VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

SCHEME OF TEACHING AND EXAMINATION OF V SEM B.ARCHITECTURE (CBCS SCHEME)

Sl. No.	Subject Code	Title of the Subject	Teaching Scheme in Periods per Week(50Mts)				Examination Scheme					Credits
			Lecture	Studio	Practical	Total	Duration (hrs)	Theory Marks	Prog./CIE Marks	Viva Marks	Total	
1	15 ARC 5.1	Architectural Design-V	-	9	-	9	-	-	150	150	300	7
2	15ARC 5.2	Materials and Methods in Building Construction-V	1	5	-	6	4	100	50	-	150	4
3	15ARC 5.3	Building Services II	3	-	-	3	3	100	50	-	150	3
4	15ARC 5.4	History of Architecture - V	3	-	-	3	3	100	50	-	150	3
5	15ENG 5.5	Building Structures-V	2	2	-	4	-	-	75	75	150	3
6	15 HUM 5.6	Sociology and Building Economics	3	-	-	3	3	100	50	-	150	3
7	15 ARC 5.7	Working Drawing I	-	5		5	-	-	100	-	100	2
8	15ARC 5.8	Elective III (any one)										
		a) Alternate Building Technology and Materials				3			50		50	2
		b) Digital Architecture				3			50		50	
		c) Architectural Lighting Design				3			50		50	
			12 or 15	21 or 24	0 or 3	36	-	400	575	225	1200	27
ARC= Architectural subjects ART= Art Subjects ENG = Engineering Subjects HUM = Humanities Subjects.												
No. of Subjects/Heads = 08 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, 15ENG 5.5 - min. progressive marks 38, Viva = 30.												

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) Emitt & 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.

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, LT Panels, Rising Mains, Sub-Mains, Circuit-Mains, Generators, 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, fuctions, 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-Noveau, 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 Sarinen- TWA and Kennedy Airports. Richard Neutra- Lovell Beach House. Phillip Johnson- Glass House, Museum Building. Oscar Niemeyar-Work in Brazilia- 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 Isreal. Sir Buck Minster Fuller-US Pavilion in Expo-67, Dymaxion Car, Bucki Dome- Public and private Building and spaces.

MODULE 5

11) **Modern Movement-VII:** Brutalism- Works of Le Corbusier, Peter and Allison Smith, James Sterling-Udse of Raw concrete, Ronchamp, Nun"s Quarters-Lyon, Library-Oxford University, elementary School by Smithsons- development of Corporate Sky Scrapers- NewYork- Having multiple uses and tinted glass cladding, Rock Feller Centre-NewYork-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, Gaustav 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, Thorbjoern (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.