



ANNA UNIVERSITY, CHENNAI

POSTGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: M. Arch. (Environmental Architecture)

Regulations: 2025

Abbreviations:

Category

PC – Professional Core

PE – Professional Elective

BS & AE – Basic Sciences & Applied Engineering

PAE – Professional Ability Enhancement

SD – Skill Development

SL – Self Learning

HUM – Humanities (including Languages and others)

Course Type

S - Studio

T – Theory

TS – Theory cum Studio

IT – Internship Training

LIT – Laboratory Integrated Theory

TCP – Total Contact Period(s)

L – Lecture

P – Practical

T – Tutorials

S - Studio

Semester I

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P/S			
1.	MH25C01	Research Methodologies for Built Environment	T	3	0	0	3	3	PC
2.	EA25101	Energy, Environment and Sustainable Development	T	3	0	0	3	3	PC
3.	EA25102	Thermal Comfort and Passive Design	T	3	0	0	3	3	PC
4.	EA25103	Environmental Impact Assessment	T	3	0	0	3	3	PC
5.	EA25104	Urban Ecology and Environmental Planning	T	3	0	0	3	3	PC
6.	EA25105	Environmental Design Studio - I	S	0	0	10	10	10	PC
Total Credits							25	25	

Semester II (Prerequisite- Pass in Environmental Design Studio - I)

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P/S			
1.		Environmental Disturbances, Pollution and Remedies	T	3	0	0	3	3	PC
2.		Sustainable, Energy Efficient Building Materials and Technologies	T	3	0	0	3	3	PC
3.		Geographical Information Systems for Built Environment	TS	1	0	3	4	4	PAEC
4.		Assessment Tools for Environmental Architecture	TS	1	0	3	4	4	PAEC
5.		Professional Elective I	---	X	X	X	3	3	PE
6.		Industry Oriented Course	---	X	X	X	---	1	SD
7.		Environmental Design Studio - II	S	0	0	10	10	10	PC
Total Credits							27	28	

Semester III (Prerequisite- Pass in Environmental Design Studio - II)

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P/S			
1.		Life Cycle Assessment of Buildings	T	3	0	0	3	3	PC
2.		Environmental Laws and Management	T	3	0	0	3	3	PC
3.		Dissertation	T	0	0	4	4	4	PC
4.		Environmental Design Studio - III	S	0	0	10	10	10	PC
5.		Professional Elective II	---	X	X	X	3	3	PE
6.		Professional Elective III	---	X	X	X	3	3	PE
7.		Internship Training	---	---	--	---	---	2	SD
Total Credits							26	28	

Semester IV (Prerequisite- Pass in Environmental Design Studio - III)

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P/S			
1.		Thesis Project	S	0	0	20	20	20	SD
2.		Professional Elective IV	---	X	X	X	3	3	PE
Total Credits							23	23	

Professional Elective Courses (PEC)

S. No.	Course Code	Course Title	Periods per week			Total Contact Periods	Credits
			L	T	P/S		
1.		Sustainability and Energy Conservation in Landscape Architecture	3	0	0	3	3
2.		Environment Infrastructure	3	0	0	3	3
3.		Building Science and Sustainability	3	0	0	3	3
4.		Environmental Psychology	3	0	0	3	3
5.		Soft Skills	2	0	1	3	3
6.		Post Occupancy Evaluation of Buildings	3	0	0	3	3
7.		Design of Energy Efficient and Healthy Buildings	3	0	0	3	3
8.		Carbon Foot Print and Measurement	3	0	0	3	3
9.		Natural Resource Management	3	0	0	3	3
10.		Environmental Management Systems and Auditing	3	0	0	3	3
11.		Psychology of Learning and Development	3	0	0	3	3
12.		Energy, Climate Change and Urban Development	3	0	0	3	3
13.		Theory of Environmental Planning	3	0	0	3	3
14.		Environment, Development and Disaster Management	3	0	0	3	3
15.		Theory of Architectural Education	3	0	0	3	3

Semester I

MH25C01	Research Methodologies for Built Environment	L	T	P/S	C
		3	0	0	3
Course Objectives: - To give introduction to the importance of critical inquiry as a way of gaining knowledge and adding to it through research. - To give exposure to the various forms of research and research methodologies/ processes. - To understand research in the specific domain of built environment research.					
Introduction: Basic research issues and concepts. Orientation to research process. Types of research: historical, qualitative, co-relational, experimental, simulation and modelling, logical argumentation, case study and mixed methods. Illustration using research samples including research in the domain of built environment.					
Research Process: Elements of Research process: finding a topic, writing an introduction, stating a purpose of study, identifying key research questions and hypotheses, reviewing literature, using theory, defining, delimiting and stating the significance of the study, advanced methods and procedures for data collection and analysis. Illustration using research samples including research in the domain of built environment.					
Researching and Data Collection: Library and archives. Internet: New information and the role of internet. Finding and evaluating sources. Misuse. Test for reliability. Ethics. Methods of data collection- Primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling. Collecting data from secondary sources. Socio-economic research techniques such as focused group discussions, participant observation.					
Methods and Tools in Urban Research: Space syntax: key concepts of space syntax and their development, spatial properties - connectivity, integration, intelligibility, etc. - of the built environment and explore their impact on user behavior, visual field/isovist characteristics - compactness, occlusivity, clustering coefficient, etc. - of the built environment and explore their impact on user behavior, analyse architectural and urban layouts using space syntax methods - convex analysis, justified graph, axial analysis and visibility graph analysis. Use of excel software for analyzing data; applications of features of excel- basic and selected advanced features. Data analysis: Advanced Excel, SPSS. Impact of 'Big Data' or statistics on interpretation of urban phenomena					
Report Writing & Case Studies: Research writing in general and its components. Developing the outline, referencing, writing the bibliography, presentation, etc,. Case studies of competent research, from project inception to completion with a focus on research in the domain of built environment. Review of research publications.					
Weightage: Continuous Internal Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Two Assessments with equal weightage. One Assessment as Internal written Test /Examination (50%), second as Assignment					

(50%) of any mode such as study, seminar, and or a combination of modes, etc.

References:

1. Groat, L., & Wang, D. (2013). *Architectural research methods* (2nd ed.). John Wiley & Sons.
2. Booth, W. C., Colomb, G. G., & Williams, J. M. (2008). *The craft of research* (3rd ed.). University of Chicago Press.
3. Borden, I., & Ruedi, K. (2005). *The dissertation: An architecture student's handbook* (2nd ed.). Architectural Press.
4. Kumar, R. (2014). *Research methodology: A step-by-step guide for beginners* (4th ed.). SAGE Publications.
5. Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
6. Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method and research* (1st ed.). SAGE Publications.
7. Ward, K. (2013). *Researching the city*. SAGE Publications.
8. Gaur, A. S. (2011). *Statistical methods for practice and research: A guide to data analysis using SPSS* (2nd ed.). Response Books.

E-resources:

1. Bell, J., & Waters, S. (2018). *Doing your research project: A guide for first-time researchers* (7th ed.). McGraw-Hill Education. ISBN 9780335243396
2. Sheppard, V. (2020). *Research methods for the social sciences: An introduction*. BCcampus & Open Textbook Library.
<https://open.umn.edu/opentextbooks/textbooks/1589>
3. Schulman, J. S. (2024, March 28). *An exploration of research methods* (ResearchMethod.net). Manteio Company.<https://researchmethod.net>.
4. Phelps, J. (2021). *Engaging Research Communities in Writing Studies: Ethics, Public Policy, and Research Design* (1st ed.). Routledge.
<https://doi.org/10.4324/9781003082002>
5. Joore, P., Stompff, G., & van den Eijnde, J. (Eds.). (2022). *Applied Design Research: A Mosaic of 22 Examples, Experiences and Interpretations Focussing on Bridging the Gap between Practice and Academics* (1st ed.). CRC Press.
<https://doi.org/10.1201/9781003265924>

	Description of CO	PO Mapping
CO1	Identify, decipher and interpret issues relating to architecture based on research enquiry methods.	PO1(3) PO2(2)
CO2	Exemplify different methods of conducting research and research writing	PO1(3) PO2(2)
CO3	Interpret specific research related to built environment.	PO1(3) PO2(2)

EA25101	Energy, Environment and Sustainable Development	L	T	P/S	C
		3	0	0	3
Course Objectives: • To enable sensitivity with respect to the linkages/ relationship between energy, lifestyle, food chain and sustainability. • To facilitate understanding of appropriate technologies aiding sustainability. • To enhance the knowledge ecological principles and system in sustainable development					
Energy Sources: Introduction to nexus between Energy, Environment and Sustainable Development; Energy transformation from source to services; Energy sources, sun as the source of energy; biological processes; photosynthesis; food chains, classification of energy sources, quality and concentration of energy sources; fossil fuel reserves - estimates, duration; theory of renewability, renewable resources; overview of global/ India's energy scenario.					
Ecological Principles: Ecological principles, concept of ecosystems, ecosystem theories, energy resources and their inter-linkages, energy flow, the impacts of human activities on energy flow in major man-made ecosystems- agricultural, industrial and urban ecosystems.					
Energy Systems and Environment: Environmental effects of energy extraction, conversion and use; sources of pollution from energy technologies (both renewable and non-renewable); primary and secondary pollutants; consequence of pollution and population growth; air, water, soil, thermal, noise pollution -cause and effect; pollution control methods, sources and impacts; environmental laws on pollution control. Kyoto Protocol; Conference of Parties (COP); Clean Development Mechanism, Reducing Emissions from Deforestation and Degradation.					
Green Innovation & Sustainability: Criteria for choosing appropriate green energy technologies, emerging trends process/product innovation-, technological / environmental leap-frogging; Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity, eco-restoration/ phyto- remediation, ecological sanitation, renewable energy technologies, industrial ecology, agro ecology and other appropriate green technologies.					
Green Energy and Sustainable Development: The inseparable linkages of life supporting systems, biodiversity and ecosystem services and their implications for sustainable development; global warming; greenhouse gas emissions, impacts, mitigation and adaptation; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCC).					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					

Assessment Methodology: Two Assessments with equal weightage.

One Assessment as Internal written Test /Examination (50%), second as Assignment (50%) of any mode such as study, seminar, and or a combination of modes, etc.

References:

1. Thorndike, E. H. (n.d.). Energy & environment: A primer for scientists and engineers. Addison-Wesley Publishing Company.
2. Loulou, R., Waaub, J.-P., & Zaccour, G. (Eds.). (2005). Energy and environment set: Mathematics of decision making (Vol. XVIII, p. 282). Springer. <https://doi.org/10.1007/978-0-387-25351-0> (if DOI unavailable, omit)
3. United Nations Development Programme. (2000). Energy and the challenge of sustainability: World energy assessment. United Nations.
4. Ristinen, R. A., & Kraushaar, J. J. (2006). Energy and the environment (2nd ed.). Wiley.
5. Wilson, R., & Jones, W. J. (n.d.). Energy, ecology and the environment. Academic Press Inc.

E-resources: <https://www.unep.org/geo/>

	Description of CO	PO Mapping
CO1	Identify the linkages between the ecosystem, food web and sustainability.	PO1(3) PO3(3) PO6(2)
CO2	Describe renewable and non-renewable sources of energies and their effects on the environment	PO3(3) PO4(2)
CO3	Explain how human activity affects the way energy flows through the largest man-made ecosystems	PO2(2) PO3(2) PO5(3)
CO4	Illustrate new developments in green energy technologies and innovation ideas.	PO1(3) PO4(2) PO6(2)

EA25102	Thermal Comfort and Passive Design	L	T	P/S	C
		3	0	0	3
Course Objectives: - To enable exploration of the relationship between architectural form, materials and environmental performance. - To give knowledge about how this relation should evolve in response to climate and emerging technical capabilities.					
Human Behaviour: Atmospheric and thermal comfort, building performance, and occupant health, safety, and productivity. Factors responsible, energy systems for human comfort, PPD & PMV analysis					
Natural Influences: Micro and Macro thermal comfort scales, Interpreting Material data through Bio climatic charts Sun path, Passive strategies, Solar heat gain, Solar radiation, Stack effect, etc.					
Design Elements: Modifications of Architectural & Landscape Elements – Fenestration, roof, walls, flooring, trees and landscape. Climatic zones and architectural features - Courtyard, Cross ventilation, Daylight factor, Walls, Trombe wall, Buried pipe system, Wind, Velocity, Wind tower etc.					
Building Materials: Properties of building materials related to Climatic zones - Properties of Heat transfer and energy flow, U-value, Appropriate materials. Mass materials/components selection strategy - Photovoltaic-Recycled Materials-Utilization of building water conserving installation- Evaporative coolers.					
Human Comfort Standards: Designing for optimum Day Lighting-Ventilation and Thermal Comfort Standards. Acoustics – Manmade influences –Sick Building Syndrome – Indoor Environment and design of Healthy buildings. Adaptive model of thermal comfort and its application to sustainable design of buildings.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Two Assessments with equal weightage. One Assessment as Internal written Test /Examination (50%), second as Assignment (50%) of any mode such as study, seminar, and or a combination of modes, etc.					
References: - Krishan, A., Yanas, S., Baker, N., & Szokolay, S. V. (2001). Climate responsive architecture. Tata McGraw Hill Publishing Company. - Chiras, D. D. (2002). The solar house: Passive heating and cooling. Chelsea Green Publishing. - Lloyd Jones, D. (1998). Architecture and the environment: Contemporary green buildings. Overlook Hardcover. - Givoni, B. (1998). Climate considerations in building and urban design (1st ed.). Wiley.					

5. Hawkes, D., & Foster, W. (2002). Energy efficient buildings: Architecture, engineering, and environment (1st American ed.). W. W. Norton & Company.
6. Koenisberger, O. H. (2012). Manual of tropical housing and climate. Longman Group United Kingdom.

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	Description of CO	PO Mapping
CO1	Describe human thermal response to natural elements and the influence of architectural design elements.	PO2(3) PO4(2)
CO2	Explain passive design techniques of architectural elements to achieve thermal comfort in built environment	PO1(3) PO5 (2) PO6(3)
CO3	Interpret the characteristics of building materials for different climatic zones	PO3(2) PO4(2)
CO4	Correlate human thermal comfort criteria and sustainable building design.	PO1(2) PO3(3)

EA25103	Environmental Impact Assessment	L	T	P/S	C
		3	0	0	3
Course Objectives: - To give exposure to the need, methodology, documentation and usefulness of environmental impact assessment. - To enable skill development to prepare environmental management plan.					
Introduction: Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA.EIA process- screening – scoping - setting– analysis – mitigation.					
Components and Methods: Matrices – Networks – Checklists – Connections and combinations of processes - Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment – Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation. EIA methods in other countries.					
Impact On Socio-Economic Systems: Definition of social impact assessment. Social impact assessment model and the planning process. Rationale and measurement for SIA variables. Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition - neighborhood and community impacts. Selecting, testing and understanding significant social impacts. Mitigation and enhancement in social assessment. Environmental costing of projects.					
Environmental Management Plan: Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment.					
Sectoral EIA: EIA related to the following sectors - Infrastructure – construction and housing Mining – Industrial -Thermal Power - River valley and Hydroelectric – coastal projects-Nuclear Power, Hill area Development and CRZ. EIA for coastal projects.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Two Assessments with equal weightage. One Assessment as Internal written Test /Examination (50%), second as Assignment (50%) of any mode such as study, seminar, and or a combination of modes, etc.					
References: 1. Canter, L. W. (1996). Environmental impact assessment. McGraw Hill.					

2. Lawrence, D. P. (2003). Environmental impact assessment: Practical solutions to recurrent problems. Wiley-Interscience.
3. Harvey, N., & Clarke, B. (2012). Environmental impact assessment: Procedures and practices. Oxford University Press.
4. Petts, J. (Ed.). (1999). Handbook of environmental impact assessment. Blackwell Science.
5. World Bank. Sourcebook on environmental impact assessment.

E-resources: <https://www.iisd.org/learning/eia>

	Description of CO	PO Mapping
CO1	Describe the significance of environmental impact assessment	PO2(3) PO4(2)
CO2	Explain the preparation of reports and organize information	PO1(3)
CO3	Recognize the link between social effects and community change	PO3(3) PO4(2)
CO4	Devise the skills to prepare environmental management plan.	PO6(3)

EA25104	Urban Ecology and Environmental Planning	L	T	P/S	C
		3	0	0	3
Course Objectives: • To enable understanding of the basic concepts of ecology, Urban Ecology, natural systems and environment. • To bring out awareness of the importance of Environmental planning for sustainability, resource planning and allocation and protection of natural resources and their use for sustainability. • To enable preparation of plans considering preservation, rehabilitation and environmental policies.					
Introduction: Introduction to Urban Eco-systems. Basis of environmental science. Ecology, Ecosystems, Habitat, structure of the ecosystem, major ecosystems, productivity of ecosystems adaptation. Flow of energy, food chain, ecological pyramids, predation, regulatory forces. Components of natural and built environment					
Concepts and Approaches to Ecological Planning: Different types of life supporting services provided by the nature. General concept of urban ecological planning. Impact of urbanization and industrialization on nature. Resiliency and Biodiversity, resources planning and climate resilient urban development.					
Human Influence on Eco- System: Examination of critical issues underlying the current and future environmental problems. Human impact on environment. Modification of natural environment – Current conditions of natural resources like land, water, air. Over exploitation of natural resources, agriculture, fishing, mineral resources, energy resource, forest wealth etc.					
Effects of Growing Population on Eco-Systems: Population and pollution, Overcrowding, congestions, hygiene and health problems. Sanitation, water supply, solid and fluid waste generation and disposal problem, changing climate of the cities-urban heat island, urban flood, etc. energy and human settlement. Ecological Land Planning: Preservation and protection of ecologically sensitive areas, Rehabilitation of degraded sites, Development of sites/ land in accordance to their environmental properties.					
Global Issues on Modern Cities: Global environmental problems: Global Warming, Ozone Layer Depletion, oceans, fresh water, trans boundary air pollution, biological diversity, Carbon Rating. International treatises, Land pollution, Overview of Government of India's policies, United Nations contribution to address these issues.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Two Assessments with equal weightage. One Assessment as Internal written Test /Examination (50%), second as Assignment (50%) of any mode such as study, seminar, and or a combination of modes, etc.					

References:

1. Khanna, D. D. (1997). Sustainable development: Environmental security, disarmament, and development interface in South Asia. Macmillan India.
2. Comín, F. A. (2010). Ecological restoration: A global challenge. Cambridge University Press.
3. Marzluff, J. M. (2008). Urban ecology: An international perspective on the interaction between humans and nature. Springer.
4. Alberti, M. (2007). Advances in urban ecology: Integrating humans and ecological processes in urban ecosystems. Springer.
5. Sharma, P. D. (2009). Ecology and environment. Rastogi Publications.
6. Bhatt, S. (2004). Environment protection and sustainable development. APH Publishing.
7. Fry, T. (2009). Design futuring: Sustainability, ethics and new practice. Berg.

E-resources: <https://www.unep.org/geo/>

	Description of CO	PO Mapping
CO1	Describe the importance of sustainable lifestyles and natural resource management.	PO1(3) PO6(2)
CO2	Relate the interaction between the effects of population growth and the environment	PO3(3) PO5(2)
CO3	Infer the need to conserve ecosystem and effective ways to do so.	PO2(3) PO3(3) PO4(2)
CO4	Summarize the government initiatives to address global environmental challenges	PO1(2) PO6(3)

EA25105	Environmental Design Studio - I	L	T	P/S	C
		0	0	10	10
Course Objectives: To enable design of small built-up spaces by taking into consideration of various climatic conditions and strategies of environmental design principles.					
Content : The building shall be designed to minimize energy use and operating costs without affecting the functionality, accommodation standards, occupant health, safety or comfort. Quantification of the results should be based on theoretical and mathematical principles. Manual quantification is essential for the following aspects. - Microclimatic analysis - Bio climatic and psychometric analysis of comfort zone (based on eco charts, and graphs) - Whole building Analysis for Energy performance, (based on heat gain and heat loss calculations etc.,) - Indoor thermal comfort, (Solar Analysis for optimizing Orientation, Shading and shading analysis, TSI, Thermal neutrality, time lag, Decrement factor etc.,) - Passive energy conservation measures (performance evaluation of passive strategies like, stack effect, trombe wall, radiant cooling system etc.,) . - Indoor lighting levels (based on Day light factor method, lumen method etc.,) - Air quality analysis (IAQ) - Analysis on Life cycle assessment/ Embodied energy and carbon foot print - Site contour analysis, Net perforated area, annual run off calculations. The project submission should be in the form of Drawings, calculations, models and reports.					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Three Assessments with equal weightage (approx.33.33% each). Each assessment shall incorporate continuous marking of the work and performance during the particular assessment period.					
References: - Bureau of Indian Standards. (1977). IS:3362-1977, code of practice for ventilation of residential buildings. BIS. - Rea, M. (2000). The lighting handbook (9th ed.). Illuminating Engineering Society of North America. - Illuminating Engineering Society of North America. (1987). Handbook on functional requirements of non-industrial buildings (lighting and ventilation). BIS. - Szokolay, S. V. (2008). Introduction to architectural science. Taylor & Francis Group. - Givoni, B. (1994). Passive and low energy cooling of buildings. Van Nostrand Reinhold.					

	Description of CO	PO Mapping
CO1	Complete the creation of compact built-up spaces while taking into account a variety of climatic variables and environmental design principles.	PO1(3) PO5(3) PO6(2)
CO2	Investigate the link between architectural form, material properties, and environmental performance.	PO2(3) PO4(2) PO5(3)
CO3	Describe the modelling tools and passive tactics for measuring the energy performance, environmental responsiveness	PO1(2) PO4(2)
CO4	Correlate the response to climate change and new technological capabilities.	PO4(3) PO6(2)