

MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ARCHITECTURE

**GRADUATE (M.Sc)
SEMINAR
ARCH504**

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Coordinator: Assoc. Prof. Ela Alanyalı Aral

09.00 - 09.25**Ataberk Yılmaz****Supervisor:** İpek Gürsel Dino**Jury:** Koray Pekerçli,
Gülsu Ulukavak Harputlugil**Design Strategies for Harnessing the Solar Energy Potential of Positive Energy Districts**

The urgency to transition to clean energy in the face of increasing urbanization and energy consumption has led to the emergence of Positive Energy Districts (PEDs). PEDs aim to achieve a net-zero annual carbon emission balance by generating more local renewable energy than the energy consumed within their boundaries. Positive energy generation is strongly correlated with the effective utilization of renewable systems. Solar power, being one of the most abundantly available energy sources, plays a pivotal role in providing a sustainable and renewable energy solution for the clean energy transition in urban areas. Architecture has a crucial role in harnessing solar energy by incorporating solar technologies into buildings, while achieving visually pleasing results. This study explores the potential of solar harvesting technologies, including various types of solar panels coupled with energy storage systems, to enhance energy efficiency within PED areas with a specific focus on the existing built areas to transform them into PEDs. The research adopts a dynamic PED approach that enables energy exchange with the smart grid, allowing for greater flexibility and efficiency, considering factors such as urban fabric and building typology. In order to maximize cost-effectiveness, various panel coupling options are explored, including photovoltaics (PV), solar water heaters (SWH), and photovoltaic/thermal systems (PVT), based on the available roof and facade areas, aiming to identify the most effective coupling scenario within limited space. The objective is to maximize the benefits of solar energy systems through the proposal of a computational design method that adjusts to varying demand, building surface area, and orientation based on simulation results. The findings

of this study contribute to the understanding and coupling of solar harvesting technologies in PEDs, highlighting their role in mitigating solar radiation variability and ensuring a stable and sustainable energy supply.

Keywords: Positive Energy Districts; Solar Harvesting; Smart Energy Systems; Design Optimization; Net Zero Building Design**09.25 - 09.50****Eser Delice****Supervisor:** İpek Gürsel Dino**Jury:** Koray Pekerçli,
Gülsu Ulukavak Harputlugil**A User-Oriented Performance Metric on Energy Flexibility in Building Clusters, and the Junction Points with Positive Energy Districts (PEDs)**

Buildings account for an important part of the world's total energy consumption, consuming a sizeable percentage of it globally. Studies of net-zero buildings, net-zero districts, positive energy districts, building energy retrofits, and many more; indicate contemporary advancements that deal with this subject. These studies have shed light on several aspects of environmentally and economically sensitive urban development. Net-zero buildings provide substantial value in establishing energy efficiency and reducing the environmental impact of the urban tissue by balancing the energy consumption with on-site renewable energy generation. The notion is further enhanced by net-zero districts and positive energy districts, which encompass entire communities. These systems blend integrated energy systems, demand-side energy management, and renewable energy generation to create sustainable and resilient communities. I aim to do a research study on the energy needs of the Çamlık Neighborhood and will concentrate on the idea of demand-side energy flexibility in my thesis. My goal is to examine how the buildings in the site consume energy and create a system that makes use

of energy flexibility to achieve carbon neutrality, or even positive energy results. In order to create simulation models, deduce alternative retrofit techniques, and compute the best outcomes based on demand-side energy flexibility factors, tools for building energy modeling such as Ladybug, Honeybee, and Ironbug will be used.

Keywords: Energy flexibility, demand-side energy flexibility, positive energy districts, net-zero buildings, net-zero districts, renewable energy generation, building energy simulations**09.50 – 10.15****Yasin Kantaş****Supervisor:** İpek Gürsel Dino**Jury:** Berrin Çakmak,
Gülsu Ulukavak Harputlugil**The Concept of Energy Citizenship for Sustainable Urbanization**

The rising concern over Climate Change draws attention to the clean energy transition. It has been reported that more than 62% of the total anthropogenic greenhouse gasses originate from burning of fossil fuels, while the portion contributed by the transportation sector amounts to 14% (Eickemeier et al., 2014, as cited in Ideris, 2020). Rather than central energy sources and markets, a new system should be implemented which can be described as decentralized. The central energy system causes energy poverty as well as unsustainable energy economy. The paper seeks to build a framework for decentralized energy production. The key element that is discussed is “Energy Communities”. Energy community is a term that considers people as a stakeholder in energy productions process. Rather than taking residents as consumer, a new concept, prosumer, is represented. The act of consuming and producing is gathered in this concept. The concept of prosumer is built upon the term “energy citizenship”. Energy Citizenship is the rule maker in which prosumers find their role in the decentralized market.

To sum up, the paper is focusing on the concepts that arrange the new residential energy production system in which people utilize their living areas as economical and clean platforms in the era to fight against climate change.

Keywords: Energy Citizenship, Energy Poverty, Sustainable Economy, Energy Democracy, Prosumerism, Social Contract, Energy Contract, Climate Contract

10.15 – 10.40
Dilara Güney

Supervisor: İpek Gürsel Dino
Jury: Funda Baş Bütüner,
Talat Özden

Façade to Fork: Computational Design Strategies for Urban Agriculture and Solar Energy Systems in Architecture

The concept of water, energy, and food nexus emphasizes the importance of holistic solutions in securing resources and meeting sustainable demands. Making the most of renewable energy sources, especially photovoltaic energy, and addressing the food safety problem by transforming buildings into agricultural areas will not only affect energy and food sustainability but also will have the power to change the quality of human life with the help of design decisions. At the architectural scale, architects can focus on strategies such as solar energy integration and green building design to optimize energy efficiency and use natural resources more sustainably. To this end, different planes of the urban context are defined, which come together and form an ecosystem with renewable energy sources such as agri-food production and photovoltaic panels which can be approximated by computational design strategies. This research will focus on developing a computational method that will support design decisions in the effective integration of urban agricultural systems, buildings, and solar energy systems.

Keywords: BIPV, solar energy, vegetation, urban agriculture, farm-to-fork, simulation

10.40 – 11.05
Serda Buket Erol

Supervisor: İnci Basa
Jury: Ayşen Savaş,
Gülşah Güleç

An Inquiry into Inclusive Architecture in the Context of Museums / Art Centers: The Case of Cermodern, Ankara

The study investigates inclusivity, defined within this research as the design approach that aims to enable all people, irrespective of their diversity, to have equal opportunities to participate in every aspect of society. This concept is examined within the context of museums and art centers, in order to explore the potential of inclusivity principles to enhance urban cultural sustainability in architectural spaces. While sustainability and inclusivity have received increased attention in architectural design, further advancements in understanding how inclusivity can be effectively implemented in the specific context of museums and art centers are warranted. To address this, the research will center on CerModern, a prominent contemporary art center in Ankara, Turkey, to analyze the relationship between inclusivity and architecture.

The proposal entails conducting a comprehensive case study on CerModern, assessing its architecture, exhibitions, and events to evaluate their promotion or hindrance of inclusiveness critically. The evaluation process will appraise the physical space, cultural representation, and urban cultural sustainability. Through a literature review that draws upon disciplines such as sociology and philosophy, the research aims to develop a theoretical framework for understanding inclusivity within the architectural context of museums and art centers.

The study will employ a research methodology that focuses on mapping the relationships between the museum's actors, spaces, and activities, with particular attention to the impact of design on their interaction with the museum, their sense of belonging and active engagement, and the alignment of physical and spatial elements with their expectations and needs. Various actors of the art center, such as architects, artists, curators, artistic directors, cultural organisations, and universities, will be examined

regarding their roles and contributions to the overall inclusivity. A comprehensive understanding of CerModern's inclusivity will be achieved by examining archival records, observing museum activities and architectural spaces, and engaging in collaborations with the stakeholders.

Keywords: inclusive design, inclusivity, cultural sustainability, art centers

11.05 – 11.30
Cemre Gül Kaya

Supervisor: Ela Alanyalı Aral
Jury: Ali Cengizkan,
F. Cânâ Bilsel

An Approach Towards Ankara's Visual-Spatial Structure

This study aims to explore spatial experiences and visual manifestations of the urban space of Ankara. The spatial-visual structure of contemporary Ankara and how it has evolved over time from the Roman period to the present will be examined by considering characteristics and elements of the spatial-visual structure of cities as well as potential methods and tools to analyze and visualize these characteristics. The visual transformation of the city and its current state will be studied by using GIS- based methods, urban panoramas, silhouettes, photographs, sections, and plans. The research focuses on two human-eye view scales: panoramic and experiential views, considering both stationary and motioned visions. Within this scope, the visual transformation of the city and its current state will be studied in both vertical and horizontal dimensions in order to form the basis of a guideline for future urban design and planning possibilities.

Keywords: Spatial and Visual Structure, Urban Physical Elements, Visual Hierarchy, Visual Experience