Development Engineering

Designated Emphasis in Development Engineering

Through coursework, research mentoring, and professional development, the Designated Emphasis in Development Engineering (DE in DevEng) prepares students to develop, pilot, and evaluate technological interventions designed to improve human and economic development within complex, low-resource settings.

The DE in DevEng is an interdisciplinary training program for UC Berkeley doctoral students from any department whose dissertation research includes topics related to the application of technology to address the needs of people living in poverty. Students from all departments can apply (https://blumcenter.berkeley.edu/academics/ development-engineering/apply/).

With initial support from USAID's Global Development Lab (https:// www.usaid.gov/innovation-technology-research/research/hesn/ fact-sheets/university-california-berkeley-development-impact- lab/), the program builds upon ongoing research in technological innovations, human-centered design, development economics, remote sensing and monitoring, data science, and impact analysis at UC Berkeley. The program also features a National Science Foundation Traineeship for Digital Transformation of Development, or DToD (https:// developmentengineering.berkeley.edu/programs/dtod/about/).

DevEng students are connected to an ecosystem of researchers and practitioners at Berkeley via the Graduate Group in Development Engineering (https://developmentengineering.berkeley.edu/people/ faculty/), and also have access to a dynamic global network.

What is a Designated Emphasis? A "Designated Emphasis" (DE) is a campus-wide system that provides doctoral students with certification in specialties outside their home discipline, to be added to their doctorates.

Requirements

The Designated Emphasis in Development Engineering requires five courses (two core courses plus three electives). The course requirements are in addition to, but may overlap with, the Ph.D. course requirements of your home department. All course work for the DE should be taken for a letter grade.

The two core courses are:

> **DevEng C200: Design, Evaluate, and Scale Development Technologies (3 units)**: DevEng C200 is co-taught each fall term by one technologist and one social scientist. Students in the DevEng DE must complete this course before their qualifying exams. Professors from the pool of faculty in the Graduate Group in Development Engineering rotate as course instructors. The course is offered for three units credit as DevEng C200, Mech Eng C200 or MBA 290T. Master's students will be permitted to take the core course as space permits and with permission of the instructors. Dev Eng C200 is organized around analysis and application of case studies by multidisciplinary student teams according to three thematic modules.

> **DevEng 210: Development Engineering Research and Practice Seminar (1–2 units)**: This course provides DevEng students with a context and community within which their research projects can be refined and developed. The seminar focuses on work-in-progress presentations by students, post doctoral scholars, and faculty within the DIL ecosystem. The research seminar can be taken before or after the qualifying examination, and students can take it more than once.

Students must take their three electives from at least two of the three thematic modules within the Dev Eng program. The three modules are: Project Design, Evaluation Techniques and Methods for Measuring Social Impact, and Technology Development. Of the three electives, only one can be from the student's home department.

Furthermore, all students must apply and be accepted to the Designated Emphasis in Development Engineering *at least one semester before their qualifying examination*. DevEng C200 must also be taken prior to qualifying exam. At least one faculty member of the Graduate Group in Development Engineering must participate in the qualifying examination committee, and will evaluate the exam from relevant perspectives. When all course work and designated emphasis requirements have been completed, this final report must be submitted to the Graduate Student Affairs Officer in 750 Davis Hall for verification of completion of the designated emphasis at the latest one month prior to your filing the dissertation. Lastly, the dissertation must contain themes relevant to the field of Development Engineering (e.g. technology for economic and social development). More about the DE's requirements can be found here (https://developmentengineering.berkeley.edu/programs/deveng-de- for-phd/required-courses/).

Master of Development Engineering

Apply now to join UC Berkeley's new Master of Development Engineering (https://developmentengineering.berkeley.edu/) degree!

The three-semester Master of Development Engineering program at UC Berkeley integrates training in engineering with entrepreneurship, design, business, and policy—among others—to support students in creating technological interventions in accordance with the needs and wants of individuals living in complex, low-resource settings.

The program's curriculum enables students to further their expertise in one of the following four predefined areas:

- **AI/Data Analytics for Social Impact:**
  Students take courses on how artificial intelligence, machine learning, and data tools and analytics give the social, civic, and international development sectors actionable insights.

- **Energy, Water, and the Environment:**
  Students take courses on core natural resource challenges—water and energy systems and their impact on the environment—and on life cycle assessment, water resource management, agricultural impact, and energy technologies and policies.

- **Sustainable Design Innovations:**
  Students take courses on sustainable design and social entrepreneurship, including principles of green design, the science of sustainability, resilient communities, sustainable economic models, green chemistry, product design, spatial modeling, affordable housing, public transportation, and equitable development.

- **Healthcare Transformations:**

Students take courses on the rapidly evolving landscape of global healthcare technologies and practices, including biomedical device design, health policy, health impact assessment, and the digital transformation of health care.

If a student has interests outside of these areas, it is possible to devise a **Self-Designed Concentration** in, for example, gender equity, global education, or technology, development and policy.

Find out more about the Master of Development Engineering program here: developmentengineering.berkeley.edu (https://developmentengineering.berkeley.edu/)

Requirements

Core courses focused on Development Engineering (18 units over the 3 semesters)

First Fall Semester

DevEng C200: Design Evaluate & Scale Development Technologies (3 units): The course provides project-based learning experience in the development of human-centered products, services, or systems. The course teaches the mindsets, skill sets, and toolsets of design thinking with a focus on its use in development. The course is focused around the following modules that cover core phases of the design process: observe and notice, frame and reframe, imagine and design, and make and experiment. Students will also learn the theory of change and methods for assessing potential impact of technology interventions. Students will be expected to learn ethnographic interviewing, webs of abstraction, ideation, and basics of both hardware and software prototyping. The course will engage social impact designers from industry as speakers and coaches.

DevEng 202: Critical Systems of Development (3 units): This course is intended to provide students in the Master of Development Engineering with the necessary background and knowledge to undertake projects and work experience of a global scope. Students will be exposed to a diversity of methodological frameworks, introduced to the skills needed to effectively participate in the sustainable development field (such as systems mapping and landscape analysis), and to understand the history and ethics of global development. Students will be required to complete an annotated bibliography and a systems analysis of a problem of interest.

Spring Semester

DevEng 203: Digital Transformation of Development (3 units): As technology use proliferates globally, there exists significant potential leverage to further understand and improve the lives and livelihoods of people in low-resource settings. Through a careful reading of recent research and through hands-on analysis of large-scale datasets, this course introduces students to the opportunities and challenges for data-intensive approaches to development. Students should be prepared to dissect, discuss, and replicate academic publications from several fields, including development economics, machine learning, information science, and computational social science. Students also will conduct original statistical and computational analysis of real-world data. They will gain an introduction to sensors as well as tools and methods for spatial modeling and spatial data analysis.

DevEng 204: Introduction to Social Entrepreneurship (3 units): Social entrepreneurship entails market-oriented approaches to address social problems for sustainable, scalable outcomes. This course will enable students to frame complex problems and devise entrepreneurial approaches for addressing them. Students study the dynamics of societal challenges and the conceptual framework of social innovation and social entrepreneurship from theoretical and practical perspectives. Students also explore technology solutions to address global social problems with a systems thinking approach. Students additionally learn how to develop appropriate business models and implementation strategies for a social venture. Student projects will integrate the development engineering goals of creating technology interventions designed to improve human and economic development in complex low-resource settings. This course is the first of a sequence of two final project courses for candidates of the Master of Development Engineering.

Second (and last) Fall Semester

DevEng 205: Development Engineering Applications (3 units): This course is the second of a sequence of two final project courses for candidates of the Master of Development Engineering. Students engage in professionally oriented independent or group projects under the supervision of an advisor. The projects integrate the development engineering goals of creating technology interventions designed to improve human and economic development within complex low-resource settings.

DevEng 206: Ethical Reflection and Portfolio Building (2 units): This course is intended to provide students with a forum for reflection on the Summer Internship component of the Master of Development Engineering as well as projects worked on to date. Topics covered by the course will include issues of power and privilege, civic engagement, political/public policy contexts, tensions between tourism vs. travel, and community service vs. engagement. Students will discuss and produce an op-ed on an issue of interest. Students will also develop a portfolio to capture their individual point of view and skill sets developed in the MDevEng.

DevEng 290: Perspectives on Development Engineering (1 unit): Development Engineering represents a new interdisciplinary field that integrates engineering, economics, business, natural resource development, and social sciences to develop, implement, and evaluate new technological interventions that address the needs of people living in poverty in developing regions and low-income areas of the United States. This seminar, offered once per year, will feature guest lecturers with insightful perspectives on the emergent field. The DevEng 290 series covers current topics of research interest in development engineering. The course content may vary from semester to semester. All topics will address the development engineering goals of developing technology interventions designed to improve human and economic development within complex, low resource settings.

Elective coursework (18 units total, of which 12 should be in the concentration area)

Two electives (https://developmentengineering.berkeley.edu/program/elective-courses/) are required each semester in addition to the above core courses. The list of currently approved elective courses can be found here (https://developmentengineering.berkeley.edu/program/elective-courses/).

More information on each course can be found in the Course Catalog (http://guide.berkeley.edu/courses/#D).

Summer internship

All students must complete a professional internship during the summer between their first and second years in the MDevEng program. The intention is for students to have an opportunity to connect the theory and practice of development engineering. Students will gain valuable learning experiences through working with non-governmental organizations, government agencies, for-profit companies, and community projects that focus on various dimensions of development engineering.

There is no course credit associated directly with the internship. However, students will receive two units of academic credit through enrollment in DevEng 206: Ethical Reflection and Portfolio Building, a course intended to provide students with a forum for reflection on the Summer Internship in Fall of their final semester.

The internship can be arranged domestically or internationally. The amount of time is flexible depending on the opportunity, but a minimum time expected for the internship is 240 hours

Final capstone project that enables students to work in teams to extend assignments from core courses, their internships, their own initiatives, or social entrepreneurship collaborations

The capstone project is a culmination of the program and will allow you to apply what you have learned, in your coursework and in your internships, towards the design and implementation of a solution to positively impact the life of a specified community. Your capstone project which will drive your theoretical synthesis simultaneously to being a vehicle for a development goal. Throughout the capstone project you will be working as part of a collaborative and interdisciplinary team offering you an opportunity to demonstrate your capacity to work collaboratively towards bringing projects to fruition within a specific development context.

Each year a portfolio of projects will be offered to students for their capstone. Students are put into teams based on their prioritized choice of projects as well as disciplinary balance to the extent possible. Each student is supervised by two advisors, their MDevEng concentration advisor and their project advisor. Projects are submitted in printed portfolio format and comprehensive oral exam that will highlight the project's achievements as well as the student's roles and individual achievements. Projects are evaluated based on their analytical qualities (e.g. understanding of the problem or an area) as well as their measured impact.

PhD Designated Emphasis

To be admitted to the Designated Emphasis in Development Engineering, an applicant must already be accepted into a PhD program at the University of California, Berkeley. Before applying for the DE, interested PhD students should arrange a consultation meeting with one of the development engineering faculty advisers. Students must apply at least one semester before their PhD qualifying examination. Admission to the Designated Emphasis in Development Engineering is determined by the development engineering faculty advisers on a rolling basis throughout the academic year.

After the initial consultation meeting, a student must submit the application by email to the Graduate Student Affairs Officer, Development Engineering Faculty Adviser, and to the Development Engineering Chair. The application must contain*:

1. Application forms for Admission to the Designated Emphasis in Development Engineering.
2. Letter of intent summarizing research interests and educational or employment background in issues related to development economics or development engineering.
3. A list of courses you expect to use to satisfy the elective requirement and a timeline for completion.
4. Letter of recommendation from a member of the development engineering faculty graduate group (or the student's graduate adviser).

For the application (https://blumcenter.berkeley.edu/academics/development-engineering/apply/) and detailed information on the Development Engineering Designated Emphasis, please see its website (https://blumcenter.berkeley.edu/academics/development-engineering/designated-emphasis/).

For further information regarding admission to graduate programs at UC Berkeley, please see the Graduate Division's Admissions website (http://grad.berkeley.edu/admissions/).

* If you have applied to DToD, you will have submitted these documents except the timeline and courses. Please submit that within one year of the DToD application.

Master of Development Engineering

Applicants to the MDevEng program should be early- to mid-career professionals with an interest in advancing technology-driven solutions for local and global development. Applicants must meet all Graduate Division admission requirements (https://grad.berkeley.edu/admissions/requirements/).

As with all approved graduate-level programs at UC Berkeley, applicants will be held to rigorous academic criteria in order to be admitted to this program. A bachelor's degree, or recognized equivalent, from an accredited institution is required. Applicants will be evaluated on:

- Undergraduate coursework and grade point averages
- Previous graduate coursework and grade point averages, if applicable
- Quality of relevant work or research experience
- Performance on the GRE (recommended but not required) and, if required, the TOEFL
- Interest in pursuing a particular problem area that will form the students' concentration focus

Applicants will also be required to submit a statement of purpose, personal statement, and three letters of recommendation, which will be evaluated by the Graduate Group in Development Engineering Admissions Committee for academic and professional promise, enthusiasm for the field, and academic and career interests that align with the program. Students may be invited for an interview, either in-person or remote, and should be prepared to explain their qualifications, motivations to apply to the program, and goals for the program.

For more information, check out our website (https://developmentengineering.berkeley.edu/) and our FAQ (https://developmentengineering.berkeley.edu/learn-more/faqs/).

The objective of the Master of Development is to enable a pathway for students with STEM or social science training to use their expertise to address health access, financial inclusion, climate resilience, and other challenges of our time. The primary learning objectives are to:

- Master methods of problem-conception and problem-solving for implementation of technologies in low-income regions;
- Develop an understanding of the political and cultural complexity and place-based nature of technological interventions;
- Deepen and expand knowledge in one engineering or natural or social science solutions area;
- Gain core skills in qualitative and quantitative methods for evaluating technological interventions;
- Improve professional skills that involve community-based approaches, teamwork, communication, cross-cultural awareness, capacity building, and sustainable design

The Master of Development Engineering (MDevEng) degree requirements are:

1. Completion of three semesters of course work as specified by the Graduate Group in Development Engineering and approved by the Graduate Council, including a minimum of two semesters in residence at the University of California, Berkeley;

2. Completion of at least 36 units as specified by the Graduate Group in Development Engineering, including a minimum of 18 units in graduate course work; These include:

- Core, required courses focused on Development Engineering (see below)
- Elective coursework in area of concentration (see below)
- Maintenance of a minimum average grade of B is required in all courses. No course in which a grade lower than C- is assigned may be counted toward the requirements for the degree.

3. Completion of a comprehensive oral exam based on the student's capstone project. The capstone project enables students to work in teams to extend assignments from core courses, their summer internship, their own initiatives, or social entrepreneurship collaborations. As part of the core classes during the last semester, students will be engaged in reflection and portfolio building to prepare for their oral exam.

Required Courses:

DEV ENG C200: Design Evaluate & Scale Development Technologies : The course provides project-based learning experience in the development of human-centered products, services, or systems. The course teaches the mindsets, skill sets, and toolsets of design thinking with a focus on its use in development. The course is focused around the following modules that cover core phases of the design process: observe and notice, frame and reframe, imagine and design, and make and experiment. Students will also learn the theory of change and methods for assessing potential impact of technology interventions. Students will be expected to learn ethnographic interviewing, webs of abstraction, ideation, and basics of both hardware and software prototyping. The course will engage social impact designers from industry as speakers and coaches.

DEV ENG 202: Critical Systems of Development: This course is intended to provide students in the Master of Development Engineering with the necessary background and knowledge to undertake projects and work experience of a global scope. Students will be exposed to a diversity of methodological frameworks, introduced to the skills needed to effectively participate in the sustainable development field (such as systems mapping and landscape analysis), and to understand the history and ethics of global development. Students will be required to complete an annotated bibliography and a systems analysis of a problem of interest.

DEV ENG 203: Digital Transformation of Development: As technology use proliferates globally, there exists significant potential leverage to further understand and improve the lives and livelihoods of people in low-resource settings. Through a careful reading of recent research and through hands-on analysis of large-scale datasets, this course introduces students to the opportunities and challenges for data-intensive approaches to development. Students should be prepared to dissect, discuss, and replicate academic publications from several fields, including development economics, machine learning, information science, and computational social science. Students also will conduct original statistical and computational analysis of real-world data. They will gain an introduction to sensors as well as tools and methods for spatial modeling and spatial data analysis.

DEV ENG 204: Introduction to Social Entrepreneurship: Social entrepreneurship entails market-oriented approaches to address social problems for sustainable, scalable outcomes. This course will enable students to frame complex problems and devise entrepreneurial approaches for addressing them. Students study the dynamics of societal challenges and the conceptual framework of social innovation and social entrepreneurship from theoretical and practical perspectives. Students also explore technology solutions to address global social problems with a systems thinking approach. Students additionally learn how to develop appropriate business models and implementation strategies for a social venture. Student projects will integrate the development engineering goals of creating technology interventions designed to improve human and economic development in complex low-resource settings. This course is the first of a sequence of two final project courses for candidates of the Master of Development Engineering.

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DEV ENG 290: Perspectives on Development Engineering: Development Engineering represents a new interdisciplinary field that integrates engineering, economics, business, natural resource development, and social sciences to develop, implement, and evaluate new technological interventions that address the needs of people living in poverty in developing regions and low-income areas of the United States. This seminar, offered once per year, will feature guest lecturers

with insightful perspectives on the emergent field. The DevEng 290 series covers current topics of research interest in development engineering. The course content may vary from semester to semester. All topics will address the development engineering goals of developing technology interventions designed to improve human and economic development within complex, low resource settings.

Master of Development Engineering Concentration Areas and Elective Courses

The program's curriculum enables students to further their expertise through elective courses in one of the following four predefined areas:

AI/Data Analytics for Social Impact

In this concentration, you will take elective classes focused on how artificial intelligence, machine learning, and data tools and analytics give the social and civic sector actionable insights. Classes may focus on data-intensive approaches to international development, applied machine learning, mapping poverty using satellite imagery and applications of information & communication technologies for development.

Examples of elective courses in this concentration area include:

ANTHRO 189	Special Topics in Social/Cultural Anthropology	4
ARCH 246	Building Energy Simulations	3
CIV ENG 263N	Scalable Spatial Analytics	3
CIV ENG 295	Data Science for Energy	3
COMPSCI 189	Introduction to Machine Learning	4
or COMPSCI 289A	Introduction to Machine Learning	
CY PLAN 257	Data Science for Human Mobility and Socio-technical Systems	4
DATA C104	Human Contexts and Ethics of Data - DATA/History/STS	4
DEVP 222	Economics of Sustainable Resource Development	3
DEVP 229	Quantitative Methods and Impact Evaluation	3
DEVP 296	Innovative Finance for Development	3
EDUC 244	Data Mining and Analytics	3
ENE,RES 131	Data, Environment and Society	4
ENE,RES 273	Research Methods in Social Sciences	3
ESPM 157	Data Science in Global Change Ecology	4
ESPM 163AC	Environmental Justice: Race, Class, Equity, and the Environment	4
ESPM 260	Governance of Global Production	3
ESPM 271	Advanced Remote Sensing of Natural Resources	3
IND ENG 135	Applied Data Science with Venture Applications	3
or IND ENG 235	Applied Data Science with Venture Applications	
INFO 188	Behind the Data: Humans and Values	3
INFO 203	Social Issues of Information	3
INFO 233	Social Psychology and Information Technology	3
INFO 247	Information Visualization and Presentation	4
INFO 254	Course Not Available	
INFO 251	Applied Machine Learning	4
INFO 257	Course Not Available	3
INFO 271B	Quantitative Research Methods for Information Systems and Management	3
INFO 272	Qualitative Research Methods for Information Systems and Management	3

INFO 283	Information and Communications Technology for Development	3
INFO 288	Big Data and Development	3
LD ARCH C188	Geographic Information Science	4
PB HLTH 272B	Course Not Available	2
PB HLTH 290	Health Issues Seminars	1-4
PUB POL 290	Special Topics in Public Policy	1-4
SOCIOL 290	Seminar	3

Energy & Water Systems and the Environment

Students, choosing this concentration area, will take courses on core natural resource challenges—water and energy systems and their impact on the environment—and on life cycle assessment, water resource management, agricultural impact, and energy technologies and policies.

Examples of elective courses in this concentration area include:

ANTHRO 140	The Anthropology of Food	4
ANTHRO 230	Special Topics in Archaeology	4
ARCH 246	Building Energy Simulations	3
A,RESEC 249	Agricultural, Food, and Resource Policy Workshop	1
A,RESEC 261	Environmental and Resource Economics	3
A,RESEC 264	Empirical Energy and Environmental Economics	3
BIO ENG C106A	Introduction to Robotics	4
CIV ENG 107	Climate Change Mitigation	3
CIV ENG 110	Water Systems of the Future	3
CIV ENG 206	Water Resources Management	3
CIV ENG 210	Control of Water-Related Pathogens	3
CIV ENG 218A	Air Quality Engineering	3
CIV ENG 263N	Scalable Spatial Analytics	3
CIV ENG 268E	Environmental Life-Cycle Assessment	3
CIV ENG 290	Advanced Special Topics in Civil and Environmental Engineering	1-3
CIV ENG 295	Data Science for Energy	3
CY PLAN C256	Healthy Cities	3
DEVP 222	Economics of Sustainable Resource Development	3
DEVP 227	Principles of Natural Resource Management	2
DEVP 229	Quantitative Methods and Impact Evaluation	3
DEVP 296	Innovative Finance for Development	3
ENE,RES 131	Data, Environment and Society	4
ENE,RES C221	Climate, Energy and Development	3
ENE,RES 254	Electric Power Systems	4
ENE,RES 275	Water and Development	4
ESPM 157	Data Science in Global Change Ecology	4
ESPM 163AC	Environmental Justice: Race, Class, Equity, and the Environment	4
ESPM 217	Political Economy of Climate Change	3
ESPM 260	Governance of Global Production	3
ESPM 271	Advanced Remote Sensing of Natural Resources	3
GLOBAL 123L	Perspectives For Sustainable Rural Development	4
GLOBAL 126	Development and the Environment	4
INFO 271B	Quantitative Research Methods for Information Systems and Management	3

INFO 272	Qualitative Research Methods for Information Systems and Management	3
LD ARCH C188	Geographic Information Science	4
MBA 212	Energy and Environmental Markets	3
PB HLTH W213	Global Health Ethics	3
PUB POL 290	Special Topics in Public Policy	1-4
SOCIOL 190-001	Course Not Available	

- ENERES C100/C200
- ENERES C176/276

Sustainable Design Innovations

In this concentration, you will take elective classes focused on building depth in sustainable designs with a social entrepreneurship theme in products, services, and system design. Classes may focus on principles of green design, the science of sustainability, sustainable economic models for consumption, circular economy, green chemistry, and product design skill sets. At the systems level, this concentration will look at sustainable and resilient communities, studying topics such as spatial modeling, affordable housing, public transportation, and equitable development.

Examples of elective courses in this concentration area include:

ANTHRO 140	The Anthropology of Food	4
ARCH 246	Building Energy Simulations	3
A,RESEC 201	Production, Industrial Organization, and Regulation in Agriculture	4
A,RESEC 241	Economics and Policy of Production, Technology and Risk in Agricultural and Natural Resources	3
A,RESEC C251	Microeconomics of Development	3
CIV ENG 107	Climate Change Mitigation	3
CIV ENG 111	Environmental Engineering	3
CIV ENG 186	Design of Internet-of-Things for Smart Cities	3
CIV ENG 211A	Environmental Physical-Chemical Processes	3
CIV ENG 218A	Air Quality Engineering	3
CIV ENG 256	Transportation Sustainability	3
CIV ENG 268E	Environmental Life-Cycle Assessment	3
CIV ENG 268S	Buildings and Sustainability	3
CIV ENG 295	Data Science for Energy	3
CY PLAN 254	Sustainable Communities	3
CY PLAN C256	Healthy Cities	3
CY PLAN 204C	Analytic and Research Methods for Planners: Introduction to GIS and City Planning	4
CY PLAN 257	Data Science for Human Mobility and Socio-technical Systems	4
DEV ENG 290	Advanced Special Topics in Development Engineering	1-3
DEVP 222	Economics of Sustainable Resource Development	3
DEVP 229	Quantitative Methods and Impact Evaluation	3
DEVP 296	Innovative Finance for Development	3
ENE,RES 273	Research Methods in Social Sciences	3
ENVECON C102	Natural Resource Economics	4
ENVECON C132	International Environmental Economics	4
ENVECON 145	Health and Environmental Economic Policy	4
ENVECON C176	Climate Change Economics	4

ENVECON C181	International Trade	4
ESPM 157	Data Science in Global Change Ecology	4
ESPM 163AC	Environmental Justice: Race, Class, Equity, and the Environment	4
ESPM 169	International Environmental Politics	4
ESPM 217	Political Economy of Climate Change	3
ESPM 260	Governance of Global Production	3
ESPM 261	Sustainability and Society	3
ESPM 290 025	Course Not Available	
GLOBAL 123L	Perspectives For Sustainable Rural Development	4
GLOBAL 126	Development and the Environment	4
IND ENG 135 or IND ENG 23	Applied Data Science with Venture Applications Applied Data Science with Venture Applications	3
INFO 271B	Quantitative Research Methods for Information Systems and Management	3
INFO 272	Qualitative Research Methods for Information Systems and Management	3
LD ARCH 130	Sustainable Landscapes and Cities	4
LD ARCH C188	Geographic Information Science	4
MEC ENG 290H	Green Product Development: Design for Sustainability	3
PB HLTH 220C	Health Risk Assessment	3
PB HLTH 290	Health Issues Seminars	1-4
PUB POL 290	Special Topics in Public Policy	1-4

- ENERES C100/C200
- ENERES C176/ENERES 276

Healthcare Transformations

In this concentration, you will take elective classes focused on the rapidly evolving landscape of global healthcare technologies and practices. Classes may focus on biomedical device design, health policy, health impact assessment, and the digital transformation of health care.

Examples of elective courses in this concentration area include:

BIO ENG C106A	Introduction to Robotics	4
BIO ENG 110	Biomedical Physiology for Engineers	4
BIO ENG C137	Designing for the Human Body	4
BIO ENG 224	Basic Principles of Drug Delivery	3
CY PLAN C256	Healthy Cities	3
DEVP 222	Economics of Sustainable Resource Development	3
DEVP 229	Quantitative Methods and Impact Evaluation	3
DEVP 232	Foundations of Public Health	2
DEVP 296	Innovative Finance for Development	3
ENE,RES 273	Research Methods in Social Sciences	3
ENVECON 145	Health and Environmental Economic Policy	4
ENVECON C176	Climate Change Economics	4
ESPM 157	Data Science in Global Change Ecology	4
ESPM 163AC	Environmental Justice: Race, Class, Equity, and the Environment	4
ESPM 169	International Environmental Politics	4
ESPM 260	Governance of Global Production	3
ESPM 290	Special Topics in Environmental Science, Policy, and Management	1-4

INFO 271B	Quantitative Research Methods for Information Systems and Management	3
INFO 272	Qualitative Research Methods for Information Systems and Management	3
LD ARCH C188	Geographic Information Science	4
PB HLTH 132	Artificial Intelligence for Health and Healthcare	3
PB HLTH 181	Poverty and Population	3
PB HLTH 212A	International Maternal and Child Health	2
PB HLTH W213	Global Health Ethics	3
PB HLTH 220C	Health Risk Assessment	3
PB HLTH 220E	Global Health Policy	3
PB HLTH 223C	Strategic Management and the Health Sector	3
PB HLTH 223D	Foundations of Health Policy and Management	2
PB HLTH 226A	Health Economics A	3
PB HLTH 226C	Economics of Population Health	3
PB HLTH W213	Global Health Ethics	3
PB HLTH W226A	Health Economics	3
PB HLTH 252C	Intervention Trial Design	2
PB HLTH 272B	Course Not Available	2
PB HLTH 290	Health Issues Seminars	1-4
SOCIOL 190-001	Course Not Available	
SOCIOL 190-002	Course Not Available	
SOCIOL 190-003	Course Not Available	

Coursework/Curriculum

The Designated Emphasis in Development Engineering requires a total of five courses, comprised of two core courses and three electives. Of the two core courses, Dev Eng C200/Mech Eng C200/MBA 290T must be taken prior to the qualifying examination. Electives must be selected from the areas listed below: 1) Problem Identification and Project Design, 2) Evaluation Techniques and Methods for Measuring Social Impact, and 3) Development Technologies. The three electives must span at least two areas. Of the three electives, only one can be from the student's home department. Students are encouraged to take one elective prior to the qualifying examination, but this is not required. All course work should be taken for a letter grade. See the program website (https://blumcenter.berkeley.edu/academics/development-engineering/designated-emphasis/) for more information.

Required Courses

DEV ENG C200	Design, Evaluate, and Scale Development Technologies	3
DEV ENG 210	Development Engineering Research and Practice Seminar	2

Development Engineering Electives: Three electives from at least two of the thematic modules.

Problem Identification and Project Design

CIV ENG 209	Design for Sustainable Communities	3
DEV ENG 215	Global Poverty: Challenges and Hopes in the New Millennium	4
DEVP 225	Course Not Available	3
DEVP 232	Foundations of Public Health	2

ENE,RES 273	Research Methods in Social Sciences (Social Science Research Methods)	3
ENE,RES 298	Doctoral Seminar (Energy and Environmental Justice)	2
ESPM 226	Interdisciplinary Food and Agriculture Studies	3
ESPM 230	Sociology of Agriculture	4
ESPM 261	Sustainability and Society	3
ESPM C282	Health Implications of Climate Change	3
INFO 213	Introduction to User Experience Design	4
INFO 214	User Experience Research	3
INFO 272	Qualitative Research Methods for Information Systems and Management	3
INFO 283	Information and Communications Technology for Development	3
MBA 215	Business Strategies for Emerging Markets: Management, Investment, and Opportunities	3
MEC ENG 290H	Green Product Development: Design for Sustainability	3
MEC ENG 290P	New Product Development: Design Theory and Methods	3
PB HLTH 200K	Environmental Health Sciences Breadth Course	2
PB HLTH 214	Eat.Think.Design	3

Evaluation Techniques and Methods for Measuring Social Impact

A,RESEC C253	International Economic Development Policy	3
DEVP 222	Economics of Sustainable Resource Development	3
DEVP 228	Strategic Planning and Project Management	3
DEV ENG 290	Advanced Special Topics in Development Engineering	1-3
ECON 219B	Applications of Psychology and Economics	3
ECON 240A	Econometrics	5
ECON 240B	Econometrics	4
ECON C270A	Microeconomics of Development	3
ECON 270B	Development Economics	3
ECON 274	Global Poverty and Impact Evaluation	4
ENE,RES 275	Water and Development	4
ENE,RES 276	Climate Change Economics	4
ESPM 260	Governance of Global Production	3
INFO 272	Qualitative Research Methods for Information Systems and Management	3
MBA 292S	Social Sector Solutions	3
MBA 296	Special Topics in Business Administration (Applied Impact Evaluation: How to Learn What Works to Lower Global Poverty)	1-3
PB HLTH 235	Impact Evaluation for Health Professionals	3
PB HLTH 252C	Intervention Trial Design	3
PUB POL 249	Statistics for Program Evaluation	4
PUB POL C253	International Economic Development Policy	3

Development Technologies (Appropriate Technologies, Sensors, Data Collection, Data Mining and Analysis)

BIO ENG 168L	Practical Light Microscopy	3
CIV ENG 210	Control of Water-Related Pathogens	3
CIV ENG 211A	Environmental Physical-Chemical Processes	3

CIV ENG 271	Sensors and Signal Interpretation	3
CIV ENG 290	Advanced Special Topics in Civil and Environmental Engineering (Control Market and Privacy Tools for Participatory Sensing)	1-3
COMPSCI 289A	Introduction to Machine Learning	4
COMPSCI 294	Special Topics (Behavioral Data Mining)	1-4
ECON 291/ ENGIN 298B	Departmental Seminar (Behavior Management and Change)	1
ENE,RES C200	Energy and Society (Energy and Society)	4
ENE,RES C221	Climate, Energy and Development (Energy, Climate, and Development)	3
ENE,RES C271	Energy and Development (Energy and Development)	3
ESPM 217	Political Economy of Climate Change	3
ESPM C234	Green Chemistry: An Interdisciplinary Approach to Sustainability	3
ESPM 261	Sustainability and Society	3
INFO 271B	Quantitative Research Methods for Information Systems and Management	3
INFO 283	Information and Communications Technology for Development	3
INFO 290	Special Topics in Information (Data-Intensive International Development)	1-4

Qualifying Examination

All students must apply and be accepted to the Designated Emphasis in Development Engineering **at least one semester before their qualifying examination.** At least one faculty member of Development Engineering must participate in the qualifying examination committee and will evaluate the exam from relevant perspectives. Satisfactory performance on the qualifying examination for the PhD will be judged according to the established rules in the student's home department. Online forms must be submitted with approval from both the department and the designated emphasis, at least one month in advance of the exam. For more details, please see the website (http://deveng.berkeley.edu/#quals).

Note: If none of the faculty advisers/committee members on your qualifying exam or dissertation are in the Graduate Group in Development Engineering, consider encouraging one of them to apply for membership in the Graduate Group in Development Engineering. The faculty should contact the faculty chair (see Contact Information tab on right sidebar).

Advancing to Candidacy

Students must have a designated emphasis member on the dissertation committee as well as obtaining the approval of the designated emphasis Head Graduate Advisor at the time of applying for candidacy. The Graduate Student Affairs Officer must affirm completion of the Designated Emphasis course work on the Academic Progress Report after advancing to candidacy and prior to graduation.

Dissertation

The dissertation must contain themes relevant to the field of Development Engineering (e.g., technology for economic and social development). The student's dissertation committee must include at least one faculty in development engineering who can evaluate the dissertation from relevant perspectives.