The Edgerton Center specializes in experiential learning and offers many interactive subjects in electronics, high-speed photography, and video production. The center is also the home of D-Lab classes (see EC.700–EC.799).

**SEMINARS**

**EC.050 Recreate Experiments from History: Inform the Future from the Past**  
(Subject meets with EC.090)  
Prereq: None  
U (Fall, IAP, Spring)  
1-3-2 [P/D/F]

Provides perspective for thinking about the future through the study of historical physical science and historically significant experiments.  

**EC.074 The Start-up Experience at MIT**  
Prereq: None  
U (Fall)  
2-0-4 [P/D/F]

Explores some of the critical actions in starting up a technology-based business, including concept generation, searching prior art and patents, protecting intellectual property, founders agreements, forming and building teams, and work-life balance. Students review case studies and complete exercises that develop practicable knowledge in these areas. Each student keeps an "idea log book," which includes critical assessments of each case study, to be presented at the end of the term. First in a two-part series (seminars do not have to be taken sequentially; see EC.075 in spring term). Preference to undergraduates; open to graduate students with permission of advisor.  

**J. Hadzima**

**EC.075 Starting Up New Technology-Based Business Enterprises at MIT**  
Prereq: None  
U (Spring)  
2-0-4 [P/D/F]

Seminar participants define and study the development stages of new enterprises at MIT, from the exciting moment a new idea for a tech product or service is realized, through to selling, customer support, and the next new idea. Follows the history of successful MIT spin-off companies with attention to the people (and their ideas) behind the start-up. Students attend MIT technology and science start-up case presentations given by individuals and teams working from zero-stage, and by partners in going concerns of historical relevance to the Institute and the economy. Second in a two-part series (seminars do not have to be taken sequentially; see EC.074 in fall term).  

**J. G. Hadzima**

**EC.090 Recreate Experiments from History: Inform the Future from the Past**  
(Subject meets with EC.050)  
Prereq: None  
G (Fall, IAP, Spring)  
1-3-2

Provides perspective for thinking about the future through the study of historical physical science and historically significant experiments.  

**EC.100 Electronics Fabrication and Design I**  
Prereq: None  
U (Fall, Spring; first half of term)  
0-3-0 [P/D/F]

Explores the science and art of building electronic devices. Using soldering techniques, each student builds the circuit board for a power supply from a kit, and installs the circuit into a case. In the process, students decide what connectors are required, where to place them, and how to incorporate a meter to measure the output voltage. No previous electronics experience necessary. Limited to 10.  

**A. Caloggero**

**EC.101 Electronics Fabrication and Design II**  
Prereq: None  
U (Fall, Spring; second half of term)  
0-3-0 [P/D/F]

Covers printed circuit board (PCB) technologies that enabled the electronics revolution. Explores techniques for making circuit boards using computer-based design tools. Each student designs and fabricates a PCB, and has the opportunity to build it into useful circuits. No previous electronics experience necessary. Limited to 10.  

**A. Caloggero**

**EC.110J Introduction to Digital Electronics**  
(Same subject as 6.072j)  
Prereq: None  
U (Fall, IAP, Spring)  
0-3-3 [P/D/F]

Design your own circuits for times when off-the-shelf solutions are not available. Seminar begins with assembly of a utility board. Weekly labs cover digital logic gates, memory elements, and finite-state machine design. Seminar concludes with a team-based design project. Preference given to freshmen. Maximum of 10 students per term, lottery at the first class session if oversubscribed.  

**J. Bales**
EC.120J Electronics Project Laboratory (Same subject as 6.070J)
Prereq: None
U (Fall, Spring) 2-2-2
See description under subject 6.070J.
J. Boales

EC.130 Introduction to Microcontrollers
Prereq: None
U (Spring; first half of term) 2-2-2
Introduces design and implementation of practical microcontroller systems. Emphasizes practical application to outside projects. Covers the essentials of microcontrollers, e.g., inputs and outputs, analog/digital conversion, programming, closed-loop control, and serial communication. Includes weekly assigned projects and concludes with a project of the student's design. No previous electrical or programming experience required. Limited to 10.
S. Banzaert

IMAGING AND VISUALIZATION

EC.210 Visualization for Mathematics, Science, and Technology Education
Prereq: None
U (Spring) 3-2-7
Introduces principles and techniques for visual communication of educational concepts in mathematics, the natural sciences, and engineering. Students complete interactive assignments and class activities in visual arts media, such as photography, illustration, stop-motion and computer animation, and web graphics. A final project in a visual arts medium of the student's choice must meet professional aesthetic standards for visualization; it must also be applicable for teaching and learning concepts in mathematics, science, or engineering in a formal or informal setting. Coursework requires use of production equipment (e.g., photo and video cameras) and software tools (Adobe Creative Suite, Final Cut Studio, and Maya) at the New Media Center. Limited to 18.
V. Ivanova

MEDIA AND PRODUCTION

EC.305 Digital and Darkroom Imaging
Prereq: None
U (Fall) 2-0-4 [P/D/F]
Credit cannot also be received for EC.310
Students use both film and digital photography to develop a creative imaging project of their own choice. Develops skills in the use of image editing software to enhance, select, and combine images that the student has taken. Uses the darkroom to develop film for scanning and for chemical enlargement. Discusses topics such as the camera, composition, lighting, modes and formats, image compression, and halftone and dye sublimation printing. Students are expected to produce a duplicate set of black and white and/or color prints, along with a writeup and digital copy as the project output.
T. Mislick

EC.310 Creative Imaging
Prereq: None
U (Spring) 2-1-6 HASS-E
Credit cannot also be received for EC.305, EC.A305
Focuses on film and digital photography. Develops skill in the use of chemical darkrooms, scanners, digital printers and cameras to create striking still images capable of evoking strong emotional and intellectual responses from a viewer. Emphasizes the interplay between classical chemical and digital techniques and how they can be used to control the use of lighting, color, depth, and composition in an image. Students present their intermediate assignments to the class for critical discussion; at the end of the term, they submit a substantive project presenting their own creative images for critique and evaluation.
T. Mislick, J. K. Vandiver

ENGINEERING AND DESIGN

EC.430 Advanced Toy Product Design
Prereq: 2.00B or permission of instructor
U (Fall, Spring) 3-5-1
A continuation of 2.00B that provides students with an opportunity for design projects in areas of entertainment and play, as well as opportunities in creative product design and community service. Students further develop ideas for new toys that serve clients in the community, and work independently with local sponsors and with experienced mentors on a themed toy design project. Provides opportunity for students to demonstrate creativity and obtain experience in advanced aspects of the product development process and experience advanced aspects of the product development process, including design aesthetics, detailed design, prototyping, user testing, and design for manufacture. Includes written, visual, and oral communication.
A. B. Smith

CULTURE AND INTERNATIONAL EXPERIENCE

EC.600 Developing Delhi
Prereq: None
U (Fall) Not offered regularly; consult department 2-0-4 [P/D/F]
Explores the planning, monuments, and architectural history of Delhi using maps, city planning documents, readings, films, and slides as resources. Fosters a general understanding of cities and urban form through site visits to Boston and Cambridge, as well as by each student leading a discussion and presenting on a city that they know well. Upon successful completion of the seminar, students are eligible to participate in an optional travel experience to India during IAP for an additional fee; financial assistance available based on need. Meets with EC.A600 (freshman advising seminar).
D. Nijhawan

D-LAB

EC.700 D-Lab: Field Study
Prereq: One D-Lab subject, permission of instructor
U (IAP) Units arranged
Can be repeated for credit
Provides the opportunity to gain direct fieldwork experience in a global context. Subject spans three-four weeks in which students continue work from a prior D-Lab subject. Students work directly with international community partners to find solutions to real world problems, focusing on one or more issues in education, design, or public service. Group presentations and written reflection required.
A. B. Smith
EC.701J D-Lab: Development
(Same subject as 11.025J)
(Subject meets with 11.472J, EC.781J)
Prereq: None
U (Fall)
3-2-7 HASS-S

Issues in international development, appropriate technology and project implementation addressed through lectures, case studies, guest speakers and laboratory exercises. Students form project teams to partner with community organizations in developing countries, and formulate plans for an optional IAP site visit. (Previous field sites include Ghana, Brazil, Honduras and India.) Recitation sections focus on specific project implementation, and include cultural, social, political, environmental and economic overviews of the target countries as well as an introduction to the local languages. Enrollment limited by lottery; must attend first class session.

A. B. Smith, B. Sanyal

EC.702J Cross-Cultural Investigations: Technology and Development
(Same subject as 21A.801J, STS.071J)
(Subject meets with EC.792J, 21A.839J, STS.481J)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: U (Fall)
3-0-9 HASS-S

See description under subject 21A.801J.

C. Walley

EC.710 D-Lab: Health Technologies for the Developing World
Prereq: Permission of instructor
U (Spring)
3-0-6

Provides a multi-disciplinary approach to global health technology design through lectures and a major team project based on fieldwork, which involves partnering with community health professionals in Nicaragua. Explores the current state of global health challenges and teaches students how to design medical technologies that address those problems using interactive laboratory modules. Culminates in the creation of a product design solution to address the challenges observed in the field. Travel to Nicaragua during spring break includes additional fee; consult instructor for details. Students may be able to arrange summer research opportunities based on coursework experience. Enrollment limited.

J. Gomez-Marquez

EC.711 D-Lab: Energy
(Subject meets with EC.791)
Prereq: None
U (Spring)
3-3-6

Provides a project-based approach that engages students in understanding and addressing the applications of alternative energy technology in developing countries. Focuses on compact, robust, low-cost systems for generating electrical power. Includes projects such as micro-hydro, solar, or wind turbine generators along with theoretical analysis, design, prototype construction, evaluation and implementation. Students will have the opportunity for an optional spring break site visit to identify and implement projects. Students taking graduate version complete additional assignments. Enrollment limited by lottery; must attend first class session.

EC.712 D-Lab: Information and Communication Technologies for Development (ICT)
(Subject meets with EC.782)
Prereq: None
U (Fall)
2-2-8

Explores the use of information and communication technologies (ICT) to address specific needs in developing countries. Establishes knowledge and engineering skills needed to successfully deploy an ICT project, with a focus on appropriateness, transferability, and long-term sustainability. The first half of term presents an introduction to communication hardware, including antenna design, RFID, Bluetooth, Wi-Fi, and low-power sensors. Second half covers development of mobile phone applications and server communications, as well as system architecture for data collection and mapping. Students work in multidisciplinary teams, collaborating with local community partners. Culminates in a final project to be deployed in the field. Students taking graduate version complete additional assignment related to the term project.

R. Fletcher, A. Smith

EC.713 J D-Lab Schools: Building Technology Laboratory
(Same subject as 4.411J)
Prereq: Physics I (GIR), Calculus I (GIR)
U (Fall)
2-3-7 Institute LAB

See description under subject 4.411J.

L. K. Norford

EC.714 D-Lab: Biodiversity
Prereq: None
U (Spring)
2-2-5

Multidisciplinary exploration of the dynamic nexus between global biodiversity and human well-being. Includes guest lectures and experiential activities and projects. Covers topics such as reforestation, nutrient cycles, poaching, complexity, climate change, fair trade, ecotourism, and governance. Provides opportunities to develop and practice skills in cross-cultural engagement, negotiation, ecological measurement, permaculture, and sustainable technology design. Students collaborate remotely with community partners on projects in which they identify community concerns and design potential solutions. Opportunities for summer travel to partner communities. Enrollment limited by lottery; must attend first class session.

A. B. Smith, J. Huang, A. Phillips, E. Reynolds

EC.715 D-Lab: Disseminating Water/Environment, Sanitation, and Hygiene Innovations for the Common Good
(Subject meets with 11.474)
Prereq: None
U (Spring)
3-0-6

Focuses on disseminating Water, Sanitation and Hygiene (WASH) or water/environment innovations in developing countries and underserved communities worldwide. Structured around field-based learning, case studies, lectures and videos in which teams propose an idea and are mentored through the process of bringing that innovation to fruition. Emphasizes core WASH and water/environment principles, culture-specific solutions, tools for start-ups, appropriate and sustainable technologies, behavior change, social marketing, building partnerships, and the theory and practice of innovation diffusion. Term project entails entering the IDEAS or other competition(s) while implementing a WASH or water/environment innovation in a specific locale. Guest lectures on specific real-world WASH and water/environment projects which have been disseminated by MIT faculty, students, alumni, and others. Students taking graduate version complete additional assignments. Limited to 30.

S. E. Murcott
The text contains course descriptions from a university catalog. Here is a summary of the courses mentioned:

- **EC.716 D-Lab: Waste**
  - Prereq: None
  - U (Fall)
  - 3-2-4
  - Provides a multidisciplinary approach to managing waste in low- and middle-income countries with strategies that diminish greenhouse gas emissions and provide enterprise opportunities for marginalized populations. Studies waste management strategies in cities in Africa, India, and Latin America; examines case studies of collection, recycling, and waste-to-energy businesses developed in low-income settings; and researches public policy that supports sustainable, integrated, solid waste management systems. Student teams develop waste management strategies that culminate in a two-week IAP trip to Nicaragua where students will work with a local NGO and the municipality to assist in the implementation of waste management initiatives. Includes guest speakers and field trips. Students taking graduate version complete additional assignments.
  - E. McDonald

- **EC.717 D-Lab: Education**
  - Prereq: None
  - U (Spring)
  - 4-0-8
  - Explores education in the international development context and how modern best practices can be applied to overcome challenges, such as limited resources, language barriers, large class sizes, and entrenched pedagogy. Through an overview of core teaching skills emphasizing experiential and project-based learning, provides the necessary background to nurture creativity in youth and develop interactive lessons around science, technology, engineering, and math. Students draft and deliver lessons, receive feedback from peers and mentors, and then practice teaching in local Boston-area schools. Opportunity to teach abroad over summer. Limited to 20.
  - A. B. Smith

- **EC.720 D-Lab: Design**
  - (Same subject as 2.722)
  - Prereq: 2.670 or permission of instructor
  - U (Spring)
  - 3-0-9
  - Addresses problems faced by underserved communities with a focus on design, experimentation, and prototyping processes. Particular attention placed on constraints faced when designing for developing countries. Multidisciplinary teams work on long-term projects in collaboration with community partners, field practitioners, and experts in relevant fields.

- **EC.721 Wheelchair Design in Developing Countries**
  - Prereq: None
  - U (Spring)
  - 2-2-5
  - Improve wheelchair technology in developing countries by applying sound engineering practices to create appropriate devices. Lectures focus on wheelchair usage, social stigmas, and manufacturing constraints. Includes lectures by third-world community partners, US wheelchair organizations, and MIT faculty. Multidisciplinary student teams conduct term-long wheelchair projects relating to hardware design, manufacturing optimization, biomechanics modeling, and business plan development. Funded opportunities are available for travel to implement class projects at wheelchair workshops in the field.
  - A. B. Smith, M. Bollini

- **EC.722 Prosthetics for the Developing World**
  - Prereq: None
  - U (Spring)
  - 2-2-5
  - Introduces the fundamentals of human walking. Provides an overview of different types of gait disabilities and the available technologies that address them. Presents patient perspective as well as current areas of research. Topics focus on lower-limb disabilities, such as polio and above- and below-knee amputation. Covers both developed and developing world techniques for overcoming these disabilities. Includes a term project in which teams of 3 to 5 students manufacture a prototype. Teams meet outside of class and work with a TA (project mentor) to research, design, prototype, and test a solution. Projects focus on low-cost orthotic and prosthetic knee designs for the developing world, as specified by partner organizations in India and Guatemala.
  - A. B. Smith

- **EC.723 D-Lab: Cycle Ventures**
  - Prereq: None
  - Acad Year 2014–2015: Not offered
  - Acad Year 2015–2016: U (Fall)
  - 1-2-3 [P/D/F]
  - Explores bicycle technology as a way to provide human power for an array of purposes in underserved communities. Presents an historical perspective on bicycle technology via lectures, guest speakers, and laboratory exercises. Students work as a group on a joint design and fabrication project; they then form project teams to take on design challenges from community organizations that work with bicycle-based technologies around the world. Optional January travel to partner communities. Limited to 16.
  - G. Jones

- **EC.729 D-Lab: Design for Scale**
  - Prereq: EC.720 or permission of instructor
  - U (Fall)
  - 3-2-7
  - Focuses on product development of technologies for people in less industrialized markets. Students work in interdisciplinary teams to develop previously established prototypes or technologies towards manufacturing-ready product designs. Topics are presented within the context of the developing world and include technology feasibility and scalability assessment; value chain analysis; product specification; design for affordability, manufacturability, usability, and desirability; and product testing and manufacturing at various scales. Lessons are experiential and case study-based; taught by instructors with field experience and by industry experts from product development consulting firms and the consumer electronics industry.
  - E. Reynolds

- **EC.731J D-Lab: Supply Chains**
  - (Same subject as 15.772J)
  - Prereq: Permission of instructor
  - G (Fall)
  - 3-0-9 H-LEVEL Grad Credit
  - See description under subject MAS.665J.
  - A. Pentland, J. Bonsen

- **EC.733J D-Lab: Development Ventures**
  - (Same subject as 15.773J)
  - Prereq: None
  - U (Fall)
  - 2-2-5
  - See description under subject 15.772J.
EC.743 An Introduction to Green Woodworking
Prereq: None
U (Spring)
1-3-2 [P/D/F]

Students with little or no previous woodworking experience design and build a post and rung stool. Starting with a green (not dried) oak log and using only hand tools, students learn material properties and tool capabilities in the historical context of a 17th-century New England woodworker. Provides the experience of creating a functional stool from basic raw materials as well as insight on life and work in 17th-century New England.

K. Stone

EC.781J D-Lab: Development
(Same subject as 11.472J)
(Subject meets with 11.025J, EC.701J)
Prereq: None
G (Fall)
3-2-7

Issues in international development, appropriate technology and project implementation addressed through lectures, case studies, guest speakers and laboratory exercises. Students form project teams to partner with community organizations in developing countries, and formulate plans for an optional IAP site visit. (Previous field sites include Ghana, Brazil, Honduras and India.) Recitation sections focus on specific project implementation, and include cultural, social, political, environmental and economic overviews of the target countries as well as an introduction to the local languages. Enrollment limited by lottery; must attend first class session.

A. B. Smith, B. Sanyal

EC.782 D-Lab: Information and Communication Technologies for Development (ICT)
(Subject meets with EC.712)
Prereq: None
G (Fall)
2-2-8

Explores the use of information and communication technologies (ICT) to address specific needs in developing countries. Establishes knowledge and engineering skills needed to successfully deploy an ICT project, with a focus on appropriateness, transferability, and long-term sustainability. The first half of term presents an introduction to communication hardware, including antenna design, RFID, Bluetooth, Wi-Fi, and low-power sensors. Second half covers development of mobile phone applications and server communications, as well as system architecture for data collection and mapping. Students work in multidisciplinary teams, collaborating with local community partners. Concludes in a final project to be deployed in the field. Students taking graduate version complete additional assignments related to the term project.

R. Fletcher, A. Smith

EC.786 D-Lab: Waste
(Subject meets with EC.716)
Prereq: None
G (Fall)
3-2-4

Provides a multidisciplinary approach to managing waste in low- and middle-income countries with strategies that diminish greenhouse gas emissions and provide enterprise opportunities for marginalized populations. Studies waste management strategies in cities in Africa, India, and Latin America; examines case studies of collection, recycling, and waste-to-energy businesses developed in low-income settings; and researches public policy that supports sustainable, integrated, solid waste management systems. Student teams develop waste management strategies that culminate in a two-week IAP trip to Nicaragua where students will work with a local NGO and the municipality to assist in the implementation of waste management initiatives. Includes guest speakers and field trips. Students taking graduate version complete additional assignments.

E. McDonald

EC.791 D-Lab: Energy
(Subject meets with EC.711)
Prereq: None
G (Spring)
3-3-6

Provides a project-based approach that engages students in understanding and addressing the applications of alternative energy technology in developing countries. Focuses on compact, robust, low-cost systems for generating electrical power. Includes projects such as micro-hydro, solar, or wind turbine generators along with theoretical analysis, design, prototype construction, evaluation and implementation. Students will have the opportunity for an optional spring break site visit to identify and implement projects. Students taking graduate version complete additional assignments. Enrollment limited by lottery; must attend first class session.

Staff

EC.792J Cross-Cultural Investigations: Technology and Development
(Same subject as 21A.839J, STS.481J)
(Subject meets with EC.702J, 21A.801J, STS.071J)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: G (Fall)
3-0-9

See description under subject 21A.839J.

C. Wolley

TEACHING, UROP, INDEPENDENT STUDY

EC.900 Independent Study
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

Opportunity for independent study under regular supervision by a staff member. Projects require prior approval, as well as a written proposal and final report.

Staff

EC.910 Edgerton Center Undergraduate Teaching
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

An opportunity for undergraduates to participate in teaching and tutoring Center subjects and seminars. Students develop one-on-one teaching skills under the supervision of an Edgerton Center instructor.

J. K. Vandiver

EC.980 Edgerton Center Independent Study—Graduate
Prereq: None
G (Fall, IAP, Spring, Summer)
Can be repeated for credit

Opportunity for independent study under regular supervision by a staff member. Projects require prior approval, as well as a written proposal and final report.

J. K. Vandiver
**SPECIAL SUBJECTS**

**EC.990 Edgerton Center Graduate Teaching**

Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

An opportunity for graduate students to participate in teaching and tutoring Edgerton Center subjects and seminars. Permission of Edgerton Center staff required.

**Staff**

**EC.UR Undergraduate Research**

Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit

**EC.URG Undergraduate Research**

Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged
Can be repeated for credit

Undergraduate research opportunities in the Edgerton Center.

*J. K. Vandiver*

**EC.S00–EC.S05 Special Subject at the Edgerton Center**

Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit

**EC.S06–EC.S10 Special Subject at the Edgerton Center**

Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged
Can be repeated for credit

**EC.S11 Special Subject at the Edgerton Center**

Prereq: None
G (Fall, IAP, Spring)
Units arranged
Can be repeated for credit

Seminar combining lectures and lab run by students and academic staff at the Edgerton Center. Students explore specialized electronics, robotics, or mechanical design and fabrication topics not offered in the regular curriculum; classes range from beginner level to more advanced. Some offerings may be taught in an intensive fashion (meeting for up to several times a week for four weeks). Up to three sequential seminars may be offered per term, covering a different topic each time. Students can take one or all of the seminars.

*J. K. Vandiver*