Foundations of Modeling & Fabrication

From Design Intent to Physical Reality

Master's Level Course

Why Modeling & Fabrication Matter

- Design today is computational, material-driven, and production-aware
- Fabrication is no longer an end step 4 it shapes design decisions
- Essential across architecture, product design, engineering & research
- Key idea: Design and making are inseparable.

Modeling: More Than Form

Modeling = representation of form, logic, and behavior

Includes:

- Geometric modeling
- Parametric & rule-based modeling
- Simulation & data-driven models

Models encode design intelligence

Fabrication: Making as Design

Fabrication transforms models into physical artifacts

Involves:

- Materials
- Machines
- Processes

Fabrication is both technical and conceptual

Design-to-Fabrication Continuum

Design

Model

Prototype

Fabricate

Evaluate

- Iterative, not linear
- Feedback at every stage
- Failure = learning tool

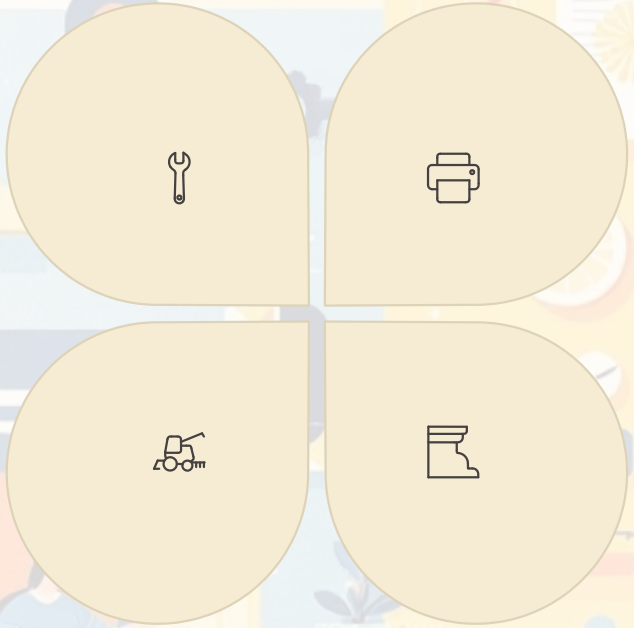
Digital Fabrication Paradigms

Subtractive

removing material

Additive

layer-by-layer construction



Hybrid

combining methods

Formative

shaping via molds & forces

Insight: Fabrication method is a design choice.

Materials & Tolerance

Materials actively influence design outcomes

Real-world fabrication introduces:

- Error
- Deformation
- Tolerance limits

Designers must design for imperfection

Parametric Thinking & Prototyping

Parameters enable variation without redesign

Prototypes act as:

- Research tools
- Assumption tests
- Evidence in design inquiry

Ethics & Sustainability

- Material waste & energy use
- Local vs global production
- Design for reuse, repair & responsibility

> Critical question: Should everything that can be made, be made?

Learning Outcomes

By the end of the course, students:

- Design with fabrication logic
- Understand material behavior
- Use modeling as a research tool
- Translate ideas into buildable systems