The Design and Research Studio INDUSTRY 4.0: SMART URBAN FACTORY focuses on models of the contemporary and future factory environment within an urban environment. Smart factories have been a focus of discussion since 2011 in the developed world as forth industrial revolution. Developing countries have largely missed the first, second and third industrial revolution, but have been inventive in the application and adaptation of new smart technologies. Developing countries, that have been exploited through European colonism and keep in dependency, have especially struggled to establish independent economies. One of these countries is Ghana with its capital Accra (2.3 m inhabitants), which this studio will investigate for potential adoption of the Smart Factory model. Technologies for digital manufacturing become widely available today and allow designers and makers to compete with larger industry producers. The initial investigation focuses on understanding spaces of production as flows of humans and machinery, as production lines with specific requirements and as programmatic entities. Further, we will develop the functional and structural systems of technological envelopes based on the prior analysis. Students will study techniques of vaulting, ribbing, fanning, stacking, layering, coffering, latticing, waffling, lacing, roughening, banding, pleating, bubbling and others to develop a digital structural model. Representation (digital modeling, drawing and physical model making) is deployed as a mode of research.

INDUSTRY 4.0:
The fourth industrial revolution, known as “Industry 4.0”, originates from a 2011 initiative - involving stakeholders from industry, politics, and academia - to increase Germany’s competitiveness in the manufacturing industries through digital integration (cyber-physical systems) into factory processes. The United States followed this approach by creating the non-profit Industrial Internet consortium in 2014 - led by General Electric, AT&T, IBM, and Intel.

The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. The Fourth Industrial Revolution encompasses a range of technologies: Emerging technologies such as the Internet of Things, the cloud, analytics, robotics, 3D printing and artificial intelligence are used for digital transformation. Information flow is the central element in all these technologies.

McKinsey defines Industry 4.0 “as the next phase in the digitization of the manufacturing sector, driven by four disruptions: the astonishing rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human-machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world, such as advanced robotics and 3-D printing.”

PROTOTYPES:
Each student team will study one of the following five prototypes: 3d Printing Motorcycle Factory, Boat Factory, Textile Factory, Robotic Reuse Factory and Agricultural Factory. For each type we will focus on the impact of digital and clean manufacturing as an urban prototype: the factory is no longer banned to the outskirts of the city, but relocated to the city allowing the general public to experience and interact with the production facility. At the same time, we will discuss the extend and appropriateness of developed technologies in its context.