

MS-RSD Program: CORE SELECTIVES

MS-RSD students must take at least one (1) Selective Course from each of the program's three focus areas, with a cumulative total of 36 units across all categories. A list of pre-approved Core Selectives is provided below. Students may request that additional courses be counted as selectives with the Track Chair's approval.

The three (3) program *categories* for Core Selective courses are:

● **TOOLS & METHODS: Computation, Analysis & Data Modeling**

Computational Design Computational Theory Robotics & Digital Fabrication Materials and Structure GIS & Urban Systems CS / Programmin Statistics AI/ML

● **ECOLOGICAL IMPACT: Environmental Assessment and Metrics**

Energy Metric Systems Material Systems & LCA Sustainable Engineering Ethics and Decision Making Urban Ecology & Infrastructure Environmental Policy and Economics

● **DESIGN SYNTHESIS: Ecological Design and Sustainable Operations**

Material Systems Simulated Systems Sustainable Operations Design Studio

Curricular offerings are subject to change. Please refer to the [CMU Schedule of Classes](#) for the most up-to-date course listings and descriptions.

Category 1:

TOOLS & METHODS: Computation, Analysis & Data Modeling

1.1. Computational Design

- 48-724 Scripting and Parametric Design (9)
- 48-314/48-614 Computing, Cognition, and Syntax (9)
- 48-568 Advanced CAD, BIM, and 3D Visualization (9)
- 48-606 Shape Grammars and Computational Design (9)
- 12-711 BIM for Engineering, Construction, and Facility Management (12)

1.2. Computational Theory

- 48-727 Inquiry into Computational Design (9)
- 48-619 Machine Intelligence, Cybernetics and Design (9)

1.3. Robotics & Digital Fabrication

- 48-755 Introduction to Architectural Robotics (9)
- 48-531/48-771 Fabricating Customization: Prototype (9)
- 48-745 Design Fabrication (6)

16-375 IDEATe: Robotics for Creative Practice (10)

1.4. Materials and Structure

48-632 Structural Design II: Materials & Analysis (9)

48-682 Advanced Structural Design: Computational Explorations (9)

48-647 Materiality and Construction Systems (9)

1.5. Urban Systems

48-753 Intro to Urban Design Media (6)

48-773 Urban Design Media (9)

48-569 GIS/CAFM (9)

48-781 Geospatial Data Analytics in Infrastructure Planning (9)

94-802 GIS: Geographic Information Systems (12)

1.6. CS / Programming

15-110 Principles of Computing (10)

15-112 Fundamentals of Programming and Computer Science (12)

15-122 Principles of Imperative Computation (10)

15-104 Introduction to Computing for Creative Practice (10)

05-661 Advanced Interaction Design (12)

05-619 Data Visualization (12)

05-839 Interactive Data Science (12)

1.7. Statistics

36-600 Overview of Statistical Learning and Modeling (6)

1.8. AI/ML

10-601 Introduction to Machine Learning (12)

11-663 Machine Learning in Practice (12)

Category 2:

ECOLOGICAL IMPACT: Environmental Assessment and Metrics

2.1. Energy Systems

48-798 HVAC & Power Supply for Low-Carbon Buildings (9)

48-787 LEED, Green Infrastructure and Community Rating (6)

48-752 Zero Energy Housing (9)

48-721 Building Controls and Diagnostics (12)

48-768 Indoor Environmental Quality (IEQ) (12)

2.2. Material Systems & LCA

27-505 Exploration of Everyday Materials (9)

27-406 Sustainable Materials (9)

27-100 Engineering the Materials of the Future (12)

48-763 Protean Systems: Sustainable Solutions for Uncertain

48-615 Experiments in Reuse (6)

12-714 Environmental Life Cycle Assessment (12)

2.3. Sustainable Engineering

12-612 Intro to Sustainable Engineering (6)

12-749 Climate Change Adaptation (6)

12-712 Sustainable Engineering Principles (12)

2.4. Ethics and Decision Making

48-763 Sustainable Design for Uncertain Futures (9-12)

48-725 Real Estate Development (6)

51-400 Transition Design (9)

51-437 The Emerging Ecological Worldview (9)

79-780 Hostile Environments: The Politics of Pollution (9)

80-244 Environmental Ethics (9)

99-783 Technology, Humanity, and Social Justice (3)

2.5. Urban Ecology and Infrastructure

48-713 MUD Urban Ecology (9)

48-657 Infrastructural Landscapes I: Design Histories (3)

48-659 Infrastructural Landscapes II: Design Futures (3)

2.6. Environmental Policy and Economics

73-427 Sustainability, Energy, and Environmental Economics (9)

90-443 Urban and Regional Economic Development (12)

90-798 Systems Analysis: Environmental Policy (12)

90-789 Resilient & Sustainable Communities (12)

48-380 Constructing Value(s): Economies of Design (6)

45-960 Sustainable Operations (6)

45-928 Energy Finance (6)

Category 3:

DESIGN SYNTHESIS: Ecological Design and Sustainable Operations

3.1. Material Systems

62-715 Shaping Environments: Geometry and Matter (12)

09-227 The Culture of Color: Dyes, Chemistry, and Sustainability (9)

48-698 Material Regeneration (9)

3.2. Simulated Systems

48-692 Shaping Daylight Through Simulation (9)

51-861 HyperSENSE: Augmenting Human Experience in Environments (12)

48-675 Designing for the Internet of Things (6)

48-676 Connected Communities: Technology and Participation (6)

3.3. Design Studio

48-XXX ASO STUDIO (Seminar): Ecological design-research focus (9-18) *

*Pending availability and advisor approval

3.4. Sustainable Operations

90-843 Development Financial Tools Sustainable Economic (3)

CMU Academic Departments' Codes:

48-XXX Architecture

09-XXX Department of Chemistry (Mellon College of Science)

12-XXX Department of Civil & Environmental Engineering (CEE, College of Engineering)

16-XXX Robotics

94-XXX Heinz College of Information Systems & Public Policy

15-XXX School of Computer Science (SCS - includes CS core courses)

05-XXX Human-Computer Interaction Institute (HCII, SCS)

36-XXX Department of Statistics & Data Science (Dietrich College)

10-XXX Machine Learning Department (SCS)

11-XXX Language Technologies Institute (SCS)

45-XXX Department of Social & Decision Sciences (Dietrich College)

51-XXX School of Design (College of Fine Arts)

62-XXX Engineering Studies and Art

73-XXX Tepper School of Business – Economics

79-XXX Department of History (Dietrich College)

80-XXX Department of Philosophy (Dietrich College)

90-XXX Heinz College – Public Policy & Management

99-XXX Interdisciplinary or University-wide courses (such as first-year experience, study abroad, etc.)