mughal Architecture-II** - Monumental arch: Akbar’s tomb, Taj mahal, Itmaud Daula b) Civic space: Mughal Gardens, Diwan-I-am, Red Fort, Meena bazaar, Red Fort, Guesthouse (Taj mahal complex) c) Domestic: Public elements like ‘Serai’-traveler’s shelters, Nobles’ houses etc.
9. **Colonial Architecture-I** – Early phase-Establishment of forts, warehouses etc- Building typologies and general architectural character of Colonial Indian Architecture.

MODULE 5

10. **Colonial Architecture-II** – Study of Examples a) Monumental- Governor’s house, Calcutta, Town hall, Victoria Terminus(Chhatrapati Shivaji Station) Mumbai, Madras Club, Pacchiappa College Chennai, Mayo Hall, Museum, Central College Bangalore. Deputy Commissioner’s Office, Palace, Mysore, Examples from Hubli and Dharwad, Karnataka. b) Civic spaces: Parade Ground ,MG Road, Bangalore, Civic spaces around Mysore Palace c) Domestic Bungalows from Calcutta, Chennai, Bangalore and Mysore Railway Stations, Administrative Buildings etc
11. **Colonial Architecture-III** – a) Design of New Capital of Delhi- Contributions of Edward Lutyens, Herbert Baker(Rashtrapati Bhavan), Layout of New Delhi, Parliament House, North Block and South Block at Rashtrapathi Bhavan. B) Monumental: Civic space-Rajpath, Janpath, India Gate etc.

12. **Colonial Architecture-IV** – Examples from Goa-Se Cathedral, Cathedral of Bom Jesus (Monumental Architecture). Architecture from Pondicherry-Indian and French Quarters(Domestic Architecture). Brief summary of Dutch and Danish settlements.

NOTE: *The following are for progressive marks*

- 1) A Portfolio containing analysis of spaces, functions, and forms (Individual submission).
- 2) Group studies through Photographic documentation of local/ regional examples or study models of the examples.

REFERENCES:

- 1) Tadgel, C. History of Architecture in India, Phaidon Press, 1990
- 2) Brown, Percy. Indian Architecture, Islamic Period, Taraporavala and sons, 1987.

15ENG 3.5 BUILDING STRUCTURES – III

CONTACT PERIODS: 4(2 Lecture+2 Studio) per week

VIVA MARKS:75

PROGRESSIVE MARKS: 75

OBJECTIVES:

- 1) *To understand the fundamental principles and structural behaviour of concrete buildings in withstanding gravity, lateral (seismic and wind), and other environmental forces.*
- 2) *To understand the mechanics of reinforced concrete, and the ability to design and proportion structural concrete members including slabs, beams, and columns.*

OUTLINE:

- 1) **RCC Materials:** Basic Characteristics of Concrete & Reinforcing Steel Materials including specifications and testing. Basics of mix design, water-cement ratio, strength, durability, workability requirements and formwork.
- 2) **Mechanics of Reinforced Concrete:** Concept of Concrete as a brittle, composite material that is strong in compression and weak in tension. Structural behavior under load and the need for reinforcement.
- 3) **Structural Analysis and Design to satisfy Building Codes and Standards;** Introduction to National Building Code and IS456: Calculation of dead weight and live loads on structure as per IS875 (Part1&2). Determination of the general loads to be considered in the design of the structure based on the type of occupancy specified for each area. Introduction to safety factor and design philosophy.
- 4) **Concrete Structural System design:** Introduction to the Project: Design of two story RCC frame office building with dimension of 15m X 30m and 3 m storey height using different Concrete Structural Systems including a framing plan, column, beam and slab arrangements and dimensions for all the different Concrete Structural systems already introduced(Indicative).
- 5) **One way Concrete slab system:** General framing arrangement of beams, columns and slabs for 15m X 30m building by One-way concrete slab system and design of singly reinforced beams using SP 16: Design Aids for Reinforced Concrete to IS 456:1978.

- 6) **One way Concrete slab Joist System:** General framing arrangement of beams, columns and slabs for 15m X 30m building by One-way Joist System and design of singly reinforced slabs using SP 16: Design Aids for Reinforced Concrete to IS 456:1978.
- 7) **Two-way Concrete Floor and Roof Systems:** General framing arrangement of beams, columns and slabs for 15m X 30m building by Two-way Slab-Beam, and design of short columns using SP 16: Design Aids for Reinforced Concrete to IS 456:1978.
- 8) **Two-way Concrete Flat Plate System:** General framing arrangement of beams, columns and slabs for 15m X 30m building by Two-way solid Flat Plate system design, and design of Isolated footings using SP 16: Design Aids for Reinforced Concrete to IS 456:1978.
- 9) **Two-way Concrete Flat Slab System:** General framing arrangement of beams, columns and slabs for 15m X 30m building by two-way solid Flat slab system, and formwork design and detailing.
- 10) **Two-way Concrete Waffle slab Systems:** General framing arrangement of beams, columns and slabs for the 15m X 30m building by two-way (waffle) slab design.
- 11) **Reinforcement Design:** Approximate calculation of Column, Beam and Slab reinforcement.
- 12) **Reinforcement detailing and placement:** Preparation of working drawings showing the type, size and location of the reinforcement in a concrete structure.
- 13) **Design Review:** Review of design of Column, Beam and Slab, total concrete volume, reinforcement tonnage and costing.

Note: Class work on loading calculation of each Concrete Structural System including structural system elements, slab, beam, column and footing, will be assessed during the Viva examination.

REFERENCES:

1. STRUCTURES - Martin Bechthold, Daniel L Schodek, PHI Learning Private limited.
2. IS 456-2000 Plain and Reinforced Concrete - Code of Practice

15ARC 3.6 – THEORY OF ARCHITECTURE-II

CONTACT PERIODS: 3(Lecture) per week

PROGRESSIVE MARKS : 50

DURATION OF EXAM: 3Hrs

THEORY MARKS: 100

***OBJECTIVE:** To acquaint the students with architectural theory from antiquity to the present and to identify issues which shaped the approach to architectural design in a particular context and age.*

OUTLINE:

MODULE 1

Introduction to Theory in Antiquity: Marcus Vitruvius and his multi-volume work entitled De Architectura. Mayamata: Indian Treatise on Housing & Architecture.

Introduction to Theory in Renaissance: Leon Alberti, Andrea Palladio – Jacques Francois Blondel and Claude Perrault of French Academic Tradition.

- 1) **18th Century Theory:** Ideas of Laugier, Boullée, Ledoux
- 2) **19th Century Theory:** Concepts of Viollet Le Duc, John Ruskin, Quatramere de Quincy and Gottfried Semper

MODULE 2

- 3) **Modern Movement Theory:** Ideas of Adolf Loos, Eero Saarinen, Erich Mendelsohn, Richard Neutra, Otto Wagner, Kenzo Tange.
- 4) **Post Modern Theory-1:** Ideas on Post-Modern Classicism by Robert Venturi and Charles Jencks. Deconstruction: Fundamental beliefs and philosophy and ideas of Peter Eisenman.

MODULE 3

- 5) **Post Modern Theory-2:** Contribution to architectural thought: Ideas of Kenneth Frampton and Christopher Alexander
- 6) **Post Modern Theory-3:** Contribution to architectural thought: Ideas of Amos Rapoport, Geoffrey Broadbent-his design generation theories.

MODULE 4

- 7) **Architectural Criticism:** Definition & Sources, to examine fundamental questions of what Architectural criticism actually is, its role and function in architecture and the relationship between criticism and judgment. Specifically in terms of, thinking, discussing, and writing on architecture, social or aesthetic issues. Positive and Normative theories of Jon Lang,
- 8) **Architectural Criticism types:** Definition, Sources, Types of Criticism according to Wayne Attoe.

MODULE 5

- 9) **Design Logic:** Design generation process: Role of logic and intuition in concept generation. Step by step development of design from problem definition, site analysis to post occupancy evaluation as the last stage of design.
- 10) **Contemporary Significant Theory:** Ideas of Hassan Fathy who pioneered the use of appropriate technology for building in Egypt, especially by working to re-establish the use of mud brick (or adobe) and tradition as opposed to western building designs and layouts and Paolo Soleri's concept of "Arcology", architecture coherent with ecology. Shape of built environment to come. Floating, walking, plug-in, satellite settlements, earth sheltered etc. Works of Archigram, Paolo Soleri, Kenzo Tange, Moshe Safdie etc.

REFERENCES:

- 1) Broadbent, Geoffrey. Design in Architecture, John Wiley & Sons Ltd, 1977
- 2) Lang, Jon , Creating Architectural Theory, Van Nostrand Reinhold Co, New York 1987
- 3) " A moment in Architecture" and Other Books by Gautam Bhatia.

15ARC 3.7 – COMPUTER APPLICATIONS IN ARCHITECTURE -I

CONTACT PERIODS: 5 (Practical) periods/ week with 1-2 periods of instruction and Remaining hrs of working on CAD workstation for submission of Assignments.

PROGRESSIVE MARKS : 100

OBJECTIVE: *To develop and train students to use computers and digital media as tools to explore, develop, evaluate and present architectural ideas. To equip the student with a range of digital tools and techniques in 2D drafting, 3D modelling, and vector graphics.*

OUTLINE:

1. Introduction to 2D drafting software: Using latest version of relevant CAD software:

a. 2D commands, viewports, dimensions, annotations. Time problem introduction;

Classroom exercises such as measured drawing of studio (windows, doors and staircases included), architecture School (windows, doors and staircases included) etc.

b. Understanding layers, paper space Vs model space, line weights, print set up and Modelling of Walls, Doors, Windows, Stairs etc.

2. 2D drafting: Presentation of time problem; plan, sections, elevations of a floor of a single storied building of II / III semester architectural design studio project.

3. Introduction to 3d modelling: Latest version of relevant 3D modelling software – software interface, demonstration of 3D modelling commands required to convert 2D project (of 2D drafting) into 3D as a time-problem.

4. Simple 3D modelling: Presentation of time problem; drawing quickly with basic shapes in 3D, viewing models in 3D, adding detail to Models in 3D space, use of cameras, material applications. Presenting models.

5. Rendering & Visualization: Presentation of time problem, generating 3d Model and introduction to concepts of visualization using rendering engines such as VRay, Flamingo, 3D studio Max, or any other appropriate software.

6. Introduction to concepts of Building Information Modelling (BIM) using REVIT or other relevant BIM software.

7. Introduction to graphics editing tools:

a. Introduction to appropriate techniques to model walls, insert fenestration, curtain walls & staircases.

b. Lecture and Classroom exercise to convert into BIM project, relationship of other Industry standard file types (.dwg for AutoCAD or Trimble Sketchup input files or from any other relevant software.).

c. Lecture and Classroom exercise to further utilize rendering and visualization

8. a. Concepts of image scanning, image editing, effects and filters.

b. Classroom exercise to demonstrate use of Image editing for simple architecture design project projects. For e.g., rendering of 2D drawings, adding nature to 3D visualizations.

9. Graphics editing tools: – Presentation of any simple project to illustrate skills attained in 2D drafting, 3D modeling, graphics editing tool.

NOTE: A portfolio of exercises and assignments done in the class to be submitted for progressive marks.

REFERENCES:.

1. Website and training material of relevant Image/Graphics editing software
2. Learning resources on Building Information Management (BIM).
3. Vast amount of CAD learning resources available on the Internet.
4. Vast amount of learning resources for Graphics editing tools available on the Internet.

15ARC3.8- ELECTIVE I

CONTACT PERIODS: 3 per week

PROGRESSIVE MARKS: 50

a. ARCHITECTURAL PHOTOGRAPHY

OBJECTIVE

To impart the skills of taking aesthetically appealing and creative architectural photographs through the use of appropriate cameras/ lenses and lighting conditions.

OUTLINE

1. Introduction to architectural photography. Various types of compositions framing, silhouette photography.
2. Use of various cameras, lenses and accessories, handling of equipment.
 - a . SLR,DSLR cameras, lenses for different focal lengths for various contexts
 - b. Use of wide angle, normal, tele, zoom, macro, close up lenses.
 - c. Filters- UV, Skylight, colour filters, special effect filter.
3. Shutter speeds- slow, normal and high and their various applications.
4. Apertures- use of various apertures to suit different lighting conditions and to enhance depth of fields.
5. Selection of ISO rating to match various lighting conditions.
6. Optimizing selection of shutter speed, aperture and ISO.
7. Twilight and night photography.
8. Various uses of photography- documentation, presentations, competitions, lectures, etc.
9. Creative photography/ photo renderings, for special effects using software.
10. Play of light and shadows to achieve dramatic pictures.
11. Effects of seasons, inclusion of greenery, foliage, clouds, human scale etc.
12. Architectural photography as a profession, law on photography.

REFERENCES:

1. Schulz, Adrian. Architectural Photography: Composition, Capture, and Digital Image Processing, Rocky Nook, 2012.
2. McGrath, Norman . Photographing Buildings Inside and Out, Watson-Guption Publications, 1993.

b. VERNACULAR ARCHITECTURE

OBJECTIVE:

To inculcate an appreciation of vernacular architecture; as an expression of local identity and indigenous traditions of the culture

OUTLINE:

The course would be conducted through seminars and field work.

1. Introduction to the approaches and concepts to the study of vernacular architecture, history and organisation of vernacular buildings of different regions in the Indian context; with an understanding of forms, spatial planning, cultural aspects, symbolism, colour, art, materials of construction and construction techniques. Study of factors that shape the architectural character and render the regional variations of vernacular architecture - geographic, climatic, social, economic, political and religious aspects, local materials and skills available in the region etc.
2. Methods of observation, recording, documenting and representing vernacular architecture with examples.
3. Study and documentation of vernacular architecture of selected building typologies. Rigorous documentation, accuracy in measuring, collating the recorded information and drawing them up in specified formats and scales are part of this module.
4. A critical review of the relevance and application of vernacular ideas in contemporary times. An appraisal of architects who have creatively innovated and negotiated the boundaries of 'tradition' while dynamically responding to the changing aspirations and lifestyles of the world around.

REFERENCES:

1. Carter, T., & Cromley, E. C. Invitation to Vernacular Architecture: A Guide to the Study of Ordinary Buildings and Landscapes. Knoxville: The University of Tennessee Press. 2005
2. Cooper, I. Traditional buildings of India. Thames and Hudson Ltd, London, 1998
3. Oliver, P. Encyclopaedia of Vernacular Architecture of the World, Cambridge University Press, 1997

c. VISUAL COMMUNICATION

OBJECTIVE: *To impart the techniques of visual communication.*

OUTLINE:

1. Visual communication used in day to day life, print, electronic media, advertisement and in art / architecture context - differences and similarities.
2. Understanding meaning generation process in visual language.
3. Devices of visual language - space, context, scale, associate, transform, crop, frame, distort, abstract, fragment, exaggerate, and subvert, irony.
4. Pictograms and ideograms.
5. Understanding the differences between logo and symbol. Process of logo creation.
6. Hierarchy in visual content being presented.
7. Relationship between text and images and their interrelationships.
8. Cultural context of meaning generation and aesthetic principles involved.

REFERENCES:

1. Barnes, Susan B. An Introduction to Visual Communication: From Cave Art to Second Life, Peter Lang Publishing Inc, 2011
2. Bergström, Bo. Essentials of Visual Communication, Laurence King Publishing, 2009

15ARC 4.1 – ARCHITECTURAL DESIGN - IV

CONTACT PERIODS: 9(Studio) per week

VIVA MARKS: 150

PROGRESSIVE MARKS: 150

OBJECTIVES:

- 1. To understand the difference between housing as a process and a product and the role of an architect in creating the product and facilitating the process*
- 2. To understand the needs of privacy, communal spaces, efficiency of open spaces and ideas of extended living areas*
- 3. To differentiate and understand the nature of organic and planned communities.*

OUTLINE:

To understand the hierarchies of different types present in spaces relating to group living(Housing) and the complexities of integrating them into an architecturally meaningful whole.

MODE OF STUDY: Three component approach to the Design Studio:

A) TRAVEL FOR SITE VISITS: Learning from visiting various settings: urban and rural, traditional, contemporary, permanent and temporary, to introduce them first hand to students.

B) SEMINARS: Seminars are intended to expose the students to a gamut of real issues that are integral to their understanding of housing. They are expected to lead students to explore different approaches to housing.

C) PROJECTS: Studio projects will structure and model design thinking in order to reveal to students the knowledge to be learnt and various strategies for unearthing, integrating and constructing knowledge and ideas in a project. Emphasis in teaching and learning is placed on bridging the gap between the imaginative and conceptual, the material and formal. Projects should involve activities that encourage students to develop techniques for identifying and negotiating competing demands and prioritizing and ordering variables. An essential part of the studio process should be peer reviews and reviews by practicing architects

Assignment-1: SITE VISITS

- 1) Two short site visits to observe, discuss and document existing residential settlements, housing projects in the vicinity of colleges.
- 2) The emphasis should be on conceptual understanding rather than on accurate measured drawing.
- 3) Attention should be given to community spaces/common areas and the emergent grouping of individual dwellings.
- 4) Sketches and documentation should show observations and inferences from the studies.

Assignment-2: SEMINARS

Introduction to Contemporary Indian Issues Related to Housing:

- Indigenous building technologies
- Contemporary Building Science and Technologies for Developing Countries
- The architect as the facilitator: DISCUSSION

Assignment-3: PROJECTS

One major project and one minor/time assignment to be tackled in the semester. Project work could be done in the following four stages of activity interspersed with seminars.

1. Introduction to the initial design parameters which include choice of:
 - a. Geography/situation (context),
 - b. User Group/development model, and
 - c. Development guidelines (bylaws).

2. Approaches and strategies to address issues of community, public and private realms, edge conditions, communication and connectivity. This could result in the generation of diagrams/models, exploring attitudes to site, allocation of built and unbuilt volumes and communication and connectivity.

3. Approaches and strategies to address issues of personal and family/user group needs, comfort and security, convenience and utility and health.

4. Negotiation of the large scale (communal) and intimate (personal) approaches to the design of housing and their integration. Certainly this could also happen during the earlier stages and alternative strategies should still be explored. The solution/ submission to integrate spaces through visual and functional hierarchies.

It is recommended that site sizes should not be larger than 2000 sqm to allow for intensive study rather than repetition of typical configuration. However the Design studio faculty shall determine the extent of the site size.

MODE OF STUDY:

Housing projects can be attempted with added complexities for example, dense context, occupation based, traditional urban fabric, social status and prevalent social strata. Details from the dwelling cell to immediate shared space to communal space shall be emphasized and worked out. Socio cultural layer of the occupants shall form a strong fabric in the ultimate weave of the design. Projects shall aim at developing a sensitive attitude towards micro level human habitation and role of architecture in enhancing or curbing the quality of living.

a) Apartments for IT employees, Govt. servants, teaching faculty, Textile weavers, Luxury flats in the center of the city etc. One of these as the major project

b) Housing for the deprived or marginalized or disaster relief shelter or temporary housing. One of these as a minor project at reduced scale.

- The design shall be sensitive to the needs of disabled, aged people and children. The context for the design problems could be both rural and urban.
- One major project and one minor/ time problem to be tackled in the semester.

- Detailing of architectural features of the major project like entrance lobby, skylights and staircases has to be attempted

SHAPE OF THINGS TO COME – 5TH SEMESTER

This studio should equip a student to tackle the 5th Semester projects of urban scale, complexity, and multiple functions.

REFERENCES:

- 1) De Chiara and Callender, Times Saver Standards for Building Types, McGraw-Hill Company, 1980
- 2) Neufert Architect's Data, Rudolf Herg, Crosby Lockwood and sons Ltd, 1970

15ARC 4.2 – MATERIALS AND METHODS IN BUILDING CONSTRUCTION-IV

CONTACT PERIODS :6 (1Lecture + 5 Studio) per week

PROGRESSIVE MARKS : 50

THEORY MARKS : 100

Duration of Exam – 4 Hrs

***OBJECTIVE:** To acquaint the students with construction practices pertaining to RCC framing systems, and other building elements such as metal doors and windows(In Steel and Aluminium)*

OUTLINE:

MODULE 1

- 1) **Introduction to Advanced RCC roofs:** Moment framed, Flat slab and Flat plate, Filler slabs, Waffle slab.
- 2) **RCC Moment framed:** Principles and methods of construction including detailing of Reinforcement.
- 3) **RCC Flat Plate & Slab:** Principles and methods of construction including detailing of Reinforcement.

MODULE 2

- 4) **RCC filler slabs:** Principles and methods of construction. Introduction to different filler materials, Mangalore tiles, Burnt Clay Bricks, Hollow Concrete blocks, Stabilized Hollow Mud blocks, Clay pots, Coconut shells etc.
- 5) **RCC Waffle slabs:** Principles and methods of construction.

MODULE 3

- 6) **Structural steel as a building material:** Types, properties, uses and manufacturing methods.
- 7) **Steel construction:** Steel columns/beam construction; Principles and methods of construction.

MODULE 4

- 8) **Steel doors and windows:** Study of joinery details.
- 9) **Steel doors for garages and workshops:** uses and manufacturing methods.
- 10) **Collapsible gate and rolling shutters:** uses and manufacturing methods.

MODULE 5

- 11) **Aluminum as a building material:** Types, properties, uses and manufacturing methods. Detailing of aluminum partitions.
- 12) **Aluminum doors and windows:** Casement, Pivot, Sliding type: Study of joinery details.

Note – Minimum one plate on each construction topic. Site visits to be arranged by studio teachers. Study of material application in the form of portfolio.

REFERENCES:

- 1) Chudley , Construction Technology, ELBS, 1993
- 2) Barry, Construction of Buildings, East West Press, 1999

15ENG 4.3 – BUILDING SERVICES – I (Water Supply and Sanitation)

CONTACT PERIODS: 3 (Lecture) per week

DURATION OF EXAM: 3 Hrs

THEORY MARKS: 100

PROGRESSIVE MARKS: 50

***OBJECTIVE:** To impart the knowledge and skills required for understanding the role of essential services of water supply and sanitation and their integration with architectural design.*

OUTLINE:

MODULE 1

1)Introduction to Environment and Health Aspects: History of Sanitation with respect to human civilization, Importance of Health, Hygiene Cleanliness, Waterborne, Water-related, Water based, Epidemic diseases, Conservancy to water carriage system, Urban and Rural sanitation.

2)Water Supply: Source of Water supply – Municipal, bore well, river, etc, Quantity of water for different usages like Domestic, Hot water, Flushing, Gardening, Commercial, Industrial Applications, Assessment of requirement for different uses, Quality of supply for different uses as per national and international standards, Treatment of water for different uses, filtration, softening, disinfection, Storage and pumping – gravity system, hydro-pneumatic system, Distribution of water to fixture and fittings, schematic diagrams, Swimming pool, water bodies, Efficient usage of water.

MODULE 2

3)Sewerage System: Assessment of sewage generated, Collection of sewage / wastewater from all sources, schematic diagram, Conveyance of sewage – gully trap, chamber, manhole, intercepting trap, grease traps, backflow preventer, Materials of construction of sewerage network – PVC, uPVC, HDPE, corrugated PP pipes, Objective of Sewage treatment, type of treatment, aerobic, anaerobic, Ventilation of STP, Space requirements

4)Storm water Management: Assessment, quantification of rainfall, flood control measures, Drainage system – piped drains, open drains, Recharging of storm water,

Harvesting of roof top water, first flush, pretreatment, Drainage of basements, podium, paved areas, Collection, Reuse of water within the project, reduction of the load on municipal system, landscape drainages and Rainwater harvesting.

MODULE 3

5) Plumbing: Water supply piping – hot, cold, flushing water, Piping in sunken areas, false ceiling areas, shaft sizes, Drainage – floor traps, drains, P-trap, bottle traps, Single stack, two stack, cross venting, fixture venting, Material of construction like GI, PPR, PB, CPVC, Composite pipes, Copper, Flow control Valves – Gate valve, Globe valves, butterfly valves, Pressure Reducing valves & station, Pipe supports, hangers, fixing, plumbing of small houses.

MODULE 4

6) Sanitary Fixtures, Fittings & Wellness: Soil appliances – Water closets, Bidet, urinals, Cisterns, Flush valve, Waste appliances – wash basin, sink, dishwasher, washing machine, Hot water system – Geysers, boilers, heat pump, Bath & water fixtures – Taps, mixers, single lever, quarter turn, bathtub, multi-jet bath, rain showers, health faucets, Wellness products : Sauna bath, steam bath, Jacuzzi, single and double stack system.

7) Solid Waste Management: Assessment of waste, Waste to wealth concept, Municipal waste, garden waste, organic & inorganic, Commercial waste, Medical waste & Industrial waste, Collection, segregation, treatment, disposal, Organic waste – Biomethanation, Vermicomposting, Organic waste converter.

MODULE 5

8) Introduction to Fire and Life safety: Causes of fire, reasons for loss of life due to fire, development of fire, fire classification of buildings, Fire water storage requirements, Fire control room, Code of practices, Idea of smoke detectors, Fire alarms, Wet risers, Fire escape stair case, equipment used eg: snorkel ladder, materials used to fight fire, Fire rating and Hydrants.

9) Special requirements: Solar Hot Water Generation, Central LPG Supply System, Medical Gases Supply, Storage of High Speed Diesel, Central Vacuum and Waste Collection.

Site Visits:

1. Water Treatment Plants, Sewage Treatment Plants, LPG & HSD Yards.
2. High Rise Residential Building – Plumbing (water supply, drainage)
3. Commercial Buildings like IT Campus, Hotel & Hospital for acquaintance of installation & space requirements.

NOTE: For Progressive Marks, individual submission of the following:

- a) Layout of Water supply and Sanitation with all fixtures in Kitchen, Bath and Utility for a small Residence i.e. Plan and Section, Terrace plan with Rainwater down take pipes, Sump and OHT calculation design.*
- b) Schematic diagram of similar study for a Basement floor.*
- c) Portfolio on*
 - i) Solid waste management and*
 - ii) Firefighting schematic plans*

REFERENCES:

- 1) Deshpande, RS. A Text Book of Sanitary Engineering, Vol:1, United Books, Pune, 1959.
- 2) Birdie, G. S. and Birdie J. S. Water Supply and Sanitary Engineering, Dhanpat Rai Publications, 2010

15ARC 4.4 HISTORY OF ARCHITECTURE-IV

CONTACT PERIODS: 3 (Lecture) per week

DURATION OF EXAM: 3 Hrs

PROGRESSIVE MARKS:50

THEORY MARKS: 100

***OBJECTIVE:** To develop the appropriate skills of reading, discussion and writing as well as understanding of the physical and aesthetic experience of buildings in order to appreciate the complexity of the influences bearing on architecture, as reflected in the major historical periods.*

OUTLINE:

MODULE 1

- 1) **Classical Greece Architecture-1:** Critical appreciation of works and synoptic study of architectural characteristic features from the Greek early periods.
- 2) **Classical Greece Architecture-2:** Critical appreciation of works and synoptic study of architectural characteristic features from the Greek later periods, Doric, ionic and Corinthian orders and optical correction
- 3) **Greek architecture Typologies:** Study of principles of design of Greek buildings through study of three kinds of Architecture: a) Monumental (Built to impress and Last) ex. Parthenon, Theatre at Epidauros. b) Domestic (Built to inhabit): House of Colline, House of Masks, etc. and c) Civic space: The Agora and Acropolis.

MODULE 2

- 4) **Introduction to Roman Architecture:** Critical appreciation of works and synoptic study of architectural characteristic features from the Roman periods. Study of Tuscan and composite orders.
- 5) **Roman architecture Typologies-1:** Study of principles of design of Roman buildings through study of proportion, composition, visual effects etc. in Monumental (Built to impress and last) Pantheon, Colosseum, Thermae of Caracalla, Pont du Gard, Nimes, Basilica of Trajan.

MODULE 3

- 6) **Roman architecture Typologies-2:** Study of principles of design of Roman buildings through study of Domestic (Built to inhabit)-House, villa and apartments.
- 7) **Roman architecture Typologies-3:** Study of principles of design of Roman buildings through study of Civic space with elements like triumphal arch, Column of Trajan(Septimius Severus), Roman Forum.
- 8) **Early Christian:** Evolution of architecture parallel to the evolution of religious practices. Study of principles of design of buildings through study of three kinds of Architecture: a) Monumental b) Domestic (Built to inhabit) and c) Civic space

MODULE 4

- 9) **Byzantine:** Study of principles of design of buildings through study of its Architecture: a) Monumental; Hagia Sophia b) Domestic (Built to inhabit) and c) Civic space-St.Marks Venice.
- 10) **Medieval:** Study of principles of design of buildings through study of its Architecture: a) Monumental; Pisa Cathedral, the Campanile and Baptistery, Angouleme Cathedral b) Domestic (Built to inhabit) and c) Civic space; Pisa.

MODULE 5

- 11) **Gothic:** Study of principles of design of buildings through study of its Architecture: a) Monumental; Notre Dame, Paris. b) Domestic (Built to inhabit) and c) Civic space;
- 12) **Gothic:** Study of Gothic Architecture, typical characteristics including the pointed arch, the ribbed vault and the flying buttress, aesthetic elements with examples like Chartres Cathedral: French High Gothic style.

NOTE: Progressive marks to include Submission of a Portfolio of sketches, study models relating to structure, aesthetics and building typology resulting from different functions.

REFERENCES:

- 1) Sir Bannister Fletcher ,“History of Architecture” CBS Publishers, 1992
- 2) Henri Stierlin , “Architecture of the world - Greece”, Benedict Taschen, 1993
- 3) Henri Stierlin, “Architecture of the world - The Roman Empire”, Benedict Taschen, 1993
- 4) Henri Stierlin , “Architecture of the world - Romanesque”, Benedict Taschen, 1993

15ENG 4.5 – BUILDING STRUCTURES – IV

CONTACT PERIODS: 4(2 Lecture+2 Studio) per week

VIVA MARKS: 75

PROGRESSIVE MARKS: 75

OBJECTIVE:

- 1. To Gain understanding of Steel Structural Systems including composite construction and fundamental principles and structural behavior of steel buildings in withstanding gravity, lateral (seismic and wind), and other environmental forces.*
- 2. To understand the process of the design of structural steel systems and the design of simple steel structures.*

OUTLINE :

1) Structural Steel: Different kinds of Steel, their Basic characteristics of Steel & Light Gauge Steel materials.

2) Concepts of design of Steel Structures: Introduction to the concept of Working Stress Design and Load and Resistance Factor Design.

3) Steel Structural Systems: Introduction to Rigid Portal Frames design of a one story industrial building 18M X 48m with two-bay mezzanine office floor. Project work to include a framing plan for both the industrial building and the mezzanine, an approximate design of structural frame elements, columns and beams. Introduction to available sections in structural steel used in the design of frame elements(Indicative).

4) Introduction to National Building Code: IS 800: Criteria & Design to satisfy Building Codes and Standards, Dead and Live load calculations as per IS875 (Part1&2). Determine the general loads to be considered in the design of the structure, based on the type of occupancy for each area specified.

5) Rigid Frames design-1: Properties of Indian standard rolled steel section and general framing arrangement of beams and columns for the one story 18M X 48m industrial building.

6) Rigid Frames design-2: Design of Rigid frame including selection of frames according to the span, spacing and frame configuration using steel manuals.

7) Composite Flooring Systems: Discussion on steel-concrete composite construction using steel beams, metal decking and concrete, including the role of shear connectors' attachment to the beam for composite action.

8) Composite flooring systems design for mezzanine: Loading and Analysis (Moment diagram to be provided) and design of composite steel decking with concrete topping.

9) Rigid frame elements design-1: Steel Structural Column design using IS special publication for the design of steel structures [SP-6 (1)]

10) Rigid frame elements design-2: Steel Structural Beams and trusses design using IS special publication for the design of steel structures [SP-6 (1)]

11) Drawings and Specifications for the Rigid frame design: Structural design criteria, including loads used, calculations, drawings and detailing, and steel tonnage calculation.

12) Field Inspection of Steel Construction Site: *The project work to include documentation and a report about the observations, learning and findings at Site*

Note: Minimum one plate on loading calculation on each Structural steel topic.

REFERENCE:

- 1) Martin Bechthold, Daniel L Schodek, STRUCTURES - PHI Learning Private limited.

15ENG 4.6 – SPECIFICATION, QUANTITY AND COSTING OF BUILDINGS

CONTACT PERIODS : : 3 (Lecture) per week

DURATION OF EXAM : 3 Hrs

THEORY MARKS: 100

PROGRESSIVE MARKS:50

***OBJECTIVE:** To develop the necessary skills for establishing and writing specifications based on proposed materials for the preparation of Bill of Quantities leading to cost estimation of proposed architectural works.*

OUTLINE:

MODULE 1

- 1) **Introduction to Estimation:** Need for estimation, relationship between choice of materials, their specifications, Bill of Quantities (BOQ), project costing, project quality/cost/ time management.
- 2) **Specifications:** How to arrive at abstract and detailed specifications for various materials leading to 'items of work' used in construction?. Including influence and impact of local and national building codes on specifications.

MODULE 2

- 3) **Bill of Quantities (BOQ):** Why and how to build flexibility, resilience and redundancy in BOQ.
- 4) **Mandatory tests & Safety Measures in Specifications:** Procedures, frequency and submission of results as part of specifications and their inclusion in the BOQ for different materials document. Integrating workers' safety and material security into specifications.

MODULE 3

- 5) **Introduction to Costing:** Why do rates vary? - study of government rates (CPWD/ Karnataka PWD Schedule of Rates) and market rates. Concept of inflation and its effect on costing.eg. escalation clause, extra items, variations
- 6) **Detailed rate analysis of building:** Basic knowledge of items as per current schedule of rates (CSR) of local PWD. Percentages (based on thumb rule calculations) of various bulk materials used in construction like cement, steel, rubble, metal, sand, brick, tiles etc.

MODULE 4

- 7) **Introduction to sequence of construction activity:** Project time/ labor /materials costing and impact of delay in project on costing.
- 8) **Term project 1:** Detailed specifications writing and estimation of Bill of Quantities (BOQ) for an RCC framed house with an attached temporary shed.
- 9) **Term project 2:** Detailed specifications writing and estimation of Bill of Quantities (BOQ) for an office interior work.

MODULE 5

- 10) **Term project 3:** Detailed specifications writing and estimation of Bill of Quantities (BOQ) for Water supply and sanitary works including overhead tanks and Sump tanks.
- 11) **Term project 4:** Detailed specifications writing and estimation of Bill of Quantities (BOQ) for a typical residential layout plan with roads, culverts, pavements, etc.
- 12) **Billing requirements:** Role of the architect in monitoring the specifications follow-up for quality control, the measurement book (MB), RA bills, interim and final checking and certification of works on site based on the BOQ and terms of contracts.

REFERENCES:

- 1) Dutta B.N ,Estimating and Costing in Civil Engineering- Theory and Practice, UBS Publishers, 1993.
- 2) Rangwala, Estimating, Costing and Valuation, Charotar Publishing House.

15ARC 4.7 – COMPUTER APPLICATIONS IN ARCHITECTURE – II

CONTACT PERIODS: 5(Practical) periods / week with 1-2 periods of instruction and remaining hrs of working on CAD workstation for submission of Assignments.

PROGRESSIVE MARKS : 100

***OBJECTIVE** – To develop awareness and familiarity with Advanced Computer applications in Architecture and to equip students with skills required in using digital tools to conceive, develop and present architectural ideas.*

OUTLINE:

- 1) **Introduction to advanced popular 3D modelling software**– e.g. 3DStudio Max, Maya, Rhinoceros and other appropriate software. Introduction to online resources, blogs, tutorials.
- 2) **Concepts of NURBS modelling:**(curves and surfaces), curve / surface editing, solid modelling, layer management, etc.
- 3) **Classroom exercise to demonstrate 3D modelling of transformed/modified/complex 3D objects:** for e.g. Twisted tower, deformed cube, sliced cylinder. Introduction to file conversions and interdependencies between 3D modelling software and 2D drafting software, e.g. Rhinoceros to AutoCAD, or any other relevant CAD software. Conversion of 3D model(of transformed/modified objects) to 2D drawings (e.g. plan, section, elevation)
- 4) **Conversion of Architecture/interior design project into NURBS modelling project:** For e.g. measured drawing of classroom, Architecture School, computer room etc.
- 5) **Working on 3D modelling & Visualisation software with rendering:** such as 3DS Max OR Maya or any other appropriate software.

Concepts of solid modelling: polygonal modelling, modifier, application of materials, simple timeline animations.

Techniques of 3D visualisations – Introduction to tool settings in 3D rendering engines for photo-realistic rendering. Application of materials and Simple Timeline animations, For e.g. using VRay, Maxwell, Flamingo, Mental Ray or any other appropriate software, Classroom demonstration of objects, of simple Architecture design projects.

6) Working on Graphics/Vector/Image editing software: To present Architecture design studio projects –Introduction to publishing tools for creating presentations and portfolios.

Project 1 – Classroom exercise to convert architecture design project 2D drawings (of semester 3 / 4 OR any simple one to three-storeyed building) into 3D model using relevant software. Project to be rendered using an appropriate 3D visualisation software.

Project 2 – Classroom demonstration/exercise of image rendering/collage using Graphics/Image editing software (for e.g., adding context to visualisations), foreground, backgrounds etc.

Project to include presentation of final outcomes in the form of drawing panels, booklets, posters.

REFERENCES:

1. Internet resources, blogs, and learning resources on the web of popular 3D modelling software and NURBS modelling,
2. Vector/Graphics/Image editing software

15ARC 4.8- ELECTIVE II

CONTACT PERIODS: 3 per week

PROGRESSIVE MARKS : 50

a. ENVIRONMENT RESPONSIVE ARCHITECTURE

OBJECTIVE: *To develop awareness and familiarity with green design and its integration with Architectural design.*

OUTLINE:

- 1) **Introduction to Green Buildings:** Why make Buildings Green? Concept and necessity.
- 2) **Green Building Rating System:** The seven categories in the rating system : Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, Innovation in Design and Regional Priority
- 3) **Introduction to a design exercise (Project application):** Design of a small building with an objective to integrate categories of green building rating.
- 4) **Sustainable Sites:** Site Specific Design; Development Density and Community Connectivity, Alternative Transportation, Site Development, Stormwater Design and Heat Island Effect.
- 5) **Water Efficiency:** Innovative Wastewater Treatment and Reuse and Water Use Reduction and Re-use factors.
- 6) **Energy and Atmosphere:** Optimization of Energy Performance, On-site Renewable Energy, Enhanced Commissioning and Green Power. To apply the principles of Solar Passive Architecture to design of buildings.
- 7) **Materials and Resources:** Building Reuse: Maintain Existing Walls, Floors, and Roof, Construction Waste Management, Materials Reuse, Recycled Content, Regional Materials and Certified Wood.
- 8) **Indoor Environmental Quality:** Construction Indoor Air Quality Management Plan and Daylight and Views. Rating Systems: GRIHA and LEED Systems.
- 9) **Regional Priority:** To provide incentive for project teams to address geographically significant environmental local issues. Introduction to passive techniques of cooling such as evaporative cooling, earth tubing, wind scoops, roof ponds, shaded courtyards etc
- 10) Review of a design project considering various factors listed above.

REFERENCES:

1. Steemers, Koen and Steane, Mary Ann. Environmental Diversity in Architecture, Spon Press, 2004.
2. McGlynn, Sue et al., Responsive Environments, Architectural Press, 2008.

b. PRODUCT DESIGN

OBJECTIVES:

- 1) *To introduce the students to the discipline of Product Design*
- 2) *To develop basic skills required in handling simple product design projects*

OUTLINE:

Preamble:

We live in a world of objects. Objects can have meanings, carry associations or be symbols of more abstract ideas. These objects are predominantly functional in nature, some are purely symbolic / decorative in nature and there are a few which combine both the functional with the symbolic and decorative.

Great Architecture has demonstrated this fusion of the functional with the symbolic through the ages. Product design, on a smaller scale, seeks to blend the technical with the aesthetic, the utilitarian with the emotional delight; the dialogue between what people need / want vs what people will buy / discard.

1. **Product design as a noun:** the set of properties of an artifact, consisting of the discrete properties of the form (i.e., the aesthetics of the tangible good and/or service) and the function (i.e., its capabilities) together with the holistic properties of the integrated form and function
2. **Product design as a verb:** the process of creating a new product to be sold by a business to its customers. A very broad concept, it is essentially the efficient and effective generation and development of ideas through a process that leads to new products.

3. **Product design process:** from idea generation to commercialization; concept, development, detail; materiality, technicality, imageability;
4. Relationship between Design, Technology and Product
5. History of product design as a discipline, the various theories of design via study of design practices
6. Mode and method of Design Process as applicable to product ideation and development
7. Materials and manufacturing process and its influence on product ideation and development
8. influence of ergonomics on product ideation and development
9. Impact of culture i.e. the aesthetics on product ideation and development, the dialogue between people's aspirations and people's needs
10. Relationship and difference between craft based and mass manufactured products,
11. Market as a tool for product promotion
12. Indian aesthetic sense and its influence on product ideation and development
13. Influence of product design on other disciplines like automobile styling, furniture, jewellery, toys, systems design, computer interfaces, etc

Class assignments / exercises:

Short projects along with a time problem will be tackled in the class exploring the influences of design process, and ergonomics on the product ideation and development`.

The student will also study the product changes that will occur through the choices made of materials, manufacturing process, and marketing techniques.

Discussions, video presentations, seminars and case studies will cover all the other topics.

REFERENCES:

1. Alexander, Christopher ,Notes on the Synthesis of Form, Harvard University Press, 1964
2. Morris, R, The fundamentals of product design, AVA Publishing 2009.

c. HERITAGE DOCUMENTATION

OBJECTIVE: *To understand the character of a settlement, street, building, spaces, materials through a process of measured drawings and photographic documentation.*

OUTLINE:

1. Introduction to Documentation

- Need for Documentation undertaken? Tools for Documentation available, Methodology, Importance of Archival research, Old Photographs, Maps etc

2. Site work

- Secondary information on the /street/heritage
- Reconnaissance survey of the /street/heritage building;
- Mapping of the street
- Identification of selected typology of structures for detailed measured drawing
- Recording of measurements- horizontal, vertical, measuring angles, marking center lines, datum, notations, building orientation
- Legend of materials used; Structural details and joineries
- Details of various elements – openings, ornamental details
- Mapping activities in various locations
- Supporting sketches
- Information on people, surroundings, climate, Access to site

3. Preparation of Drawings

- Developing drawings from the field data – Plans at various levels, Building floor plans, Reflected ceiling plans, roof plans, all elevations, relevant sections.
- Drawings of details such as openings, ornamental details, joineries

4. Analysis:

- Analysis as tools for understanding and interpreting the measured drawings

REFERENCES:

1) RSP Program Monographs –CEPT University

2) Building Craft Lab- DICRC, CEPT University

15 ARC 5.1 – ARCHITECTURAL DESIGN -V

CONTACT PERIODS : 9 (Studio) per week

PROGRESSIVE MARKS : 150

VIVA MARKS : 150

OBJECTIVES:

- 1) *To understand the need for creating architecture as an envelope to system dependent program .*
- 2) *To understand the use of technologies developed in other fields as a precursor to creating architecture.*
- 3) *To identify and understand the role of services in the design of buildings; significance of material and construction techniques; climatic factors.*
- 4) *Introduction to development Regulations (building byelaws and rules); circulation networks (people, vehicular access), site planning.*
- 5) *To explore Computer Aided Design techniques to generate drawings and models to better understand envelopes and systems in architecture.*
- 6) *To understand the (thematic) abstract character of architecture (symbolism, aesthetics, identity) in the public domain; influence of socio-cultural, economic dimensions; user perception.*

OUTLINE:

- (a) *Familiarize with the impact of technology, utilities, and regulations in shaping architecture*
- (b) *Understand the various complex parameters to be considered while designing in the public domain*

MODE OF STUDY: 3 component approach to the Design Studio:

- A. Literature review and case studies:** Learning from detailed study and analysis of building systems and envelopes; character of public buildings through literature review and visiting buildings in varied settings (urban, contemporary, permanent and temporary).
- B. Seminars:** Seminars are intended to review parallel academic studies completed up to and during 5th semester studies in Building Construction/Structures/history/computer graphics, climatology/services and its importance and integration with the studio.
- C. Design Projects:** Studio projects structure shall emphasize the non-linear **interdisciplinary design process** encountered in Architectural design and the importance of other fields of knowledge in Architectural Design. The Design Studio will give prominence to bridging the gap between innovations in materials and techniques of construction. An essential part of the studio process should be peer reviews and reviews by consultants in the field of Structures, Utilities and Services.

Assinment-1: Case Study

1. Detailed review of each of the building types: retail/hospitality/transport. Students to be split into three groups; each group assigned to perform a case study of one building type. Short study trips to observe, discuss and document building types: retail/hospitality/transport, building projects in the vicinity of their colleges.
2. The emphasis should be on conceptual understanding and accurate measured drawing.
3. Attention should be given to Structures, Utilities and Services and Passive energy systems.

4. Sketches and documentation should show observations and inferences from the studies.

Assinment-2: Seminars

1. Overview by a PHE, MECH/Elec., HVAC & firefighting consultant on what to expect and practical rules of thumb to help students plan
2. Overview by a Structural consultant on large span structural systems in parallel academic studies of 5th semester in MATERIALS AND METHODS IN BUILDING CONSTRUCTION – V and BUILDING STRUCTURES - V
3. Discussion on innovations in materials and techniques of construction and passive energy systems.

Assinment-3: Projects

One major project and one minor/time problem to be tackled in the semester. Projects shall be of urban scale with multiple functions and a need for imagery as one of the architectural goals. Museums, art galleries, theme-based hotels, transport interchanges, terminals and shopping, Industrial structures areas can be chosen.

Project work could be done in 3 stages of activity interspersed with seminars.

- 1) Introduction to the initial design parameters which include choice of;
 - a. *Geography/situation (context),*
 - b. *User Group/development model,*
 - c. *Development guidelines (byelaws).*
- 2) Approaches and strategies to address issues of community, public and private realms, edge conditions, communication and connectivity. This could result in the generation of diagrams/models exploring attitudes to site, allocation of built and un-built volumes and communication and connectivity.
- 3) The design shall be sensitive to the needs of disabled, aged people and children.

It is recommended that site sizes should not be larger than 1 acre to allow for intensive study. However the Design studio faculty shall determine the extent of the site size.

Projects shall be of urban scale with multiple functions; identity of public building (aesthetics, symbolic character, meaning) will be one of the architectural goals. Museums, art galleries, theme-based hotels, transport interchanges, terminals and shopping areas can be chosen. Design emphasis shall be on the use of innovations in materials and techniques of construction. Concurrent or sequentially, another project shall be attempted with utilities and service dominant buildings like pharmaceutical manufacturing units or medical facilities. Consultants in the field of utilities and services shall be called as part of studio review.

Alternatively projects involving large span structures like industrial structures may be attempted. Design emphasis shall be on the skins and support of structural systems and resulting architectural form, space and experience.

NOTE:

- One major project and one minor/ time problem to be tackled in semester.
- Detailing of architectural features of the major project like entrance lobby, skylights and staircases has to be attempted.
- Submission shall comprise of duly drawn/drafted site plans, elevations, section views, models etc.

REFERENCES:

1. Richard Patrick Parlour(200); "Building services : A Guide to Integrated Design : Engineering for Architects"; 3rd Edition - Integral Publishing.
2. Paul Tymkow ; Building Services Design for Energy Efficient Buildings.
3. Russell Fortmeyer, Charles Linn ; Kinetic Architecture: Designs for Active Envelopes.
4. Michael Fox ; Interactive Architecture: Adaptive World (Architecture Briefs).
5. Prof. A.K.Bansal ; Solar Passive Design.

SHAPE OF THINGS TO COME – 6TH SEMESTER

This studio should equip a student to tackle the 6th Semester program like Institutional projects of higher learning, vocational training or a small-scale campus.

15ARC 5.2 – MATERIALS AND METHODS IN BUILDING CONSTRUCTION – V

CONTACT PERIODS : : 6 (1 Lecture + 5 Studio) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM: 4 Hrs

OBJECTIVE: *This course will further student's understanding of the logic and details of construction technologies of complex systems and their impact on production of complex buildings.*

OUTLINE:

MODULE 1

- 1) **Introduction to Steel plane Trusses:** Construction of Steel trusses for various spans, ridged truss, saw tooth truss with lattice girders, roof lighting, aluminum sheet and profiled MS sheet cladding and roof fixing details.
- 2) **Detailing of Steel trusses:** Tubular and L-angle trusses with 8-16m spans.

MODULE 2

- 3) **Introduction to pre-engineering metal buildings**
- 4) **Detailing of a Pre-engineered building:** Including Roof fixing details with aluminium sheet and profiled MS sheet cladding.
- 5) **Introduction to large span roofs:** Shell roof, vaults folded plate, geodesic domes, space frame, tensile structures, pneumatic structures etc.

MODULE 3

- 6) **Detailing of hyperbolic paraboloid shell roof:** Principles and methods of construction including form-work techniques and reinforcement details.
- 7) **Detailing of folded plate and cylindrical shell roof:** Principles and methods of construction including form-work techniques and reinforcement details.
- 8) **Detailing of a geodesic domes:** Principles and methods of construction with explorations using physical models.

MODULE 4

- 9) **Detailing of a space frame;** Principles and methods of construction with explorations using physical models.
- 10) **Tensile structures and pneumatic structures:** Principles and methods of construction with explorations using physical models.

MODULE 5

- 11) **Plastics as a building material:** types, properties and uses of plastics such as polycarbonates, acrylics, PVC polymer films, and fiber reinforced plastic. Application and details.
- 12) **Waterproof components:** Water Proofing elements, construction chemicals and additives, adhesives, plaster of Paris, gypsum, Polystyrenes, sealants. Detailing of waterproofing of basement, toilets, terrace garden, French drains etc.

NOTE: Minimum one plate relating to each construction topic. Site visits to be arranged by studio teachers. Study of material applications in the form of portfolio.

REFERENCES:

- 1) Emmitt & Gorse (2006), "Barry's Advanced Construction of Buildings", Second Edition, Wiley India Pvt. Ltd.
- 2) Francis, D.K. (2008), "Building Construction Illustrated", Fourth Edition, Wiley India Pvt. Ltd.
- 3) Mackay, J.K. (2015), "Building Construction", Fourth Edition, Pearson India.
- 4) Roy Chudley (2014), "Construction Technology" Second Edition, Pearson India.
- 5) Barry R. (1999) – Volume 3 & 4, "The Construction of Buildings", Fourth Edition, East-West Press Pvt Ltd., New Delhi.
- 6) Lyons Arthur (2014), "Materials for Architects and Builders", Fifth Edition: 2014, Routledge.
- 7) Varghese P.C. (2015), "Building Materials", Second Edition, PHI Learning Pvt. Ltd.

15ARC 5.3-BUILDING SERVICES-II (Electrical Services and Illumination)

CONTACT PERIODS: 3 (Lecture) per week

THEORY MARKS: 100

PROGRESSIVE MARKS: 50

DURATION OF EXAM: 3 Hrs

OBJECTIVE: *To introduce students to electrical services and illumination and to sensitize them with respect to their integration into Architectural Design.*

OUTLINE:

MODULE 1

Electrical Services - Electricity Generation; Transmission and Distribution

1. **Introduction to Electrical Services:** Introduction to commonly used terminology – Voltage, Current, Power, Connected Load, Max. Demand, Load Factors, Diversity Factor Etc.; Importance of Electrical Services and Its implications on building design; Introduction to Codes and Standards like National Building Code, National Electric Code, IS Rules, State Electricity Board and Chief Electrical Inspectorate Guidelines.
2. **Supply and distribution of electricity to buildings:** Brief introduction to various Sources for Electricity generation. Introduction to Transmission and Distribution system (from generation to Building's main) - Cables-HT/LT, Voltage Levels, Sub-Stations, Ring Main Units, Metering Panels, HT Panel, Transformers, Generators, LT Panels.

MODULE 2

Electrical Services - Internal Electrical distribution systems and Renewable Energy Systems

3. **Residential Building internal electrical distribution system & Commercial Building internal electrical distribution system:** Power Requirement, Incoming Power Source Voltage, RMU, Transformers, HT Metering & Sub Metering Panels, Rising Mains, Sub-Mains, Circuit-Mains, UPS requirements, Server power requirements, Point Wiring, Point Matrix, Utility Loads, Wiring Systems, Wiring Installation systems.
4. **Introduction to Renewable Energy Systems (On-Site and Off-Site):** Solar, Wind, Bio-Mass, Achieving Net Zero Building design through utilization of above natural resources; Energy Conservation techniques in Electrical systems.

MODULE 3

Electrical Services - Protection Systems

5. **Switchgear & Protection Devices – Fuses, Breakers:** Miniature Circuit Breakers; Earth Leakage Circuit Breakers; Moulded Case Circuit Breakers & Air Circuit Breakers and Protection Relays.
6. **Earthing & Lightning Protection System:** Definition, Purpose; Types of Earthing Systems, Factors affecting selection and system specification - Type of Soil, water table, soil resistivity etc. Brief about new advances in earthing systems; Lightning system design - Factors affecting the system specification, basic rules as per NBC and other relevant codes.

MODULE 4

ILLUMINATION:

7. **Fundamentals:** Quality & Quantity of Lighting; Recommended Lux Levels; Type of Lamps – Incandescent, Discharge Lamps, Fluorescent, CFL, LED and OLED. Integration of Day lighting with Artificial Lighting, Control Systems, Laws of illumination.
8. **Techniques, Principles and Applications:** Lighting Methods - Ambient, Task & Accent lighting; Systems of Luminaries - Up-Lighting, Down-Lighting, Spot Lighting etc.; Street Lighting, Façade Lighting, Landscape Lighting, Architectural Typologies; Preparation of Lighting Layout.

MODULE 5

EXTRA LOW VOLTAGE SYSTEMS AND LOAD ESTIMATION

9. **Extra Low Voltage systems:** Telephone; Data & Cable TV Networking; Service provider requirements; Point matrix for Individual residential / Apartment.
10. **Electrical Layout Design and Load Estimation:** Residential Electrical Layout Design (using symbols as per IS codes), Compliance to local building codes; and Electrical Load Calculations.

Case studies: Typical Layouts & Layout Generation for Lighting, Transformers Yards, Generator Rooms, Lighting layouts for shops/clinic.

Site Visits: Sub-Stations, Transformer Yards, Generator Yards and Panel Rooms etc. of Multi-storeyed Residential Buildings/Campus, Hotels, Hospital & IT Buildings etc.

NOTE: For Progressive marks, submissions to contain a) Calculation of required load and preparation of Electrical lay out design for a 3-bedroom house with standard notations (Plan). b) Study Portfolio relating to modules 1, 2, 3, 4 and 5.

REFERENCES:

1. L.Uppal ; Electrical Wiring, Estimating & Costing.
2. Aly. S. Dadras (1995), Electrical Systems for Architects by N.G.A.R.B. McGraw-Hill.
3. Anwari ; Basic Electrical Engineering.
4. National electric Code, Indian Electricity Rules 1956, Energy Conservation and Building Code.
4. Handbook of Lighting Design by Ruediger Ganslandt, Harald Hofmann; ERCO Edition
5. Fundamentals of Lighting by Susan M. Winchip.
6. National Building Code, 2016 – Part 8 (Section 1, 2, 6).
7. Code of Practice for Interior Illumination (IS 3646-1 (1992); Indian Standard - BIS.

15ARC 5.4 – HISTORY OF ARCHITECTURE - V

CONTACT PERIODS : 3(Lecture) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 Hrs

OBJECTIVE: *To provide an introduction to the culture and architectural currents of Western Architecture during Renaissance, Baroque, Neo Classical and Modern periods. To identify the socio-cultural changes aptly reflected in the typology of buildings through this phase.*

OUTLINE:

MODULE 1

- 1) **Introduction to Renaissance Architecture:** Background and influences on Renaissance Architecture. Characteristics of Renaissance Architecture in general. Monumental, public and residential spaces.
- 2) **Renaissance Architecture Examples:** St Andrea, Mantua and Palazzo Rucellai by Leon Alberti, Villa Rotunda (Capra) by Palladio, (New) St Peter"s Rome by Michelangelo and others, St Paul"s London by Sir Christopher Wren. Baroque Architecture: General characteristics of Baroque. Eg: St Peter"s Piazza by Bernini. Monumental, public and residential spaces.
- 3) **1750-1900 Transitional Period Architecture:** A brief account of the situation before the changeover to Modern architecture in Europe. Palladian Revival in Britain, Greek revival and Gothic Revival. Transitional Period Examples: Chiswick House, London, Mereworth castle, Kent, St Pancras Church, London, West Minister Palace, London, Arc de Triomphe, Paris. Monumental, public and residential spaces.

MODULE 2

- 4) **Impact of Industrial Revolution in Europe:** The Social, economic and political changes effected, new requirements, functions, new materials and technological developments. New proto types- Ex. Bridges, Expositions, Factories and Railway stations-Use of metal and glass. palace. Monumental, public and residential spaces.
- 5) **Early Modern Architecture I:** Modern movement-Arts and crafts, Art-Nouveau, Italian futurism-The Chicago School and rise of early sky scrapers-Ex Monadnock building, Carson pierre Scott, store in NewYork-Public and private spaces Casa Mila, , Sagrada Familia church etc.

MODULE 3

- 6) **Early Modern Architecture II:** Destijl movement, Brutalian and Bahaus, Schroder House, Ronchamp, Modern sky scraper, Mies Van der Rohe (Glass and Steel), Bahaus School design- Examples for the above movements for Public and private spaces and Monumental approach(eg Sky scrapers)- IIT Campus buildings- Public and private spaces.
- 7) **Modern Architecture III:** Influence of concepts and ideas generated by FL Wright - Robie House, Falling Waters, Guggenheim Museum, Johnson Wax Tower. Le Corbusier-Villa Savoy, Domino House, Five points of Architecture. Mies Van der Rohe-Less is more, minimalism, Glass and steel tower - Seagram.
- 8) **Modern Architecture IV:** Walter Gropius, Bahaus building, Fagus shoe Factory, Harward campus, Team approach. Louis Sullivan-Chicago Auditorium, Wain Wright Building, Theory of Sky scrapers. Alvar Aalto and his works.

MODULE 4

- 9) **Modern Architecture V:** International style, works of Eero Saarinen- TWA and Kennedy Airports. Richard Neutra- Lovell Beach House. Phillip Johnson- Glass House, Museum Building. Oscar Niemeyer-Work in Brazil- Legislature building and Church. Monumental, public and private spaces.
- 10) **Modern Movement-VI:** New Ideas – Archigram Britain-Walking City, Floating City etc. Kenzo Tange- Japan-Floating City and Shimbon Office Building. Moshe Safdie- Housing in Israel. Sir Buckminster Fuller-US Pavilion in Expo-67, Dymaxion Car, Buckminster Fuller Dome- Public and private Building and spaces.

MODULE 5

- 11) **Modern Movement-VII:** Brutalism- Works of Le Corbusier, Peter and Alison Smith, James Sterling-Udessa of Raw concrete, Ronchamp, Notre-Dame des Victoires-Lyon, Library-Oxford University, elementary School by Smithsons- development of Corporate Sky Scrapers- New York- Having multiple uses and tinted glass cladding, Rockefeller Centre-New York-Public and Private examples.
- 12) **Modern Movement-VIII:** Parallel movement-Soviet Union of 1920's- Constructivist movement, Modernism and works of Vladimir Tatlin- contributions of Engineers like Pierre Luigi Nervi- Rome Olympic Buildings, Pirelli Tower Italy, Gustave Eiffel-Eiffel Tower, bridges, Statue of Liberty base, Candela etc.

NOTE : Progressive Marks A) individual presentation by a Student on one topic. B) Group studies of chosen issues. C) Impact of modernism on India.

REFERENCES:

- 1) Frampton Kenneth ; "Modern Architecture – A Critical History".
- 2) Fletcher, Bannister ; "A History of Architecture".
- 3) Siegfried Gideon ; "Time, Space and Architecture".

15ENG 5.5 – BUILDING STRUCTURES - V

CONTACT PERIODS : 4 (2 Lecture +2 Studio) per week

PROGRESSIVE MARKS : 75

VIVA MARKS : 75

OBJECTIVE: *Integration of structures with architectural objectives by developing an understanding of building structures and selection criteria for appropriate horizontal systems; conceptual design of long span structures for gravity and lateral wind and seismic loads.*

OUTLINE:

- 1) Introduction:** Horizontal or Long Span Structures
- 2) Introduction to the Structural design Project:** Design for an Airport terminal building of dimension 75M X 300M using horizontal system. Selection of Horizontal structural systems including load calculation based on Building Codes and Standards(indicative).
- 3) Structural Analysis and Design to satisfy Building Codes and Standards:** Determine the general loads to be considered in the design of the structure, based on the type of occupancy specified for each area. a) Gravity loading: Dead and Live load calculation based on IS 875 (Part 1&2) b) Seismic loading: Seismic loading calculation based on IS 1893 Code Static Analysis Procedure c) Wind loading: Wind loading calculation based on Indian Standard I.S. 875 (Part3).
- 4) Design of Portal frame Structure System:** Design of two-dimensional rigid frames that have a rigid joint between column and beam. General framing arrangement of Portal frame for 75M X 300M building, basic load path and total structural weight calculation.
- 5) Design of Arch and Vault Structures:** Design of curved structural member spanning two points, of masonry, concrete or steel and used as the roofing systems of large span buildings. Design of Arch and Vault arrangement for spanning 75M X 300M building, and basic load path and total structural weight calculation.
- 6) Design of Dome Structures:** Domes as polar arrays of curved structural systems in masonry, concrete, steel with glass cladding, their structural strength and properties as roofing systems of large column-free spans. Design of dome(s) for spanning 75M X 300M building, basic load path and total structural weight calculation.
- 7) Long Span Planar Truss Design:** Triangular structural system; assembly of simple triangular planar trusses. Planar trusses in roofs and bridges. General framing arrangement of Long Span Truss for 75M X 300M building, and basic load path and total structural weight calculation.
- 8) Vierendeel truss design:** Truss design with rectangular or square assembly of members with rigid joints capable of resisting bending moments. General framing arrangement of Vierendeel truss for 75M X 300M building, and basic load path and total structural weight calculation.
- 9) Cable and Suspension Structures:** Design for long-span systems using Cable and suspension systems. Design cable suspended roof to span 75M X 300M building, and basic load path and total structural weight calculation.
- 10) Space Truss:** Design of three dimensional trusses, their structural properties and strength due to three dimensional triangulation. Design of Space Truss roof for spanning 75M X 300M building, and basic load path and total structural weight calculation.
- 11) Concrete Shell structure design:** Design of double curved surfaces formed from warped surface (e.g. hyperbolic parabolic); their properties and strength as light-weight construction

for column free large spans. Design of Concrete shell roof to spanning 75M X 300M building, and basic load path and total structural weight calculation.

- 12) Fabric Structure:** Design of membrane structures of thin flexible fabric covers that provide light-weight free-form roofing system. Design of Fabric roof to span 75M X 300M building, and basic load path and total structural weight calculation.

NOTE:

- a) Minimum one plate on each loading calculation and vertical structural system.
- b) This course to be conducted jointly by Structures and Architecture Design Studio faculty.

REFERENCE:

- 1) Martin Bechthold, Daniel L Schodek , "STRUCTURES"; PHI Learning Private limited
- 2) Works of Felix Candela
- 3) Works of Frei Otto
- 4) Works of Hassan Fathy
- 5) Works of P.L. Nervi
- 6) Works of Sir Buckmirter Fuller

15HUM 5.6: SOCIOLOGY AND BUILDING ECONOMICS

CONTACT PERIODS: 3 (Lecture) per week

THEORY MARKS: 100

PROGRESSIVE MARKS: 50

DURATION OF EXAM: 3 Hrs

***OBJECTIVE:** To familiarize students with the basic concepts of sociology and economics and their influence on architecture.*

OUTLINE:

MODULE 1

1. **Introduction to Sociology:** Definition of Sociology; Nature, Scope and Utility of Sociology; Branches of Sociology; Relation of Sociology and its branches to architecture and the built environment.
2. **Elements of Society:** Biosocial and Sociocultural associations; Definitions of sociological terms: society, community, family, culture; Difference between society and community; Different family structures and architectural responses to different family types in and outside India (examination of different housing typologies responding to different family types – traditional and contemporary); Relation between culture and built form (exploration of architectural examples).

MODULE 2

3. **Communities:** Origin, growth and nature of settlements and communities. Their characteristics and spatial patterns.
4. **Urban and Rural Communities:** Definitions of the terms “urban” and “rural”. The social, economic and spatial characteristics associated with urban and rural settlements. Relation and interdependencies between urban and rural settlements. Urban sociology and rural sociology.
5. **Cities and Society:** Urbanization – definition; causes. Effects of urbanization on rural areas. Impact of growing urbanization on urban life, viz. health, housing, transportation. Different types of migration. The impact of migration on urban form. The origin and characteristics of slums in European, American and Indian cities. Official definition of slums as per Census of India. Governmental and non-governmental approaches to engaging with issues regarding slums in Indian cities.
6. **Social Research:** The need for research; the research process; ethics of social research; scope of social research. Difference between methodology and methods. Types of research methods: qualitative, quantitative, mixed research methods. Sources of research data: primary and secondary sources. Secondary data sources include literature review, official and unofficial documents. Primary data sources use methods such as field surveys, questionnaires, different types of interviews (open-ended / closed / structured / semi-structured), and case study approach.

MODULE 3

7. **Economics:** Definition of economics; Definitions of terms: Goods; Utility, Value, Price and Wealth. The relationship of economics with the built environment and land use.

8. **Economic organization of society:** Different economic systems: capitalism; socialism, communism, mixed-economies. Primary, secondary and tertiary sectors of economy: agriculture, mining, manufacturing, banking, marketing, transport and service sectors. Factors of production: land, labour, capital and entrepreneurship. Relevance of factors of production to architecture and construction practice.

MODULE 4

9. **Economics and the market:** Consumption, wants and needs and their characteristics. Concepts of economics: Opportunity cost; Laws of supply and demand; Laws of increasing, diminishing and constant returns; Standard of living. Analysis of the housing market in Indian cities to understand the dynamics of urban housing supply and demand.

MODULE 5

10. **Urban land values:** Various factors affecting the value of urban land. Difference between land use and land cover. The characteristics of developed land in the city. The Bid Rent theory that defines relationship between location and land value. Theoretical city models based on land use and land value – Burgess's Concentric Zone Theory; Hoyt's Sector Theory; Ullman and Harris's Multiple Nuclei Theory.
11. **Building Costs:** Cost and cost indices. Life cycle costs. Total cost of construction. Time value of money. Different sources of financing buildings.

REFERENCES:

1. Openstax College (2012) Introduction to Sociology. Openstax College.
2. Samuelson, P. and Nordhaus, W. (2010) Economics. Mcgraw-Hill Education.
3. Yin, Robert K. (2014) Case Study Research Design and Methods (5th Ed.). Thousand Oaks, CA:Sage.
4. Groat, Linda N. and David Wang (2013) Architectural Research Methods (2nd Ed.). John Wiley & Sons.
5. Jones, Paul (2011). The Sociology of Architecture: Constructing Identities. Liverpool University Press.
6. Mann, Thorbjorn (1992) Building Economics for Architects. Wiley.

15ARC 5.7 – WORKING DRAWING I

CONTACT PERIODS : 5 (Studio) per week

PROGRESSIVE MARKS:100

OBJECTIVE:

Introduction of Working Drawings and Details; Coordination between Architectural, Structural, Services and other disciplines; Preparation of Architectural Working Drawings for a design project.

OUTLINE:

1. Introduction: Overview of Working Drawings; historical perspective; consultants involved in preparation of working drawings, their role and scope; reading, error checking, problems in working drawings.
2. Drafting Conventions: Representation of materials, graphic symbols, line type conventions, grid lines, lettering, color codes, paper sizes, title blocks, office practices, standardization of details.
3. CAD Drawings: Working with layers, blocks, templates, assemblies, libraries, layouts, plot styles, error checking, editing.
4. Project work: Preparation of Architectural Working drawings and details for one of the design projects of medium rise-framed structure, from earlier semester, like Residence, Primary Health Center or School etc.

PORTFOLIO:

Drawings to include Site Plan, Marking Plan, Plans at all levels, Terrace Plan; all Elevations; two Cross Sections passing through staircase & lift shaft; Profile Sections; Details to include Toilet, Kitchen, Staircase, Door, Window, Railing, Gate, Sky-light.

NOTE: Same project may be continued for preparation of working drawings w.r.t. structures and services for Working Drawing-II.

15ARC 5.8 - ELECTIVE III

CONTACT PERIODS: 3(Lecture) per week

PROGRESSIVE MARKS: 50

a) ALTERNATE BUILDING TECHNOLOGY AND MATERIAL

OBJECTIVE:

1. Introduce students to overall understanding of Building Technology and Material.
2. Introduce details of Building Material and Alternate Techniques of Building.
3. Introduce students with relevant examples.

OUTLINE:

1. Introduction to building material: Soil, types of soil, characteristics of soil, simple tests conducted at site, Bamboo as building construction material, properties, types, joinery details with examples.
2. Masonry wall- SMB (Stabilised Mud Blocks), Hollow clay blocks, Cement blocks – Making of blocks, Properties, Specifications and Applications with examples.
3. Mud wall, Rammed Earth Wall- Making of wall, Properties, Specification and Application with examples.
4. Alternate method for Foundation, Lintel and Chajja. Roof-Dome, Arch Panel Roof, Vault using SMB, Clay blocks with examples .
5. Concept of Ferro Cement structure, Building Components made out of Ferro cement such as Roof, Wall, Staircase with examples.

NOTE: Field visits to be arranged by teachers. Group work could be encourage.

REFERENCES:

1. K S Jagadish, "Building with Stabilised Mud"; IK International Publishing House PVT Ltd.
2. K S Jagadish, B V Venkatarama Reddy, K S Nanjunda Rao, "Alternative Building Materials and Technology"; New Age International Publishers.
3. Jules J A Janssen , "Building with Bamboo-A Handbook".
4. Chris Van Uffelen , "Bamboo Architecture and Design(Architecture and materials)".
5. Laurie Bakers work.
6. Documentation "Earth Architecture", Auroville.
7. Hassan Fathy's work.

b) DIGITAL ARCHITECTURE

OBJECTIVE:

Digital Architecture strategically utilizes digital media in the process of its architectural design.

Provide students with a strong foundation in the process of Digital design.

Training tools to comprehend Conceptual Design through the early design stage, design-development, analysis and representation of architectural spaces.

OUTLINE:

This course uses **theoretical and practical study** to examine how digital tools and processes can be developed and applied to design built environments. Vis-à-vis Architects conventional approach of Architects.

a) Introduction to Digital Architecture:

Exploration of new design process in architecture, Exploration and case study of various available Design process involving digital media.

SESSIONAL WORK:

Cases study of available approaches on utilisation of Design tools leading to presentation of case studies and examining pros & cons and suitability of various Design approaches.

b) Parametric Architectural Geometry

Explore parametric software as a first stage of learning software for replicating ideas in to 2D & 3D forms.

SESSIONAL WORK: Students will be given different small exercises which will be based on the primary stage form development in the parametric software.

c) Geometrical explorations:

Explore the relationships and dependencies of progression concepts and architecture. The exploration will be based on geometrical ideologies to develop relationships and new design process for form generation.

The exercise will explore generative design methodologies through the application progression techniques.

SESSIONAL WORK: Students will work on geometric transformations ad an approach for form generation.

d) Simulation, Visualisation

Explore simulation and visualisation, as a first stage of learning software leading to digital publication.

SESSIONAL WORK: Students will be given small exercises which will be based on the primary stage form development for visualisation & Publication of creative process and outputs with Desktop and Web tools.

Software: Any relevant and appropriate 3D-modelling , visualisation software can be used for sessional work

REFERENCES:

- 1) Contemporary techniques in Architecture – by Ali Rahim
- 2) Digital Tectonics, Digital Cities AD: Architectural Design – Prof. Neil Leach
- 3) Digital to from control to design –by Michael Meredith

c) ARCHITECTURAL LIGHTING DESIGN

CONTACT PERIODS: 3 (Lecture) per week
PROGRESSIVE MARKS: 50

OBJECTIVE: *This course surveys the scope and possibilities of integrating light in architecture.*

OUTLINE:

Architectural spaces are designed for a specific purpose, and are sometimes constructed through a specific theme to create such experiences. The aspect of light in architecture is a crucial element in the fabrication of such spatial experiences as illustrated below:

1. Introduction: Quantitative vs Qualitative aspects of lighting design.
2. Experiencing Architecture: Fundamentals and factors that shape spatial experiences ranging from emotion, memory, imagination, aesthetics, culture etc.
3. Seeing Form-Space Relationships in developing lighting strategies.
4. Relationship between man, light and space.
5. A primer to Place-Making through light in architecture.
6. Light in Architecture – Conceptual proposal of lighting design for an architectural space using Perception Based Approach.

METHODS:

Presentations by staff to introduce the concepts; Student presentations to take the discussions further. Practical understanding in principles of light and perception through visualisations/calculations/mock-ups.

Students will work on related assignments. They will develop ideas and concepts for lighting projects.

ASSESSMENT:

The group/individual assignments will be assessed via mock-ups, presentations and reports.

REFERENCE:

1. Boyce, Peter R.,(2014),"Human Factors in Lighting"; CRC Press, 3rd Edition.
2. Cuttle, Christopher(2015),"Lighting Design: A Perception Based Approach"; Routledge, 1st Edition.
3. Michel, Lou. (1995), "Light: The Shape of Space: Designing with Space and Light"; Van Nostrand Reinhold.
4. Steffy, Gary R.(2008), "Architectural Lighting Design" by Wiley.
5. Tanizaki, Junichiro,(1977), "In Praise of Shadows"; Leete'S Island Books, 1st Edition.
6. Zumthor, Peter(2006), "Atmospheres"; Birkhäuser Architecture, 5th Edition.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
SCHEME OF TEACHING AND EXAMINATION OF VI SEM B.ARCHITECTURE (CBCS - 2015 SCHEME)

Sl. No.	Subject Code	Title of the Subject	Teaching Scheme in Periods per Week (50 Mts)				Examination Scheme					Credits
			Lecture	Studio	Pract	Total	Dur (hrs)	Theory Marks	Prog. Marks	Viva Marks	Total	
1	15 ARC 6.1	Architectural Design-VI	-	9	-	9	-	-	150	150	300	7
2	15ARC 6.2	Materials and Methods in Building Construction-VI	1	5	-	6	4	100	50	-	150	4
3	15ARC 6.3	Building Services III	3	-	-	3	3	100	50	-	150	3
4	15ARC 6.4	Contemporary Architecture	3	-	-	3	3	100	50	-	150	3
5	15ENG 6.5	Building Structures-VI	2	2	-	4	-	-	75	75	150	3
6	15 ARC 6.6	Landscape Architecture	3	-	-	3	3	100	50	-	150	3
7	15 ARC 6.7	Working Drawing II	-	5		5	-	-	100	-	100	2
8	15ARC 6.8	Elective IV (any one)										
		a) Culture and Built Environment	3			3			50		50	2
		b) Geographical Information System	3			3			50		50	
		c) Design of High-Rise Buildings	3			3			50		50	
9	15ARC 6.9	Study Tour	-			-	-	-	50	-	50	2
			12 or 15	21 or 24	0 or 3	36	-	400	575	225	1250	29
ARC= Architectural Subjects ART= Art Subjects ENG = Engineering Subjects HUM = Humanities Subjects.												
No. of Subjects/Heads = 09 No. of Theory Examinations = 04												
Progressive Marks to be awarded by the subject teacher.												
Minimum Marks for passing: Progressive Marks 50%, Theory Marks and viva marks 40% in each. ENG 6.5 min. pass 38 out of 75.												

15ARC 6.1 – ARCHITECTURAL DESIGN - VI

CONTACT PERIODS: 9 (Studio) per week

PROGRESSIVE MARKS: 150

VIVA MARKS : 150

OBJECTIVE: *To enable the students to integrate design with history, theory, building construction and material science in a more informed way.*

OUTLINE:

To understand the role of built environments of increasing complexity by:

- a) Intrinsic factors: Size, volume, levels, functional spaces or zones, structural possibilities
- b) External factors: site, approach, traffic, ecology, services
- c) Constraints: bye-laws, budget, ideology, attitudes
- d) Create an ' Identity' to the Campus through integration of the above.

MODES OF STUDY:

The aim of the studio is to explore STRUCTURING: structuring of a research or a case study, structuring of the program, spatial structuring and informal structuring.

Structuring of research: Case studies, reading material and site studies have to be a directed exercise with the involvement of tutors where visiting the project of concern would be of utmost importance. This studio is also about how one organizes research. It should be mandatory to use analytical models, diagrams to understand the chosen case study in terms of Design Intent, site and spatial structuring. There needs to be emphasis on Graphical consistency and legibility of the study. It is recommended to add a reading list as part of the studio to further enrich this discussion about institutions. Once a week, students could be asked to present the case studies and selected readings to the class.

Structuring program: Studying requirements from various point of views which include relationship between requirements and values, requirements and phenomenology, area of the site and functional area requirements, issues of public and private domains, open and closed spaces, interrelationship between the various components, formal and informal, service requirements, relationship between whole and the part, requirement and climate etc. information resulting from this exercise becomes the individual's program for the project which can then lead to structuring of space.

PROJECTS

a). One major project and one minor/time project to be tackled in the semester. Institutional projects like facilities of higher learning, such as, Engineering college campus, medical college campus, management institute campus, hotel management institute, Law college campus, Dental college campus, Nursing college campus, Juvenile Correction Centre, etc.

b). The minor project could include a case study documentation of the project proposed for the design intervention. This work could be done in a group and as part of its findings shall be an outline program to be a major project.

In view of the current urban contexts where land is precious and resources are scarce, the project could also be institutional buildings on a small urban plot, on multiple levels and still engage with its context and establish an environment within that captures the essential nature of an institution. However, Project selection is left to the discretion of the tutors.

Project work could be done in 5 stages of activity jointly with research and analysis.

1. Introduction to the initial design parameters which include choice of:
 - a. Geography/situation (context)
 - b. Constraints (bye-laws, budget, ideology, attitudes, etc.)
2. Spatial structuring: To understand spatial structuring as a set of logical operations after an analytical understanding of the site, surroundings, program and intent expressing diversity of program and its resulting spatial variety and the relationship between the built and the unbuilt established through movement systems, linkages and nodes etc.
3. Informal structuring: Architecture is an integrative discipline. Establishment of a structure enables reverse integration with other subjects where the students look beyond their studio offering a mechanism to observe the surroundings and document it, understand history and theory analytically, integrate design with building construction, climatic, environmental and material science in a more informed way.
4. The design exercise shall focus on ideas of scale, engagement (social, economic, political), hierarchy, public/private space, and challenge the students to reflect on these as part of the design development. The emphasis should be to establishing these larger goals as part of the discussion on the nature of an institution.
5. Goal of the studio shall be to see the architect as *instigator* - defining the nature of engagement with the city, through the articulation of the program and its relationship with the context. Studio must provoke students to define clearly their agenda and to think of architecture as an active, live engagement rather than a passive and inert one. By having students spell out a hypothesis it then doesn't matter what the type is. This prepares the students to frame a series of questions to address the problem at hand.

READING AND REFERENCE MATERIAL:

- 1) Roger H. Clark and Michael Pause, "Precedents in architecture", 1984, John Wiley & Sons.
- 2) Geoffrey H Baker, "Le Corbusier an analysis of form", 1996, Van Nostrand Reinhold.
- 3) Herman Hertzberger, "Lessons for students in architecture", 1991, Delft University.
- 4) Charles Correa, "A Place in shade", 2010, Penguin India
- 5) Rem Koolhaas, "Conversation with students", 1996, Princeton Architectural Press

15ARC 6.2 – MATERIALS AND METHODS IN BUILDING CONSTRUCTION–VI

CONTACT PERIODS: 6 (1 Lecture + 5 Studio) per week

THEORY MARKS : 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM - 4 Hrs

OBJECTIVE: *To acquaint the students with construction practices pertaining to structural glazing, Metal Cladding and roofing systems and to study constructional systems and detailing of alternative material doors, windows and partition.*

OUTLINE:

MODULE 1

- 1) **Glass as a building material:** Glass manufacturing in various types like plate, tinted, decorative, reinforced, laminated glass block, fiber glass, glass murals, partially colored glass, etching of glass and its applications in building industry for both exteriors and interiors. Glass fabrication techniques, fiber reinforced composite materials and products.
- 2) **Frameless glass doors and windows and partitions:** Fixing and fabrication details.

MODULE 2

- 3) **Structural Glazing and cladding:** Fixing and fabrication details.
- 4) **Point supported glazing:** Fixing and fabrication details.
- 5) **Introduction to metal cladding:** ACP, Aluminum louvers; Fixing and fabrication details.

MODULE 3

- 6) **Metal cladding of facades and building envelopes:** Fixing and fabrication details.
- 7) **UPVC, PVC & FRP:** Doors and windows and partitions (Detailing and study of joinery).
- 8) **Wooden sliding and folding doors and partitions:** Principles and methods of construction and detailing.

MODULE 4

- 9) **Steel sliding and folding doors and partitions:** Principles and methods of construction and detailing.
- 10) **Aluminum sliding and folding doors and partitions:** Principles and methods of construction and detailing.

MODULE 5

11) Skylight in steel and glass: Principles and methods of construction and detailing.

12) Alternative wall technologies: Sandwich panel walls, PUF panels etc.

NOTE : Minimum one plate on each construction topic. Site visits to be arranged by studio teachers. Study of material applications in the form of portfolio.

REFERENCES:

1. Francis, D.K. (2008), "Building Construction Illustrated", Fourth Edition, Wiley India Pvt. Ltd.
2. Mackay, J.K. (2015) – Volume 1, "Building Construction", Fourth Edition, Pearson India
3. Roy Chudley (2015) – Volume 1, "Construction Technology" Second Edition, Pearson India
4. Barry R. (1999) – Volume 3 & 4, "The Construction of Buildings", Fourth Edition, East-West Press Pvt. Ltd., New Delhi.
5. Lyons Arthur (2014), "Materials for Architects and Builders", Fifth Edition, Routledge.
6. Varghese P.C. (2015), "Building Materials", Second Edition, PHI Learning Pvt. Ltd.

**15ARC 6.3 - BUILDING SERVICES - III
(AIR-CONDITIONING, MECHANICAL TRANSPORTATION and FIRE PROTECTION)**

CONTACT PERIODS: 3 (Lecture) per week

THEORY MARKS: 100

PROGRESSIVE MARKS: 50

DURATION OF EXAM: 3 Hrs

OBJECTIVE: *To develop the knowledge and skills required for understanding the mechanical services in buildings and their integration with architectural design.*

OUTLINE:

MODULE 1

MECHANICAL VENTILATION AND AIR-CONDITIONING - Introduction

- 1) Introduction to Mechanical Ventilation:** Need for mechanical ventilation for spaces like Basements, Kitchen, Toilets, etc. Guidelines as per NBC / ISHRAE: Types of ventilation systems.
- 2) Introduction to Air-conditioning:** Definition, Psychometric processes and requirements, Air & Refrigeration cycles, Basics of Load Calculations, Zoning and Air Distribution, Heating system,

MODULE 2

AIR-CONDITIONING SYSTEMS

- 3) Air Conditioning systems:** Window, Split, Packaged, Basics of Centralized Air-conditioning system, Water & Air Cooled Chillers, Air Handling Units, Basics of duct sizing and routing, preferred locations of equipment and Architectural Requirements of various equipment. Illustration of duct layout through a small example.
- 4) Specialized Air Conditioning Systems:** Clean Rooms, Server, Hub & UPS Rooms, Operation Theaters etc.

MODULE 3

MECHANICAL TRANSPORTATION SYSTEMS IN BUILDINGS

- 5) Elevators:** Types of Elevator systems, design considerations like Peak Handling capacity, Average Waiting Time, Lift speed etc., Architectural Requirements & Details for Elevator shaft - Elevator pit - Elevator Machine Rooms, Automatic Rescue Device for Elevators, Elevator car interiors, Possible Location and arrangements of Elevators in a building. Lift Acts and National Building Code.
- 6) Escalators & Travelators:** Applications, Calculation of Traffic capacity, Location and arrangements of escalators and travelators, inclination factor.

MODULE 4

FIRE SAFETY IN BUILDINGS & PASSIVE FIRE PROTECTION

- 7) **Introduction:** Classification of fire, causes & hazards; Grading of structural elements for its fire resistance as per NBC. Classification of building types as per NBC and brief description of characteristics of combustible and noncombustible materials.
- 8) **Concepts in passive fire protection in buildings:** Escape routes, fire driveways, fire refuge area, fire assembly areas, pressurization, travel distance, fire tower and compartmentation, fire signages etc.

MODULE 5

ACTIVE FIRE PROTECTION AND FIRE SAFETY IN HIGH RISE BUILDINGS

- 9) **Active fire control:** Basic concepts in fixed firefighting installations, Fire sprinklers, Fire Hydrants, Automatic fire detection and alarm systems.
- 10) **National Building Code Requirements for Fire Safety:** Rules for Fire Protection and Fire Fighting Requirements for High Rise Buildings in India.

Notes:

Suggested assessments:

- A. The subject teacher could arrange for visits to relevant facilities to provide an understanding of the various provisions and integration of air conditioning, vertical transportation and fire safety in buildings. Case study reports could be submitted as group assignments.
- B. Conceptual design of air-conditioning systems, mechanical ventilation, mechanical transportation, active & passive fire fighting systems for a high rise building. Ideally the assignment could be integrated with the Architectural Project of ongoing or previous semester.

REFERENCES:

- 1) Roy J Dossat , "Principles of Refrigeration" 1961, John Wiley & Sons.
- 2) Manohar Prasad , "Refrigeration & Air Conditioning Data Hand book" 2013, New Age International, 2nd edition.
- 3) Don Kundwar , "Refrigeration and Air Conditioning", 2016, Dhanpat Rai & Co. (P) Limited.
- 4) "National Building Code of India (NBC)", 2016, Bureau of Indian Standards
- 5) Walter T. Grondzik, Alison G. Kwok, "Mechanical and Electrical Equipment for Buildings", 2010; 11th edition, Wiley Publication.
- 6) Shan K. Wang , "Handbook of Air Conditioning and Refrigeration", 2000, McGraw-Hill Edu.
- 7) "National Building Code of India (NBC) 2016"; Part 8 Section 3 and 5 & Part 3 & 4, BIS.
- 8) NFPA 101
- 9) IS Codes -
 - 1391 (Part 1 & 2) : 1992 - Specification for room air conditioners
 - 8148 : 2003 - Specification for packaged air conditioners
 - 4591 : 1968 - Code of practice for installation and maintenance of escalators
 - 14671 : 1999 - Hydraulic lifts
 - 14665 : 2000 - Traction lift
 - 15259 : 2002 - Home Lifts
 - 15330 : 2003 - Lifts for handicapped persons
 - IS codes for Fire Services

15ARC 6.4 – CONTEMPORARY ARCHITECTURE

CONTACT PERIODS : 3 (Lecture) per week

THEORY MARKS: 100

PROGRESSIVE MARKS : 50

DURATION OF EXAM : 3 Hrs

OBJECTIVE : *To do a critical survey of contemporary architecture from the 1960s to the present, and to provide an understanding and appreciation of contemporary issues and trends in Indian and western architecture in terms of ideas and directions.*

OUTLINE:

MODULE 1

1. **Architecture in India (Pre independence):** The Architecture of the Princely States of Jaipur, Bikaner and Mysore: Their city examples – clock towers, railway stations, public offices, assembly halls, water systems, public hospitals, etc.
2. **Modern Architecture in India-1:** Architecture in India(Post-Independence): Works of public nature in Chandigarh and Ahmedabad (Legislative Assembly Complex including High Court, Legislative assembly and Secretariat, Chandigarh and Mill Owners“ Building, Ahmedabad), IIM, Ahmedabad and its significance.
3. **Modern Architecture in India-2:**Ideas and works of BV Doshi (Institute of Indology Ahmedabad, IIM-Bangalore and Gufa, Ahmedabad) and Charles Correa: (RamaKrishna House, Ahmedabad, Kanchen Junga Apartments, Mumbai and MRF Headquarters, Chennai).

MODULE 2

4. **Modern Architecture in India-3:**Ideas and works of Raj Rewal and Uttam Jain (Pragati Maidan, New Delhi and Asian Games Village, New Delhi), Achyut Kanvinde(IIT, Kanpur and Nehru Science Centre, Mumbai), Uttam Jain(Lecture Theatres, Jodhpur and Engineering College, Kota).
5. **Modern Architecture in India-4:**Enrichment of Indian experience- Cost effectiveness and local influences. Laurie Baker and Anant Raje (Centre for Development Studies, Thiruvananthapuram and St. John Cathedral at Tiruvalla) and Anant Raje(IIFM, Bhopal and Management Development Centre, IIM-A).
6. **Parallel trends in Indian architecture;** a) Revivalistic- monumental, Religious b) Experimental-Pondicherry, Belgium embassy, IITB, Sriram Centre Newdelhi c) Vernacular influence-Cost effective concepts.

MODULE 3

7. **Last phase of Modern Architecture: Ideas and works of Richard Meier** (Smith House, Connecticut and Getty Centre, Brent Wood, LosAngeles) and Charles Moore (Architect“s Own House at Orinda and Piazza d“Italia, New Orleans), Bernard Tschumi (Kyoto Railway Station Project and Parc de la Villete, Paris).

8. **Ideas and works of Frank Gehry** (AeroSpace Museum, Santa Monica and Guggenheim Museum, Bilbao).
9. **High-tech architecture or Structural Expressionism-1:** An architectural style that emerged in the 1970s: The High-tech architecture practitioners include British architects Sir Norman Foster(Hong Kong Shanghai Bank and Renault Distribution Centre, Swindon, England), Sir Richard Rogers, Sir Michael Hopkins.

MODULE 4

10. **High-tech architecture or Structural Expressionism-2:** The High-tech architecture practitioners include Italian architect Renzo Piano (Pompidou Centre, Paris and Menil Museum, Houston) and Spanish architect Santiago Calatrava (Lyon-Satolas Railway Station and Olympic Stadium at Athens).
11. **Postmodern Architecture:** Development of Postmodernism with its origins in the alleged failure of Modern architecture from 1950s, and spreading in the 1970s and its continuous influence on present-day architecture. Ideas and works of Michael Graves, James Stirling, Robert Venturi etc.

MODULE 5

12. **Hyper theories of Architecture-1:** Development of postmodern architecture in 1980s is the ideas of Deconstructivism including, Frank Gehry (AeroSpace Museum, Santa Monica and Guggenheim Museum, Bilbao), Daniel Libeskind (Jewish Museum, Berlin and World Trade Centre, New York), Rem Koolhaas(Dance Theatre, The Hague and Netherlands Sports Museum).
13. **Hyper theories of Architecture-2:** Ideas of Deconstructivism including, Peter Eisenman, Zaha Hadid (The Peak Club, HongKong and IBA Housing Block 2, West Berlin), Coop Himmelb(l)au, and Bernard Tschumi.

REFERENCES:

- 1) Morgan, Ann Lee & Taylor Colin , “Contemporary Architecture”.
- 2) Bahga, Bahga and Bahga , “Modern Architecture in India”, 1993, Galgotia Pub. Co.

15ENG 6.5 – BUILDING STRUCTURES - VI

CONTACT PERIODS : 4 (2 Lecture + 2 Studio) per week

PROGRESSIVE MARKS : 75

VIVA MARKS: 75

OBJECTIVE: *Integration of structures with architectural objectives by developing an understanding of building structures and selection criteria for appropriate vertical systems; conceptual design of structures for gravity and lateral wind and seismic loads.*

OUTLINE

- 1 Introduction of High Rise Structures.**
- 2. Introduction to the Structural design Project:** Design for a 10 story building of dimension 30m X 30m [Suggested Dimension], 35 meter height, 10m X 10m column grid and with service core in the central bay. Calculation of building loads load calculation based on the IS 875 and seismic loads and wind loads and design of gravity and lateral systems.
- 3. Gravity loading:** Dead and Live load calculation based on IS 875 (Part 1)and NBC.
- 4. Seismic loading:** Seismic loading calculation based on IS 1893 Code; Static Analysis Procedure .
- 5. Wind loading:** Wind loading calculation based on Indian Standard I.S. 875 (Part 3).
- 6. Introduction to Lateral Load Resisting System:** The structural systems of buildings designed to withstand lateral loads caused by wind and seismic activity.
- 7. Moment resisting frame design:** Design of Moment-resisting 2-dimensional frame assemblies of beams and columns, with the beams rigidly connected to the columns. General moment resisting framing arrangement and sizing and design of beams, columns and slabs for 30m X 30m [Suggested Dimension], 35 meter high building, and basic load path and total structural weight calculation.
- 8. Shear Wall System:** Design of Shear walls as lateral load resistance structural systems. Application of lateral loads along the height, transference to the wall by diaphragm slabs in concrete or masonry. General Shear wall framing arrangement and sizing and design of beams, columns/ shear wall and slabs for 30m X 30m [Suggested Dimension], 35 meter high building, and basic load path and total structural weight calculation.
- 9. Dual System:** Design of twin structural system typically shear walls (RCC) and beam-column moment frames as combined resistance system to lateral forces. General Dual framing arrangement and sizing and design of beams, columns/ shear wall and slabs for 30m X 30m [Suggested Dimension], 35 meter high building, and basic load path and total structural weight calculation.

10. **Braced frame:** Design of lateral structural system to resist lateral loads (wind and seismic). Braced frames as vertical trusses with members designed to resist in tension and compression due to triangulation in steel or RCC. General Braced frame arrangement for 30m X 30m [Suggested Dimension], 35 meter high building, and basic load path and total structural weight calculation.
11. **Introduction to underground structures:** RCC retaining walls and water tanks, calculation of forces on vertical walls.

Note:

- 1) **Minimum one plate on each loading calculation and vertical structural systems.**
- 2) **This course should desirably be conducted involving consulting engineers and architects.**

REFERENCE:

1. Martin Bechthold, Daniel L Schodek, "*Structures*"; 2014, PHI Learning Private limited.
2. Francis D.K. Ching, "*Building Structures Illustrated*", 2nd Edition; 2013, John Wiley & Sons.
3. Francis D.K. Ching, "*Building Construction Illustrated*", 4th Edition; John Wiley & Sons
4. Indian Standard Codes - IS456-2000, IS-875 (Part I to IV), IS-1893; National Building Codes, SP-34 Steel detailing.

15ARC 6.6 – LANDSCAPE ARCHITECTURE

CONTACT PERIODS : 3 (Lecture) per week

PROGRESSIVE MARKS : 50

THEORY MARKS: 100

DURATION OF EXAM : 3 Hrs

Objective:

1. To introduce the students to the discipline of Landscape Architecture.
2. To advance analytical and planning skills for Architectural project sites.
3. To develop design skills for small landscape projects.

Course Outline:

Introduction, design philosophies and contemporary approaches to landscape architecture and design are reviewed through various landscape design projects over time while modules on site analysis, site planning, elements of landscape architecture and landscape design process are supported with theoretical inputs.

Mode of study:

- i. **Lecture component:** Various landscape design projects to explain the design philosophies, theoretical aspects of site analysis and site planning, element of landscape architecture and design process will be delivered as lecture component.
- ii. **Literature study:** Exercise on 'relating architecture and landscape' may be undertaken as a literature study exercise.
- iii. **Studio component:** Studio exercises in site analysis, site planning and a small landscape design project.

Module 1: *Introduction to the discipline of landscape architecture*

- a. Landscape as a broad terminology, Natural and Man-modified landscapes.
- b. Brief history and the growth of landscape architecture as a design and planning profession from gardens to regional landscapes.
- c. Scope and nature of professional work in contemporary landscape architecture, changing priorities of disciplinary approach: ecology, biodiversity and sustainability.

Module 2: *Relating Architecture and Landscape, Site analysis and Site planning*

- a. Study of architectural response to landscapes and understanding the relation between architecture and landscape through case examples.
- b. The idea of site as part of whole/larger landscape, Site inventory and analysis: physical, biological, social contextual studies and layers of site analysis, site suitability analysis, inferences and response for architectural interventions.
- c. Design considerations and approaches to site planning, site program, siting of buildings and open spaces, introduction to grading and land modifications, working with sloping sites.

Demonstration of understanding of site analysis and site planning through studio exercise.

Module 3: *Elements of landscape architecture and their application in landscape design*

- a. Primary landscape elements: Landform, water and vegetation, Design considerations and their role in articulating outdoor spatial design
- b. Secondary landscape elements: Street furniture, landscape walls, paving, inert ground covers, trellis, outdoor shading structures, embellishments, etc. Design considerations and their role in spatial design. Hard and soft landscapes.

Module 4: *Works of noted landscape architects and landscape projects*

- a. Eastern landscape philosophies: Chinese and Japanese gardens, Asian landscapes: Mughal and Persian gardens, Western landscape designs: Italian and French gardens, English romantic gardens and American parks, Examples in modern landscape: works of Garret Eckbo, Lawrence Halprin and Peter Latz.
- b. Examples of contemporary landscape projects: works of Martha Schwartz , Maya lin, Peter Walker & Partners, Hargreaves Associates, Sasaaki, SWA, Michael Van Valkenburgh, Andropogon Associates, Field Operations, Turenscape etc. Landscape projects in India: works of RavindraBhan, Shaheer Associates etc.

Examples should cover various categories of landscape design such as residential, commercial, institutional, public plaza, water/riverfront and other categories. The content of this module should emphasis on design philosophies, the changing styles and changing priorities of the profession over time.

Module 5: *Landscape Design project*

Demonstration of an understanding of landscape design through simple and small design exercise as studio project. Clarity in design process, detail development and representation of the landscape design scheme is to be emphasized.

NOTE: Studio exercises should be introduced after relevant theoretical inputs are delivered utilizing the contact periods.

REFERENCES:

1. **Laurie, M.** *An introduction to landscape architecture*, Elsevier. 1975.
2. **Motloch, J.** *Introduction to landscape design*, John Wiley & Sons, 2001.
3. **Holden, R & Liversedge, J.** *Landscape Architecture: An Introduction*, Laurence King publishing ltd. 2014.
4. **Girot, C.** *The course of landscape architecture: A history of our designs on our natural world*, Thames & Hudson. 2016.
5. **Simonds, J O.** *Landscape Architecture: A manual of site planning and design*, McGraw-Hill, 1997.
6. **LaGro, J.** *Site Analysis: Sustainable site planning and design*, John Wiley & Sons. 2013.
7. **Birksted, J.** *Relating architecture to landscape*, E&FN Spon. 2004.
8. **Shaheer, M & Dua, G.** *Landscape Architecture in India: A reader*, LA, Journal of landscape architecture. 2010.

15ARC 6.7 – WORKING DRAWING II

CONTACT PERIODS : 5 (Studio) per week

PROGRESSIVE MARKS: 100

OBJECTIVE: : *Introduction to ‘Good for Construction’ drawings; Preparation of Structural, Electrical, Water Supply and Sanitary drawings for the project from previous semester; Comprehensive set of drawings.*

OUTLINE:

1. Project Work: Project continued from previous semester; Preparation of structural and services drawings and details.
2. Structural drawings: Conventions & symbols; Foundations, Columns, Beams, Slab.
3. Electrical drawings: Conventions & symbols; Plans at all levels.
4. Water Supply drawings: Conventions & symbols; Plans at all levels.
5. Sanitary drawings: Conventions & symbols; Plans at all levels; Site Plan, Terrace Plan
6. Mechanical drawings: Conventions & symbols; Plans at all levels; Details of Lift.
7. Complete integration of Architectural, Structural and Services drawings and details.

15ARC 6.8 – ELECTIVE IV

CONTACT PERIODS : 3 (Studio) per week

PROGRESSIVE MARKS : 50

a) CULTURE AND BUILT ENVIRONMENT

Objective:

To sensitise students to culture and behavioral sciences and their influence on design and built environment

Culture is a major attribute of humans with deep evolutionary roots. It has an important role in fostering economic, social and environmental dimensions of development. This elective course explores to gather insight into cultural identity, the nature of culture as it relates to the physical environments and how people shape environments, use them and interact with them.

The course needs to address two primary enquiries:

- A. Understand the interrelationship between design and behavioral sciences
- B. Understand the contributions to the design field that behavioral sciences have made and can make.

Architect Amos Rapoport, well-renowned for his seminal contributions to the field of environmental behavioral studies, raises three questions regarding the relationship between culture and the built environment:

- 1) What biosocial, psychological, and cultural characteristics of human beings, as members of a species, as individuals, and as members of various groupings, influence (and, in design, should influence) what characteristics of the built environment?
- 2) What effects do what aspects of what environments have on groups of people, under what circumstances and why?
- 3) Given these two-way interactions between people and environments, what are the mechanisms that link them?

Guided by Rapoport's questions, this course examines the role of culture in shaping built environment that varies with the type of environment, over time, for different groups, in different situations and contexts with the help of comparative studies of built environments across Indian subcontinent, South Asia and Latin America to understand the intersections of cultural practices and the built environment and their influence over one another.

References:

1. Rapoport, "A. *Culture, Architecture and Design*", Locke Science publication, 2005.
2. Zube, E & Moore, G(Ed.), "*Advances in environment, behaviour and design*", Springer, 1991.

b) GEOGRAPHICAL INFORMATION SYSTEM

Objective:

Geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

The course is intended to provide students with a foundation for basic GIS techniques which are relevant to architectural analysis and Presentation. The elective is intended to establish a bridge between the conceptual realms - Architecture /Site -Terrain Analysis/Landscape architecture/Urban planning. Output being digital, online and printed maps.

Outline:

1. Introduction to GIS:

GIS as a Hardware/software/application? GIS data, Vector data, Raster data, attribute data, Data capture & methods, Coordinate reference systems

2. Introduction to Google Earth

An overview of Google Earth & KML, Google Objects, Descriptive HTML in Placemarks, Ground overlays,

Screen overlays, Paths, manipulating a path Polygon, taking profiles of site, creating KML files and exporting to GIS format.

3. Creating & analysing GIS data:

Capturing survey data through hand held GPS or mobile application. Traversing boundary of site , bringing routes and way point data into GIS.

Spatial data, loading raster files, Mosaic raster, Geo referencing raster and vector files, Loading data from OGC web services, databases.

Creating vector data layers, joining tabular data, Topology errors & tools, Analyzing raster data, Combining raster and vector data, Raster surface through interpolation, leveraging the power of Spatial database, Vector and raster analysis, Vector Spatial analysis (Buffers), Spatial analysis (interpolation)

4. Terrain Analysis& scientific computing of Raster dataset:

Creating Digital elevation model (DEM) from point data, Hill shade, Slope, Aspect

Creating great Maps: Composing maps: Vector styling, Labelling, Using adobe illustrator for composing multiple vector layers of maps, Designing print maps, Publishing GIS 2D maps on the web

5. Create 3D maps:

3D maps in html format and navigate in the internet browser

References:

- 1) <https://sites.duke.edu/envgis/tutorials/introduction-to-google-earth/>
- 2) Anita Graser , "Learning QGIS" PAKT open source, 2016.
- 3) GISP Dr. John Van Hoesen, Dr. Luigi Pirelli, GISP Dr. Richard Smith Jr., GISP Kurt Menke, " A refreshing look at QGIS: Mastering QGIS", PACKT Pub., 2016.
- 4) Displaying and analysing 3D data in Surfer software.
- 5) **Carson**, Tom, **Baker**, Donna L., "Adobe® Acrobat® and PDF for Architecture, Engineering, and Construction", Springer publication, 2006 ,available as Google Ebook.

c) DESIGN OF HIGH - RISE BUILDINGS

Objective:

The design and construction of skyscrapers involves creating safe, habitable spaces in very tall buildings. The buildings must support their weight, resist wind and earthquakes, and protect occupants from fire. Yet they must also be conveniently accessible, even on the upper floors, and provide utilities and a comfortable climate for the occupants. The problems posed in skyscraper design are considered among the most complex encountered given the balances required between economics, engineering, and construction management. The students may be given a snapshot of this very important typology that gives them an insight into complex world of various services that form the backbone of any skyscrapers.

Outline:

1. Evolution of Sky scrapers
2. Basic design considerations
3. Loading and Vibrations
4. Structural systems for high rise buildings; Trussed tube & X bracing, Bundled tube, etc.
5. Economic rationale
6. Environmental Impact
7. Services in Skyscrapers
8. Fire safety in Skyscrapers
9. Skyscrapers in India

The faculty in-charge should organise inputs by inviting various consultants and visits to few high rise buildings in the area. Students may be given assignments on relevant topics.

References:

1. Basem M.M., "Construction Technology for High Rise Buildings: Handbook", 2014, CreateSpace.
2. Basem M.M., " Mechanical and Electrical Services for High Rise Buildings: Handbook", 2014, CreateSpace.
3. Mark Sarkisian, " Designing Tall Buildings: Structure as Architecture" Routledge, New york, 2012.
4. Johann Eisele & Ellen Kloft, " High-rise Manual : Typology and Design, Construction, and Technology" Birkhäuser, 2003.
5. Nigel Clark and Bill Price, " Tall Buildings: A Strategic Design Guide", RIBA & BCO, 2016.

15ARC 6.9-STUDY TOUR

PROGRESSIVE MARKS : 50

OBJECTIVE: *To expose students to historical, vernacular and contemporary architecture.*

OUTLINE:

A minimum of two Study tours are to be undertaken before the commencement of 6th semester B.Architecture classes. The study tour may include places of architectural interest in India or Abroad. The choice of places and buildings to be visited is left to the concerned department / college. The students have to submit a study tour report as group work (4 to 6 students per group) within 15 days after the end of the study tour. The two reports are to be assessed by the department / colleges for progressive marks. The department/ college may use its discretion about the choice of places for study tour and suitable time schedule.