**Course Name: Environmental Design and GIS Application**

**Number of credits: 2 ECTS**

**Period: Spring semester**

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| Coordinator | **Dr Aparna** |
| Credits | 2 |
| Lecturers | **Dr Aparna, Peeyush Purohit and Prof. Purvi Jadav** |
| Level | Bachelors |
| Host institution | Nirma University |
| Course duration | 15 Weeks |

**Summary**

This is a 2 ECTS course which will be provided as an elective to Bachelors of Architecture students. This course will introduce various parameters of environmental design as well as applications of GIS (Geographic Information System) to BArch students.

**Target student audiences**

Bachelors students majoring in Architecture

**Prerequisites**

NA

**Aims and objectives**

The main course objective is to understand the guiding principles for the successful design of urban public spaces through contextual analysis of various parameters related to climate, topography, culture, and human behaviour.

**General learning outcomes:**

By the end of the course, successful students will:

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| Knowledge | * Know fundamentals of GIS and work with database on GIS |
| Comprehensive | * Identify the role and importance of climate and culture in the built environment |
| Application | * Apply climatic, cultural context and sustainability principles in spatial planning and design of public spaces |
| Analysis | * Illustrate parametric analysis and representation. |
| Synthesis | * Develop maps based on selected parameters in the built environment |

**Overview of sessions and teaching methods**

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| **Unit** | **Syllabus** |
| Unit-I | Introduction to climate, culture and built environment –   * Elements of climate, Tropics and its Climatic zones * Different agro-climatic zones in India * Importance of Earth’s orbit, and Sun path in determining the climatic and weather conditions |
| Unit-II | Sustainability at various scales of urban form   * Elements and scales of urban form * Issues of sustainability at various scales of urban form * Urban landscape and ecology, biodiversity * Site planning and layout * Emerging climatic challenges |
| Unit-III | Social life and the urban built environment   * Urban public spaces - place, people and activities * Relationship between built and un-built elements to create experiences of the built environment * Pattern language at various scales |
| Unit-IV | GIS Application for Site Planning   * Concept and Definition, Components and Functions of GIS * ArcMap, Exploring Graphical User Interface (GUI), Identifying the toolbar and its tools * Understanding Maps and Layers * Understanding Vector and Raster datasets * Application in site planning and layout specific to contexts |

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| **Learning methods** | * Literature review * Video presentations * Project-Based Learning * Base map preparation through GIS * Field trip, interviews, surveys, group work * Stakeholder analysis * Written articles/essay |
| **Course outline** | **Week 1 and 2**  Introduction to Environment  Context  Types of context - topographical, cultural, climatic  **Week 3 and 4**  Elements of Urban Design and relevance of the above  Intro to basic GIS as a tool of information  Components & Functions of GIS  **Week 5, 6 and 7**  Neighbourhood and Cluster Design - Patterns from Built environment studies,  Sketch-up modelling/ visualizing/ sun path diagrams  **Week 8, 9, 10 and 11**  Understanding Vector & Raster Datasets, Maps & Layers, Site Planning and modelling with practical  Activity Mapping and Environment Behaviour Studies  **Week 12 and 13**  Relating to Public Life, Pattern Language and Site Planning  **Week 14 and 15**  Lessons from environmental modelling |

**Literature**

1. Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Shlomo, A. (1977). A pattern language: Towns, buildings, construction.
2. Alexander, C, Neis, Hajo; Anninou, Artemis; King, Ingrid (1985) New Theory of Urban Design. Center for Environmental Structure Series.
3. Cullen, Gordon, The Concise Townscape, Architectural Press, 1961
4. David J Maguire et al, “GIS, Spatial Analysis, and Modelling”, ESRI Press
5. Dekay, Mark (2014) “Sun, Wind and Light: Architectural Design Strategies” USA: John and Wiley Sons Inc.
6. Gehl, Jan, Life between Buildings, Island Press, 1971.
7. Lynch, Kevin and Hack, Gary, Site Planning, The MIT Press, 1984
8. Mesfin T Bekalo et al, “Landuse Change Detection using GIS, Remote Sensing and Spatial Matrices”, Lap Lambert Academic Publications
9. Olgyay, Victor (1963) “Design With Climate – Bio-Climatic Approach to Architectural Regionalism” New Jersey: Princeton University Press
10. PA Longley et al, “Geographic Information Systems and Science”, John Wiley and Sons Ltd.
11. Vastu Shilpa Foundation for Studies and Research in Environmental Design. (1990). Towards: A Humane Habitat: Directions for a Code of Planning and Design Practices. Ahmedabad Vastu-Shilpa Foundation.
12. Whyte, William H, The Social Life of Small Urban Spaces, Project for Public Spaces, 1980

**Course workload**

The table below summarizes course workload distribution:

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| **Activities** | **Learning outcomes** | **Assessment** | **Estimated workload (hours)** |
| **In-class activities (30 hours)** | | | |
| Lectures | Understanding theories, concepts, methodology and tools | Class participation | 12 |
| Moderated in-class discussions | Understanding various policy and management contexts and common problems in communication in environmental design and GIS application | Class participation and preparedness for discussions | 8 |
| Reading and discussion of assigned papers for seminars and preparation for lectures | Familiarity with and ability to critically and creatively discuss key concepts, tools and methods as presented in the literature | Class participation, creative and active contribution to the discussion | 4 |
| Group presentation | Ability to interpret data, to analyze the audience, and use the concepts, tools to understand environmental design and GIS application | Quality of group assignments and individual presentations | 6 |
| **Independent work (18 hours)** | | | |
| Group work (field assignment and GIS-based analysis):   * Contribution to the group case-study projects * Contribution to the preparation and delivery of individual presentation * Contribution to the web-application |  | Quality of group assignments and individual presentations | 12 |
| Group presentation | Ability to interpret data, analyze the audience, and use the concepts, and tools, to understand environmental design and GIS application | Quality of group assignments and individual presentations | 6 |
| ***Total*** |  |  | ***48 Hours*** |

**Grading**

The students’ performance will be based on the following:

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| **Assessment** | * Progress assessment (50%):   - Individual submissions for selected parameters in the built environment (25%)  - Activity Mapping (25%)     * Final assessment (50%): * Group reports: 25% for base map preparation of given study sites and 25% for parametric analysis and representation. |
| **Evaluation** | A+ (10)  A (9)  B+ (8)  B (7)  C+ (6)  C (5)  Interim Fail (0)  Final Fail (0) |