

# INDUSTRIAL DESIGN LAB

RESREACH-DESIGN-INNOVATE

Department of Architecture & Planning, IIT-Roorkee



**Lab Coordinator:**

**Dr. Sonal Atreya**

Ph.D.

Assistant Professor

Department of Architecture & Planning



## Area of Research:

- Architectural Design, Human Factor and Ergonomics
- Industrial Design, Product Innovation and Visual Communication
- Biomechanics, Biomedical Product Design and Assistive Technologies
- Universal Design, Design for Disaster Management



The Industrial Design Lab at the Department of Architecture and Planning has a research group that is uniquely equipped to address significant social concerns, such as access to healthcare for elderly, children, women and the differently abled as well as healthcare planning for smart cities. India is undergoing a demographic health transition, the average life expectancy of an Indian has increased thus India has acquired the tag of "an ageing nation". The rising elderly population in developing countries demands a timely initiative to create age-friendly health environment and identify factors that influence the healing process of the elderly and shorten their recovery period. The healthcare needs of urban population and those of rural areas differ significantly, in part due to distance between health centers and villages, poor infrastructure, water quality, and site-specific disease patterns. Access to quality public healthcare remains a pressing need amongst rural and remote populations of India.

Waste management and transportation are other serious concerns that are an important area of research. Physical infrastructure such as Water supply, sewage and sanitation, solid waste management and transportation services are being burdened with the ever growing population and because of the continuous increase in solid waste generation, its ever-changing composition, mismanagement and poor public attitude, people are directly exposed to health risks, which is a serious concern. 100 cities are declared as Smart cities in India, which are to be planned with smart city's various initiatives dealing with increased quality of life where walkable localities with increased accessibility and mobility for people of different age group, efficient public transport which offers last mile connectivity are some of the areas that need to be explored. It is an urgent need of the hour to make our cities sustainable so that dependence on resources can be decreased.

Although in the 21<sup>st</sup> century, India has provided the world with some great contemporary architectural examples in terms of high tech skyscrapers and planned smart cities but we are equally appreciative of our unique vernacular architecture. Taking illustration of Ladakh, the topography and climate has remained unchanged for many centuries allowing slow adaptation of humans and their dwellings. However, due to harsh climatic change, in the past years including heavy rainfall, these vernacular construction techniques are not performing as they used to, hence appropriate construction technologies for Ladakh need to be designed.

Current Lab research examines the deeper implications of the areas mentioned as well as other interdisciplinary research areas such as Behavioral Science, Ergonomics and Universal Design - identifying significant contemporary problems, instilling critical thinking, critiquing conventional solutions, and challenging conventional ways of learning to arrive at creative solutions, through collaborative team efforts at different levels of society that lead to innovations.

# Lab Equipment Details



Neurological Disorders



Sports Performance



Rehabilitation and Gait



Robotics and Prosthetics



Motor Control

Wearable Sensors For Movement Sciences



Desktop PC – 3



3D Pen



3D printer



Testing Equipment

The aim of the project is to identify interaction between humans and spaces used on a daily basis that may affect the physical functioning and pose a risk of injury due to an awkward posture or the repetitive nature of work and induce work-related stress. By taking into account people's capabilities and limitations, an ergonomically designed space can prove to be effective in fulfilling the functional requirements of users.

## Study of Gait and Circulation Analysis for Workstations and Spaces for Architecture (Ongoing)

**MOTIVATION AND PROBLEM STATEMENT**

Work in an Indian household kitchen imposes high dynamic and static loading on the whole musculoskeletal system. It involves various repetitive parallel tasks like accessing cabinets placed too high or too low that may cause injuries like muscle tear, strain, body pain, etc.

Average time spent per day = 3-4hrs

**Aim of this study is to provide innovative accessible storage**

**METHODOLOGY**

- Literature Study
  - Primary Research
  - Secondary Research
- Live Study
  - Questionnaire
  - Anthropometric Data
  - Videography
- Survey- 15 subjects
- Group housing- 20 flats

**RESULTS AND DISCUSSION**

Sections showing visibility and accessibility-

**When standing:**

- Accessible and visible- 3
- Partially visible- 2 and 4
- Not visible- 1 and 5

**When sitting:**

- Accessible and visible- 4
- Partially visible- 5
- Not visible- 1, 2 and 3

**Therefore, a new storage was designed to make non-accessible space accessible.**

**A pull-down cupboard and its mechanism**

**Preferred type of storage**

**New storage design**

Suggestion included moving the window away from cooking area to avoid direct air flow.

**SUMMARY AND FUTURE OUTLOOK**

- Unusable spaces are now usable.
- Reduced muscle straining and awkward postures.
- Decreased repetitive motion.
- Accessible by all heights and age groups.
- Comfortable to use and well-organised.

**Final Output**

Other possible intervention areas such as adjustable counter top and optimization of space will be further explored for a complete ergonomic kitchen.

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# Researchers Team



**SMITA**

B.Arch , M.Tech (Urban Planning)

PhD Scholar

**Research area:**

- Solid waste management in Tier-II cities.



**SANCHIT JAIN**

B.Arch , M.Arch

PhD Scholar

**Research area:**

- Healthcare planning in smart cities.



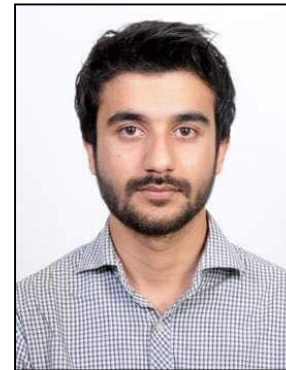
**ASHISH GAUTAM**

B.Arch, M.Arch

PhD Scholar

**Research area:**

- Construction systems for vernacular architecture.



**MD. YASSER ARAFAT**

B.Arch , M.Arch

PhD Scholar

**Research area:**

- Healthcare for elderly