CHANDIGARH COLLEGE OF ARCHITECTURE

SECTOR 12, CHANDIGARH

MASTERS IN ARCHITECTURE

SCHEME OF EXAMINATION AND SYLLABUS OF M. ARCH. PROGRAMME

w.e.f. August 2018

SEMESTER –I

Objective: To develop an understanding of Sustainable Design Principles and their subsequent application in design.

Courses	Course no.	Subject	Hours per week				Assessment			
			S	L	T	R&D	Internal	Exam.	Jury	Total
Studio	**M.Arch-I / ST-01**	**Architectural Design Studio : Sustainable Design**	12	-	-	-	300	-	200	**500**
Core	**M.Arch-I / C-01**	**Sustainable Design : Appropriate Technologies**	-	2	1	-	50	50	-	**100**
	M.Arch-I / C-02	**Cultural Anthropology**	-	2	1	-	50	50	-	**100**
	M.Arch-I / C-03	**Lessons from Traditional Buildings**	-	2	1	-	50	50	-	**100**
Elective		*(Choice of Two Electives)*								
	M.Arch-I / EL-01	**Historic Building Materials and Structural Systems**	-	2	1	-	50	-	50	**100**
	M.Arch-I / EL-02	**Disaster and Risk Management of the Built Environment**	-	2	1	-	50	-	50	**100**
	M.Arch-I / EL-03	**Sustainable Building Design : Policies and Regulations**	-	2	1	-	50	-	50	**100**
Total			**12**	**10**	**5**	**-**	**-**	**-**	**-**	**1000**

S – Studio T – Tutorial

L – Lecture R&D – Research and Development

SEMESTER - II

Objective: To develop an understanding of the theories and principles of Urban Design with respect to the historic modern city.

Courses	Course no.	Subject	Hours per week				Assessment			
			S	L	T	R&D	Internal	Exam.	Jury	Total
Studio	**M.Arch-II / ST-02**	**Architectural Design Studio : Urban Design**	12	-	-	-	300	-	200	**500**
Core	**M.Arch-II / C-04**	**Concepts of Urban Form & Space**	-	2	1	-	50	50	-	**100**
	M.Arch-II / C-05	**The Contemporary City as Urban Landscape**	-	2	1	-	50	50	-	**100**
	M.Arch-II / C06	**Urban Infrastructure**	-	2	1	-	50	50	-	**100**
Elective		*(Choice of Two Electives)*								
	M.Arch-II / EL-04	**Concepts of Mobility and Multi-Modal Transport**	-	2	1	-	50	-	50	**100**
	M.Arch-II / EL-05	**Ecology and the Built Environment**	-	2	1	-	50	-	50	**100**
	M.Arch-II / EL-06	**Softwares for Urban Design**	-	2	1	-	50	-	50	**100**
	M.Arch-II / EL-07	**GIS Applications in Urban Design**	-	2	1	-	50	-	50	**100**
Total			**12**	**10**	**5**	**-**	**-**	**-**	**-**	**1000**

S – Studio T – Tutorial

L – Lecture R&D – Research and Development

Semester – III

Objective: To develop an understanding of the Modern City.

Courses	Course no.	Subject	Hours per week				Assessment			
			S	L	T	R&D	Internal	Exam.	Jury	Total
Studio	**M.Arch-III /ST-03**	**Architectural Design Studio – Urban Habitat**	12	-	-	-	300	-	200	**500**
Core	**M.Arch-III /C-07**	**Principles & Policies of Housing**	-	2	1	-	50	50	-	**100**
	M.Arch-III /C-08	**Dissertation**	3		3		100	-	100	**200**
Elective		*Choice of Two Elective*								
	M.Arch-III /EL-08	**Services in High Rise Buildings**	-	2	1	-	50	-	50	**100**
	M.Arch-III /EL-09	**Construction Project Management**	-	2	1	-	50	-	50	**100**
	M.Arch-III /EL-10	**Principles of Building Envelope Design**	-	2	1	-	50	-	50	**100**
	M.Arch-III /EL-11	**BIM & Computer Application**	-	2	1	-	50	-	50	**100**
Total			**15**	**6**	**6**	**-**	-	-	-	**1000**

S – Studio T-Tutorial

L– Lecture R&D- Research and Development

Semester – IV

Objective: To apply the knowledge gained in previous three semesters

Courses	**Course No.**	**Subject**	**Hours per week**				**Assessment**			
			S	L	T	R&D	Internal	Exam.	Jury	Total
Studio	M. Arch-IV/ST-04	Thesis Project	12	2	-	13	500	-	500	1000
			12	2	-	13	-	-	-	1000

Semester –I

Architectural Design Studio: Sustainable Design M.Arch-I/ST-01

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
12				300		200	**500**

Objective:

To develop an understanding of the Principles of Sustainable Design using Passive and Active Strategies.Site Planning shall be the main component of the design studio.

Course Content:

- The Studio will commence with an identified project area from the suggested list. The area shall be thoroughly documented, and analysis with reference to the principles of sustainable design, including physical as well as environmental sustainability. The key issues shall be based on a detailed analysis with respect to the principles of sustainability and the inherent context of the climate, site and environs of the project.
- Aspects such asclimate responsive strategies, energy-conscious design, low carbon footprint, use of indigenous materials, appropriate low-cost technology,green building concept, adaptive re-use, retrofitting of existing buildings etc. may form the basis for the design strategies which will be demonstrated through tangible design demonstration of the entire project or a predetermined part of the project is of a regional level.
- *Suggested list of projects which could be undertaken: High School, midrise office complex, hotel cum convention centre, mid-rise housing, cultural complex, resort, healthcare, and higher education campuses.*

References:

1	GRIHA MANUAL VOL 1-5	2010
2	Sustainable by Design: Methods for Holistic Housing, Basics, Strategies, Projects by Hans Drexler & Sebastian El Khouli	

3	The Sustainable Sites Handbook: A Complete Guide to the Principles, Strategies, and Best Practices for Sustainable Landscapes by Meg Calkins	2011
4	Material Revolution: Sustainable Multi-Purpose Materials for Design and Architecture by Sascha Peters	2011
5	Cradle to Cradle: Remaking the Way We Make Things by William McDonough & Michael Braungart	2002

Semester -I

Sustainable Design: Appropriate Technologies M.Arch-I/C-01

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50	50		**100**

Objective:

To educate on strategies, concepts and appropriate technologies related to Sustainable Design

Course Content:

UNIT I:Introduction

- Understanding sustainability from social, cultural, economic and ecological aspects
- Understanding of sustainability of built environment– Global and Indian perspective
- General premise and strategies for sustainable and green design

UNIT II: Resource and Energy Conservation

- Economy of Resources
- Life Cycle Design
- Energy Conservation
- Water Conservation
- Materials Conservation
- Humane Design

UNIT III: Environmental impact of building materials

- Measuring the impact of building materials
- Cradle to Grave, Cradle to Cradle (Concepts of embodied energy – extraction, processing, transportation, recycling, time)

- Low energy building and masonry materials
- Life cycle analysis
- Zero Carbon Footprint Building

UNIT IV: Green construction and environmental quality assessment

- Controlling the water cycle
- Optimizing construction
- Site management
- Environmental management of buildings
- Case studies which look at the environmental approach and renewable energy

References:

1	Eco design - A Manual for Ecological design by Ken Yeang	2006
2	Ecohouse: A design Guide; Elsevier Architectural Press by Sue Roaf et all	2007
3	Green Building Construction by Thomas E Glavinich	2008
4	Green Architecture- Design for a Sustainable Future by Brenda and Robert Vale	1996
5	Best Practices in Sustainable Building Design	
6	Ecological Architecture- a critical history by J. Steele	
7	Sustainable Infrastructure: The guide to green engineering and design by S. Bry Sarte	2010
8	Advanced Building Technologies for Sustainability by Asif Syed	2012
9	Sustainable Architecture and Urbanism by Dominique Gauzin-Muller	2002

Semester -I

Cultural Anthropology **M.Arch-I/C-02**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objectives:

- To understand the relationship between society and the making of the built environment
- To understand phenomenology and the role of meaning in built form
- To look at place making from the architectural as well as urban design point of view

Course Content:

UNIT I: Relationship between Culture, Society, Anthropology and Architecture

- Concepts of culture, society, politics and anthropology – relation between society and built environment
- Introduction to cultural -anthropology view of architecture

UNIT II: Cultural Influence in Traditional Architecture

- Architecture as process – kinship, house and societies
- Perceptions of built form, conceptions of space, symbolism and technology
- Settlement plans: cultural perspective, villages – folk and folk culture – towns and cities
- Role of rituals and festivals in generating settlement patterns,Role of culture in cities and sacred complex – Rural and urban continuum

UNIT III: Culture and Place Making

- Conditions of modernity - fragmentation of society
- Studies on the meaning of built environment

UNIT IV: An overview of Cultural Influence on Urbanity

- Meaning of urban studies and urban patterns
- Role of cities – primary units, major components and units of integration – cultural evolution and contemporary urban issues

Note: Students would make presentations exploring the relevance and impact of cultural studies on contemporary architecture and design through readings/case studies.

OUTCOME:

A comprehensive understanding of architecture and urbanism as expressions of particular societies in time and place.

References:

1	O F Bollnow; Mann, Bensch and Raum, Stuttgart	1963
2	Idea of a Town: The Anthropology of Urban Form in Rome, by Joseph Rykwert	1976
3	Anthropology of the City by Edwin James	1977
4	On Adams house in Paradise by Joseph Rykwert	1987
5	Architecture and Anthropology by Claire Melhuish	1996
6	The City Cultures Reader edited by M.Miles, Tim Hall and Ian Borden	
7	Privately Owned Public Spaces by Jerold S. Kayden	2000
8	Urban Geography – A global perspective by Michael Pacione	2009
9	Shaping Neighbourhoods for local health and global sustainability by Hugh Barton, Marcus Grant and Richard Guise	2010

Semester -I

Lessons from Traditional Buildings M. Arch-I /C-03

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50	50		**100**

Objective:

To acquaint the student with the sustainable nature of traditional and vernacular built environments. Students will explore the meaning and classification of Traditional and Vernacular Architecture, and, build up an understanding of various aspects of their sustainability, such as material and technology, resource management, response to landscape, etc.

Course Content:

Unit I:Traditional Architecture

Definition and Meaning, Historical context, Theories and Philosophies of traditional architecture, Importance and relevance of traditional architecture in modern context

Unit II:Vernacular Architecture

Definition and Meaning, Historical context, Theories and Philosophies of Vernacular architecture, Importance and relevance of traditional architecture in modern context

Unit III:Case Studies

Focusing on sustainable aspects of materials and technology, resource management, response to landscape, etc. for vernacular and traditional buildings

Unit IV:Application

Integration of passive and active strategies/technologies learned from the above applied in design studio or any other project having more than 1 acre site area.

References:

1	Lessons from Vernacular Architecture (Hardcover) by SimosYannas(Editor)	2009
2	Vernacular Architecture: Towards a Sustainable FutureC. Mileto, F. Vegas, L. García Soriano, V. Cristini	2014
3	Building with Earth: Design and Technology of a Sustainable Architecture byGernotMinke	2006
4	Vassigh, S., Ozer, E. and Spiegelhalter, T., "Best Practices inSustainable Building Design", J. Ross Publishing.	2012
5	Syed A., "Advanced Building Technologies for Sustainability", JohnWiley and Sons.	2012
6	ASHRAE 90.1 Energy Standard for buildings except low-rise residential buildings	2013

Semester – I

Historic Building Materials and Structural Systems M. Arch-I /EL-01

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

This course provides an introduction to the practical and technical aspects of the methodical study of historic building systems and related conservation techniques. This includes details of the characterization and behavioral aspects of materials; structural performance of historic buildings, deterioration processes and conservation interventions.

Course Content:

UNIT I

- Traditional building materials used in India, from pre historic times till date: Earth, clay, stone, brick, timber, bamboo, lime, iron, metals and glass
- Materials used in structural, non – structural and decorative applications: mortars, renders, paints and plasters, additives and stabilizers
- Categorization of materials as organic and inorganic, mixture of both and compound materials: physical, chemical and mechanical properties
- Common binding materials, their properties and techniques of preparation

UNIT II

- Process of identification of defects: Field investigations, field-tests, standard test methods, equipment used for detecting and measuring common problems in historic buildings
- Diagnosis and assessment of defects and common problems in historic building materials

- Remedial measures for common material defects in historic structures. Cleaning and maintenance of historic building fabric

UNIT III

- Introduction to historic building technology, structure and construction systems
- Problems in historic buildings due to alteration in material properties and performance
- Theory of structures and analysis of structural components of historic buildings: Load transfer systems, support systems, spanning systems, infill material, strength and weakness of traditional building technologies and composite structural systems (foundations, arches, domes, vaults, columns, beams, roofing etc)

UNIT IV

- Common structural defects in historic buildings, cause and nature of distress: types of cracks, differential settlement, geo-technical issues
- Methodologies for inspection and diagnosis of structural defects: Introduction to various types of tests such as Destructive Tests (DT), Minor Destructive Tests (MDT), Non Destructive Tests (NDT),monitoring techniques,structural analysis techniques
- Conservation of historic building: Immediate temporary emergency measures for distressed buildings: shoring, underpinning, shuttering etc. Stabilization, consolidation, grouting, pointing, strengthening, retrofitting and replacement etc.
- Deterioration and conservation of 20^{th} century heritage structures in concrete and other modern materials

References:

1	The Repair of Historic Buildings: Advice on principles and methods (Aspects of Conservation) by Christopher Brereton (Author), Christopher Bereton (Author),	

	Philip Whitbourn (Editor)	
2	Maintaining and Repairing Old and Historic Buildings by John J. Cullinane	
3	Materials, Technologies and Practice in Historic Heritage Structures	
4	Materials & Skills for Historic Building Conservation	2008

Semester – I

Disaster and Risk Management of the Built Environment M. Arch-I /EL-02

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

To give a comprehensive overview on how existing buildings can be adapted and retrofitted to function sustainably

Course Content:

Unit I: Introduction

- Disasters: a Global View
- Understanding Disasters: Causes and Effects, Significance
- Disaster Profile of India: Regional and Seasonal
  - Disaster: Definition, Meaning, Factor and Significance
  - Difference between hazard and disaster
  - Natural and Manmade Disasters
  - Nature of disasters,
  - Causes and effects of Disasters
  - Climate change-Emissions and Global warming, impact on sea level in south Asian region Environmental disruptions and their impact on built environment.

Unit II: *Risk Assessment, Reconstruction and Rehabilitation, in Disasters*

- Risk- Its concept and analysis, Risk Reduction ,Vulnerability: Its concept and analysis, Strategic Development for Vulnerability Reduction
- Disaster Preparedness and Response - Disaster Preparedness: Concept and Nature, Disaster Preparedness Plan ,Prediction, Early Warnings and Safety Measures of Disaster

- Rehabilitation, Reconstruction and Recovery **-** Reconstruction and Rehabilitation as a Means of Development, Damage Assessment ,Post Disaster effects and Remedial Measures, Disaster Resistant House Construction, Dealing with Psychological issues, Long-term Counter Disaster Planning.

Unit III: Policy, Legal Framework

- Policies in Disasters- its significance, approaches, essential components, Formulations and coordination.
- Laws in Disaster Preparedness and Rehabilitation. Environmental Protection Act 1986; National Disaster Management Act 2005. Other Institutional / Legal Policies.
- National Agencies - National Disaster Management Cell, National Disaster Management Authority (NDMA), National and other civilian and non civilian Agencies
- State and District Level Agencies, State Disaster Management Authority
- (SDMA), District Disaster Management Authority (DDMA).Disaster
- Management cells at state level and District level,Role of Municipalities.
- International Agencies: United Nations and its specialized agencies like UNDP, FAO, WHO, AEC (Atomic Energy Commission), United Nations Disaster Management Cell etc

Unit IV: Informatics and Communication System in Disaster

- Role of information technology in Disasters,Disaster management Information System, Organizing and effective dissemination of information: feedback for improving information, Role of Information from disaster affected community.
- Role of Communication in Disasters. Types of communication in case of disasters – HAM radio, Satellite, Video Conferencing, Electronics devices, detailed study with practical.
- Data collection (Information extraction from images) and analysis and interpretation.
- Maps, Mapping techniques and its usefulness. .Mapping as a tool for risk assessment and damage evaluation GIS in the context of disaster.

- Remote Sensing: Fundamental of Remote Sensing, platform and sensors, image interpretation, digital image processing, microwave remote sensing, remote sensing application, Indian space programme, future satellites for disaster management;
- GIS: Introduction, definition of GIS, GIS and other information system, maps and spatial information, concept of space and spatial data, domains of spatial information system, elements of GIS (hardware, software, data and liveware), components of GIS (end use/management, data acquisition, data input, data storage & retrieval, data processing and analysis/modeling),

References:

1	Dr. Mrinalini Pandey ,Disaster Management, (Wiley India Pvt. Ltd)	2014
2	Tushar Bhattacharya ,Disaster Science and Management(McGraw Hill Education (India) Pvt. Ltd.)	2012

Semester – I

Sustainable Building Design :Policies and Regulations M. Arch-I /EL-03

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

Understanding the politics, socio-technical transitions, regulation and policy concerning sustainability of the built environment

Course Content:

UNIT I: Introduction

- Aspects of sustainable development (climate risks, policy, market, technology)
- Economics and sustainability
- Environmental law and regulation

UNIT II:Environmental governance: issues, theories and rationales

- Need for environmental governance
- Global discourse for environmental conservation (examples- Stockholm Declaration 1972, Brundtland Commission 1987, Earth Summit 1992- RIO Declaration, Convention on Climate Change and Convention on Biodiversity, Agenda 21, Earth Summit 2002, COP 21,etc.)
- Emergence, development and application of key environmental governance theories – Important conventions and protocols relating to pollutants (examples - Montreal Protocol, Rotterdam Convention, Kyoto Protocol, Climate Policy- IPCC, etc.)

UNIT III:Environmental ethics and initiatives

- Environmental ethics and building design, Social accountability
- Green globe certification, International organization for standardization, Global reporting initiative

- Global Initiatives - Millennium development goals; Corporate social responsibility, Carbon trading
- Finance - Global Environment Facility (GEF), Green Climate Fund (GCF)

UNIT IV: National Initiatives on Sustainability

- Sustainability missions – climate action, solar energy
- Energy regulations and incentives
- Regulatory bodies – BEE, MOEF
- Sustainable Building Guidelines and Ratings, Codes – GRIHA, IGBC-LEED, ECBC, etc.
- Energy Rating of Appliance and Materials

References:

1	Environmentally Sustainable Buildings Challenges and Policies by OECD (Organisation for Economic Co-Operation and Development)	2003
2	Building Sustainability in East Asia: Policy, Design and People by Vincent S. Cheng, Jimmy C. Tong	2017
3	Sustainable Buildings and Infrastructure: Paths to the Future by Annie Pearce, Yong Han Ahn	2012
4	"Environmental Management" by Kulkarni, V. and T. V. Ramchandra	2006
5	GRIHA MANUAL VOL 1-5	2010
6	Energy Conservation Building Code	

Semester –II

Architectural Design Studio II: Urban Design M. Arch-II /ST-02

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
12				300		200	**500**

Objective:

To develop insight into issues of urban design contexts

Course Content:

Projects taken up in Design Studio-II will focus on designing the public realm, particularly public urban space. The city should be a contemporary city experiencing pressures of new development. Projects will range from design of a new group of buildings of both single and multiple ownerships, application of urban legislation to larger areas, intervention in a given environment, to regeneration of historic environments.

- Study of the city in its regional, ecological and historical setting as a part of a larger level network
- An on-site urban design survey will be conducted in correlation with theory classes
- Existing image structure will be studied and proposals for a new structure, for a specific projected time period, would be made
- Within the framework of the proposed structure, an area under transition is identified for detailed design development, based on a programme using data collected on site and from secondary sources
- The programme is interpreted as a design exercise with report, drawings and models. The emphasis will be on contextual response and sensitive infill design at the urban level

The intent of the studio shall be to understand the current urban design practices in their urban context by a critical appraisal of the socio-cultural, economicaspects,publicperception, imageability and townscape, sense of place,urban form, townscape, urban spaces, streetscapes, building forms and facades, public art and various other aspects.

Suggested Exercises:

- Analytical studies of traditional and contemporary public places
- Street design
- Riverfront development
- Urban renewal
- Sustainable urbanism and urban retrofitting in different contexts; Design Solutions for the contexts

Note:

1. Projects chosen must include all constituent elements of a public / urban space such as buildings of varied functions and ownerships, intermediate and surrounding open spaces, a variety of activities / uses / functions, vehicular and pedestrian traffic networks, utility infrastructure, etc.
2. It should be possible to generate / access sufficient data that will permit making of a complete the design proposal within the given timeframe.

References:

1	The Image of the City by Kevin Lynch	
2	A Pattern Language: Towns, Buildings, Construction by Christopher Alexander	
3	A New Theory of Urban Design by Christopher Alexander	
4	Drawing for Urban Design by Farrelly	2011
5	Sustainable urbanism and beyond: Rethinking cities for the future	2011
6	Street design: The Secret to great cities and towns	2012

Semester –II

Concepts of Urban Form & Space M. Arch-II /C-04

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50	50		**100**

Objective:

To introduce the subject of Urban Design, its vocabulary and differentiate from Architecture and to deal with the components of urban design which are primarily Urban Form and Space, through historical references and contemporary urban spaces.

Course Content:

UNIT I:Introduction to the vocabulary of Urban Design and its interrelationship to other disciplines

- The ways of reading a city -1 using the tools of Urban Design delineated by Kevin Lynch
- Wayfinding using the imageability concept that makes some cities and parts of cities more imageable than others
- Legibility as a tool for urban design explored in the city the student is a native of or familiar with. Understandingurban structure
- Reading a City-2 through Grain, Texture,Nolli Diagram with examples from historical evolution of city fabrics

UNIT II:Urban Form and Urban Space: Interrelationships that contributes to Placemaking in the City

- Urban form &space for various degrees of enclosure, human comfort and urban space, psychological effects in urban space design. How does a space become a place?

- Landscape as a tool for urban space design - the role of groundcover, foliage, plantation, water and other landscape elements as determinants of urban space and form

UNIT III: Urban Space Terminologies and Legislations

- Density, FAR,FSI, Zoning as advanced tools for urban form and massing
- Introduction to terminologies – Incentive Zoning, Planned Unit Development, Transfer Development Rights, bulk and height,zoning through examples and case studies
- Urban space design w.r.t. Legislations addressing sunlight, air exchange, human comfort, fire safety, seismic and other risks, contemporary building materials

UNIT IV: Exercises

- Documentation of a chosen urban space, historical or contemporary, using the vocabulary of urban design
- Evaluation of the urban form and space using the tools of urban design
- Redesign of the space using the learnings of the subject. This can be chosen at the end of Unit 1 and periodically assessed

Note: Unit IV should be carried out through a seminar to enhance the oral and presentation skills of the students.

References:

1	A Pattern Language: Towns, Buildings, Construction by Christopher Alexander	
2	A New Theory of Urban Design by Christopher Alexander	
3	The Image of the City by Kevin Lynch	
4	Drawing for Urban Design by Farrelly	2011
5	Sustainable urbanism and beyond: Rethinking cities for the future	2011
6	Street design: The Secret to great cities and towns	2012

Semester – II

The Contemporary City as Urban Landscape M. Arch-II /C-05

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50	50		**100**

Objective:

- To create an awareness of contemporary culture in the post-colonial, modern city resulting from the interdisciplinary participation drawn from sociology, history, cultural studies and political analysis
- To understand the values and significance of contemporary cities as World heritage sites

Course Content:

UNIT I:

- Overview of the cross-cultural influences in city development and the city as an urban ecosystem and a human network –social structure and urban form, ekistics and the built environment
- Social Access-territoriality, exclusion and inclusion, minority groups and the marginalized communities, child friendly cities and the geographies of disabilities
- Urban lifestyle diversity and spaces of consumption in a city
- Pedestrian predominance as a factor of human comfort & performance of the city

UNIT II:

- The role of Jane Jacobs, Patrick Geddes and Lewis Mumford in humanizing the contemporary city
- Evolution of town planning in India, formation of the Bombay Improvement Trust and the early foundations of the contemporary city

- The automobile explosion & the changing fabric of the contemporary city, the city in flux

UNIT III:

- Theories of City planning –garden City to Radburn, followed by Wellwyn, Letchworth, Paris, Vienna, New York, Los Angeles – ways of seeing
- The city as a contested space-public, private, concept and production of everyday space
- The politics and economics of city space

UNIT IV:

- Design codes for the contemporary city. Development of Mumbai, Calcutta, Delhi and other metropolitan cities, especially in South Asia
- Multi layered urbanities of the modern city. Their conflicts, contestations and hybridization
- The concept of world heritage cities- Brasilia, White City Tel Aviv, Le Havre – significance, Outstanding Universal Value and statement of integrity and authenticity. Notion and meaning of world heritage as a shared heritage of humanity
- Management of world heritage cities as repositories of cultural heritage

Note: Unit IV should be carried out through a Seminar to enhance the oral and presentation skills of the students.

References:

1	A Pattern Language: Towns, Buildings, Construction by Christopher Alexander	
2	Emerging Concepts in Urban Design by Geoffery Broadbent	
3	The Image of the City by Kevin Lynch	

4	Urban Pattern by Gallion and Fischer	
5	Death and Life of Great American Cities by Jane Jacobs	
6	Cities in Evolution by Patrick Geddes	
7	The Garden City by Ebenezer Howard	
8	Highway and the City by Lewis Mumford	

Semester –II

Urban Infrastructure **M. Arch-II /C-06**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50	50		**100**

Objective:

To familiarize the students with the physical infrastructures of an urban area, the management system, the modern methods of governance and financial requirement of urban development. At the end of the course, they will be ready to make a detailed project report for any development plan.

Course Content:

UNIT I: Transportation systems

- Technological characteristics of transport modes and systems; the nature of demand and supply of transport services; the spatial structure vis-a-vis the level and quality of transport supply systems
- Land use-transportation inter-relationships; transportation planning process; Travel demand forecasting
- Planning of public transport systems; intermediate public transport modes; Planning considerations for goods transportation; Traffic flow characteristics; Traffic analysis and design considerations; design of intersections; traffic signals and street lighting; local area traffic management
- Recent innovations in technologies and its probable impacts on future urban forms
- Environmental impacts of traffic; energy issues in transportation
- Government transport policies and evaluation of transportation proposals

UNIT II: Technologies for Water and Waste Management

- Water and wastes: General considerations, Role of water in life, Water crisis & causes, Concept of waste, Solid wastes & industrial effluents, Hazardous and toxic wastes, Natural cycles for zero waste systems, Eco sanitation, Water resources and management, Rainwater, runoff and ground water, Rainwater harvesting, Water storage and lifting devices
- Water and waste in the domestic sector, Drinking water and non-potable uses, Domestic wastewater recycling options, Domestic solid waste management
- Water audit, water conservation measures, Composting and its application, Water requirement and management in industries

UNIT III: Systems of local governments in India

- development administration of National, State and Local level and the process of decision-making, development and management
- Structure of implementing authorities: Improvement trusts, Development authorities, Metropolitan Development Authorities, and their relationship with local governments
- Public relation and citizen participation

UNIT IV: Urban finance

- Financial perspective of urban development (water supply and sewerages, land development and housing, transportation and road)
- Municipal fiscal administration: property tax administration, rent control system, user changes and pricing of public services

References:

1	Urban Transport Planning and Management : PratibhaDeshmukh, SBS Publishers and Distributors
2	Flexible Urban Transportation : Jonathan Lewis Gifford, Publisher: Elsevier
3	Alternative Water Sources and Wastewater Management : E. W. Bob Boulware, McGraw Hill Publishers,

4	Municipal Water and Waste Water Treatment : R. N. Singh and Rakesh Kumar, TERI (2006)
5	A reconceptualisation of urban management: The administration of cities, their services, and their growth: Irina Bačlija, Edwin Mellen Press, UK

Semester – II

Concepts of Mobility and Multi-Modal Transport M. Arch-II /EL-04

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

- To study the various modes of public transport, systems of public transport and their relationship to city size and shape
- To understand the interrelationship of activity nodes and transport corridors with reference to economic feasibility, urban aesthetics and transport infrastructure design

Unit I: Introduction

- Introduction to public transport issues and modes in cities. The impact of graded and at grade transport corridors on city form
- Classification of roads, road networks and hierarchy; road geometries and road components; design and preparation of layout for road intersections, rotaries and signalized intersections
- Functional structure of cities, urban growth trends and assessment of urban travel demand, urban public transport infrastructure

Unit II:Transit Development

- Public transport nodes, disposition of activity nodes& the resulting city structure
- Sustainable development and public transport development vis a vis size and shape of cities
- Modal split, and the role of technology for sustainable urban transport
- Role of urban design in humanizing public transport led urban development

Unit III:Feasibility

- Feasibility and financing of public transport systems. Pricing structure and resource mobilization options for mass transport design
- Interrelation and management of all related services such as telecommunication, fire fighting, solid waste management, water supply & drainage etc.
- Case examples of public transportation systems in India/other Asian countries

Unit IV:Planning

- Comparison and feasibility of public transport systems in smaller cities. Resource mobilization and planning options for mass transit systems
- Traffic Management- Existing organizational and legal framework; Traffic and Environmental Management Techniques; Review of the Existing Traffic Management Schemes in case cities with proposals for Chandigarh

References:

1	Regulation and the Management of Public Utilities by C. S. Morgan
2	Principles of Urban Transport Systems Planning by B.G. Hutchinson
3	Urban Transport: Planning and Management by A K Jain
4	Traffic Engineering and Transport Planning by L.R. Kadiyali
5	Urban Planning Manual

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Semester –II

Ecology and the Built Environment M. Arch-I /EL-05

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

- Introduction of basic understanding of ecology
- Understanding ecology and its relation to habitats - natural and man-made on regional scale
- Sensitizing to alternative models of environmental conservation

Course Content:

Unit I: Introduction

- Introduction to ecology & ecosystem services
- Ecology as a model
- The value of air, water and land
- Ecosystem integrity and environmental capacity

Unit II: Biodiversity and Urban Ecosystems

- Ecological pyramids, energy flows and productivity in eco-system
- Biogeochemical cycles, bio magnification
- Species and interspecies interactions
- Biodiversity and ecological equilibrium
- Urban ecosystem processes, urban climate, urban water cycle, urban nutrient dynamics

Unit III: Ecology and Habitation

- Ecological cybernetics - Relation to urban habitats

- Impact of natural and human influence
- Ecosystem-atmosphere interactions
- Urban heat island; urban wind pattern, aerosols and air pollution

Unit IV: Sustainable Built Environment

- Regional ecology and bio-urbanism
- Sustainable urban planning and development strategies
- Sustainable communities
- Conservation science, alternative development approaches, sustainable lifestyles
- Case studies

References:

1	Sustainable Design: Ecology, Architecture, and Planning by Daniel E. Williams	2007
2	Reshaping the Built Environment: Ecology, Ethics, and Economics by Charles J. Kibert	1999
3	Urban Ecosystems: Ecological Principles for the Built Environment by Frederick R. Adler, Colby J. Tanner	2013
4	Principles of Ecological Designs by Todd, N.J, and Todd, J	2004
5	Ecological Climatology by Bonan, G	2002
6	Tress of Chandigarh by Prof. Rajnish Wattas	

Semester – II

Softwares for Urban Design **M. Arch-II /EL-06**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objectives:

To equip students with computer application in urban mapping and architectural design. The major focus is addressed to GIS and AutoCAD 2D – 3D. These software's are the basic modules for digitization of 2D and 3D virtual environments.

Course Content:

Unit I: Auto Cad & 3D Software

- Introduction to AutoCAD
- 2D in AutoCAD
- 3D in AutoCAD
- 3DS Max

Unit II: GIS

- Introduction to GIS
- Geographical features in GIS
- Concept of digital maps and its advantages
- Difference between raster and vector maps
- Data in GIS - spatial and attributes data
- Application of spatial and non-spatial analysis in urban planning using GIS

Unit III: GIS Software

- ArcView of ArcGIS software
- Geo-referencing, digitization, query building, spatial and non-spatial analysis
- Development of maps using GIS

Unit IV: Data in GIS

- GIS data procurement
- Creating maps- symbology and visualization, advanced mapping applications, annotations, web mapping etc.
- Common analytical tasks
- Working with data- raster data, CAD data and hydrology data
- Practical urban design exercises

References:

1	AutoCAD Architecture 2010 Fundamentals by Moss Elise	2013
2	Mastering AutoCAD by George Omura	2010
3	Understanding AutoCAD by Frazer	2009
4	AutoCAD Architecture 2008 – Comprehensive Tutorial by Joseph Goldenberg	2009
5	Thinking about GIS: Geographic Information System Planning for Managers by Roger F. Tomlinson	2009
6	Mastering AutoCAD Architecture by Paul F Aubin	2008
7	GIS in Land and Property Management by Martin P. Ralphs, Peter Wyatt	2003
8	Urban Planning and Development Applications of GIS by Said Easa, Yupo Chan	2000

Semester – II

GIS Applications in Urban Design M. Arch-II /EL-07

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objectives:

The objective of the course is to develop an understanding of the basic GIS techniques, the range of analyses and their applications in various fields of design and planning.

Course Content:

Unit I:

- Fundamentals of GIS:
    - Concept of GIS, Components of GIS, Data Structure of GIS
- Geo-referencing:
    - Satellite imagery and topographical sheet
    - Perform map to map and image to map transformation

UnitII:

- Spatial and Non Spatial Data Creation:
    - Create Geo-database, Feature Dataset and Feature Class
- Editing Features:
    - Fixing errors by topology and other editing tools
    - Spatial Data Query, Attribute Data Query

Unit III:

Data Analysis

- Vector Data Analysis:
    - Perform buffering and overlay
- Spatial Analysis:
    - Preparing for analysis

- Accessing Spatial Analyst and Data Exploration.

- Raster Data Analyst:
  - Perform a local operation
  - Perform a combine operation
  - Perform a neighbourhood operation
  - Perform a zonal operation

UnitIV:

- Data Display and Cartographic Representation:
  - Make a Choropleth Map
- GIS Models and Modeling:
  - Creating and Executing tools in Model Builder
- 3D Analysis:
  - Creating Contours, Slope, Aspect, Relief
- Conversion of GIS data into various formats:
  - Conversion of GIS data into CAD, KML format etc.

References:

1	GIS in Land and Property Management by Martin P. Ralphs, Peter Wyatt	2003
2	Urban Planning and Development Applications of GIS by Said Easa, Yupo Chan	2000

Semester –III

Architectural Design Studio: Habitat Studies M. Arch-III /ST-03

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
12				300		200	**500**

Objective:

- To enable the students to understand the issues in designing habitat – including housing and it's all encompassing environment, aspects related to socio-economic and cultural needs, public or private sponsorship, planning, design and appropriate technological solutions.

Course Content:

The students shall undertake the design of a housing complex having a minimum site area of 10 acres. The design project shall be carried out in 2 stages.

1. Study of housing typologies in Chandigarh –
   a. Study of relevant rules and regulations, urban context, architectural vocabulary
   b. Typology of housing: Higher income group or combinations of income groups, slum improvement schemes by government or private organizations
   c. Neighborhood / site appraisal and planning: planning for community, neighborhood, and sector
2. Design of the project

References:

1	Documenting Chandigarh: The Indian Architecture of Pierre Jeanneret, Edwin Maxwell Fry, Jane Beverly Drew, Vol. 1 by Kiran Joshi	1999
2	Chandigarh: An Irony of History by Dr.S.S. Bhatti	2014

SEMESTER -III

Principles & Policies of Housing **M. Arch-III /C-07**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

- To understand the basics of housing policy, strategy, programs, legal and economic dimensions and their implications in planning
- To impart the knowledge and skills for preparation of rural/regional plan and formulation of city scale housing strategy and an understanding towards the process of generating a mass housing stock vis-à-vis its anthropological, social, fiscal and legislative implications

Course Content:

UNIT I: Introduction to Housing, Social and Economic Infrastructure

- Importance, need, problems and issues in housing
- Housing & Urbanization:Significance of housing in National Development Goals
- Housing Design:housing typology, housing layouts, housing density, community facilities, housing norms and standards
- Current issues in housing: health and safety related issues in housing, social aspects of housing, built environment and human behavior, public and private sector housing development
- Housing for the Poor:issues in slums and squatter settlements, characteristics of rural housing, government initiatives for providing housing
- Rental housing in India: an overview, current practices and upcoming initiatives
- Co-operative housing: concept, evolution, structure of cooperative housing
- Housing in third world countries

UNIT II: Planning Regulations,Policies& Acts

- The National Housing Policy: Review, policy framework for urban and rural housing, UNHCS, World Bank and USAID
- Building byelaws &regulations
- Understanding Five Year Plans
- Affordable Housing Policy 2009, affordable housing in public private participation,role of central & state governments in the development of National Housing Stock
- Slum rehabilitation schemes and incentives,landless housing policy
- *PradhanMantriAwasYojana, Rajiv AwasYojana, AMRUT ,Indira AwasYojana*
- The impact of resettlement policies and issues for the formulation of future resettlement policies
- Urban housing policy in India: context, shift and implications
- Institutions for housing finance and their role for subsidy in India such as HUDCO, HDFC, NHB,National Building Organization (NBO), Hindustan Prefab Limited, laws and acts on housing
- Access to land, Land Acquisition Act of India. Concept and techniques such as Land Pooling and Readjustment, Plot Reconstitution, etc. for acquiring land to meet future housing demands
- The Real Estate Act 2016
- National Housing Development Authority (amendments act) 2003, Housing act&building act,Emergency housing
- Acts- REPA(right to shelter), Landlord and Tenant (amendment) act no.21 of 2009, Town &Country Planning Act

UNIT III: Planning Aspects atCity Level: Housing in Chandigarh

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- Social aspects of housing within various income groups
- Characteristics and problems of housing areas of Chandigarh
- Concept of HIG, LIG, EWS, SFS and other typology of housing – genesis and impact on the urban form of the city
- Role of government bodies :Chandigarh Housing Board,CBRI

References:

1	"Housing Sector in India; Issues, Opportunities and Challenges" by Balaji V. &Rajmanohar	2008
2	"High Density Housing; Concepts, Planning,Construction" by Christian Schittich(ed)	2004
3	"Key Urban Housing of the Twentieth Century", byFrench H.	2008
4	"Introduction to Social Housing", by Reeves P.	2005
5	"The Architecture of Affordable Housing", by Davis S.	1995
6	Modernity and Housing; Peter G. Rowe	
7	National Building Code	
8	National Housing and Habitat Policies, (urban), Govt. of India	1998,2007
9	URDPFI Guidelines, TCPO Publication(draft)	2014
10	Housing Sustainable Development and the Rural Poor: a study of Tamil Nadu; Bernhard Glaeser	
11	The Architecture of Affordable Housing; Sam Davis	

Semester –III

Dissertation **M. Arch-III /C-08**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
3		3		100		100	**200**

Objective:

This module seeks to enable students to formulate appropriate research methodologies and theoretical frameworks and eventually develop research skills in their chosen area (relevant from previous semesters).

This module shall help in undertaking independent research, and make informed architectural design decisions for their thesis in the subsequent IVth semester.

Course Content:

Students will undertake an individual research-led dissertation, in which comprehensive research related to one of the previous semester modules will be assessed through written dissertation work. The dissertation would be a length of 4000 to 5000 words with suitable graphics, data representations, references, footnotes and annotations. Students will have regular individual research-led tutorials with their appointed academic supervisor. Evaluation shall be done through presentations at various stages.

1. Topic Selection in consultation with appointed faculty
    a. Define objectives and scope
    b. Develop appropriate research questions
    c. Plan a methodology for the investigation
2. Critically review the appropriate literature
3. Collect data on relevant case studies and critically analyze it based on research questions
4. Interpret findings and critically evaluate the study

5. Make appropriate suggestions and recommendations such that it is a base for the thesis module in the next semester

Outcomes:

1. A knowledge and understanding of the different methodological approaches (interpretive-historical, qualitative or quantitative including experimentation, simulation and modelling).

2. Intellectual skills that allow them to demonstrate that they can

   a. Identify a suitable research topic

   b. Seek out, assimilate and critically evaluate published research/design works

   c. Develop approaches to data collection and frameworks for practical analysis

   d. Make sense of the data and analysis within the context of previous research and theory

   e. Critically reflect on changed scenarios as a result of the investigation, perform SWOT analysis and draw appropriate conclusions

3. Transferrable skills that allow students to develop:

   a. The ability to formulate research questions in a manner that is relevant to and cognizant of their field of study

   b. The ability to carefully monitor one's own learning and draw upon other sources of knowledge and expertise as necessary

References:

1	Architectural research methods by Linda	2002
2	Design methods by J. Christopher	1980
3	Good research guide by MartynDenscombe	2003
4	Advanced Research Methods in Built Environment by A. and Ruddock	2008
5	Doing Qualitative Research: APractical Handbook by D. Silverman	1999
6	Social research: Issues, Methods and Process by Tim	2001

Semester – III

Services in High Rise Buildings **M. Arch-III /EL-08**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

To examine various services in high rise buildings and understand how the integration of services can translate into an intelligent and energy efficient system which will enable sustainability of the structure.

Course Content:

UNIT I:Introduction

- A brief description of evolution of high rise buildings
- Standards of high rise buildings- Indian standards and global standards on high rise buildings
- Introduction to various services; their significance with regards to high rise buildings; some examples of buildings and services used in them
- Aspects and integration of services- Concepts of Intelligent Architecture and Building Automation

UNIT II: Water supply and waste disposal

- Water supply and waste water collection systems- water storage and distribution systems- planning and design- selection of pumps- rain water harvesting – sewage collection systems and recycling of water- solid waste disposal. Some latest trends observation, NBC's recommendations in these areas can be included

UNIT III: HVAC, Electrical and Mechanical Systems

- Natural and mechanical ventilation systems- air conditioning systems and load estimation- planning and design for efficiency-basic concepts- automation and energy management concepts
- Natural lighting systems- Energy efficiency in lighting systems- load and distribution- planning and design for energy efficiency- automation- basic concepts, glass and glazing system for natural lighting.
- Types of elevators, systems and services- lobby design- escalators- safety principles, some latest trends, NBC's recommendations

UNIT IV: SAFETY AND SECURITY

- Security systems- Access Control and Perimeter Protection- CCTV Intruder alarms- passive fire safety- Fire Detection and Fire Alarm Systems- planning and design- NBC

Note: A case study exercise to understand the above concepts can be given and a report can be submitted along with a presentation made by the student at the end of the semester.

Case Studies of High Rise buildings and skyscrapers through appropriate examples can include the works of Norman Foster; Ove Arup; Ken Yeang, etc. as suggestive authors of high-rise ideas.

References:

1	Mechanical and Electrical by William J. Mcguinness, Benjamin Stein and John S. Reynolds	1980
2	Time-Saver Standards for Architectural Design Data by Donald Watson, Michael J. Crosbie and John Hancock Callender	1997
3	Electrical and Mechanical Services in High Rise Buildings Design and Estimation Manual by A K Mittal	2001
4	Fire Safety Issues in High-Rise Residential Buildings: escape routes design and specification by YahyaMohamadYatim	2011
5	High-Rise Manual by Johann Eisele and Ellen Kloft	2003

Semester –III

Construction Project Management **M. Arch-III /EL-09**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

To manage people, equipment, materials, built environment and assets, as well as roles overseeing technological processes including managerial aspects related to the design, construction and maintenance of buildings and civil infrastructure.

Course Content:

Unit I: Network Techniques

Introduction to network techniques; use of computer aided CPM and PERT for planning, Scheduling andcontrol of construction works; Computerized network scheduling and bar charts; Errors in networks;Types of nodes and node numbering systems.

Unit II: Construction Planning

- Planning of construction and site facilities using networks; Preparation of construction schedules for jobs, materials, equipment, labour and budgets using CPM
- Project costing,construction law, engineering project management, construction site operations, introduction to risk and due diligence

Unit III:

- Environmental sustainability in construction , international construction, engineering project control , location-based management for construction, procurement and risk management in projects, resource planning and management

- Construction equipmentsand methods: Equipments for earth construction and application; concrete construction; aggregate production
- Concrete: production, handling and placement; mixers, vibrations and temperature control

Unit IV:

- Principles of sustainability, maintenance management of engineering assets, risk perception and analysis, risk management, quantitative risk modeling.
- Control on construction
- Construction quality control and inspection; significance of variability in estimation of risk; construction cost control; crashing of networks

References:

1	Construction, Planning Management by Srivastava	1999
2	Construction Planning, Equipments and Methods by Peurifoy, R.L	1996
3	Construction Performance Control by Networks by Ahuja, H.N	
4	Project management with CPM & PERT by Moder and Philipese	1970
5	The due diligence Handbook – Corporate Governance, Risk Management & Business Planning by Linda S. Spedding	2009

Semester-III

Principles of Building Envelope Design **M. Arch-III /EL-10**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

- To understand the norms for building envelope, including thermal and acoustic performance requirements for walls, roofs, and windows for energy efficient design and construction of buildings
- To understand the energy performance standards for buildings, energy auditing and automation in various building services with integration for energy conservation

Course Content:

Unit I: Building Envelope

- Streets and buildings- room zoning- layer of shades, overhead shades – Solar organizations: heat producing zones, stratification zones, buffer zones, daylight zones
- Shape and enclosure: direct gain, sun-spaces, thermal storage walls, roof ponds, thermal collector walls, wind catchers, solar chimneys courtyards: size, shape, orientation, breezy andshady courtyards
- Estimation of skin heat flow, window solar gain, ventilation/ infiltration gain or loss
- Thermal behaviour of buildings: Introduction to concept of Effective Temperature – Corrected Effective Temperature- comfort zone – overheated period – design of shading devices
- Thermal properties of materials - resistance and conductance – transmittance – thermal gradient– periodic heat flow– time lag & decrement factor–thermal exchange in buildings– building heat gain and heat loss– thermal mass and insulation

UNIT II: Planning For Ventilation

Functions of ventilation – stack effect and its related calculations – provision for air movement – air flow through buildings – calculation of indoor air velocity – ventilation rate - orientation, external features, cross ventilation – position of openings, size of openings, controls of openings - air flow around buildings – humidity control

UNIT III: Daylighting

Principles of light- transmission, reflection and absorption – illumination – day lighting concepts - day lighting in the tropics – daylight requirements – daylight protractor – calculations – distribution of daylight

UNIT IV:

- **Acoustics -** Sound insulation strategies wrt outdoor context - Reverberation time, Echo, Noise transmission, Refraction, etc for various building typologies
- **Façade Technologies -**Sensor based, double envelopes, ventilated facades, smart facades, etc

References:

1	Manual of Tropical Housing and Building, Part 1 – Climatic Design by Koenigsberger	2004
2	Housing, Climate and Comfort by Martin Evans	1980
3	Climatic Responsive Architecture- A Design Handbook for Energy Efficient Buildings by Arvind Krishnan, Nick Baker, Simons Yannas, S V Szokolay	2001
4	Handbook on Functional Requirements of Buildings (Other than Industrial Buildings) by BIS	1987
5	Climate considerations in building and urban design by David Egan. M	1998
6	Green Building Materials A Guide to Product Selection and Specification, 3rd Edition	2010
7	Understanding Green Building Materials by Traci Rose Rider, Stacy Glass, Jessica McNaughton by Ross Spiegel.G	2011

Semester- III

BIM and Computer Application **M. Arch-III /EL-11**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
	2	1		50		50	**100**

Objective:

To acquire a comprehensive base of knowledge in BIM (Building Information Modelling) and its application in Architecture

Course Content:

Unit I: Introduction to BIM

- Introduction to Revit Architecture and explaining core concepts of Revit
- Application of Revit for a sample residential project, with sun path diagrams, site details and analysis, annotations, and plotting a sheet
- Revit Element Hierarchy:
    - Category>Family>Type>Instance:
    - Introduction to Model Elements, Datum Elements, View Elements, View specific elements, Annotation, Detail Elements
- Basic user interface:
    - Ribbon: Architecture, Annotation, Modify, View etc
    - Context Changing Ribbon, Options bar, Quick Access Bar, Properties Pallet, Viewport Options Bar, Viewport Quick toggle Bar
- Customize User Interface
- 2D Views, 3d Views, Camera, Camera settings, Rendered viewport display settings, Sun study, Sections
- Selections and Selections toggles
- Revit Options Customization
- Templates - Metric and Imperial, Setting up New Project

UNIT II:

- **Datum Elements, View Elements, Basic Model Elements and Structural elements**
    - Levels, Grids
    - Witness lines
    - Columns and Structural Columns
    - Walls, Joints &transformation/edit commands (move, offset, extend, trim etc)
    - Loading Libraries, Doors, Windows, Components
    - Constraints and Dimensions
- **Advanced model elements,**
    - Floor, Slabs, Roofs, Ceilings, Projections/Extrusions
    - Stairs and Railings
    - Custom Model Elements, Walls customization
    - Curtain Walls, Grids and Mullions, Model Lines, Stacked walls, sweeps & reveals

UNIT III: Site Management, Files management and Teamwork

- Creating site topography, Importing survey plans
- Referencing and Importing CAD and Revit Projects
- Manage Links, Shared Coordinates and Teamwork

UNIT IV: View specific elements, Annotation, Detail Elements and Sheets

- Crop region, Cutaway views
- Adding, Numbering and Bounding Rooms,
- Schedules, Tags, Images in Schedules, Key schedules and Modify schedules
- Array, Detail callout, Detail components, Dimensions, Legends, Regions, Symbols, Texts
- Adding Sheets, Guide Grid and Placeholders

References:

1	Mastering Revit, Omura G.	2009
2	BIM Handbook : A guide to Building Information Modelling by Eastmen C., Tiecholz P., Sacks R.	2008
3	The Impact of Building Information Modelling : Transforming Construction by Ray Crotty	2011

Semester- IV

Thesis Project **M. Arch-IV /ST-04**

Hours per Week				Assessment			
Studio	**Lecture**	**Tutorial**	**R&D**	**Internal**	**Exam.**	**Jury**	**Total**
12	2		13	500		500	**1000**

Objective:

To apply the discipline and skills of the programme based on the research findings from the dissertation that shall enable the student to make informed professional decisions.

Course Content:

The thesis semester is a continuation to the previous dissertation module each student has attempted. The thesis is the culmination of work done on the dissertation and is considered to be of prime importance in the M.Arch course.

The thesis shall be based on the content of the previous semesters and the technical knowledge gained from the entire course which may include the simulations, analysis and /or design.

Each student is allocated a thesis supervisor, from within the faculty, who is responsible for academic guidance through the process, but can have a co-supervisor from the relevant field. The overall program would be co-ordinated by a Thesis Co-ordinator. A detailed program for the thesis would be prepared by the Thesis Co-ordinator, in due course.

At the end of the semester each student is expected to submit all the research findings and design interpretations as per the requirements and specifications of the department.

The department shall schedule a date for the viva-voce as per the academic calendar.