May 2017

**MIT Medical Device Design Class 2017 – 2018 Call for Proposals**

Do you have a clinical challenge that needs a new medical device?

Clinicians and sponsors are invited to submit applications to work with teams of MIT engineering students to create prototype solutions. We are actively seeking projects with mechanical and/or electrical challenges.

This course, developed over the last decade, is offered jointly between Mechanical and Electrical Engineering for seniors and graduate students.

Beginning in September, clinicians/sponsors whose projects are selected will team up with a small group of students and course staff in an aggressive, but efficient 14 week design process. Firstly, the team will develop a detailed understanding of the clinical need and a resulting set of design specifications. Then they will follow a deterministic design process to create strategies, concepts and prototype solutions for testing. Final proof-of-concept prototypes will be presented in December to a clinical and industry audience. Particularly successful projects may be invited to continue on into the spring for further development.

This course is, in effect, an efficient idea generation engine and has yielded significant IP, numerous papers, served as a pipeline for new research areas and fostered licensing deals and a few start-ups. Proposers and students have enjoyed the process and often continued collaborating beyond the course.

Course staff will review applications and identify a subset that are suitable for presentation to the class. Students will make the final selections and form teams after the presentations.

**Key Dates**

- Two page proposals due: 14 July 2017
- Submission via: [Course Website](https://web.mit.edu/2.75)
- Finalists notified: 25 August 2017
- Presentation to students: 11 & 13 September

The final project selection will be made by the students with minimal instructor intervention.

**Proposal Guidelines**

Your proposal is limited to 2 pdf pages, including pictures and references, and must contain:

1. Name, affiliation and contact information (direct phone & e-mail)
2. Background on the current clinical procedure, with pictures, links to videos and references
3. Statement of clinical challenge and its significance
4. Functional requirements of desired solution, but not a description of concepts already conceived
5. Disclosure of any relevant previous work (research notes, publications or patents filed)
6. Specific resources available to support this proposed project (Including financial as applicable)

We ask that proposers avoid specifying a particular solution, rather present the problem as precisely as possible. Experience has shown that the final solutions are more creative when the team starts with a blank slate.

Projects should require the development of new mechanical or electrical hardware. We are not able to support pure software development projects, however software can be part of the solution.
Each project submission must have one clearly defined proposer, practicing in the area of the identified need, who will serve as the project champion and interface directly with the students over the semester. (This person can facilitate interaction with other clinicians/personnel and resources as needed.)

We understand that you have numerous ideas, but only two applications per proposer, per year will be accepted, so please pick your favorite.

Do not hesitate to contact us if you would like guidance.

**Finalist Selection Criteria**

Course staff will conduct the initial screening of projects. Proposals will be selected for presentation to the students by applying the following criteria:

1. Will the students start with a clean slate? – There should be no obvious pre-existing solutions and, while proposers are encouraged to participate in idea development with teams, they should not have settled upon a particular solution or have an existing device that only needs improvement.

2. Does the problem require the creation of new electronic or mechanical hardware? – The instructors seek to identify that a solution space exists within the realm of mechanical/electrical engineering.

3. Can the solution be accomplished within time and budgetary constraints? – Working from problem to proof-of-concept device should take a student team on average 12-15 hours per week for the 14 week term. Parts, materials and custom fabricated components should not exceed $4000.

4. Is the proposer ready to be an active team member? – Proposers must agree to frequent interaction with their teams and engaging in the design process as described in the following.

5. Does the project seem fun and exciting? – Good design requires passion!

Proposers whose applications are selected as finalists for presentation to the class will be provided with a PowerPoint template to assist in preparing a 10 minute “pitch” to the class, which should include ample time to answer questions. The students will indicate their project preferences and the instructors will make the final selections and form teams consisting of 4 – 5 persons.

*We will endeavor to provide feedback on proposals that are not selected and, where possible, offer suggestions as to other means of pursuing solutions.*

**Design Process**

Once teams are formed they will follow a demanding 14 week design process consisting of:

1. Understanding the clinical challenge and crafting of mission statement
2. Prior art and literature search
3. Creating a set of *functional requirements*. As opposed to specific features or technical specifications, these are capabilities that the prototype device should enable
4. Individual thought and then brainstorming and selection of preferred strategy
5. Bench-level prototyping and experimentation
6. Individual thought and then brainstorming and selection of preferred concept
7. Detailed mechanical/electronic design, with emphasis placed on *most critical module*
8. Manufacturing and/or selection of components
9. Integration and testing
10. Presentation and documentation
11. Evaluation of IP and path forward
It is essential that proposers commit to becoming active team members throughout the course and, often, beyond, meeting with students, providing hospital and laboratory access to view procedures, engaging in device testing in an appropriate clinical or laboratory environment and resourcing medical equipment. *At minimum students need direct engagement with proposers on a bi-weekly basis.* The fuller the participation the more fruitful the experience!

Course instructors serve the role of project managers and technical advisors/consultants and will meet weekly, outside of lectures, with each team for design reviews during which they will assess the past week’s progress, brainstorm solutions for current design challenges and help identify the crucial tasks for the next week. Proposers are welcome to join these meetings and generally enjoy participating in the design process.

**Deliverables, Publications & Intellectual Property**

In December teams will demonstrate their final prototype to a clinical and industry audience. Proposers are encouraged to participate in these presentations. Teams will also write a conference-ready paper to which the proposer is expected to contribute substantially and thus be an author. Many papers have been accepted for conference publication and have subsequently fostered ASME, IEEE and clinical publications.

Intellectual property (IP) is often generated in this course, and thus *it is essential that all team members keep bound, signed and witnessed design notebooks to record individual contributions.* The more engaged a proposer is, the greater the likelihood that he or she will contribute specific features (claims) to the IP and, thus, be formally considered an inventor. (US Patent law states that merely framing the problem does not make someone an inventor.) In the case where a team member (student or proposer) contributes to the development process, but does not specifically create claim elements, i.e., is not an inventor, they can, by mutual agreement by all inventors, be included in revenue sharing (should any ever occur in the future). All patent filings are managed by the MIT Technology Licensing Office. Our MIT TLO officer is Bennett Rockney.

**Path Forward**

All projects will be reviewed at the end of the semester and promising projects may be invited to continue into the spring via a follow-on class, independent project, a senior thesis or graduate research. The primary focus of the spring is to evolve a proof-of-concept prototype into a refined prototype suitable for presentation to potential licensees or investors.

While clinicians are not required to provide financial resources for the initial prototyping in the fall term, *project funding is not guaranteed in the spring term.* Taking the next steps to move forward from a proof-of-concept prototype is expensive and teams are encouraged to seek further development funding. Proposers are asked to take the lead in reaching out to industry contacts who might be interested in supporting or acquiring the project.

Course instructors will seek to help Name, affiliation and contact information (direct phone & e-mail)place high potential projects on the path towards commercialization!

**Questions?**

For proposal questions contact Nevan Hanumara, PhD: hanumara@mit.edu, +1.617.258.8541

The course staff can be contacted at: 2.75-admin@mit.edu

*We look forward to receiving your proposals!* - Prof. Slocum, Gim Hom, Dr. Hanumara, Prof. Roche

Updated May 8, 2017