Instructor: Siddhartha Sikdar
- Title: Professor, Bioengineering and Director, Center for Adaptive Systems of Brain-Body Interactions
- E-mail: ssikdar@gmu.edu
- Office: Online only for Fall 2021
- Office hours: By appointment

NRT Program Coordinator: Stephanie Carmack
- Email: scarmac@gmu.edu
- Office hours: By appointment

Other faculty mentors/participants:
- Nathalia Peixoto, Electrical and Computer Engineering
- Holly Matto, Social Work
- Padmanabhan Seshaiyer, Mathematics
- Jim Thompson, Psychology

Lectures: Wednesdays, 9:00 am-10:00 am
Zoom link: https://go.gmu.edu/casbbi

Website/Course Management System: (Blackboard): 202170.86139 PROV-801-001 (Fall 2021) on courses.gmu.edu

Important Notes and Dates:
- Holidays: Thanksgiving (Nov. 25th – 29th)
- Last Day of Classes: Dec 5th
- Final Exam: There is no final exam for this class: the final deliverable is a project report document and the final project presentation.

Students should visit http://registrar.gmu.edu/calendars/ for information on the University Academic Calendar.

Course Delivery: Online synchronous and field work

Required Textbook: There is no required textbook for this class. Some resources are provided below. Others will be posted on Blackboard under Course Content.
## Optional Recommended Sources:

<table>
<thead>
<tr>
<th>Content</th>
<th>Resources</th>
</tr>
</thead>
</table>
| Community-engaged Participatory Research     | Implementation Research Toolkits  
http://adphealth.org/irtoolkit/  
Research Toolkit  
http://researchtoolkit.org/index.php/about |
| Design Thinking and Root cause analysis       | Lean Startup Methodology  
https://steveblank.com  
Biodesign  
| Team Science                                 | Penn State Team Science Toolbox  
https://ctsi.psu.edu/research-support/team-science-toolbox/  
Team Science Field Guide  

### Required Technology:
Activities and assignments in this course will regularly use the Blackboard learning system and web conferencing software (Zoom), available at [https://mymason.gmu.edu](https://mymason.gmu.edu). Students are required to have regular, reliable access to a computer with an updated operating system, a stable broadband internet connection, and access to a device with a functional camera and microphone. We expect you to have your camera on during class.

### Course Description:
This two-course sequence addresses a national need to develop new models of interdisciplinary graduate education that prepares graduate students for a diversity of careers in STEM. This course sequence is designed to provide graduate students with a firm foundation in applying interdisciplinary design thinking to develop creative solutions to real world challenges with the objective of creating actionable knowledge in a community. In close collaboration with community partners, students will receive hands-on training to define problems, understand the challenges associated with data in the real world, collaborate on multidisciplinary teams, communicate with diverse audiences, integrate multiple perspectives including disciplinary knowledge, lived experiences, and community insights, and apply multidisciplinary methods to create actionable knowledge.

The following are the expectations for the two-course sequence:

1. Formulate a research question
2. Iteratively refine question in collaboration with community partners
3. Develop a collaborative solution to address the research question
4. Submit IRB protocol as needed.
5. Collect and analyze data to evaluate feasibility (Phase 1)
6. Write a research report, including background research to identify knowledge gaps, clearly articulated research question, research methods, preliminary results and discussion (PROV 801 deliverable)
7. Refine proposed collaborative solutions, based on preliminary data
8. Collect and analyze new data to evaluate refined solution (Phase 2)
9. Write and submit a research proposal (PROV 802 deliverable)
10. Disseminate results (PROV 802 deliverable)

In this course (PROV 801), multidisciplinary teams of students will immerse themselves in community settings to identify and articulate a problem with participation of community stakeholders, design a proposed solution, and collect preliminary data to evaluate feasibility. The deliverable for PROV 801 is a research report formatted as a journal manuscript.

Course Topics:
Student are expected to work in multidisciplinary groups to address one or more of the following:
• Work with community stakeholders to identify challenges and needs.
• Engage in participatory design with stakeholders to develop and test practical solutions to challenges that are specific to particular settings and environments.
• Propose methods to overcome the identified challenges that can be practically deployed in real-world settings.
• Investigate ecological validity of outcome assessments of proposed solutions.

Prerequisites: None

Requirement or Elective: Required for students in the CASBI NRT cohort

Course Goals and Objectives/Learning Outcomes:
Guided by the NSF definition of convergence as “deep integration of knowledge, techniques, and expertise from multiple fields to form new and expanded frameworks for addressing scientific and social challenges and opportunities,” we will utilize the following learning outcomes:
When faced with a complex societal problem, trainee demonstrates the following skills:
a. Knowledge integration: Applies knowledge based on a disciplinary foundation, and integrates knowledge from different disciplines; can define a problem using multiple perspectives based on disciplinary knowledge, lived experiences, and community knowledge.
b. Procedural learning: Knows how, when, and why to apply different methodological approaches to problems and questions.
c. Transfer of learning: Independently adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations to explore complex issues in original ways.
d. Communication: Demonstrates team work, critical and reflective thinking, and intercultural knowledge and competence to communicate effectively with community stakeholders.
e. Team science attitude: Values the diversity of the multiple disciplines, perspectives, and experiences that support convergence and team science.

Assignments and Examinations: There are no formal examinations in this class. There will be several writing assignments throughout the semester, including drafts of the project proposal and presentation. Students will be working in teams, but are expected to develop their own individual portfolio (reflective pieces) and show progress throughout the 801/802 semesters.
**Class Participation:** Class participation is an important aspect of this course. Participation will be assessed not only through the weekly synchronous video conferences, but also through asynchronous participation on Slack and through reports of interviews with community stakeholders. Peer mentoring and peer review is another important aspect of this course. It is expected that students who have specific disciplinary expertise will participate in educating/mentoring other students to come up to speed on methods. It is also expected that students will be asked to review drafts of project reports of their peers. During Week 12, we will conduct a peer review of the project report drafts. The class participation grade will be determined based on the student’s contribution to the team project, assessed through written materials submitted by the student, as well as participation in the peer review and peer mentoring activities.

**Grading Structure:**

- The final grade will be based on:

<table>
<thead>
<tr>
<th>PROV 801</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The final project report is a team effort and the grade will apply to</td>
<td>40%</td>
</tr>
<tr>
<td>all members of the team. The other elements will be graded individually.</td>
<td></td>
</tr>
<tr>
<td>Final project report (Written) Team assessment</td>
<td>40%</td>
</tr>
<tr>
<td>Final project presentation (Oral) Team assessment</td>
<td>20%</td>
</tr>
<tr>
<td>Homework assignments/contribution to team (individual assessment)</td>
<td>20%</td>
</tr>
<tr>
<td>Reflective pieces in ePortfolio (individual assessment)</td>
<td>20%</td>
</tr>
</tbody>
</table>

- Homework assignments/contribution to team: Each member of the team will be asked to coordinate the completion of one homework assignments that are due throughout the semester are completed in a timely manner. Each member will be given the opportunity to pick which of the assignments they will lead. While all team members are expected to contribute, the quality of the work submitted will reflect on the ability of the lead team member to get everyone else to contribute appropriately and consolidate all the contributions into a submission.

- ePortfolio: At the end of the semester, you will be asked to submit a document reflecting on your growth throughout the semester on the learning outcomes. You can work on this ePortfolio reflection throughout the semester documenting your growth (think of this as a personal journal or a blog). You can include artifacts/products that you created that you are proud of. The quality of the final submission and the use of appropriate documentation will be graded individually.

- The grading scale for this course is:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A +</td>
<td>95-100%</td>
</tr>
<tr>
<td>A</td>
<td>90-95%</td>
</tr>
<tr>
<td>A -</td>
<td>85-90%</td>
</tr>
<tr>
<td>B +</td>
<td>80-85%</td>
</tr>
<tr>
<td>B</td>
<td>75-80%</td>
</tr>
<tr>
<td>B -</td>
<td>70-75%</td>
</tr>
</tbody>
</table>
* Grades of C or lower in this course are considered unsatisfactory.

Course Policies:
- Students are expected to exhibit professional behaviors and dispositions at all times.
- **Make-up Policy:** If for some reason, you are sick or otherwise unable to participate in the course sessions or activities, please contact the instructor by email to set up alternative arrangements.
- **Communication Policy:** The instructor will be available to answer queries by email or on Slack, and will attempt to respond to you as soon as possible, no later than within the next working day.
- **Face-Covering and Social Distancing:** While we do not plan to meet on campus for this class, you are reminded that face coverings are required for anyone in all buildings on campus in accordance with [University Policy 1415](#). If plan to be on campus for any reason, please be sure to follow this guidance. If you are unable to meet this guidance, please refrain from coming to campus.
- **Video recordings:** All synchronous Zoom sessions will be recorded and the recordings posted on Blackboard.

Tentative Course Outline (subject to change)

The expectation for this 3-credit class is that students will meet weekly online for one hour and spend two hours per week in the community setting. During online meetings, there will be some didactive presentations based on the schedule below customized to the topic of team projects, and there will also be hands-on activities related to development of the team project reports.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic for in-class discussion/readings</th>
<th>HW/Deliverables</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/25</td>
<td>Setting expectations for the project and deliverables.: SMART Goals</td>
<td>Prioritized list of questions you would like to answer about your project topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercises using question formulation technique for research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9/1</td>
<td>Divergence and convergence exercises for refining research question</td>
<td>First draft of focused research question</td>
<td>8/31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Revised team charter (Sections 4-7)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9/8</td>
<td>Discussion of study design logistics for IRB protocol submission</td>
<td>Systematic literature review and gap analysis.</td>
<td>9/7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data privacy, security and bias</td>
<td>Second draft of focused research question</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9/15</td>
<td>Research design, qualitative, quantitative and mixed methods</td>
<td>Complete IRB protocol and submit (including input from mentors)</td>
<td>9/14</td>
</tr>
<tr>
<td>5</td>
<td>9/22</td>
<td>Conducting semi-structured interviews; needs assessment; value propositions</td>
<td>Revise and resubmit IRB protocol as requested.</td>
<td>9/28</td>
</tr>
<tr>
<td>Week</td>
<td>Date</td>
<td>Activity</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9/29</td>
<td>Clinical study design</td>
<td>Finalize study logistics Revised team charter (Sections 8-9).</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10/6</td>
<td>Dealing with unstructured and incomplete data sets</td>
<td>Start data collection for feasibility study 10/5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Methods for data linking and aggregation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>10/13</td>
<td>Discussion on statistical and computational data analysis methods</td>
<td>Outline of research report with anticipated results. 10/12</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10/20</td>
<td>Discussion on statistical and computational data analysis methods</td>
<td>Continue data collection for feasibility study</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10/27</td>
<td>Team Science: Performance Assessment</td>
<td>Complete preliminary data analysis</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11/3</td>
<td>Team Science: Conflict Resolution</td>
<td>First draft of research report</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>11/10</td>
<td>Peer review and discussion of research reports</td>
<td>Complete data collection and analysis</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>11/17</td>
<td>Communicating with a broad audience</td>
<td>Revised draft of research report</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>11/24</td>
<td>Thanksgiving recess, no class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>12/1</td>
<td>Reading day</td>
<td>Upload practice presentations on Blackboard</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>12/8</td>
<td>Final Project Presentations</td>
<td>Final draft of research report</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e-Portfolio final reflection on PROV 801</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12/10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assignment for first day of PROV 802: Team update; IRB amendments as necessary</td>
<td>1/25/22</td>
<td></td>
</tr>
</tbody>
</table>

Note: the instructor reserves the right to make any changes in the course determined academically advisable. Changes will be announced in class and updated in the syllabus (where appropriate). It is your responsibility to keep up with any changed policies.

If the campus closes or class is canceled due to any concerns, students should check Blackboard [or other instruction as appropriate] for updates on how to continue learning and information about any changes to events or assignments. Since this course is all online, we do not anticipate major disruptions.

**Student Expectations, Policies and Resources:**

**University Policies**
Students must follow all university policies. [See http://universitypolicy.gmu.edu]. Responsible Use of Computing: students must follow the university policy for Responsible Use of Computing. [See http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/].

**Academic Integrity**
It is expected that students adhere to George Mason University’s Honor Code. Please see the University Catalog or https://oai.gmu.edu/mason-honor-code/full-honor-code-document/ for a
full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. Any instances of misconduct will be referred to Mason’s Office of Academic Integrity, the consequences of which could significantly affect your career. Depending on the level of severity and the number of recorded incidents this could result in academic suspension or even permanent dismissal.

Students should not cheat, plagiarize, steal and/or lie in matters related to academic work. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions.

Posting or sharing of instructor-created course content (e.g. instructor lecture notes, assignments, exam and quiz questions, or anything else not credited by the student) using any non-electronic or electronic medium where it is accessible to anyone other than the individual student constitutes stealing/copyright infringement and is considered a violation of the honor code. This is strictly prohibited without prior instructor approval.

When in doubt (of any kind, including what constitutes an honor code violation) please ask your instructor for guidance and clarification. Students must be responsible for their own work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university culture.

Diversity and Inclusion
The Center for the Adaptive Systems of Brain-Body Interactions is committed to providing an inclusive and equitable work and learning environment. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. Please also refer to the Office of Diversity, Inclusion, and Multicultural Center (ODIME). ODIME is located in the Student Union Building I (SUB I), Suite 2400. Email: odime@gmu.edu | Phone: (703) 993-2700. [See https://odime.gmu.edu/about-odime/]

Gender identity and pronoun use: if you wish, please share your name and gender pronouns with me and how best to address you in class and via email. I use he/him/his for myself and you may address me as “Siddhartha” in email and verbally.

Anti-racism statement
As a member of the George Mason University community, the Center for the Adaptive Systems of Brain-Body Interactions plays an integral role in building an educational environment that is committed to anti-racism and inclusive excellence. An anti-racist approach to higher education acknowledges the ways that individual, interpersonal, institutional, and structural manifestations of racism against Black individuals and other people of color contribute to inequality and injustice in our classrooms, on our campuses, and in our communities, and it strives to provide our community members with resources to interrupt cycles of racism so as to cultivate a more
equitable, inclusive, and just environment for all of our students, staff, faculty, alumni, and friends, regardless of racial background.

To be anti-racist means:

- To make constant, conscious decisions to interrupt racism and cultivate equity, inclusion, and justice for people of all racial backgrounds, and in particular those from Black communities and other communities of color, who are most likely to bear the direct and indirect costs of systems of white supremacy;
- To interrogate histories of white supremacy and white-dominant culture, and to examine the ways in which these histories have impacted our individual beliefs, our interpersonal relationships, our institutional and structural policies and processes, and our entire society;
- To make a commitment to being responsible for our own relationships to, and actions within, systems of white supremacy; and
- To cultivate a practice of self-awareness and self-reflection that allows us to critically evaluate our own role in upholding white supremacy and identify the ways we can interrupt cycles of racism at the individual, interpersonal, institutional, and structural levels.

We believe that the work of anti-racism starts with each individual, and that in cultivating an anti-racist approach to research, scholarship, and practice, our students will build a skillset rooted in principles of equity, inclusion, and justice that they will carry with them throughout their lives.

For more information on how to continuously cultivate the practice of anti-racism, see this guide from the National Museum of African American History and Culture on how to be anti-racist: https://nmaahc.si.edu/learn/talking-about-race/topics/being-antiracist

MasonLive/Email (Mason Email)
Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account. [See https://masonlive.gmu.edu/login].

Privacy:
Family Educational Rights and Privacy Act (FERPA) of 1974, also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See http://registrar.gmu.edu/privacy]. Note, all course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class. This includes video recordings (whether made by instructors or students) and live video conference meetings that can identify specific students (via name, voice, or image).

Students with Disabilities:
Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit
https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in the Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474.

Learning Services and Peer Mentoring:
Students can reach out to Learning Services for assistance. They provide free, experience-based learning opportunities through one-on-one academic coaching, academic success workshops, and online resources. Learning Services is located in the Student Union Building I (SUB I), Room 3129. Email: lsstaff@gmu.edu | Phone: (703) 993-2380. [See https://learningservices.gmu.edu/]. You can also reach out to VSE’s Peer Mentoring Center for assistance in engineering, computer science, and information technology courses. Note, you should also contact them if you want to serve as a peer mentor. The peer mentor center is located in the Nguyen Engineering Building, Room 2614. Phone: 703-993-1511. [See https://volgenau.gmu.edu/about/current-student-resources/find-tutor].

University Career Services:
University Career Services provides a variety of career-related resources and services (e.g. career advising, resume help, and interview prep). They also host various career-related events including the Fall and Spring career fairs, on-campus interviews, and workshops. Career Services is located in the Student Union Building I (SUB I), Room 3400. Email: careers@gmu.edu | Phone: (703) 993-2370. [See https://careers.gmu.edu/].

Writing Center
The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/]. You can now sign up for an Online Writing Lab (OWL) session or for a face-to-face session in the Writing Center, which means you set the date and time of the appointment! Learn more about the Online Writing Lab (OWL) (found under Online Tutoring).

University Libraries
The Mason library provides resources for both in-class [See http://library.gmu.edu/] and distance students. [See http://library.gmu.edu/distance].

Counseling and Psychological Services
The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance. CAPS is located in the Student Union Building I (SUB I), Room 3129. Phone: (703) 993-2380. [See http://caps.gmu.edu].

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence
As a faculty member, I am designated as a “Responsible Employee,” and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s Title IX Coordinator per University Policy 1202. If you wish to speak to someone confidentially, please contact one of
Mason’s confidential resources, such as the Student Support and Advocacy Center (SSAC) at 703-380-1434 (24-hr. crisis line) or Counseling and Psychology Services (CAPS) at 703-993-2380 or 703-380-1434 (crisis line). You may also seek assistance from Mason’s Title IX Coordinator by calling: 703-993-8730 or emailing titleix@gmu.edu.

The Student Support and Advocacy Center
The Student Support and Advocacy Center (SSAC) provides various support services for students including one-on-one consultations, educational programming, and resources in the areas of sexual and interpersonal violence, financial well-being, substance use, and collegiate recovery. In particular during this challenging time, they are here to assist you. SSAC is located in the Student Union Building I (SUB I), Suite 3200. Email: ssac@gmu.edu | Phone: (703) 993-3686. [See https://ssac.gmu.edu/].

Student Health Services (SHS)
SHS provides confidential health care to enrolled students in emergency and non-emergency circumstances on the Fairfax, Arlington and Prince William campuses. If there is a medical emergency and Student Health Services (SHS) is closed, please contact the free after-hours nurse (703 993-2831), a hospital emergency room, an urgent care facility, or call 911. [See https://shs.gmu.edu/].

University Police
Emergency: 911 Non-Emergency: (703) 993-2810
Reporting a Crime (Crime Solvers Anonymous Tip Hot-Line): (703) 993-4111
Mason Police Website: http://police.gmu.edu/