ATTENTION SOPHOMORES AND JUNIORS
BIO 228A & B iGEM The International Genetically Engineered Machine Competition
NEW 2-Part Course Series (8 credits) / Information Meeting and Luncheon October 3rd

UPBM Majors, it’s Here! The University of Rochester Biology Department is launching its first team to compete in the International Genetically Engineered Machines Competition AKA iGems in 2020.

Dr. Ann Meyer, Ph.D. Associate Professor, will be the UR Team’s mentor and project lead.

iGEM, the International Genetically Engineered Machines competition, is the world’s largest synthetic biology competition, with over 300 international teams taking part. In iGEM, diverse groups of undergraduate students engineer a new function into a living organism.

Team projects must not only be functional within the laboratory but must also consider how the project can safely and ethically interact with society. Additionally, the new biological parts must be built in a standardized way and the results communicated on a team wiki in an open-source manner, so that future teams can re-use the pieces and build on previous teams’ experience. Student teams choose their own project, design their own research, perform their own experiments and modeling, and at the end of the summer present their results to a large, international community.

iGEM projects aim to solve local, real-world problems, for example by engineering bacteria that can break down plastic waste or that can detect sick farm animals.

iGEM is based on the high-impact practice of undergraduate research. iGEM students brainstorm and select their own project ideas. Students design their own experiments, construct new genetic parts and validate the parts using new characterization assays. In addition to the wet-lab research, iGEM involves mathematical modeling to predict the behavior and guide the design of the unique biological components and characterization assays. Students also design, construct, characterize, and improve their piece of hardware that will work together with the designed biological organism.

iGEM students engage in community-based learning throughout their project by going “beyond the lab” and imagining their projects in a social/environmental context. iGEM students pick a plan that will contribute to solving a real-world problem. Students
will engage in open dialogue with community stakeholders in an attempt to address specific societal issues, as well as the potential of their designed system to serve as a viable solution. The social, legal, and ethical aspects of the project are considered, through identifying the possible risks of the project, interviewing relevant end-users and affected community members, and designing appropriate safety and deployment mechanisms.

iGEM students cooperate with scientific and non-scientific communities to promote and communicate their projects. In their outreach activities, iGEM students travel to local festivals, markets, schools, and other gathering places to share their project ideas with the public and learn from their feedback. The project will be publicized through public relations efforts, including social media, the team wiki page, and competition talks and poster presentations.

Funding for the team is partially raised by the students from university groups and local industries.

iGEM is multi-disciplinary, highly collaborative, and student-managed. iGEM teams typically include students from Biology, Chemistry, Physics, and Engineering study programs working together on a single multi-faceted project, with the possibility to include students from humanities and Business programs. Each student takes on a management role for one aspect of the project (team leader, science, modeling, hardware, human practice, PR, fundraising, etc.) and also works in a team role to assist in several other areas of the project.

The project leader (Prof. Anne Meyer) has successfully served as the head advisor for the iGEM team at the Delft University of Technology for five years before moving to the University of Rochester last year. Her teams have tackled projects ranging from bomb-detecting bacteria, to 3D printing of biofilms, to engineering bacterial lasers and microlenses. Her teams have won five gold medals as well as more than a dozen special awards, including the 2015 Grand Prize. Her iGEM teams have also been well-publicized in media outlets including national television, national radio, and the Washington Post, garnering valuable attention for the host institute, department, and team sponsors.

While iGEM activities will run fairly continuously between February-November (minus holidays), the course will officially be offered as two 4-credit courses, in spring semester of one academic year and fall of the subsequent calendar year, for the purpose of assigning credit. The pilot run of iGEM at the University of Rochester will take place from Feb. 2020-Nov. 2020. See timeline on the last page for more details.

Igem courses can be used to fulfill requirements in some biology majors. Students are encouraged to discuss applicability with their advisors.

INFORMATIONAL MEETING
All interested should attend the informational meeting on 10/3 to get more information and learn about assistance that is available to off-set summer living expenses.
12noon – 2pm (Lunch Served)
Douglas 407
Please RSVP at the following website to let us know you will attend:

Project leader: Dr. Anne S. Meyer, Ph.D., Associate Professor, Dept. Biology (Head advisor)
Co-instructors:
Dr. Alexis Stein, Ph.D., Assistant Professor of Instruction, Dept. Biology (Laboratory advisor)
Dr. Nancy Chen, Ph.D., Assistant Professor, Dept. Biology (Modeling advisor)
Omar Soufan, Technical Associate, Dept. Mechanical Engineering (Hardware advisor)

iGEM students (led by Anne Meyer) at work creating new biological parts (left) and new hardware devices (right).
Course outline, BIO228A + 228B:

February: Brainstorming: idea gathering
Research previous projects, compile possible societal problems to target and biological systems to explore
Time: Meetings (2/wk, 2-3 h). Estimated time 12 h/week.

March: Brainstorming: project selection
Feasibility studies, experimental design, narrowing down idea list
Time: Meetings (2/wk, 2-3 h). Estimated time 12 h/week.

April 1: Present top 3 (or fewer) project ideas, with full experimental plans for each, to advisors. Select final project idea.

April: Select team roles, design and order of new DNA, write fundraising letters to sponsors, planning of modeling, hardware, and human practice
Time: Meetings (1/wk, 1-2 h). Estimated time 12 h/week.

May – Sept: Full-scale launch of labwork, modeling, hardware, human practice, etc.
Time: Meetings (1 team meeting, 1 lab meeting, and 1 modeling meeting/ wk, 1-2 h each). Estimated time 30 hrs/wk in the iGEM office when no classes/ exams.
For holidays, agree with the team members on the dates, making sure that the workload is well-balanced in the team.

June 1: Mid-term individual meetings with advisors to discuss progress

mid-Oct. Wiki freeze
Deadline for wiki (website) content; check the iGEM website for final date.

Oct. 29: iGEM Jamboree in Boston!
Present the project to 300+ international teams, with a talk and poster presentation.

November: Project wrap-up
Clean and organize the lab and office, finalize fundraising and thank sponsors, prepare final budget. After these are accomplished, final meetings to give grades are scheduled.

iGEM teams (led by Anne Meyer) winning the iGEM awards for Best New Application, Best Model, and Best Composite Part of 2016 (left) and the 2015 awards for the Grand Prize, Best Hardware, Best Applied Design, and Best Wiki (website) (right).
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<th>Major</th>
<th>Requirement</th>
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<tr>
<td>BA Biology (BIO)</td>
<td>2 Diversification Electives</td>
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<tr>
<td>BS Biochemistry (BBC)</td>
<td>diversification elective and credit for an upper level lab (replace BCH 308)</td>
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<tr>
<td>BS Cell and Developmental Biology (BCD)</td>
<td>upper-level (4credit) lab and diversification elective for the BMG major</td>
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<tr>
<td>BS Computational Biology (BCB)</td>
<td>diversification elective</td>
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<tr>
<td>BS Ecology &amp; Evolutionary Biology (BEB)</td>
<td>1 – 2 diversifications for the BEB major</td>
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<tr>
<td>BS Microbiology (BMB) / Biotech Certificate</td>
<td>1 diversification elective and credit for an upper level lab counting for the biotechnology certificate, but cannot replace MBI 221</td>
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<tr>
<td>BS Molecular Genetics (BMG)</td>
<td>upper-level (4credit) lab and diversification elective for the BMG major</td>
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<tr>
<td>BS Neuroscience (BNS)</td>
<td>diversification elective</td>
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How do I register?
Contact Dr. Anne Meyer for more information and for the instructor’s permission code (IPC) needed for online registration. She can be reached through email (anne.meyer@rochester.edu) or phone 585-275-9290.

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<th>Term</th>
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<td>86327</td>
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<td>IGEM I</td>
<td>Spring 2020</td>
<td>4.0</td>
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Schedule: Day Begin End Building Room
TR 1400 1600 HUTCH 226

Enrollment: Section Enroll Section Cap
0 12

Instructors: MEYER A
Restrictions: [A] Instructor’s permission required
Description: The objective of the International Genetically Engineered Machines competition is to design and build an engineered biological system using DNA technologies over the course of the summer. iGEM projects aim to solve local, real-world problems, for example by engineering bacteria that can break down plastic waste. You will design your own experiments, construct new genetic parts, and validate the constructs using new characterization assays. In addition to the wet-lab research, iGEM involves mathematical modeling to predict the behavior and guide the design of the new biological parts and characterization assays. Students also design, construct, characterize, and improve their own piece of hardware that will work together with the designed biological organism. The policy and practice component addresses the social, legal, and ethical issues of the project. iGEM is multi-disciplinary, highly collaborative, and student-managed. You will travel to Boston and interact with 300 universities from all over the world.

Books
Click to buy books for this course from the bookstore

Is financial assistance available to help with summer housing costs?
For more information on applying for funding to off-set summer housing costs to stay in Rochester for iGEMs visit the Office of Undergraduate Research Funding Website:
https://www.rochester.edu/college/ugresearch/funding/index.html

Research and Innovation Grants:
https://www.rochester.edu/college/ugresearch/funding/rig.html

Discover Grants
https://www.rochester.edu/college/ugresearch/funding/discover-grant/index.html