

ISE Lab

Interdisciplinary Science and Engineering Lab

UNIVERSITY OF DELAWARE

AYERS
SAINT
GROSS



“ISE Lab is, indeed, the temple of our future, where the university’s pioneering research will find a home built on the foundation of openness and collaboration: where new discoveries will redraw the boundaries of human knowledge, and new innovations will help us harness it: where young talent will be developed and deployed to solve the problems that challenge us locally and globally: where students will see everyday the enormous power of putting science to work.”

PATRICK T HARKER, PRESIDENT UNIVERSITY OF DELAWARE, 2013

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Introduction

Interdisciplinary Science and Engineering Building

The University of Delaware is admired for its distinguished science and engineering teaching and research programs. Over its long tenure in producing some of the most remarkable scientists and researchers, the university has embarked on a revolutionary change to better prepare its students and researchers for meeting today's ever changing needs. This transformation is manifest in a new facility, Interdisciplinary Science and Engineering lab (ISE), whose purpose is twofold: to enhance the learning and discovery experience for its students through a new interdisciplinary curriculum, and to provide state of the art research space for the institutes of Energy and the Environment.

Unrestrained by the conventional silos of the core science disciplines, the framework for the new interdisciplinary curriculum uses the collaborative Problem Based Learning (PBL) format in conjunction with highly flexible instructional labs. These new technology-rich lab-PBL classroom module formed the underpinning of the new interdisciplinary curriculum and informed the layout of the building.

In a similar manner, the building provides a home for the two research institutes (Energy and the Environment). Space is provided for the institutes to conduct research and includes open/ collaborative labs, lab support, and administrative and office space. These spaces are supported by core facilities that provide the university much needed resources and include a Class 100 Clean Room, advanced materials characterization, synthesis and an imaging suite.

Together, the teaching and research vision of openness and collaboration for the ISB will provide students and researchers state-of-the-art facilities to educate and prepare tomorrow's leaders.



Programming

An Interdisciplinary Curriculum

Programming for the ISE lab considered several successful pedagogical models for the delivery of Problem- Based science education developed and refined at the university. The structure for the new interdisciplinary curriculum utilizes the PBL format classrooms in conjunction with highly flexible instructional labs. This new technology- rich learning environment of a PBL classroom- lab module formed the foundation of the new interdisciplinary curriculum. This arrangement of labs and classrooms offers the university limitless flexibility and adaptability to accommodate future curriculum growth and refinement

Technology is incorporated into the classrooms in two different paradigms: Collaborative groups of six with adjacent flat panel display, and movable chairs easily configured into lecture or collaborative group work. Supporting technology of 3-D projection, distributed monitors, etc. varies to support these two paradigms of PBL learning.

The perimeter walls in the PBL classroom are 'writable' allowing students creative freedom to problem solve in a collaborative learning environment. Arrays of flat panel monitors and glass panels visually connecting the PBL classroom to the lab provide a measure of safe monitoring of lab procedures.

In lieu of traditional lab-lecture-discussion format, students in this new curriculum meet once a day for two hours five days a week to fulfill the weekly requisite contact hours. This distribution of class time engages the students with science discovery in the ISB on a daily basis, and the building becomes a meaningful part of the student's everyday campus life. As a result, the building has a high daily traffic and high utilization throughout the week.



Rendering of clean room

Project Principles

ACADEMIC & STUDENTS

- Teaching lab space for the undergraduate programs of Biology, Physics, Chemistry and Engineering that energizes the learning of the sciences
- Improve the delivery of the science education enabling a richer, fuller experience
- Cultivate and enhance students' experience in the art of science discovery
- Encourage and stimulate excitement curiosity and wonder in the sciences and stewardship of the natural environment
- Showcase modern science education
- Destination point for students and the campus community including faculty
- Flexible lab spaces that can adapt to changing Pedagogies
- Adaptable arrangement of spaces that respects traditional disciplinary boundaries while vigorously exploring interdisciplinary curricular opportunities
- Student oriented spaces that encourage dialog and exchange of ideas and experiences



Flexible Classroom

SUSTAINABILITY

- Consistent with sustainable planning principles outlined in the Capacity Plan
- Use proven building technologies in lieu of experimental technologies
- Life Cycle cost payback to occur in a reasonable time frame (7- 10 yrs)
- Technologies to be functionally and operationally appropriate
- Utilizing best 'green' practices (not seeking LEED certification)
- Visibility of sustainable measures

FUNCTION & PERFORMANCE

- Build a building that is durable and adaptable 'wear nicely' over the years
- Not over designed but has what's needed- designed to freely adapt and adjust to future needs
- Providing space for infrastructure capacity (expansion/ replacement)
- Adaptable to future science or non-science programs
- Robust mechanical systems

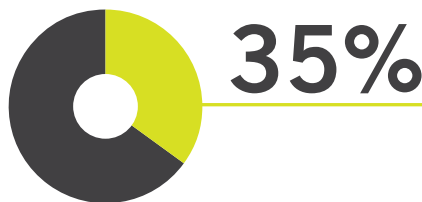
AESTHETICS

- Acknowledge context while respecting institutional need and look to the future
- Create an image that evokes excitement and passion for science learning
- An image that is commensurate with the institutions commitment to excellence in the sciences
- Learning hub/ gathering space



Space Allocation

TEACHING & LEARNING



- (4) 48 seat SCALE UP/ PBL Active Learning Classrooms
- (8) 24 seat Instructional Labs
- (9) 40 seat General Purpose Classrooms
- (2) 30 seat SCALE UP/ PBL Active Learning Registrar Classrooms
- Lab Support & Prep spaces
- Interdisciplinary Faculty space

RESEARCH INSTITUTES



- Institute Research Labs (open)
- Institute Offices (Energy, Environment)
- Office spaces (Principal Investigators, Post Docs & Graduate students)

20%

Core Facilities -
Campus Resources

15%

Building
Shared Facilities

- Imaging & Microscopy Suite
- Clean Room (class 1,000, 100)
- Synthesis Lab
- Advanced Material Characterization Suite
- Commons & Food Service
- Social spaces; Group Study, Crash and Private
- Conference & Seminar Rooms
- Loading & Receiving



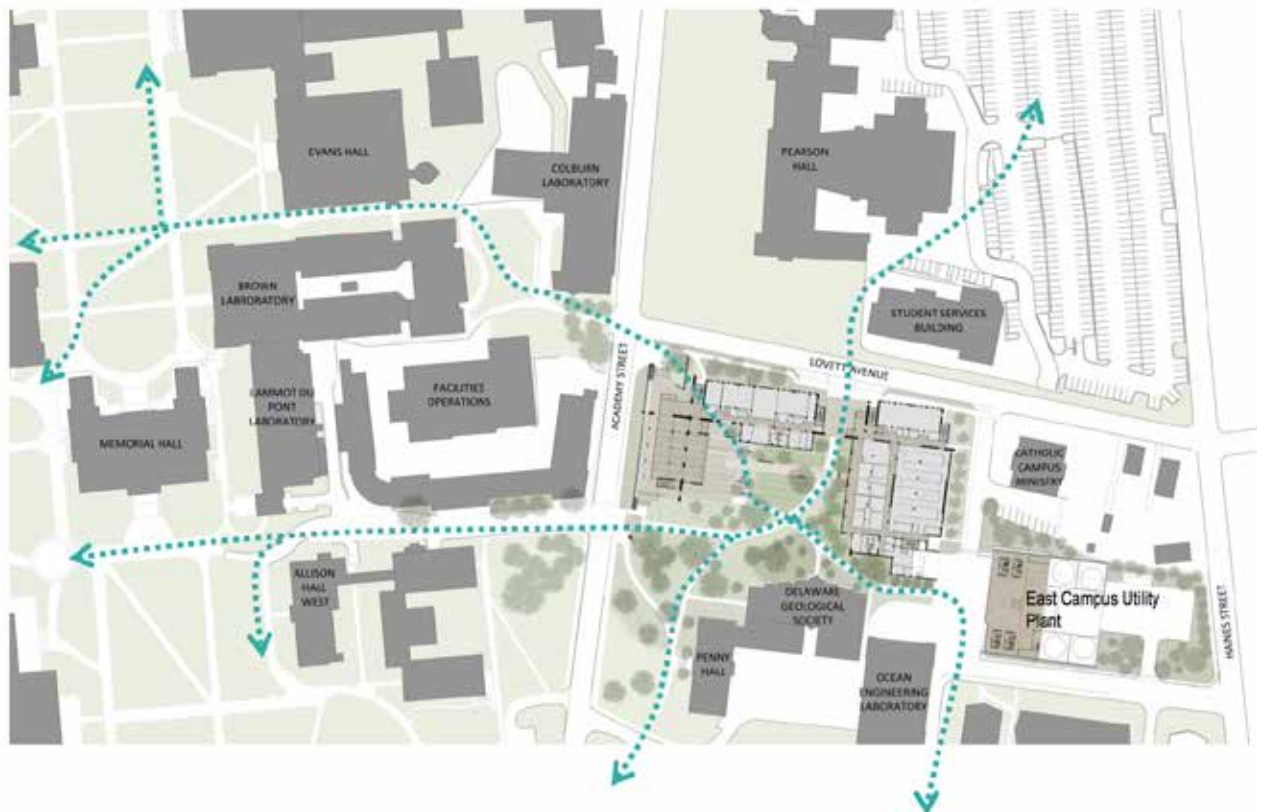
Connectivity

The project site is located east of the main campus green and adjacent to the existing science and engineering teaching and research buildings. Strategically located between the main campus green and student housing (2,000 beds) to the southeast, the building is organized to capture the flow of student traffic between these two points, while becoming a campus wide destination.

By anchoring the southern boundary of science and engineering precinct, it is anticipated that over time, new science and engineering growth will occur to the north of the project site.

AN ARCHITECTURAL COMPLEMENT

A Utility plant (also designed by Ayers Saint Gross) was constructed to provide the necessary utilities to the new building and to redundant adequate steam and chilled water capacity to the campus loop. It also acts as an instructional tool for engineering students.





The Site

The layout of the building joins instructional space from research space and promotes pedestrian flow in and around the building, allowing potential for connectivity to future science and engineering buildings. The clarity in circulation patterns and organization of important spaces creates a memorable and easily navigable way to move throughout the building. The introduction of natural light and 'vision' windows provide connection with the outside, visual relief, and awareness of where one is within the building.

The service drive to the east allows service to the ISE lab and the new utility plant.



An Outward Expression

Contributing to a Vibrant Streetscape



The building is designed to contribute to a vibrant streetscape and pedestrian realm facilitating movement to and through the site connecting the main campus core to the developing east campus. The buildings outward expression uses materials and fenestration patterns to connect it to older campus buildings while other materials express the exploration of modern science and transparency. Strategically located to capture movement through the site, the commons is a campus-wide destination for students, faculty and staff to congregate, collaborate, and study.

The building forms a 'U' shape, framing a south facing plaza. This plaza provides exterior gathering space for students and formal events. Stormwater management is visibly expressed through the buildings green roofs, runnels, pre-treatment planters, and bio-retention plantings.



Floor Plans

First Floor



FIRST FLOOR

The main entry level contains the most public and vibrant spaces in the building - the commons. Strategically positioned to intercept the flow of students flowing east to west across campus, the commons is a multi-height space furnished to encourage study, relaxation, and socialization. Functioning as a destination on campus, the commons provides space for students, faculty and researchers to come together in a stimulating collegiate atmosphere. As typical on all floors, the PBL collaborative classroom is flanked by and connected to instructional labs, creating a contiguous instructional lab. To support learning outside the classroom, an informal study area is provided opposite the entry to the classroom. This space is outfitted with identical furnishings and technology as the PBL.

The research wing has its own entry and access to the institute offices, in effect, functioning as its own building. On the first floor, the core facilities of the Clean Room, imaging, and materials characterization are located on this level for access, vibration and EMI control.

INSTRUCTIONAL

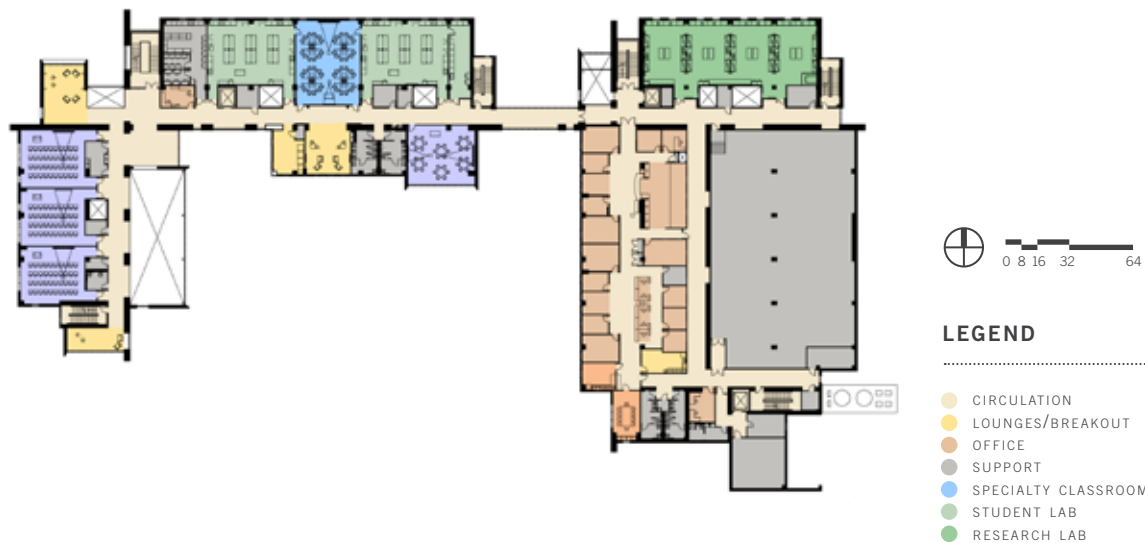
- ONE SCALE UP/PBL COLLABORATIVE LAB
- CLASSROOM (48 STUDENTS) 1,500 SF
- TWO INSTRUCTIONAL LABS 1,500 SF EACH
- ONE INFORMAL STUDY SPACE 670 SF
- TWO LAB PREP ROOMS 1,166 SF TOTAL

RESEARCH (CORE FACILITIES)

- ONE ADVANCED MATERIALS CHARACTERIZATION SUITE 2,900 SF
- ONE IMAGING PREP LAB 1,150 SF EACH
- EIGHT IMAGING ROOMS
- ONE CLEAN ROOM 7,775 SF
- PROCESSING CLEAN BAY (CLASS 1,000) 775 SF
- ETCHING CLEAN BAY (CLASS 1,000) 775 SF
- DEPOSITION CLEAN BAY (CLASS 100) 775 SF
- LITHOGRAPHY CLEAN BAY (CLASS 100) 775 SF
- CLEAN ROOM SUPPORT: TOOL GAS DISPENSING ROOM, GOWNING, AIRLOCKS, LOCKERS, OFFICES, ETC. 1,325 SF

Floor Plans

Second Floor



SECOND FLOOR

The second floor of the ISE Lab is the first of three floors physically connecting the instructional and research wings with the intention of making research more visible to the students. The PBL/lab ‘grouping’ is replicated and is augmented with registrar classrooms, intended to schedule non- science/engineering students into the building to enhance the students exposure to science and to encourage exploring interdisciplinary opportunities. Different types of informal study areas are provided for collaboration, socialization, and private (quiet) study. The main administrative offices for the two institutes (Energy and the Environment) are located on this level, along with the synthesis lab.

INSTRUCTIONAL

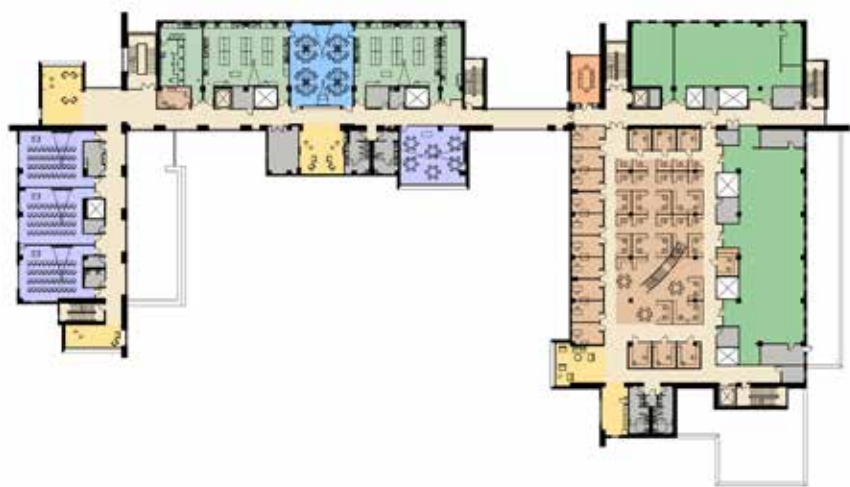
- THREE GENERAL PURPOSE CLASSROOMS (40 STUDENTS) 1,000 SF EACH
- ONE SCALE UP/PBL COLLABORATIVE LAB CLASSROOM (48 STUDENTS) 1,500 SF
- TWO INSTRUCTIONAL LABS 1,500 SF EACH
- THREE INFORMAL STUDY AREAS TOTALING 1,500 SF

RESEARCH

- ONE SYNTHESIS SUITE (CORE FACILITY) 2,940 SF
- INSTITUTE OFFICE SUITE FOR ENVIRONMENT & ENERGY 6,650 SF
- TWO CONFERENCE ROOMS 550 SF EACH

Floor Plans

Third Floor



LEGEND

- CIRCULATION
- LOUNGES/BREAKOUT
- OFFICE
- SUPPORT
- SPECIALTY CLASSROOM
- STUDENT LAB
- RESEARCH LAB

THIRD FLOOR

The instructional wing of the third floor is a replication of the second floor. The research wing is the first full level of open research labs, offices for PI’s and Post docs, and cubicles for graduate assistants. To create a unified research community, an open communicating stair with clerestory lighting is centrally located to promote interaction between floors and research groups.

INSTRUCTIONAL

THREE GENERAL PURPOSE CLASSROOMS (40 STUDENTS) 1,000 SF EACH
 ONE SCALE UP/PBL COLLABORATIVE LAB CLASSROOM (48 STUDENTS) 1,500 SF
 ONE SCALE UP/PBL COLLABORATIVE CLASSROOM (30 STUDENTS) 940 SF
 TWO INSTRUCTIONAL LABS 1,500 SF EACH
 THREE INFORMAL STUDY ROOMS TOTALING 1,500 SF

RESEARCH

THREE OPEN RESEARCH LABS 6,475 SF
 TEN PI OFFICES, (7) POST DOCS, AND OPEN WORK AREA (40) GA’S- 7,385 SF
 RESEARCH COMMONS 820 SF
 WORK AREA, KITCHEN/ BREAK ROOM

Floor Plans

Fourth Floor



- LEGEND**
-
- CIRCULATION
 - LOUNGES/BREAKOUT
 - OFFICE
 - SUPPORT
 - SPECIALTY CLASSROOM
 - STUDENT LAB
 - RESEARCH LAB

FOURTH FLOOR

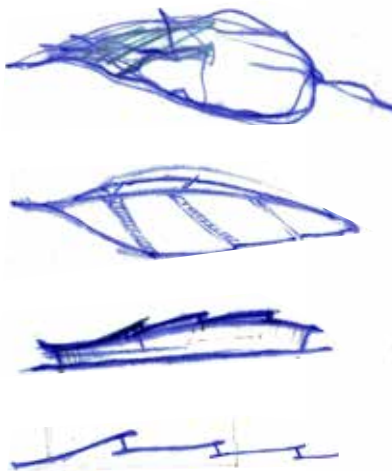
In addition to the fourth PBL/lab grouping and informal gathering spaces, the fourth floor houses office space for the new interdisciplinary faculty, preceptors, and graduate assistants. The research wing is organized similarly to the third floor, interconnected through the communicating stair and the two- story commons.

- INSTRUCTIONAL**
-
- ONE SCALE UP/PBL COLLABORATIVE LAB CLASSROOM (48 STUDENTS) 1,500 SF
 - TWO INSTRUCTIONAL LABS 1,500 SF EACH
 - ONE SCALE UP/PBL COLLABORATIVE CLASSROOM (30 STUDENTS) 940 SF
 - THREE INFORMAL STUDY ROOMS TOTALING 1,500 SF
 - FACULTY/PRECEPTOR OFFICES, INSTRUCTIONAL SUPPORT

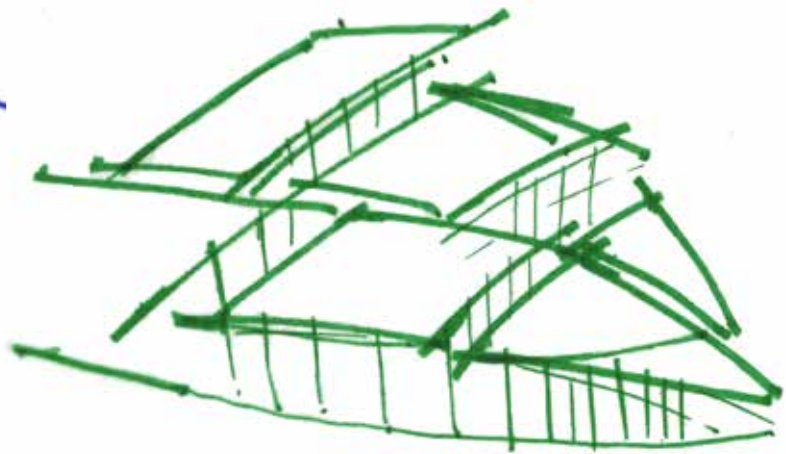
- RESEARCH**
-
- THREE OPEN RESEARCH LABS 6,270 SF
 - SEVEN (7) PI OFFICES, POST DOCS, AND OPEN WORK AREA GA'S- 7,385 SF
 - CONFERENCE ROOM 550 SF
 - WORK AREA, KITCHEN/ BREAK ROOM

The Leaf

The two institutes in this building focus on energy and the environment, both looking to nature for inspiration and ideas.



EARLY SKETCHES



MASSING SKETCH



RENDERING



CONSTRUCTION PHOTO



FINISHED STAIR

The post doctorate and graduate student work area on the 3rd and 4th floors of the research wing occupies the center of a large floor plate. Opportunities for views out and direct sun light in this space are limited. Centrally located, this area permits students and principal investigators to quickly access their labs and each other horizontally and vertically. The interdisciplinary spirit of the research environment demanded the space celebrate the collaboration and foster the synthesis of ideas between principal investigators, post docs and graduate assistants.

The design solution evolved into a double height space capped by a light monitor with a gently curved stair linking the 3rd and 4th floor research neighborhoods. The monitor allows sunlight to flood the interior while the stair provides an elegant link from floor to floor. The form of the space and monitor is based on the leaf form. This form is meant to reflect the research occurring in the building for the institutes of Energy and the Environment. Thus the 'leaf' symbolically reflects the transformation of energy as carried out by plants through the process of photosynthesis. To further amplify the idea, photovoltaic panels are placed on top of the clerestory roof, and provide power to the building.







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Facilities Design
Landscape Architecture: Ayers Saint Gross
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EMI Shielding:
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