BERKELEY MASTER OF ENGINEERING PROGRAM

CAPSTONE PROJECT PREVIEW 2015-16

CAPSTONE PROJECT SUMMARY

The capstone project is a 5-unit course (ENGIN 296) over both the fall and spring semesters. Students work in teams of 3 to 5 to solve a real-world problem through integration of the depth of knowledge from their technical coursework, with the breadth of knowledge from core leadership curriculum. The capstone projects require teams to develop a solution that meets an industry, market or social need through the use of a new technology or a new application of an existing technology.

Berkeley faculty or industry partners propose capstone projects, and serve as technical advisors for the project teams. Incoming students will apply to projects during the first few weeks of the fall semester through a process similar to applying for a job. The sponsoring faculty advisor or industry mentors will review applications and then choose their project teams.

CAPSTONE DELIVERABLES

Each team will be required to give a 10-minute oral presentation as part of the Final Capstone Project Showcase in May, and to develop an interactive display for the Capstone Expo in December. Each student will also be required to submit an individual final capstone report that serves as the required Master's Project report for the M.Eng. program. In addition to these reporting deliverables, teams must provide three interim project deliverables and one final project deliverable to their project advisors. The nature and form of these deliverables depend on the project and are defined in collaboration with the advisors at the beginning of the project.

2015-2016 CAPSTONE PROJECTS: PARTIAL PREVIEW

We have started soliciting Capstone Project proposals from faculty and industry for the 2015-16 academic year. The following projects are a preview of what is being proposed for next year. We expect approximately 70-80 proposals total for students to choose from and launch 55-60 projects. A complete list with project details will be released to incoming students over the summer.

- All project ideas are currently tentative and are not guaranteed offered for fall 2015.
- Most BIOE projects will not be available until the summer. The BIOE projects in the following list is a sampling from what was offered in 2014-15.

EECS 2015-2016 CAPSTONE PROJECTS

The Electrical Engineering and Computer Science (EECS) department believes that their M.Eng. students will have the best capstone experience if the projects are followed closely by an EECS professor throughout the academic year. To ensure this, they have asked the faculty in each concentration for which the Master of Engineering is offered in EECS to formulate one or more project ideas from which the incoming students will choose. Depending on the number of enrolled students in each concentration, only a subset of these project ideas may run.

Faculty Advisor Dept	Project Name	Faculty or Industry-Proposed Project	Contact Name	Industry Partner (if applicable)	Project Keywords/Phrases	Depts Accepted
BIOE	Design of novel prosthetic heart valves	Faculty	Mohammad Mofrad		design, heart valve, replacement, cardiovascular	BIOE, CEE, IEOR, ME, MSE
BIOE	Bacteriophage-based Electric Generators for Portable Electronics	Faculty			Bioenergy, piezoelectric generator, biotechnology	BIOE, ME, MSE
BIOE	Design of an Algorithm for Automating Labeled Organelles for Microscope Barcoding	Faculty			Synthetic Biology, microscopy barcoding, image analysis	BIOE, IEOR
BIOE	Developing and Modeling Cardiac Regeneration Therapies	Faculty				BIOE, MSE
CEE	Managing Traffic Congestion in Travel Corridors: The Role of Connected and Automated Vehicles	Faculty	Alexander Skabardonis	Cambridge Systematics	traffic control and management, connected vehicles, automated vehicles	CEE, IEOR, ME
CEE	Market for Water Reclamation Process	Faculty	Slav Hermanowicz	Grundfos	water reuse, industrial water, municipal water, mechanical engineering	CEE, IEOR, ME
EECS	Mobility-on-demand: machine learning and optimization for transportation networks	Faculty	Alexandre M. Bayen		machine learning, data fusion, stochastic online convex optimization, multi-objective optimization, mobility-on-demand, traffic management	CEE, IEOR, ME, MSE, NE
EECS	Cell Tower Handoff Dynamics	Faculty	Alexandre M. Bayen		cellular network data, cellular handoffs, signal strength, RF noise, load balancing, hysteresis, traffic estimation, traffic management	CEE, IEOR, ME, MSE
EECS	Machine Learning, Wearable Computing, and Alzheimer's Disease	Faculty	Alex Bayen		Machine Learning, Wearable Computing, Alzheimer's Disease, Anomaly Detection, Classification, Android, Smart Watch	EECS
EECS	Graphic Tools for Big Data	Faculty	John Canny			EECS: DSS
EECS	Streaming Model Synchronization for deep learning and more	Faculty	John Canny			EECS: DSS

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EECS	Development of Entrepreneurial Opportunities in Patent Data Analysis	Faculty	Lee Fleming			EECS: DSS
EECS	Petabit Switch-fabric Design	Faculty	Vladimir Stojanovic, Elad Alon			EECS: PEIC
EECS	Digital Radio Baseband and Testbed for Next Generation Wireless System	Faculty	Borivoje Nikolic, Vladimir Stojanovic			EECS: PEIC
EECS	Beamforming and MIMO Digital Radio Baseband and Testbed for Next Generation Wireless System	Faculty	Elad Alon, Vladimir Stojanovic			EECS: PEIC
EECS	Wireless Technology for collecting information from families on the verge of poverty	Faculty	Ruzena Bajcsy	Family Independence Initiative		EECS: RES
EECS	Interactive Remote Diagnostics of physically handicapped patients	Faculty	Ruzena Bajcsy, Gregorij Kurillo, Jay Han			EECS: RES
EECS	Sensory Fusion and Selection for Car and its driver with respect to safe driving	Faculty	Ruzena Bajcsy, Katherine Driggs			EECS: RES
EECS	Application of Collaborative Robots to Two-person Manipulation Tasks	Faculty	Ruzena Bajcsy, Aaron Bestick			EECS: RES
EECS	Scalable video-on-demand with edge resources	Faculty	Kannan Ramchandran			EECS: SPC
EECS	Spectrum Access Systems	Faculty	Anant Sahai			EECS: SPC
EECS	FabSense	Faculty	Eric Paulos		Machine Learning, Python, Inertial Measurement Unit, Fabrication	EECS: VCCS
EECS	Fizels	Faculty	Eric Paulos			EECS: VCCS
EECS	Bio-Electric Hybrids	Faculty	Eric Paulos			EECS: VCCS
EECS	Programmable Materials: Magnetic Sketching	Faculty	Eric Paulos			EECS: VCCS
EECS	Sensr: Citizen Science for All	Faculty	Eric Paulos			EECS: VCCS
EECS	Vision Correcting Displays	Faculty	Brian Barsky			EECS: VCCS
EECS	A Social/mobile platform for optimizing health services for complex, chronic care management	Faculty	Bjoern Hartman			EECS: VCCS

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FUNG	IT for the Home in an IOT Context	Industry	Justin Dawe	Butter	IOT, home, IT, services, SAAS, integration	CEE, IEOR, ME
FUNG	UC Berkeley Student Wellness App	Faculty	Donald Wroblewski		App development, data analytics, product development, student wellness	IEOR, ME
FUNG	Direct thermal energy conversion	Industry	Jared Schwede	Spark Thermionics	thermionic energy conversion, heat engine, thermomechanical modeling, device design	All
FUNG	Improving workplace safety using personal wearable devices and responsive machines	Industry	Florian Michahelles	Siemens Corporation	work place, safety, wearable sensors, internet of things	CEE, IEOR, ME, NE
FUNG	Chatty robots: machine-machine and human-machine communication and coordination using activity streams	Industry	Florian Michahelles	Siemens Corporation	robot, human robot interaction, activity streams, communication	All
FUNG	Smart Things vs Smart Cloud: Analysis and implementation of a framework for mobile code in an IoT context	Industry	Florian Michahelles	Siemens Corporation	cloud computing, fog computing, mobile computing, mobile code, internet of things	All
FUNG	Marketplace for manufacturing	Industry	Florian Michahelles	Siemens Corporation	industry 4.0, internet of things, smart america, future manufacturing	All
FUNG	Extracting driving maneuvers from crowdsourced vehicle trajectories	Industry	Don Wroblewski	Vehicle Data Science	Big data, GIS, machine learning, mapping	CEE, IEOR, ME
FUNG	Low-Cost Disposable Battery for the Developing World	Industry	Mike Tucker, Principal Scientific Engineering Associate	LBNL	3D printing, prototyping, circuit design, developing world, consumer device, battery	ME, MSE
IEOR	Prosper Data Mining Project	Industry	Lee Fleming	Prosper Marketplace	machine-learning, data-science, applied, programming	IEOR
ME	Modeling and simulation of advanced manufacturing processes	Industry	Tarek Zohdi	Siemens	manufacturing, modeling, simulation	All
ME	Modeling and simulation of sporting equipment	Faculty	Tarek Zohdi		sports, equipment, modeling, simultion	All
ME	Water Desalination	Faculty	Phil Marcus		sustainable, large-scale water desalination	CEE, IEOR, ME, MSE, NE

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ME	Highly Maneuverable Unmanned Underwater Vehicle	Faculty	Reza Alam		Unmanned Underwater Vehicle (UUV), Maneuverability, Ocean Engineering,	CEE, IEOR, ME
ME	Design Fabrication and Control of a Viscous Flow Swimmer (Quadroar)	Faculty	Reza Alam		Viscous flow, microswimmer,	BIOE, CEE, EECS, IEOR, ME, MSE
ME	Mitigation of Epileptic Seizures via Ultrasonic Excitation	Faculty	Reza Alam		Epilepsy, Seizure Mitigation, Ultrasound	BIOE, IEOR, ME, MSE, NE
ME	Spinal disc-replacement implant	Faculty	Tony Keaveny		spine, biomechanics, design, orthopaedics, implants, prostheses, bone	BIOE, ME
ME	Injection molding of nanostructures for plasmonics	Faculty	Hayden Taylor	TBA	Materials, manufacturing, simulation	ME, MSE
ME	Thermal behavior of through-silicon vias	Faculty	Hayden Taylor	TBA	Silicon integrated circuits, thermal management, semiconductor manufacturing	ME, MSE
ME	Wave Carpet	Faculty	Prof. Reza Alam	CalWave	MHK, Wave Energy, Renewable Energy	ME
ME	Sustainable Materials	Faculty	David Dornfeld		material selection, sustainability, human health, environmental impacts	BIOE, ME, MSE
ME	Sustainable manufacturing technology for emerging economies	Faculty	David Dornfeld		emerging economies, development engineering, sustainability, appropriate manufacturing technology	All
ME	Data Analytics (Big Data) for Manufacturing	Faculty	David Dornfeld		big data, manufacturing optimization, energy and productivity, cybersecurity	CEE, IEOR, ME, MSE
ME	Samsung IoT + Display	Industry	Alice Agogino	Samsung Research America, NEXD (Next Display Experience) Lab	Internet of Things, Display Experience	All

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ME	Tensegrity Soft Robots for NASA Missions	Industry	Alice M. Agogino	NASA Ames, Intelligent Systems Group	tensegrity robots, NASA, space exploration, design, controls	ME
ME	Repair Scorecard	Industry	Alice M. Agogino	iFixit	disassembly, repair, sustainability, design for environment	CEE, IEOR, ME
ME	Oscillating Wind Power	Industry	Alice M. Agogino	TSF Group, PAX Scientific	Wind power, clean energy, renewable energy, sustainability	ME
ME	Prioritized Green Design Guide	Faculty	Agogino	Lunar Design	Sustainable design, green design, product design, life-cycle assessment (LCA)	CEE, IEOR, ME, MSE
ME	The Underactuated Lightweight Tensegrity Robotic Assistive Spine (ULTRA Spine)	Faculty	Alice Agogino		Robotics, Bio-inspired, Quadruped, Locomotion, NASA,	BIOE, IEOR, ME
ME	Remanufacturing Assessment for Artificial Photosynthesis	Faculty	David Dornfeld		Sustainability, remanufacturing, alternate energy, photosynthesis, life cycle analysis	CEE, IEOR, ME, MSE
ME	Manufacturing in the Circular Economy	Faculty	David Dornfeld		sustainable manufacturing, circular economy, production, re-manufacturing, end of life	All
ME	Isochoric preservation	Faculty	Boris Rubinsky		preservation, thermodynamics, mechanical engineering design	BIOE, ME
ME	Design of new helmets to prevent traumatic brain injury	Faculty	Mohammad Mofrad		design, helmet, brain injury, biomechanics,	BIOE, CEE, IEOR, ME, MSE
ME	Novel Microsupercapacitors Fabricated by Carbon/Carbon Nanotube Composite with Increased Power and Energy Density	Faculty	K. Komvopoulos		super-capacitors, carbon nanotibes, high-energy storage	ME, MSE
ME	Electro-Chemical-Mechanical (ECM) Design of High-Capacity/High-Endurance Li-Ion Batteries	Faculty	K. Komvopoulos		Li-ion batteries, fracture, optimal design	ME, MSE
ME	Ballistic Performance Analysis of Bio-Inspired Body Armor Systems	Faculty	K. Komvopoulos		Mechanics of materials, impact, penetration resistance, wearble armor systems	CEE, ME, MSE

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ME	Plasma-assisted Modification of Biochemical Properties of Biopolymer Membranes	Faculty	K. Komvopoulos		biomaterials, plasma surface treatment, biochemical characteristics	BIOE, ME
ME	Surface Modification of Magnetic Recording Media for Extremely-High Information Storage Density	Faculty	K. Komvopoulos		thin films, high-desnity magnetic recording, film deposition	ME, MSE
ME	Microneedle Arrays for Controlled and Painless Localized Drug Delivery	Faculty	K. Komvopoulos		microneedle arrays, transdermal, drug delivery, skin	BIOE, ME
ME	Nanomechanics of Surface Polishing	Faculty	K. Komvopoulos		surface planarization, roughness, atomic-scale polishing, nanomechanics of polishing	ME, MSE
ME	Physicochemical Modification of Biopolymer Surfaces for Controlled Cell Attachment, Growth, and Proliferation	Faculty	K. Komvopoulos		cell attachement, growth, proliferation; plasma surface biochemistry modification	BIOE, ME
ME	Fatigue of Polysilicon Microelectromechanical Devices	Faculty	K. Komvopoulos		microelectromechanical devices, reliability, fatigue, microfabrication	ME, MSE
ME	Nanoscale friction and wear analysis of thin-film media for magnetic recording hard-disk drives	Faculty	K. Komvopoulos		nanomechanics of thin films, hard-disk drives, contact simulations	ME, MSE
ME	A Novel Computational Approach for Noninvasively Assessing the Mechanical Strength of Diseased Bone	Faculty	K. Komvopoulos		bone mechanics, voids, cracking, simulations	CEE, ME, MSE
ME	Wind Turbine Blade Defect Detection and Damage Analysis	Faculty	K. Komvopoulos		wind turbine blades, defects, fracture mechanics, numerical simulations	CEE, IEOR, ME, MSE
ME	Laser Annealing of Metal Nanowires	Faculty	Costas Grigoropoulos	Laser Prismatics	Flexible electronics, Stretchable electronics, Metal Nanowires, Laser	ME, MSE
ME	Design of Energy-Efficient CNC Toolpaths	Faculty	Sara McMains		energy efficiency, CNC machining, manufacturing, computer graphics	CEE, IEOR, ME, MSE
ME	Automating Workflow from CAD to Control	Faculty	D. Auslander, G. Anwar	Nat'l Instruments, Autodesk	Robotics, mechatronics, control, CAD, design tools	All
ME	Fault Tolerant Control in Autonomus Driving	Industry	Francesco Borrelli	Hyundai	autonomus driving	IEOR, ME

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MSE	Design of a High-Efficiency Pyroelectric Energy Conversion System	Faculty	Lane W. Martin		waste heat, energy conversion, ferroelectric, efficiency, devices, materials	MSE
MSE	Li-ion battery cell model evaluator	Faculty	Kristin Persson and Mark Asta		Battery Materials, Data Driven Materials Design	MSE
NE	Development of viable spent nuclear fuel management	Faculty	Joonhong Ahn		spent nuclear fuel, long-term storage, stakeholder agreement, safety, safeguards	CEE, IEOR, ME, MSE, NE
NE	Offshore Co-generation of Electricity and Desalinated Water	Faculty	Per Peterson	Westinghouse	Nuclear Energy, Desalination, Electricity	CEE, IEOR, ME, MSE, NE
NE	Energy and public perception	Faculty	Massimiliano Fratoni, Joonhong Ahn		energy sources, global warming, energy policy	All