1. Introduction

The capstone design projects span over a single semester, taking place in the spring. The purpose of this handbook is to provide students and advisors with general guidelines, dates, deadlines and deliverable requirements for the capstone design project course.

2. Getting ready for capstone design projects

2.1 Course Registration

In the spring semester each approved advisor within the ECE department is assigned a capstone design course number in the form 14:332:448:XX (UNIT:SUB:CRSE: SECT), where SECT represent a section number unique to each advisor. Capstone teams need to be signed up to their advisor capstone course section. The ECE undergraduate Director, Dr. Godrich, will send each advisor their section number and a set of special permission numbers for the spring semester. The project advisor should assign each team with a set of special permission numbers, one for each of the team members. These permission numbers should be sent by the advisor to the team point of contact (POC) to be distributed among the members.

Advisors that are not within the ECE department will be assigned an ECE faculty as a POC to assist with project coordination within the ECE department. The ECE faculty will provide the students with a capstone course number and special permission numbers for registration.

With any questions regarding registration please contact Dr. Godrich (godrich@soe.rutgers.edu).

2.2 Checklist for the first few weeks of the spring semester:

a. [responsibility: Team POC] Please update the Sakai site assignment ‘TEAM UP’ with the latest updated information as for: Team members, their emails, advisor, and project title. Only the POC should be uploading this information.

b. [responsibility: Team POC] Please check the projects list file uploaded on Sakai under ‘Resources\Capstone Info\’ and email Dr. Godrich (godrich@soe.rutgers.edu)
with any issues or updates (please make sure the assignment ‘TEAM UP’ is updates accordingly as well).

c. [responsibility: Team POC] please fill up the ‘Capstone Project Proposal’ (available under ‘Resources’) and upload a digital copy of the document under the assignment ‘TEAM UP’ and the POC Dropbox folder.

d. [responsibility: Advisors] Please provide your students with individual special permission numbers and course section information for registration.

3. Capstone project timeline and guidelines

This section provides an overview of the general timeline for the spring semester and general guidelines as for students and advisors responsibilities and roles.

3.1 Capstone projects timeline

Please mark down the following important dates and deadlines for spring semester:

- **Friday on the first week of February**: Project abstract to be submitted to the advisor by the team POC and uploaded on Sakai under ‘Deliverables upload’ assignment.

- **Third Week of February**: Project presentations session I will be held during this week. Times and dates will be published on Sakai and via emails.

- **Friday on the second week of March**: Interim report to be submitted to the advisor by the team POC.

- **Third Week of March**: Project presentations session II will be held during this week. Times and dates will be published on Sakai and via emails.

- **Thursday on the third week of April**: Final revision of approved Project poster to be uploaded on the Sakai site.

- **Wednesday on the fourth week of April**: Poster Day/ Capstone Expo. A project competition will be held, and team members are required to be on site for the presentation.
- **Friday on the first week of May:**
  - Final report final revision approved by the advisor to be uploaded on the Sakai site
  - A 60 seconds video to be uploaded on the Sakai site.
  - Exit survey for seniors to be submitted on the Sakai site.

- **Friday on the second week of May:** deadline for submission of capstone course grades by the advisors.

### 3.2 Deliverables Guidelines

Capstone design project duration is around three months. The project process is divided herein into three main phases, each corresponding to a period of a month, leading up to the final project submission in the end of the spring semester. These phases are separated by the presentation days, which define mid-project millstones while the last millstone is the poster day presentation.

During the third week of February and the third week of March the department will hold several project presentation sessions. The team POC needs to coordinate with the project advisor and sign up to one of these sessions. Students participation is mandatory and will be reported back to the advisor. The students need to attend the full presentation session.

The objective and deliverables of each phase are as follows:

a. **Phase I:** getting organized with a final project SOW, individual team members responsibilities allocation, project design objectives and constraints, and project plan, cost, and deliverables.

*Project deliverables:* SOW will be presented in the first round of presentations during the third week of February.

**Guidelines for round I of Presentations:**

- Several presentation sessions will be held. Please use the ‘Sign up’ tab on Sakai to sign to one on the sessions. Please coordinate session choice with your advisor.
- At least 50% of each team needs to attend the presentation session in full to get credits.

- All slides need to be submitted on Sakai under ‘Deliverables Upload’ at least 5 hours before the session.

- To present teams need to be in within the first 15 minutes of the session and sign in.

- Presentations will be peer-graded and will count towards the final grade.

- Each team will have up to 5 minutes for the presentation and 2 minutes for Q&A.

- The deck of slides should include no more than 5 slides:
  
  o First slide should include the team project number, project title, team members names, and advisor(s) name(s).

  o Second slide should provide background information about the problem addressed by the project.

  o Third slide will discuss the proposed solution and how/why is it different than existing solutions.

  o Forth slide will describe the project scope of work for the spring semester.

  o Fifth slide will review general work plan and its allocation among the team members.

b. **Phase II**: project design and development, including modeling, simulation, prototyping, and any required purchases (if not done in phase I).

*Project deliverables*: project progress will be presented in the second round of presentation during the third week of March.

**Guidelines for round II of presentations:**

- Several presentation sessions will be held. Please use the ‘Sign up’ tab on Sakai to sign to one on the sessions. Please coordinate session choice with your advisor.

- At least 50% of each team needs to attend the presentation session in full to get credits.
- All slides need to be submitted on Sakai under ‘ Deliverables Upload’ at least 5 hours before the session.

- To present teams need to be in within the first 15 minutes of the session and sign in.

- Presentations will be peer-graded and will count towards the final grade.

- Each team will have up to 10 minutes for the presentation and 2 minutes for Q&A.

- The deck of slides should include no more than 7 slides:
  
  o First slide should include the team project number, project title, team members names, and advisor(s) name(s).

  o Up to two slides will offer a short review of the project scope of work (recap from session I), task allocation among team members.

  o Up to three slides will detail the project design and project status. Including project progress, implementation, performance, and challenges.

  o At least one slide should detail project tasks and milestone.

  o At least one slide should detail prototype costs, project expenses and estimated cost of mass production.

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c. **Phase III**: prototype debugging and project finalization.

Project deliverables: project poster needs to be delivered by Thursday of the third week in April. Final report, poster and 60-seconds video should be submitted by Friday on the first week of May.

**Guidelines for capstone final report:**

A template for the poster is provided on Sakai under the ‘Resources’ folder.

**Section 1**: this section should provide relevant background information on the project and the motivation for it. It should emphasize the problem identified and significance of the project compared with other existing solutions. The introduction should include:

a) A background review of the state of the art in the relevant field.
b) The problem addressed in the project.

c) Objective of the proposed projects.

d) The adopted approach

Include a discussion on the current trends in the relevant field of interest.

Describe real world systems that are related to your capstone project. Address issues such as ethics, economics and sustainability, research and development.

Research the literature and provide formal citations from publications in the Reference Section.

4. Getting started

4.1 Checklist for Phase I:

The project team needs to:

- Make sure the team meets periodically and works towards project deliverables. The first month of the semester is when most students have more available time.

- Set periodic meetings for the team with the project advisor.

- Make sure the bill of material (BOM) is ready on time and the budget is approved before moving forward with purchases.

*General deliverables*: project presentation session I

4.2 Checklist for Phase II:

The project team needs to:

- Make sure any required material is available and there are no bottlenecks that might result from ordering schedule.

- Make sure the team is on schedule with tasks and milestones.

- Keep the advisor updated with any issues and delays with project execution.
General deliverables: interim report and project presentation session II.

4.3 Checklist for Phase III:

Special attention needs to be given in this phase to the project report. There are ABET requirement with respect to this report. Both students and advisors need to work together to make sure the report is compliant with these requirements.

The project report template includes detailed information on what needs to be addressed in each section. Please refer to the template (available on the Sakai site under the Resources tab) for guidelines. Some important topics that need to be covered in the report are:

- List of relevant standards used in the project
- Detailed cost analysis of the project prototype (when relevant), work invested, time, resources, software platform, services etc.
- Sustainability aspects of the project
- Inclusion of a detailed references list
- Copyright violation - make sure that the students have generated any figures used in the report.

General deliverables: project report, poster, 60-seconds video, and presentation on Capstone Expo Day. In the last few weeks of the semester Dr. Godrich will send an exit survey to all students. This survey needs to be filled up by all students before grades can be released.

5. Capstone project Lab space and Funding

5.1 Lab space and training

The ECE department allocated EE 109 laboratory for capstone project needs. The team POC should contact Ms. Pamela Heinold (room EE120; email: pamela.heinold@rutgers.edu) within
the first few weeks of the semester to let her know if a lab space is required for the project. A lab a time slots will be allocated according to the needs and availability.

During weekdays from 9AM to 3PM teams may get access to the lab from Ms. Pamela Heinold (room EE120; email: pamela.heinold@rutgers.edu) or Ms. Arletta Hosciowicz (room EE124; email: ah860@soe.rutgers.edu). After 3PM, the lab will have a designated departmental supervisor. Please check the home page on Sakai for weekdays late PM hour and weekend lab availability.

Students that need to work in a lab must attend safety training sessions. These will be held during the month of January and February of 2018. Please follow announcement on Sakai as for training session scheduling. Please contact Ms. Pamela Heinold (room EE120; email: pamela.heinold@rutgers.edu) with any questions regarding lab use and training.

5.2 Project budget and funding

The ECE department allocates a budget of $300 per capstone project. Prior to making any purchases, the capstone advisor needs to approve them.

Capstone teams looking for additional funding can apply for ‘Seed Money’ grants by contacting Dr. Godrich (godrich@soe.rutgers.edu). Seed money grants application will be accepted up until February 17, 2018.

Purchase procedure:

All purchases need to be placed through the department. We can accommodate 2 days delivery or express, but they need to be made with the help of the Capstone Program administrator listed on the Sakai homepage.

Please follow the instruction on Sakai for any purchases.
**Borrowing Policies**

Some equipment and devices are available from the ECE to borrow for the duration of the projects. Please check with Ms. Pamela Heinold (room EE120; email: pamela.heinold@rutgers.edu), Mr. John Scafidi (scafidi@soe.rutgers.edu) or Dr. Hana Godrich (godrich@soe.rutgers.edu) for equipment and devices availability. Arduino, Raspberry PIs, and some sensors are available in the department to be loaned for the semester.

All borrowed equipment must be returned by the end of the first week in May. Equipment borrowers assume full responsibility for damage, loss or theft. Advisors will be notified when their students borrow equipment. Grades should not be posted until advisor gets confirmation of equipment return.

6. **Students and Advisors Responsibilities**

6.1 **Students responsibilities**

Capstone design team members have full responsibility and ownership for their capstone project. A POC needs to be selected for each team. The POC is responsible to making all communication with the advisor and the department. He/she are not responsible for the project, the responsibility for the project executions is equally split between all group members. Team members should decide in the first week what is the role each member takes in the project, both technical and administrative, and share this information with the advisor. Please make sure all are taking a fair share of the project load. Students are responsible, among others, for:

- Reviewing and understanding the project timelines, milestones and deliverables.
- Signing up to the advisor capstone course.
- Coordinating and agreeing with the advisor on the project scope of work (SOW) and deliverables.
- Managing tasks, project milestone, budgeting and purchases for the project.
- Tracking project progress and making sure the team is on schedule.
- Setting time to meet periodically with all team members and with the team advisor.
- Keeping the advisor informed in a timely fashion with the project progress and any roadblocks.
- Keeping the department informed with any issues that require the department attentions or assistance.
- Preparing the required material for project presentations and getting advisor feedback in advance.
- Working on the project in a consistent fashion and allocating an appropriate amount of time for its execution.
- Delivering any reports, poster, presentation and other project deliverables on time.
- Being responsive to the advisor and department communication and requests.
- Participate in Poster Day and all presentations.

Students will be graded individually for their performance in the capstone design project.
Remember, every team member has full responsibility to the team’s success.

6.2 Capstone advisor role

Capstone design project advisors are required to supervise the planning and progress of the project and the team. The advisor needs to
- Assist the students with defining the project scope of work
- Provide students with registration information
- Provide the student with feedback on proposed project solutions and purchases
- Meet with the students on a regular basis to review their progress
- Be available to the students in person or via email to support the students with problem solving if needed
- Review the proposal, abstract, presentations, poster and reports and verify compliance with department requirement as detailed in this booklet and in the report guide
- Attend capstone presentations
- Grade the students (individual grading)

7. Capstone project grading

The advisor is grading students’ performance. ECE advisor should upload grades directly and others should send the grade to the POC within the ECE department that will coordinate the grade submissions. The grades are not a group grade but and individual one.
Grading breakdown:

1. 6% (2x3%) - participation in scheduled events. Each team needs to participate in capstone expo and ONE departmental event including Open House, Rutgers Day, Engineering week, Admitted Students tours, and other spring outreach events. Each count towards 3% of the grade.

2. 14% (2x7%) - presentation rounds I & II grading; for each presentation the 7% breakdown is as follows: 3% for participation and slides; 4% presentation quality by peer review.

3. 80% - Advisor project evaluation; advisor should clearly communicate to students with his/her expectations of the project in terms of quality and deliverables.

8. Capstone Deliverables

The advisor is grading students’ performance. ECE advisor should upload grades directly and others should send the grade to the POC within the ECE department that will coordinate the grade submissions. The grades are not a group grade but and individual one.
Appendix A: Capstone design project registration info

An example of the document titled 'Special Permission Number Assignments', that was sent by Dr. Godrich in the previous semester includes the individual section number and 12 special permission numbers.

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CONTACT SCHEDULING OFFICE FOR ADDITIONAL NUMBERS

MEETING TIMES

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</table>
Appendix B: Capstone project proposal document

Capstone Project Proposal

Project Number:

Project Title:

**Project term:** Spring 2017

Student names (last and first name) and contact information (please start with the team point of contact):

1. 
2. 
3. 
4. 

Project Advisor(s) name(s):

1. 
2. 
Appendix B: Capstone project proposal document (cont. P2)

Capstone Project Proposal

Team number:

Title:

This section should include a one page (max) description of the project.