

42. NINTH SEMESTER SYLLABUS

Sem	Subject Group	Course Code	Subject	Hours/week			Credits	Marks			Total
				T	S	W/L		CA	University Exam		
									Jury	Written	
IX	I (a)	19AR09001	Architectural Design 8		10		10	250	250		
Course Overview:											
<ul style="list-style-type: none"> To familiarize students with urban design vocabulary and expose them to complexities of architectural intervention in urban settings To introduce the students to the analysis, planning and design with the understanding of a wide range of related issues in urban or rural context. To make the students understand the role of architecture in shaping the urban fabric and to create architecture which fits into a specific urban context. To understand the part to whole design process and improve communicative skills, team work etc. To sensitise the students about the interface between public and private domain Sustainable design objectives: To understand the relationship of urban design with economic, environmental and social sustainability. To equip the students to adopt sustainable urban design principles considering climate, urban heat island mitigation, building envelope, site selection and planning, water efficiency, energy efficiency, indoor air quality, green materials and resources, green infrastructure, compact city planning, green mobility, barrier free accessibility, renewable energy, natural lighting and fresh air ventilation, efficient landscape etc. Indian Green building standards such as IGBC (Green Cities), GRIHA, ECOHOUSING or other relevant rating systems may be considered. 											
Course Outcomes:											
<p>Upon completion of the course, the student should have an:</p> <ul style="list-style-type: none"> Understanding of contemporary urban issues as well as learn about possible solutions Understanding of various components of urban environment and their interrelationship Understanding of people as users of various urban environment and design implications on the end user Understanding of mapping and diagramming techniques 											
Major Project											
<p>The project may focus to address varied components including large scale urban interventions, guidelines for heritage areas, adaptive reuse, transportation nodes and infrastructure additions, densification along transit nodes and corridors revitalization and renewal of urban fragments, new communities and community development, multi-use urban complexes, conservation and reuse of building in the context, Redevelopment of historic city center, revitalization of traditional urban cores, Green field / Brownfield development, urban waterfront development, Market squares etc.</p> <p>The students are expected to carry out urban intervention in a real-life location. The design considerations may involve context, views, orientation, volumetric study, skyline, vehicular and pedestrian circulation, figure ground study, utility, circulation network, street scape etc. The socio-cultural and economic perspectives may be well documented and analysis may be carried out to</p>											

finalize the suitability of intervention. Types of planning instruments such as structure plans, master plans and local area plans and zoning guidelines shall be introduced. The project will have to focus on the development of a physical environment considering planning norms, infrastructure network, built unbuilt relationship, connectivity and character.

Emphasis may be given on

- Understanding the Elements and principles of Urban design
- Urban Conservation, Reuse and Building in Context.
- Urban insert, relationship of building to urban character and existing form
- Urban renewal and urban sprawl
- Urban sector or Block, its structure and composition.
- Sustainability and reuse of buildings in context
- Infrastructure, building bye laws, co-relation of part to whole,
- Typo morphology
- Ecological concerns and sustainable urbanism
- Expressions of relationship to tradition urban forms
- Design communication and role of public participation
- Preparation of urban design guidelines

Minor Project

Urban design detailing - (built and landscape) – Plazas, city square, adaptive reuse-built form, residential/ public, commercial/mixed buildings, character of buildings in detail, sustainability and infrastructure detailing in site level, streetscape and street furniture, activity mapping, Preparation of urban design guidelines etc.

Time bound project

Tactical urbanism projects in their campus or any selected sector/street, design of a streetscape of the selected sector, Mental mapping of the selected sector, Understanding successful public places through individual live (video documentation & presentation) and literature case studies etc.

Reference:

- Gordon Cullen, *The Concise Townscape*, The Architectural Press, 1978
- Donald Watson, *Time Saver Standards for Urban Design*.
- Paul D. Spreinegar, *Urban Design, the Architecture of Towns and Cities*, Mc Graw Hill.
- Jonathan Barnett, *An Introduction to Urban Design*, Harper Row, 1982
- Geoffrey Broadbent, *Emerging Concepts in Urban Space Design*, Taylor & Francis, 2003.
- Kevin Lynch, *Image of the City*.
- Edurand Bacon, *Design of Cities*.
- Edward D. Mills, *Planning the Architects Handbook*.
- Julius Panero & Zeluik, *Human Decision and Interior Space*, Whitney Library of Design Publication, 1989.
- Jane Jacobs, *Death and Life of Great American Cities*.
- William H. Whyte, *The social life of small urban spaces*.
- Moughtin, C., Cuesta, R., Sarris, C. and Signoretta, P. (2003). *Urban Design - Methods and Techniques*. Oxford: Architectural Press.
- Lang, J. T. (2005). *Urban Design: A Typology of Procedures and Products*. Oxford: Elsevier/Architectural Press.
- Watson, D., Plattus, A. and Shibley, R. (2003). *Time-Saver standards for urban design*. New York: McGraw Hill.
- Marshall, S. (2009). *Cities design and evolution*. New York: Routledge
- Lynch, K. (1984). *Good city form*. Boston: MIT Press.

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				T	S	W/L		CA	University Exam		Total
									Jury	Written	
IX	I (b)	19AR09002	Advanced Building Technology	2	3		5	125	125	250	

Course Overview:

The subject primarily aims at developing understanding in use of appropriate construction technique and material in building design based on feasibility of technology, physical properties (like density & specific gravity, strength, thermal properties), aesthetic value, socio-cultural impacts and relevance, socio-economic factors, Ecological footprint etc.

The course introduces the technological aspects of a building design from the perspective of functional building component where use of natural and artificial materials is discussed based on their application. Construction technology and appropriate materials for structural systems, roofing, enveloping and interior finishes shall be considered under this subject from simple examples to complex.

Course Outcomes:

Upon completion of the course, the student should:

- Develop necessary decision-making skills in using appropriate construction technologies and materials while designing buildings, based on understanding of their potentials and properties.
- Develop the skill to represent various construction techniques as well as materials through drawings supporting their building design.

Module 1: Pre-fabrication & Modular Co-ordination

Learning Strategies:

- Lecture on pre-fabricated components
- Market study on current construction practices
- Site visits and documentation to understand construction practices
- Detailed drawings of small prefabricated structures

Module Contents:

- Introduction to the concepts of standardization – need and importance.
- Introduction to concepts of Modular Coordination Objectives of Modular coordination & definition of Basic Module. Modular controlling dimensions, Planning Modules and preferred Multi-modules.
- Introduction to concepts of prefabrication. Advantages & disadvantages of onsite & off-site prefabrication. Methods of prefabrication & Examples of prefabricated components. Process of prefabrication. Various issues related to prefabrication industry & Examples of prefabrication concepts
- Modular and prefabricated construction using various materials – Concrete, Steel, Aluminum, Ceramics, Plastics, Wood – applications on wall, roof, structural members, floor, fenestrations.

Module 2: Advanced Architectural Building Structures

Learning Strategies:

- Lecture on various types advanced building structures
- Site visits to construction sites during various stages
- Case studies and presentations of different advanced building structures
- Detailed drawings of construction methods

Module Contents:

- Pre stressed concrete structures: Precast pre stressed construction. Use and examples of various pre stressed structures. Two-way waffle slab, Two-way flat plate, Two-way flat slab, Pre tensioning, Post tensioning, Hollow core slabs, T beam and slab.
- Tensile structures: Concept of tensile structures, formation, classification, use and examples of various cable structures. Application of cable structures in architecture. Materials and construction methods of membrane structures.
- Special Structures: Concept, Classification and Application of Pneumatic Structures, Kinetic Structures and Mobile Structures, Portal frames: Definition, and Application.

Module 3: Advanced Building Types

Learning Strategies:

- Lecture on various types advanced building structures
- Site visits to construction sites during various stages
- Case studies and presentations of different advanced building structures
- Detailed drawings of construction methods

Module Contents:

- Design of buildings for earthquake resistance - Structural Systems, Seismic Design Code Provisions, design of nonstructural elements.
- Seismic design and detailing of RC and steel buildings
- High rise structures – structural systems – braced frame, rigid tube, tube in tube, diagrid, bundled tube, space frame and mega frame.
- High rise structures - planning and scheduling for high rise building, scheduling, Typical Floor Construction Cycle, Self-climbing form work & cranes

Reference:

- M.S. Shetty, 'Concrete Technology', S. Chand & Co. Ltd, New Delhi, 1986.
- S.C. Rangwala, 'Engineering Materials', Charotar Publishing House, India, 1997.
- P.C. Varghese, 'Building Materials', Prentice hall of India Pvt Ltd, New Delhi, 2005.
- Don A. Watson, 'Construction Materials and Process', McGraw Hill Co., 1972.
- Jack M. Launders, 'Construction Materials and Methods', Careers, South Holland, Illinois, Wilcox Co. Ltd., 1986.
- Chudley, Construction Technology, ELBS, 1993
- Barry, Construction of Buildings, East West Press, 1999
- Emmitt & Gorse (2006), "Barry's Advanced Construction of Buildings", Second Edition, Wiley India Pvt. Ltd.
- Mackay, J.K. (2015), "Building Construction", Fourth Edition, Pearson India.

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				T	S	W/L		CA	University Exam		
									Jury	Written	
IX	I (c)	19AR09003	Professional Skill Enhancement 8			4	2	50	50		

Course Overview:

This course intends to provide/ enhance the soft skills in order that students perform well in their academics and beyond. These skills are intended to support the student to perform better in her/his core subjects and also build up robust performance through hands-on workshops and laboratory training. This course is subdivided into two categories – Mandatory and Optional. Mandatory courses help in preparations for respective semester subjects. The optional category helps students to take personal initiatives to develop in specific areas that can widen their horizon of their understanding of architecture and also initiate action at the society level. There are also options to work on competitive exercises alongside other similar institutions.

Course Outcomes:

Upon completion of the course, the student should:

- Be given an exposure of varied skills that can bring in confidence in handling their core subjects such as workshops, communication skills, computer applications etc.
- Be able to develop team spirit and interpersonal skills to manage complex situations.
- Be able to cope with stress and develop multi-tasking capabilities.

Module 1: Thesis Initiation workshop

Learning Strategies:

- Seminars on Thesisorientation

Module Contents:

- Identify the broad study area for thesis based on literature review and case study, and its oral and visualpresentation.
- Interpretation drawings, visual presentation techniques withinfo-graphics.
- Literature review and identification of research area and stating the researchquestion.
- Time-workschedule
- Presentation on-Selection of topic, reason for selection, justification,synopsis

Module 2: Career perspectives**Learning Strategies:**

- Group discussions and Interactivesessions

Module Contents:

- Exploring the Future in Architecture
- Employmentopportunities
- Diversifyingskills
- Specializations in Architecture and alliedfields
- Academicpursuits
- Research opportunities

Reference:

- Coles, R., Siener, W. and Coles, S. (2016). *Architecture + advocacy*. Buffalo ArtsPublishing.
- CROUCH, C. (2019). *DOING RESEARCH IN DESIGN*. [S.I.]: BLOOMSBURY VISUALARTS.
- Indranil, S. (2018). *11 Steps to Architectural Thesis*. 1st ed. NotionPress.
- Spector, T. and Damron, R. (2013). *How architects write*. New York, N.Y: Routledge, Taylor & Francis Group

Sem	Subject Group	Course Code	Subject	Hours/week			Credits	Marks			
				T	S	W/L		CA	University Exam		Total
									Jury	Written	
IX	II	19AR09004	Green Built Environment	2			2	50		100	150

Course Overview:

- To give an understanding of the concept of human comfort and sustainabledevelopment.
- To enable understanding of the concept of sustainable communities and associated socioeconomic dimensions through casestudies.
- To inform about the need to use alternative sources of energy in view of the depleting resources and climatechange.
- To create awareness of current trends and futuristic ideas in the design of sustainable built environment.

Course Outcomes:

Upon completion of the course, the student should:

- Have an understanding of the concepts of ecosystem, carrying capacity, ecological footprint, human comfort and sustainable development.
- Have familiarity with approaches to achieving sustainable buildings and communities.
- Have familiarity with current trends in creating a sustainable built environment.

Module 1: Global Environmental Issues and Approaches Towards Sustainability

Learning Strategies:

- Lecture notes
- Journals
- E-journals

Module Contents:

- Overview of global warming, climate change and environmental degradation, impact on humans
- Approaches to sustainability, Space-Ship-Earth concept, global trends in environmental mitigation and remediation, Overview of green rating systems.
- Environmental ethics, polluter pays, environmental credits, carbon trading, global conventions, agreements and strategies, Climate protocols, Brundtland report
- Sources of energy & resources - renewable and nonrenewable, energy systems, energy crisis, energy demand, carbon emissions, embodied energy and transportation costs
- Green energy- Solar, Wind, Bio, On grid and off grid, hybrid systems and new technologies.

Module 2: Sustainable Development

Learning Strategies:

- Lecture notes
- Journals
- E-journals

Module Contents:

- Sustainable Development and Green cities, carrying capacity concepts, sustainability assessment
- Sustainable communities- social, cultural and economic factors, Low waste and net-zero community concepts, eco-communities
- Efficient urban mobility, multimodal public transport systems, electric vehicles & related infrastructure
- Sustainable urban waste management, Community level waste management
- Open spaces, recreational spaces and urban forestry, urban ecology, public health etc.
- Water and common resources management, Nuclear policy, Institutional framework for monitoring and promoting sustainability - Master plans, Development control etc.

Module 3: Sustainable Design

Learning Strategies:

- Lecture notes
- Journals
- E-journals
- USGBC, IGBC and GRIHA webresources

Module Contents:

- Introduction to sustainable, ecological and green design, sustainable site selection and design
- Sustainable lifestyles, vernacular techniques and approach to sustainability, use of local materials in construction
- Thermal properties of materials, technological advancements in climatic control in different climatic zones with particular reference to Tropical climate, innovative construction materials and techniques
- Energy, water and resource conservation in design, reduced, reused and recycled products in construction, Energy and Water efficiency
- Indoor Environmental Quality - Importance of Ventilation, Low emitting materials, Lighting controls, Thermal comfort and Acoustical performance.
- Introduction to Green building rating system in India- Griha, IGBC, BEE-ECBC with suitable examples.

Reference:

- 'Manual on Solar Passive Architecture', IIT Mumbai and Mines New Delhi, 1999.
- Arvind Krishnan et al, 'Climate Responsive Architecture A Design Handbook for Energy Efficient Buildings', Tata McGraw Hill Publishing Company Limited, New Delhi, 2001.
- Majumdar M, 'Energy-efficient Building in India', TERI Press, 2000.
- Givoni. B, 'Passive and Low Energy Cooling of Buildings', Van Nostrand Reinhold, New York, 1994.
- Fuller Moore, 'Environmental Control Systems', McGraw Hill Inc, New Delhi, 1993.
- Sophia and Stefan Behling, 'Solpower The Evolution of Solar Architecture', Prestel, New York, 1996.
- Patrick Waterfield, 'The Energy Efficient Home: A Complete Guide', Crowood press Ltd, 2011.
- Dean Hawkes, 'Energy Efficient Buildings: Architecture, Engineering and Environment', W.W. Norton & Company, 2002.
- David Johnson and Scott Gibson, 'Green from the Ground Up: Sustainable, Healthy and Energy Efficient Home Construction', Taunton Press, 2008.
- LEED v4.1 Building Design and Construction, US Green Building Council
- Abridged GRIHA Manual, Griha India

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				T	S	W/L		CA	University Exam		Total
									Jury	Written	
IX	II	19AR09005	Disaster Management & Mitigation	2			2	50		100	

Course Overview:

The course intends to provide a general concept in the dimensions of disasters caused by nature beyond human control as well as the disasters and environmental hazards induced by human activities with emphasis on Natural disasters & Man-made disasters.

The subject primarily aims at developing a fundamental understanding of different aspects of Disaster Management. It would also provide basic knowledge, skills pertaining to Planning, Organizing and Decision-making process for Disaster Risk Reduction.

Course Outcomes:

Upon completion of the course, the student should:

- Develop a comprehensive understanding of the concepts and fundamentals of disasters caused by nature as well as the disasters and environmental hazards induced by human activities
- Develop a basic understanding of the principles and processes pertaining to disaster preparedness, response and recovery

Module 1: Introduction to Disaster Management

Learning Strategies:

- Lectures explaining the concepts & fundamentals of disaster management.
- Case analysis of global disasters
- Screening of documentaries on recent disasters

Module Contents:

- Disaster & Emergencies: Concept & Fundamentals of Disaster Management
- Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity & Equations of Disaster Management
- Types & Classification of Disasters
- Causes & Consequences of Disasters
- Global Disaster Trends - Changing Types & Patterns
- Disaster vs Development
- Emerging Risks of Disasters – Climate Change and Urban Disasters

Module 2: Disaster Management Cycle and Framework

Learning Strategies:

- Lecture on disaster management cycle & phases of disaster management
- Case analysis

Sem	Subject Group	Course Code	Subject	Hours/week			Credits	CA	University Exam		Total
				T	S	W/L			Jury	Written	
IX	I (c)	19AR09006	Research Methodology	2			2	50	50		100

Course Overview:

This course is designed to explore the meaning of research and generate an understanding about the importance of research in the field of architecture and train to write a technical paper of related research topics good for publishing.

Course Outcomes:

Upon completion of the course, the student should:

- Have an understanding of the role of research in architecture.
- Develop abilities to interpret and evaluate research.
- Develop abilities to conduct architectural research.
- Have an understanding of data, information, and knowledge and present research results.
- Develop technical writing skills.

Module 1: Introduction to Research

Learning Strategies:

- Lecture/Workshop on significance of research and significance of research in the field of Architecture

Module Contents:

- Introduction to "Research", Meaning of Research, Significance of Research, Research world views and approaches.
- Types of Research, Scientific and Social Research, Research process
- Meaning of research and its significance in the field of Architecture, Types of research in the field of architecture, potential areas/types, qualitative and quantitative paradigms.

Module 2: Research Design

Learning Strategies:

- Lecture/Workshop on Research Design components & Research methods.

Module Contents:

- Components of Research design, formulating research questions, research objectives
- Choosing the research strategy- inductive and deductive research, Hypothesis types and testing
- Choosing the sample, Methods of data collection, specific techniques in architectural research.
- Literature search and review, significance, sources of information, the use of libraries and data bases, aim and structure of a literature review, Referencing and documenting the bibliography.
- Methods of Research in Architecture- Interview Techniques: Questionnaires /Face to face

Interviews / Internet survey. Designing a Questionnaire / Interview schedule. Visual Techniques: Observations (participant / nonparticipant / direct), activity mapping, accession/erosion trace observations, cognitive maps, etc. Content Analysis: Secondary data analysis.

Module 3: Quantitative Data Analysis and Introduction to Applied Statistics

Learning Strategies:

- Lecture/Workshop on Data analysis, interpretation & representation methods

Module Contents:

- Understanding the nature and scale of data collected and methods of analysis suitable for that data (graphical / numerical / descriptive). Converting data into numerical form for data analysis.
- Concepts of dependent and independent variables, unit of analysis.
- Introduction to the simple statistical methods of analyzing numerical data – measures of central tendency and dispersion, Introduction to the concept of tests, correlation and regression. Inferring from the data and interpreting the meaning of those inferences. Use of MS Excel for statistical data analysis.
- Techniques of presenting the numerical data – graphical (pie charts, bar charts, line graphs etc.), tabulations, verbal qualitative data, architectural drawings /maps.

Module 4: Research writing & Technical paper

Learning Strategies:

- Workshop on Research writing. Technical paper presentation

Module Contents:

- Significance of report writing, steps in writing report, structure of a report, Different sections of a research report, technical writing and language (tense, voice, etc.), the necessity for the development of writing skills, technical data about formal writing, the use of visuals.
- Introduction to scholarly writing and publishing a paper, guidelines for writing a research paper, structure of a research paper, sequence of tasks for research paper writing, writing and presenting a conference paper, presentation of scientific research.
- Use of primary and secondary references, bibliography, notation, cross-reference etc.
- Understanding the relative advantages, disadvantages and application of various methods mentioned above and choosing a method appropriate for a research to achieve its objectives. The student is required to write a technical paper good for publishing, on any of the approved topics at the end of the course.

Reference:

- Groat, Linda N. and Wang, David C. 2002. Architectural Research Methods. New York: JohnWiley.
- Norman K Denzin and Yvonna S Lincoln (Eds.) Handbook of Qualitative Research, Thousand Oaks: Sage Publications, pp. 377392.1994.
- Giere R.N. (1991), "Understanding Scientific Reasoning", Holt Rinehart & Winston,U.K.
- Moroney M.J., "Facts from Figures", Penguin,1990.
- Day R.A., (1991) "How to Write and Publish a Scientific Paper", Cambridge University Press,R.K.
- Yin, R.K. (1994). Case Study Research- Design and Methods, Applied Social Research Methods Series. Vol V. Sage Publications.California.
- Krishnaswami, O.R. (1993). Methodology of Research in Social Sciences. Himalaya Publishing House. Bombay.
- Creswell John. W. (1994). Research Design – Qualitative and Quantitative Approaches. SAGE Publications. California.
- Thakur, N. (1998). "Building Knowledge through a Holistic Approach towards Architectural Education and Research". Proceedings of the seminar on Architecture and Interdisciplinary.
- Turabian Kate. L. (1982). A manual for Writers. The University of Chicago Press.Chicago.
- Bockman, J., R., and Couture, B. (1984). The Case Method in Technical Communication: Theory and Models. Texas: Association of Teachers of Technical Writing.
- Kothari C.R. (2004). Research Methodology- Methods and Techniques, New Age International (P) Ltd, Publishers, NewDelhi
- Till, Jeremy. (2007), Architectural research: Three myths and one model, RIBA,UK
- Dve, Anne (ed.), (2014), How Architects use research- Case studies from practice, RIBA,UK
- Frayling, Christopher. (1993), "Research in Art and Design", Royal College of Art Research Papers.

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				T	S	W/L		CA	University Exam		Total
									Jury	Written	
IX	II	19AR09007(A)	Elective Theory 4: Architectural Conservation	2			2	50	100		

Course Overview:

To introduce the field of Architectural Conservation, and to familiarize the students with the principles and methodology of management of heritage buildings and historic settlements.

Course Outcomes:

Upon completion of the course, the student should:

- Have an understanding of Architectural Conservation as an approach that establishes a link between past, present and future.
- Familiarise the students with the history of the conservation movement and various agencies involved in the field of conservation worldwide and their policies.
- Be Introduced to international framework of conservation, definitions, principles and concepts. Various guidelines for the preservation, conservation and restoration of building, and an overview of current status of conservation and preservation in India are elaborated.
- Understand the concept of integrating development and heritage preservation, about opportunities and community participation are highlighted along with exposure to management of heritage buildings and sites.

Module 1: Introduction to Conservation

Learning Strategies:

- Introduction to the evolution of theories in conservation, and an introduction to planning theories, practice and worldheritage.

Module Contents:

- Introduction to Architectural Conservation: Need for conservation, Objectives, Values, Ethics and Scope of Architectural Conservation: from material based, value based to living heritage approach.
- Definition: Architectural Conservation, Urban conservation & Cultural Landscapes. Understanding Heritage: Types - Cultural heritage, Natural heritage, Built heritage - Ancient Monument, Tangible & Intangibleheritage.
- History of the Conservation movement in India & World view - Pioneers of conservation John Ruskin & William Morris, Eugène Viollet-le-Duc, Alexander Cunningham and others. Charters such as Venice charter (1964), Burra charter (1979), Florence charter (1982), Athens charter (1933), etc. Jirnodhar - the Indian philosophy ofconservation.
- Values in Conservation, Ethics of Conservation practice, Authenticity & Integrity in Conservation practice, Naradocument.
- Agencies involved in conservation - UNESCO, ICCROM, ICOMOS, Getty Conservation Institute, ASI, State departments of Archaeology, Town Planning departments, State Art and Heritage Commission & INTACH.
- World Heritage Sites & Nomination process & Endangered sites, elaborated with case studies (like Bhimbetka, Group of monuments at Hampi, Sydney Opera House, Angkor Wasetc.

Module 2: Diagnosis of decay in materials and structures**Learning Strategies:**

- The module emphasises on the causes of decay of historic building materials and the technical aspects of the methodical study and development of appropriate conservation interventions for historic buildingmaterials/systems.

Module Contents:

- Traditional and modern building materials used in India, from pre historic times till date: Earth, clay, stone, brick, timber, bamboo, lime, iron, metals, glass, steel and concrete. Materials used in structural, non – structural and decorative applications. Study of types of plasters, stucco work and paints.
- Causes of decay in materials and structure: Natural agents of deterioration and loss- Climatic causes – thermal movements, sun, rain, frost, snow, moisture, wind, gravity, ground water and dust. Botanical, biological and micro biological causes such as animals, birds, insects, fungi, moulds, lichens. Natural disasters – Fire, earthquakes, flood, lightning, storms. Human factors- Wars, pollution, vibration, vandalism, and neglect.
- Process of Identification of defects: Field investigations, Introduction to various types of tests such as Destructive Tests (DT), Minor Destructive Tests (MDT), Non-Destructive Tests (NDT), Monitoring techniques.
- Diagnosis and assessment of defects and common problems in historic building materials, Estimation and remedial measures for common material defects in historic structures. Cleaning and maintenance of Historic building fabric – damp proof course, corrosion protection, fire protection, termite proofing.
- Conservation of historic building: Immediate temporary emergency measures for distressed buildings: shoring, propping, underpinning, shuttering etc. Stabilization, consolidation, grouting, stitching, pointing, surface coating, retrofitting and replacement, Strengthening and stabilization of concrete structures using gunite or shotcrete, post tensioning, bracing, repair using polymers and epoxies, underwater repairs, jacketing etc.

Module 3: Principles, Methodology of Conservation & Introduction to Urban Conservation**Learning Strategies:**

- The module focuses on the basic theories in the practice of conservation, an understanding of which is vital for responsible conservation of architectural heritage. Introduction to urban conservation and the role and link of conservation in development planning.

Module Contents:

- Understanding basic principles of conservation such as (a) Prevention (b) Preservation (c) Conservation (d) Restoration (e) Rehabilitation (f) Reproduction (g) Reconstruction (h) Adaptation
- Preparatory procedures for conservation- Identification of the 'values/significance' of the object, monument or site: 'emotional', 'cultural' and 'use' values. Preparation of Inventories, listing, Initial inspections/Inspection report, Documentation - Condition & Material mapping, Research, Analysis and recording (Reports).
- Case studies of Heritage building conservation and documentation of historic monuments and sites.

- Introduction to Urban Conservation: Morphology of historic towns, introduction to the concept of heritage zones, methodology and analysis of character of heritage zones. Interventions in conservation such as Reuse, Revitalization, Rehabilitation, Regeneration, Renewal, Up-gradation, Redevelopment of historic areas and cities. Examples of Urban Conservation.
- Multidisciplinary of conservation: Scope, parameters of Integrated Conservation, and its role/link with development planning and environmental design and the concept of Historic Urban Landscapes.

Reference:

- Fielden, Bernard M. 2003, Conservation of Historic Buildings, Architectural Press, London.
- Ashurst, J. and Dimes, F.G., 1990, Conservation of Building and Decorative Stone, Butterworth-Heinemann, London.
- Historic England, 1988, Practical Building Conservation Series, Routledge, London.
- Jokilehto, Jukka 2002, A History of Architectural Conservation, Butterworth-Heinemann,
- ICOMOS, 1993, Earthen Architecture: The conservation of brick and earth structures- A handbook.
- Beckmann, Poul & Bowles, Robert 2004, Structural Aspects of Building Conservation, Elsevier Butterworth-Heinemann.
- Kain, Roger 1981 Planning for Conservation, St. Martin's Press, New York
- Dobby, Alan 1978 Conservation and Planning, Hutchinson.
- Worskett, Roy 1969, Character of Towns: An approach to Conservation, Architectural Press
- Harvey, J. H. 1972, Conservation of Buildings, J. Baker: London.
- Smith, J. F. 1978, A Critical Bibliography of Building Conservation, Mansell, England.
- Mathews, M. S. 1998, Conservation Engineering, Universitat Karlsruhe, Karlsruhe.
- Asian Heritage Management: Contexts, Concerns, and Prospects, 2013, Routledge, New York.

Websites:

- <https://whc.unesco.org/en/list/>
- <http://asi.nic.in/>
- <https://cpwd.gov.in/Publication/ConservationHertBuildings.pdf>
- <https://www.nps.gov/tps/how-to-preserve/briefs.htm>

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				T	S	W/L		CA	University Exam		Total
								Jury	Written		
IX	II	19AR09007(B)	Elective Theory 4: Earthquake Resistant Architecture	2			2	50	100	150	

Course Overview:

- To enable an understanding of the fundamentals of earthquake and the basic terminologies.
- To give basic knowledge of earthquake resistant design concepts.
- To provide familiarity with design codes and building configuration
- To enable understanding of the different types of construction details to be adopted in a seismic prone area.
- To give knowledge for applying earthquake resistant principles in an architectural design project.

Course Outcomes:

Upon completion of the course, the student should:

- Have the ability to understand the formation and causes of earthquakes
- Have an understanding of the factors to be considered in the design of buildings and services to resist earthquakes.

Module 1: Fundamentals of Earthquakes

Learning Strategies:

- The module focuses on the basic understanding about the fundamental theories and terminologies in earthquake resistant structures.

Module Contents:

- Basic understanding on fragile ecosystem, physiographic and geo-chemical data mapping, soil and topography, hydrological factors, climatic conditions. Site planning, building form and shape, considerations for earthquake resistant buildings
- Earth's structure, seismic waves, plate tectonics theory, origin of continents, seismic zones in India.
- Predictability, intensity and measurement of earthquake. Basic terms- fault line, focus, epicentre, focal depth etc.

Module 2: Site planning, Performance of Ground and Buildings

Learning Strategies:

- This module emphasis on the impact of earthquakes on structural and nonstructural elements

Module Contents:

- Historical experience, site selection and development.
- Earthquake effects on ground, soil rupture, liquefaction, landslides. Behaviour of different types of building structures, equipment, lifelines, collapse patterns.
- Behaviour of non-structural elements like services, fixtures in earthquake-prone zones

Module 3: Seismic design codes and Construction details

Learning Strategies:

- This module familiarise students various design strategies to be adopted for an efficient earthquake resistant building

Module Contents:

- Seismic design code provisions. Introduction to Indian codes.
- Building configuration - scale of building, size, horizontal and vertical plane, building proportions, symmetry of building - torsion, reentrant corners, irregularities in buildings like short storeys, short columns, etc.
- Seismic design and detailing of masonry structures, wood structures, earthen structures.
- Seismic design and detailing of RC and steel buildings.
- Design of non-structural elements – architectural elements, water supply, drainage, electrical and mechanical components.

Module 4: Design and Analysis of Earthquake resistant Buildings**Learning Strategies:**

- This module equips students to analyse earthquake prone buildings and to design earthquake resistant structures

Module Contents:

- Vulnerability of existing buildings, facilities planning, fires after the earthquake, socio-economic impact after earthquakes.
- Conceptual design for earthquake resistance involving institutional masonry building with horizontal spread and height restriction, multi-storey RC framed apartment/commercial building.

Reference:

- Guidelines for earthquake resistant non-engineered construction', National Information centre of earthquake engineering (NICEE, IIT Kanpur, India), 2004.
- C.V.R Murthy, Andrew Charlson, 'Earthquake Design Concepts', NICEE, IIT Kanpur, 2006.
- Agarwal.P, 'Earthquake Resistant Design', Prentice Hall of India, 2006.
- Ian Davis, 'Safe Shelter within Unsafe Cities: Disaster Vulnerability and Rapid Urbanization', Open House International, UK, 1987
- 'Socio-economic developmental record'- Vol.12, No.1, 2005.
- Mary C. Comerio, Luigia Binda, 'Learning from Practice- A Review of Architectural Design and Construction Experience after Recent Earthquakes', Joint USA-Italy workshop, Oct.18-23, 1992, Orvieto, Italy.

Sem	Subject Group	Course Code	Subject	Hours/week			Credits	Marks		
								CA	University Exam	
				Jury	Written					
IX	II	19AR09007(C)	Elective Theory 4: Green Building Rating system	2			2	50	100	150

Course Overview:

- To make students appreciate and learn the role and importance of Green Buildings in promoting sustainability and components involved in the planning and designing of Green Buildings
- To get awareness on the ratingsystem.

Course Outcomes:

Upon completion of the course, the student should:

- Have an understanding about the importance in creating sustainable planning while conceiving building/ development projects and become environmentally responsive to construction requirements.

Module 1: Introduction to Green Building

Learning Strategies:

- To give an understanding of the basic concepts of Green building and its relevance in Building construction

Module Contents:

- Green Buildings—Introduction, definition, objectives, scope, role and importance Green building, Benefits of green building- Tangible &Intangible.
- Green Building’s Design—Approach, components, design parameters, orientation, Integrated approach to buildingdesign
- Green Building Rating System - Concept of green building ratingsystem
- Green building facilitation- Role offacilitator.
- Schemes and incentives provided for green buildings by different state govt with inIndia.

Module 2: Indian Green Building Rating System

Learning Strategies:

- A combination of Guest lectures, Field visits and debates enables the student to acquire knowledge about the latest trends in green buildings, rating systems in Indiancontext.

Module Contents:

Introduction to Indian rating system, certification process of –

- GRIHA, IGBC, ECBC etc.- approach, components, scoring, comparative and criticalanalysis.
 - Green Rating for Integrated Habitat Assessment- Introduction to GRIHA, Role of GRIHA in recognizing environment- friendly initiatives, Concept, its context, challenges, benefits, development and operationalization process and basic features, Process of rating buildings- registration and documentation, GRIHA evaluation process, Criteria for rating and Scoring points forGRIHA.
 - Indian Green Building Council system- Introduction to IGBC, Role of IGBC in recognizingenvironment-friendlyinitiatives,Concept,itscontext,challenges, benefits, development and operationalization process and basic features, Process of

IX	II	19AR09008(A)	Elective Theory 5: Architecture and Sustainability	2			2	50	100		150
Course Overview:											
To make aware of: -											
<ul style="list-style-type: none"> • The environmental, Energy and Water scenario of our planet in general and Kerala in particular. • To appraise them of the urgent need of making all future buildingsustainable. • To equip them with the capacity to design and construct Sustainablebuilding. 											
Course Outcomes:											
Upon completion of the course, the student should:											
<ul style="list-style-type: none"> • Have an understanding of the importance in creating sustainable planning while conceiving building/ development projects and become environmentally responsive to construction requirements • Have critical awareness of existing environmental rating systems (3) Practical application possibilities sustainable construction practices in regionalcontext 											
Module 1: Introduction to Sustainability											
Learning Strategies:											
<ul style="list-style-type: none"> • Lectures, discussions andseminars 											
Module Contents:											
<ul style="list-style-type: none"> • Basics of Sustainability, Needs of Sustainable Outlook, State of theArt • Pillars of sustainability, SustainableDevelopment • Concept of Renewable/Non-renewable, Global warming, Space-Ship-Earthconcept, • Objectives of Sustainable/ GreenBuildings, • Different Indian and International Green building rating systems; LEED India rating & TERI GRIHArating • Examples of Green buildings (Case Studies, Analysis and Architectural design of Sustainable buildings asTutorials). 											
Module 2: Energy efficiency											
Learning Strategies:											
<ul style="list-style-type: none"> • Lectures and seminars 											
Module Contents:											
<ul style="list-style-type: none"> • Energy Efficiency, Reasons for the Energy Crisis, State of theArt • Energy conservation, Need for the EnergyConservation • Conventional and non-conventional sources, renewable, non-renewable energysources • ECBC rules, Energy andbuildings, • Concept of embodied energy & Transportationenergy • Total Energy assessment inbuildings, 											
<ul style="list-style-type: none"> • Relation between Energy Efficiency and Sustainabledevelopment • Energy Scenario of Kerala. (Case studies, Redesign of Own house to make it Energy Efficient asTutorial) 											

Module 3: Water Efficiency											
Learning Strategies:											
<ul style="list-style-type: none"> Lectures and Seminars 											
Module Contents:											
<ul style="list-style-type: none"> Water, Water cycle, Water Conservation, Waste recycling, Waste water, Methods and techniques for water conservation in buildings Rain data of Kerala, Calculation of tank sizes for storage of rain water in Kerala Green buildings and water conservation. (Case studies, Design of Rain Water tanks for buildings as Tutorials) 											
Module 4: Material Efficiency											
Learning Strategies:											
<ul style="list-style-type: none"> Lectures and discussions, market research, workshops 											
Module Contents:											
<ul style="list-style-type: none"> Selection of materials, Eco building materials and construction Low impact construction – bio mimicry, zero energy buildings, nano technology and smart materials Understanding various parameters for Sustainable Building Materials and evaluate using LCA (ISO14000) 											
Module 5: Waste Management											
Learning Strategies:											
<ul style="list-style-type: none"> Lectures and workshops, case studies 											
Module Contents:											
<ul style="list-style-type: none"> Types of waste, solid waste management Methods and techniques for waste management in buildings New technologies in waste management to make net zero. 											
Reference:											
<ul style="list-style-type: none"> 'A Water Harvesting Manual; for Urban Areas; Case Studies from Delhi', Centre for Science and Environment, New Delhi, 2003. Baker Nick and Steemers Koen, "Energy and Environment in Architecture", E& FN, Spon. London, 1999. Goulding, John, R, Lewis, Owen J and Steemers, Theo C., "Energy in Architecture", Bastford Ltd., London, 1986. Bansal Naveendra K., Hauser Gerd and Minke Gernot, "Passive Buildings Designs: Handbook of Natural Climatic Control", Elsevier Science, Amsterdam 1997. Energy Conservation Building Code, Government of India. Websites of TERI, LEED India, ECBC, etc. Manuals of GRIHA, IGBC 											
Sem	Subject Group	Course Code	Subject	Hours/week			Credits	Marks			
				T	S	W/L		CA	University Exam		Total
									Jury	Written	

IX	II	19AR09008(B)	Elective Theory 5: Architecture Pedagogy	2			2	50	100		150
Course Overview:											
To expose the students to education methods in architecture											
Course Outcomes:											
Upon completion of the course, the student should: <ul style="list-style-type: none"> • Be acquainted with the history of development of education methods in architecture. • Be introduced the students with the prevailing models of teaching-learning methods and their application in architectural design education. • Familiarize students with the skills to evaluate architectural design and other artforms. • Be introduced research methodology, paper writing and presentation as tools to transmit knowledge 											
Module 1: History and development of Architectural Education											
Learning Strategies: <ul style="list-style-type: none"> • Lectures, discussions, seminars 											
Module Contents: <ul style="list-style-type: none"> • Traditional teaching methods of India – Gurukul, Universities of Nalanda & Takshashila; • Transmission of knowledge in architecture through temple architecture in ancient India; • History of formal architecture education in West and in India. • Peculiar requirements of Architecture Education, Requirements of generation of creative thinking 											
Module 2: Introduction to learning methods											
Learning Strategies: <ul style="list-style-type: none"> • Lectures, discussions, seminars 											
Module Contents: <ul style="list-style-type: none"> • Aims and objectives of architecture education in India, • Blooms Taxonomy, Levin's field theory, Carl Roger's theory of experiential learning, • Peculiar requirements of Architecture Education; • Models of Teaching: Advanced Organizer, Concept Attainment Model, • Simulations – Use of advanced softwares to shape and visualize ideas, • Synectics, Concept Mapping for organizing & communicating ideas, • Basic aspects of classroom management 											
Module 3: Design Process pedagogy											
Learning Strategies: <ul style="list-style-type: none"> • Lectures, discussions, seminars 											

Module Contents:

- Various thinking skills, tools and techniques adopted by architects for deriving design ideas,
- Development of Design Thoughts, Experiential learning (case study methods) as guide in Design process,
- Use of synectics in the design studio, the essence of creativity in synectics, various forms of metaphoric thinking to activate “generative thinking”
- Arts, skill and technique of visual perception and form analysis,
- Communication of the aesthetics of architecture and other associated art forms in a journalistic manner.

Reference:

- S. K. Mangal (2009) “Essential of educational technology”, PHI Learning Pvt. Ltd., 2009.
- Bruce Joyce and Marsha Weils, “Models of Teaching”, Pearson; 9 edition (April 14, 2014)
- Klausmier and Ripple (1971) “Learning and Human Abilities” Harper & Row, New York.
- Eames Charles & Ray, „An Eames Anthology”, Yale University Press, Edited by Ostroff Denial.
- George Kneller (1971), “Philosophy of Education” John Wiley & Sons Inc; 2nd Revised edition
- J. S. Chauhan, “Advanced Education Psychology” Sumit Prakashan
- J. C. Agrawala (2009), “Essential of educational technology” Vikas Publishing House Pvt Ltd, 01-Nov-2009
- Bruce Joyce (2014), “Models of Teaching” Pearson; 9 edition (April 14, 2014)
- Rizzoli (March 18, 2008); “How to Read A Building” Rizzoli (March 18, 2008);
- Bruce Joyce, “Models of Teaching”, Pearson; 9 edition (April 14, 2014)
- New Trends in Architecture Education, By- Ashraf Salama

Sem	Subject Group	Course Code	Subject	Hours/week			Credits	Marks			
				T	S	W/L		CA	University Exam		Total
									Jury	Written	
IX	II	19AR09008(C)	Elective Theory 5: Building Performance and Compliance	2			2	50	100		150

Course Overview:

- To provide fundamental knowledge of building sciences for the development of high-performance buildings utilizing building modeling and simulation technology as a building performance analysis.
- To impart requisite knowledge for taking effective managerial decisions to ensure desirable performance conforming to good practices and national / international codes / standards.
- The purpose is to equip students with skills and techniques to calculate the energy consumption of heating, cooling, lighting, and other equipment by hand to understand the energy & thermal behavior of buildings, then compare and analyse these calculations with others calculated using energy modeling and simulation programs.
- To develop competence to understand the environmental compliances and management systems for buildings and infrastructure projects.

Course Outcomes:

Upon completion of the course, the student should:

- Have an understanding the use of IT applications and software packages related to functional performance of buildings like thermal and lighting analysis, environmental quality analysis.
- Get knowledge on policies, standards, procedures, and various formats relating to environmental compliance requirements practically applicable for projects, and develop competence in their application.
- Develop the necessary skills and sensitivity towards sustainability of built-environment.

Module 1: Environmental Policies, Codes & Standards

Learning Strategies:

- Lecture notes, Journals, e-journals, ASHRAE standards, ECBC

Module Contents:

- Definition, Environmental Policies and Laws- Environment protection act, Water act, Kyoto protocol, ISO standards, CDM etc. Case studies in India under CDM; COPs / United Nations Climate Change Conferences; Government incentives and Schemes, Financial aid, subsidies
- ASHRAE standards – 90.1-2010 Appendix-G; ASHRAE standards – 55- 2010; ASHRAE standards – 62.1- 2013
- IESNA standards for lighting
- Energy Conservation Building Codes, BEE Star rated equipment's.

Module 2: Thermal Environment

Learning Strategies:

- A combination of Guest lectures, Field visits, debates and study of latest trends in green buildings, locally and globally, simulation tools.

Module Contents:

- Introduction to Thermal behaviour of buildings
- Introduction to Thermal behaviour of buildings- Building physics; Latent, specific heat gains in the building; Psychometric analysis; Weather analysis, building envelope.
- Introduction to energy efficient buildings; Energy use in buildings; Energy Supply in Buildings: Heating, Ventilating, and Air-Conditioning (HVAC) Systems; Heating and cooling loads; Energy conservation consideration.
- Energy Performance Analysis: Energy Codes, Guidelines, and Standards; Constructing energy simulation models: Thermal modelling, Models for ventilation, Steady state and dynamic heat flow analysis; Evaluating models: Measurements, Comparisons and verifications
- Approaches to Thermal Simulation–
 - Prescriptive Approach – Codes & Standards
 - Performance building simulation – Energy plus, e-Quest 6.3

Module 3: Luminous Environment

Learning Strategies:

- A combination of Guest lectures, Field visits, material study, debates and study of latest trends in green buildings, locally and globally, simulation tools

Module Contents:

- Introduction to Luminous environment- Parameters – openings and sizing, shape & configuration, skylights, U value, SHGC, VLT, light shelves, study on sky conditions
- Lighting Performance Analysis: Lighting Codes, Guidelines, and Standards; Constructing lighting simulation models: Lighting modelling; Evaluating models: Measurements, Comparisons and verifications
- Approaches to Luminous Simulation–
 - Prescriptive Approach – Glazing calculation, IESNA
 - Performance building simulation – ECOTECT v5.20

Reference:

- Givoni, B., 1969. Man, Climate and Architecture, Elsevier Publishing Company Limited.
- Energy Conservation Building Codes- BEE star rating system.
- Manual on Mechanical and Electrical Equipment for Buildings
- Manual on Sustainable Building Design Software
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc - www.ashrae.org
- Environment and forestry - <http://www.envfor.nic.in/>