



جامعة جدة
University of Jeddah

Senior Project Guidelines

College of Computer Science and Engineering
University of Jeddah

Prepared by:

CCSE Senior Project Committee (2019-2021)

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Message of the CCSE Committee for Senior Projects

The Undergraduate Senior Project is an experience in which students work in teams on an applied real-world problem of their interest, go through its software or artifact development lifecycle in order to develop a prototype solution for the problem at hand. The Senior Project offers an opportunity for students to integrate the knowledge they acquired in preceding courses, as well as promote and improve communication skills, writing skills, and self-learning skills. Senior Projects synthesize a student's general educational experiences; open new opportunities for future employment, and encourages pursuing postgraduate studies.

Senior Project Objectives

Senior Projects at CCSE are an opportunity for students to continue a sustained line of skill acquisition that they already begun. A Senior Project may develop out of a research paper, an entrepreneurial idea, or a software project that a student has done in a course. It may also derive from ideas stimulated by a student's imagination. Successful Senior Projects will involve formulating a real-world problem and developing a solution for it. Therefore, students interested in pursuing a Senior Project are encouraged to consult with an advisers early in their undergraduate program to plan for appropriate courses well in advance.

Senior Project Outcomes

The Senior Project provides students an opportunity to demonstrate a strong foundation in general and discipline-specific knowledge as well as an advanced proficiency in the core competencies of computer science, written and oral communication, and teamwork.

After completion of the Senior Project, the student shall be able to:

- Formulate a real-world problem and develop its requirements.
- Develop a design solution for a set of requirements.
- Test and validate the developed prototype.
- Work as a responsible member, and possibly a leader, of a team in developing software solutions.
- Self-learn new tools, algorithms, and/or techniques that contribute to the software solution of the project.

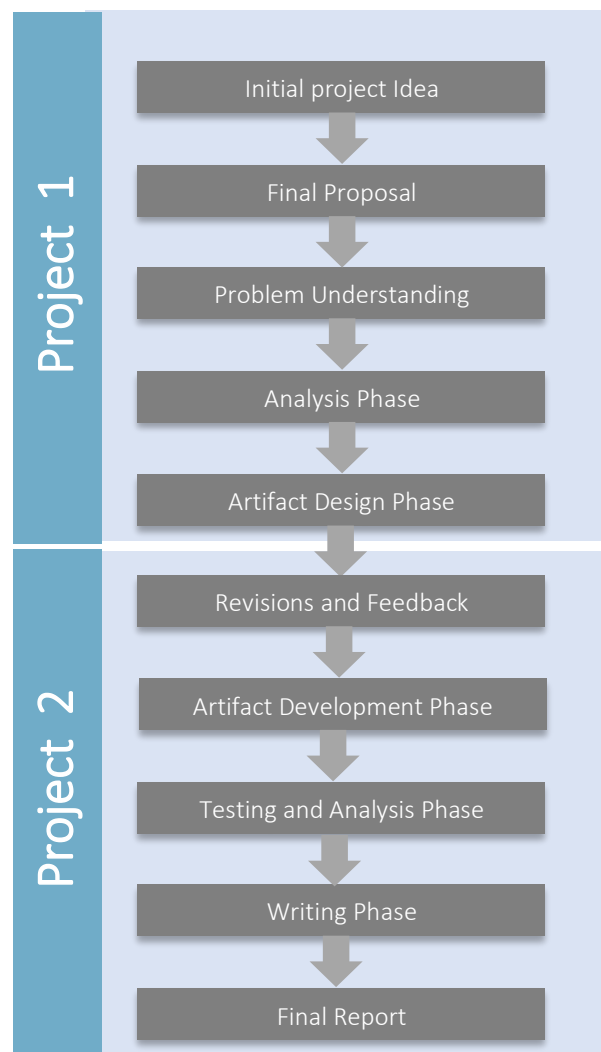
Senior Project Tracks

Senior Projects are divided into three tracks (**General Track**, **Data Science Track**, and **Research Track**). Each group and their advisor(s) can select one of these tracks to develop their project idea and work on it. Each of these tracks has its own guidelines, expectations, and evaluation criteria. All of the three tracks are explained in the following subsections.

General Track

For the general track, each group must choose an idea or topic/theme on which they would like to create a technical artifact such as an application, a new algorithm, a system that combined both hardware and software, and so on. Students in each group must find an advisor to whom they will present their idea. It is possible for each group to come up with their own idea and topic, but students can also be guided by their advisor on which project idea might be suitable and can be done within the timeframe.

General Track Roadmap



General Track Plan

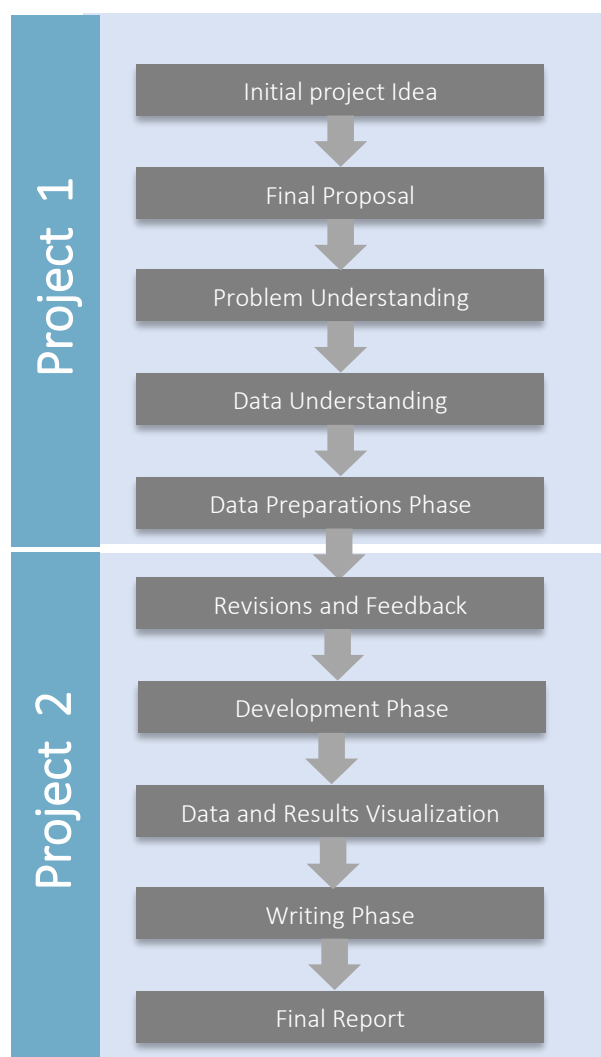
Senior Project 1 – General Track Plan			
	Phase	Deliverables	Tool
Week 1	Selection Phase	<ol style="list-style-type: none"> 1. Choose Team members 2. Talk to potential supervisors 	
Week 2 & 3		<ol style="list-style-type: none"> 1. Choose a Supervisor 2. Finalize the project topic 	
Week 4	Planning Phase	Phase 1: Planning <ol style="list-style-type: none"> 1. Description of the context (Scope) and the problem to solve 2. Aims 3. Objectives 4. Report outline 5. Project Plan Submit Chapter 1 (Plan)	Microsoft Word, LaTeX
Week 5	Problem Understanding	Phase 2: Problem Understanding <ol style="list-style-type: none"> 1. Stakeholders definition 2. Detailed Description of the background (project domain) 3. Literature Review 4. Comparison criteria definition 5. Comparison results and the feasibility study Submit Chapter 2 (Problem Understanding)	Microsoft Word, LaTeX
Week 6, 7 & 8	Analysis Phase	Phase 3: Analysis <ol style="list-style-type: none"> 1. Functional & Non-Functional Requirements (If Applicable) 2. Hardware Requirements (If Applicable) 3. UML diagrams (If Applicable) 4. Data collection instruments (Data logger) Submit Chapter 3 (Analysis)	Microsoft Project Microsoft Word, LaTeX
Week 9, 10 & 11	Design Phase	Phase 4: Design <ol style="list-style-type: none"> 1. System Architecture 2. Diagrams (If Applicable) 3. User interface Design (If Applicable) Submit Chapter 4 (Design)	Microsoft Visio, Microsoft Word, LaTeX
Week 12	Final Report	Submit Final Report to Supervisor and Committee	Microsoft Word, LaTeX
Week 13	Final Report	<ol style="list-style-type: none"> 1. Supervisor Feedback 2. Improvements/Corrections 3. Presentation with Supervisor 	Microsoft Word, LaTeX
Week 14-15	Presentations	Final Report and Presentation	Microsoft Word, PowerPoint, LaTeX

Senior Project 2 – General Track Plan			
	Phase	Deliverables	Tool
Week 1	Revisions	<ol style="list-style-type: none"> 1. Give a full update to supervisor 2. Supervisor Feedback 3. Make edits or updates to previous parts 	
Week 2 – 10	Development Phase	Phase 1: Development <ol style="list-style-type: none"> 1. Use the Design Document 2. APIs and Plugins (If Applicable) 3. Data collection instruments (Data logger) 4. Implementation/Coding 5. Testing Submit Chapter 5 (description of the developed system) and a working version of the developed artifact	Microsoft Word, LaTeX
Week 11	Testing and Analysis Phase	Phase 2: Testing the develop artifact <ol style="list-style-type: none"> 1. Conduct a testing study 2. Data collection (Quantitative, Qualitative) 3. Clean the data and prepare for analysis 4. Analyze the collected data using the appropriate method and tool 5. Visualize the results 6. Understand what the results mean Submit Chapter 6 (Testing)	Microsoft Word, LaTeX
Week 12	Writing Phase	Phase 4: Writing Final Report <ol style="list-style-type: none"> 1. Follow a technical report template to write your final report. 	Microsoft Word, LaTeX
Week 13	Final Report	Submit Final Report to Supervisor and Committee <ol style="list-style-type: none"> 1. Supervisor Feedback 2. Improvements/Corrections 3. Presentation with Supervisor 	Microsoft Word, LaTeX
Week 14-15	Presentations	Final Report and Presentation	Microsoft Word, PowerPoint, LaTeX

Data Science Track

For the data science track, each group must choose a topic or theme related to data science on which they would like to do a project on. Students in each group must find an advisor to whom they will present their data science related idea. It is possible for each group to come up with their own idea and topic, but students can also be guided by their advisor on which project idea might be suitable and can be done within the timeframe.

Data Science Track Roadmap



Data Science Track Plan

Senior Project 1 – Data Science Track Plan			
	Phase	Deliverables	Tool
Week 1	Selection Phase	<ol style="list-style-type: none"> 1. Choose Team members 2. Talk to potential supervisors 	
Week 2 & 3		<ol style="list-style-type: none"> 1. Choose a Supervisor 2. Finalize the research project topic 	
Week 4	Planning Phase	Phase 1: Planning <ol style="list-style-type: none"> 1. Description of contents 2. Aim and Scope 3. Motivation and Objective 4. Project Deliverables Submit Chapter 1 (Plan)	Microsoft Word, LaTeX
Week 5	Problem Understanding	Phase 2: Problem Understanding <ol style="list-style-type: none"> 1. Related work 2. Project Methodology 3. Project Framework 4. Formulate Initial Hypotheses 5. Identify Data Sources 6. Begin Learning the Data Submit Chapter 2 (Problem Understanding)	Microsoft Word, LaTeX
Week 6, 7 & 8	Data Understanding	Phase 3: Data Understanding <ol style="list-style-type: none"> 1. Data Collection 2. Data Description 3. Data Exploration 4. Data Quality Submit Chapter 3 (Data Understanding)	R Studio, Microsoft Word, Rapid miner
Week 9, 10 & 11	Data Preparations Phase	Phase 4: Data Preparations Phase <ol style="list-style-type: none"> 1. Removal of unwanted observations (deleting duplicate/ redundant or irrelevant values from your dataset) 2. Fixing Structural errors 3. Managing Unwanted outliers 4. Handling missing data 5. Develop data sets for testing, training, and production purposes Submit Chapter 4 (Prepared Data)	R Studio, Microsoft Word, Rapid miner
Week 12	Final Report	Submit Final Report to Supervisor and Committee	Microsoft Word, LaTeX
Week 13	Final Report	<ol style="list-style-type: none"> 1. Supervisor Feedback 2. Improvements/Corrections 3. Presentation with Supervisor 	Microsoft Word, LaTeX, Microsoft Visio
Week 14-15	Presentations	Final Report and Presentation	Microsoft Word, PowerPoint, Visio, LaTeX

Senior Project 2 – Data Science Track Plan			
	Phase	Deliverables	Tool
Week 1	Revisions	<ol style="list-style-type: none"> 1. Give a full update to supervisor 2. Supervisor Feedback 3. Make edits or updates to previous parts 	
Week 2 – 9	Development Phase	Phase 1: Development <ol style="list-style-type: none"> 1. Use the Design Document 2. APIs and Plugins (If Applicable) 3. Data collection instruments (Data logger) 4. Implementation/Coding 5. Testing Submit Chapter 5 (Data/System)	R Studio, Microsoft Word, Rapid miner
Week 10 & 11	Data and Results Visualization Phase	Phase 2: Data and Results Visualization <ol style="list-style-type: none"> 1. Analyze the collected data using the appropriate method and tool 2. Visualize the results 3. Understand what the results mean Submit Chapter 6 (Results)	R Studio, Microsoft Word, Rapid miner
Week 12	Writing Phase	Phase 4: Writing Final Report <ol style="list-style-type: none"> 1. Follow a technical report template to write your final report. 	Microsoft Word, LaTeX
Week 13	Final Report	Submit Final Report to Supervisor and Committee <ol style="list-style-type: none"> 1. Supervisor Feedback 2. Improvements/Corrections 3. Presentation with Supervisor 	Microsoft Word, LaTeX
Week 14-15	Presentations	Final Report and Presentation	Microsoft Word, PowerPoint, LaTeX

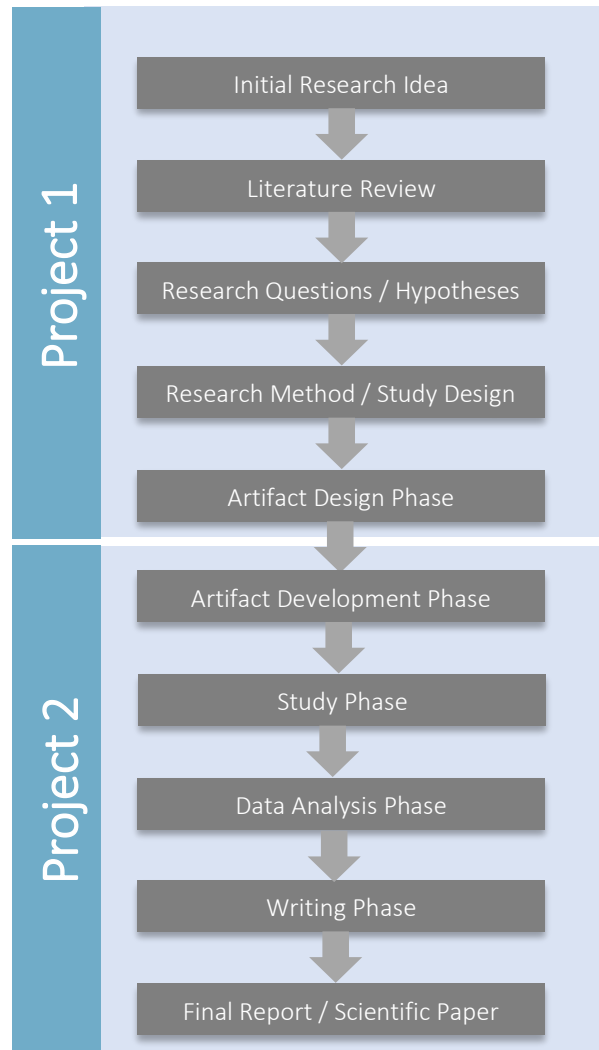
Research Track

For the research track, each group must choose a topic or theme on which they would like to do a scientific research project. Students in each group must find an advisor to whom they will present their research idea. It is possible to come up with their own topic, but students can also do guided research that their advisor is already conducting or planning to conduct. The project must be of scientific nature, i.e. start from an original research question/ hypothesis and aim at contributing new knowledge to the specific area of study by answering this question or testing this hypothesis. **Each group supervisor must prepare their students for this type of project by giving them a short introduction on how to conduct scientific research and what they need to do in each phase of the project and closely work with them to guide them and assist them when needed.** Also, students must be the owners and leading researchers in this graduation research project and be active in completing the research from beginning to end.

Every research project has five mandatory parts (this is an overview of both project 1 & 2):

1. **Doing actual research:** which includes: doing a literature review of relevant scientific papers, writing a synthesis of all reviewed literature, formulate research questions/hypotheses, and propose a study design that can help answer the proposed research question.
2. **Design and develop a new and novel artifact:** which can be a tool, a system, an application, a new or improved algorithm, an interface, or anything else. This new artifact needs to be designed and developed to conduct the study and answer the research question.
3. **Use the developed artifact in a research study:** (Quantitative, Qualitative, Mixed Method) to answer the proposed research question. The type of study, data collected, and analysis method depends on the research question and methodology agreed upon with the help of the supervisor. For example, testing the performance of the designed artifact, evaluating how users use the artifact, comparing the designed artifact with other ones, and so on.
4. **Synthesis the results and discuss the contribution of these results:** All the results from the study need to be described and visualized in a scientific manner in which the initial research questions/hypotheses need to be clearly answered/tested, and determine whether they were supported or not supported by the results of the study.
5. **Present and submit the research project to a conference or journal:** The scientific contribution, context, artifact, methods and results of the research project need to be described in a scientific-style paper that can be submitted to a conference or journal (e.g., short paper, workshop, work-in-progress, long abstract, poster, etc.).

Research Track Roadmap



Research Track Plan

Senior Project 1 – Research Track Plan			
	Phase	Deliverables	Tool
Week 1	Selection Phase	3. Choose Team members 4. Talk to potential supervisors	
Week 2 & 3		3. Choose a Supervisor 4. Finalize the research project topic	
Week 4	Introduction	Phase 1: Introduction 5. Description of contents 6. Aim and Scope 7. Motivation and Objective 8. Project Deliverables Submit Chapter 1 (Research Plan)	Microsoft Word, LaTeX
Week 5	Problem Understanding	Phase 2: Problem Understanding 1. Related Work (Literature Review) 2. Formulate Initial Hypotheses/Research Questions 3. Expected Contribution Submit Chapter 2 (Problem Understanding)	Microsoft Word, LaTeX
Week 6 & 7	Research Methodology	Phase 3: Research Methodology 1. Overview of the Research Methodology 2. Analysis and Design Plan 3. Research Study Design 4. Data Collection Method 5. Data Analysis Method Submit Chapter 3 (Methodology)	Microsoft Word, LaTeX
Week 8 & 9	Analysis Phase	Phase 4: Analysis 5. Functional & Non-Functional Requirements (If Applicable) 6. Hardware Requirements (If Applicable) 7. UML diagrams (If Applicable) 8. Data collection instruments (Data logger, Survey) Submit Chapter 4 (System Analysis)	Microsoft Project Microsoft Word, LaTeX
Week 10 & 11	Design Phase	Phase 5: Design 4. System Architecture 5. User interface Design (If Applicable) Submit Chapter 5 (Design)	Microsoft Visio, Microsoft Word, LaTeX
Week 12	Final Report	Submit Final Report to Supervisor and Committee Select a Research Venue (Conference, Journal)	Microsoft Word, LaTeX
Week 13	Final Report	4. Supervisor Feedback 5. Improvements/Corrections 6. Presentation with Supervisor	Microsoft Word, LaTeX
Week 14-15	Presentations	Final Report and Presentation	Microsoft Word, LaTeX

Senior Project 2 – Research Track Plan			
	Phase	Deliverables	Tool
Week 1	Revisions	4. Give a full update to supervisor 5. Supervisor Feedback 6. Make edits or updates to previous parts	
Week 2 – 8	Development Phase	Phase 1: Development 1. Use the Design Document 2. APIs and Plugins (If Applicable) 3. Data collection instruments (Data logger) 4. Implementation/Coding 5. Testing Submit Chapter 6 (description of the developed artifact) and a working version of the developed artifact	Microsoft Word, LaTeX
Week 9	Study Phase	Phase 2: Study 1. Conduct the study 2. Data collection (Quantitative, Qualitative, Mixed) 3. Clean the data and prepare for analysis Submit Chapter 7 (Study)	Microsoft Word, LaTeX
Week 10	Data Analysis Phase	Phase 3: Data Analysis 1. Analyze the collected data using the appropriate method and tool <ul style="list-style-type: none"> a. Quantitative: R, SPSS, SAS b. Qualitative: ATLAS.ti, NVivo 2. Visualize the results 3. Understand what the results mean Submit Chapter 8 (Results)	Microsoft Word, LaTeX
Week 11 & 12	Writing Phase	Phase 4: Writing (Combining Project 1 & 2) 2. Follow a paper template, which depends on the selected venue (ACM, IEEE, etc.) 3. Abstract 4. Introduction 5. Literature Review 6. Methodology 7. Artifact Description 8. Study Design 9. Data Collection and Analysis 10. Results 11. Discussion 12. Conclusion	Microsoft Word, LaTeX
Week 13	Final Report	Submit Final Paper to Supervisor and Committee 4. Supervisor Feedback 5. Improvements/Corrections 6. Presentation with Supervisor	Microsoft Word, LaTeX
Week 14-15	Presentations	Final Paper and Presentation Submit Final Paper to a Conference or Journal	Microsoft Word, PowerPoint, LaTeX

Senior Project Registration

Senior Projects may only be undertaken in the Fall or Spring semesters. Generally, students will complete their Senior Projects in their final two semesters. Students planning to graduate on time should plan to complete their Senior Projects in the preceding academic year.

Units

The Senior Project is a five-unit course of study that is divided into two semester. The arrangement of contact hours will vary depending on the needs of the specific project and the student's level of progress. However, **faculty mentors must meet weekly** and regularly with the student to discuss progress, as well as provide feedback on the development of the final project.

Team Formation

Team formation must satisfy the following requirements:

- All senior projects must be performed as groups.
- A senior project group must be created from students of the same department.
- Each group is advised by one or two faculty member from the relevant department.
- The size of a group is two to three students.

Adviser Selection and Adviser's Role

Students arrange to execute their Senior Projects under the guidance of an CCSE faculty member. In most cases, students are already acquainted with the faculty mentor who will be supervising the study. The faculty mentor should help the student clarify the Senior Project proposal to ensure that it includes all necessary components based on the guidelines. In the semester that the Senior Project is undertaken, faculty mentors must meet weekly and regularly with the student to discuss progress, as well as provide feedback on the development of the final project. At the end of the term, faculty mentors must submit a report that briefly describe and provide a final evaluation of the student's work to accompany the assignment of a letter grade.

Registration

Students are expected to register for the senior project with a faculty member whose specialty and interests are compatible with the preferred topic of the project. Students may find a senior project supervisor by meeting with individual faculty members prior to the beginning of the term and receiving their approval as a supervisor. To assign a senior project, student(s)/faculty should go through the following steps:

1. Every Group must complete and sign the advisor selection Form and select the project track they plan to follow.
2. Register the students with the selected faculty member.

Senior Project Evaluation

Weekly Advisor Meetings

In the semester that the Senior Project is undertaken, faculty mentors must meet weekly and regularly with the student to discuss progress, as well as provide feedback on the development of the final project. At the end of the term, faculty mentors must submit a report that briefly describe and provide a final evaluation of the student's work and commitment to the project to accompany the assignment of a letter grade.

Deadlines

Senior Project proposals and final papers/projects must be submitted according to the schedule of submission explained in details for each track.

Final Project Evaluation

Each academic department determines specific senior project requirements, yet all senior projects and senior project policies adhere to the following requirements:

- The senior project should serve as a bridge from the college experience to a professional/postgraduate career;
- include clearly defined learning outcomes that are aligned with the program learning objectives;
- have faculty oversight with scheduled meetings for which specific timelines/outcomes are defined;
- include a formal proposal to be submitted to the faculty advisor;
- involve inquiry, analysis, evaluation, and creation;
- demonstrate core competencies in technical skills, design thinking, written and oral communication, information literacy, and quantitative and/or qualitative reasoning; and
- require a process/production and culminate in a final product as defined at the program level.

Senior Project Domains

The various CCSE departments will enable students to engage in different innovative senior projects that covers various domains and areas, including but not limited to:

1. *Computer Science and Artificial Intelligence*
 - 1.1. Computer Vision
 - 1.2. Natural Language Processing
 - 1.3. Computational Linguistics
 - 1.4. Optimizations
 - 1.5. Internet of Things
 - 1.6. Machine Learning
2. *Data Science*
 - 2.1. Environmental Data Analytics
 - 2.2. Decision Support Systems
 - 2.3. Blockchain
 - 2.4. Cloud Computing
3. *Cybersecurity*
 - 3.1. Mobile Device Forensic
 - 3.2. Digital Rights Protection
 - 3.3. URL Filtering
 - 3.4. Intrusion Detection and Prevention
4. *Computer and Network Engineering*
 - 4.1. Robots
 - 4.2. Autonomous Vehicle
 - 4.3. Wireless Communication
 - 4.4. Computer Hardware and Architecture
5. *Software Engineering*
 - 5.1. Software Quality
 - 5.2. Human-Computer Interaction
 - 5.3. Resources Allocation
 - 5.4. Software repository
 - 5.5. User Experience
 - 5.6. Entertainment and Game Studies
 - 5.7. Reserve Engineering

Potential Advisors

Each department within the CCSE is expected to contribute tremendously to different senior projects. To access a list of current potential senior project advisors and their information, please contact your academic department.

Appendices

Project 1 - Assessment Rubric Form

Senior Project Assessment Rubrics (Project 1)

Project Title:

Supervisor(s):

- 1.
- 2.

Student Names:

- 1.
- 2.
- 3.

This form will be filled out by the evaluation committee members

Score Distribution

5 Outstanding
4 Very Good
3 Good
2 Fair
1 Poor

	Item	Yes	No	Score	Comments
Planning Phase	Problem and Idea Description				
	Clear Project Plan				
Planning Phase Score				() out of 10	

	Item	Yes	No	Score	Comments
Literature Review Phase	Stakeholders Definition				
	Literature Review (Feasibility Study)				
Literature Review Phase Score				() out of 10	
Analysis Phase	Requirements Gathering (Functional and Non-Functional Requirements)				
	Diagrams				
Analysis Phase Score				() out of 10	
Design Phase	Clarity of the Suggested Design				
	The Design of the Interfaces or System				
Design Phase Score				() out of 10	

	Item	Yes	No	Score	Comments
Teamwork and Presentation	Teamwork cohesiveness				
	Presentation Skills				
Teamwork and Presentation Skills Score				() out of 10	
Committee Score				() out of 50	
Advisors' Score				() out of 50	
Final Score				() out of 100	

Project 2 - Assessment Rubric Form

Senior Project Assessment Rubrics (Project 2)

Project Title:

Supervisor(s):

- 1.
- 2.

Student Names:

- 1.
- 2.
- 3.

This form will be filled out by the evaluation committee members

Score Distribution

5 Outstanding
4 Very Good
3 Good
2 Fair
1 Poor

	Item	Yes	No	Score	Comments
Implementation	The implemented software/hardware components are clearly described				
	Components implemented satisfies the requirements defined				
Implementation Score				() out of 10	

	Item	Yes	No	Score	Comments
Demo	Students successfully demonstrated a functional and usable system				
Demo Score () out of 5					
Code Review	The code is running appropriately				
	The code is running without any errors during runtime				
	Students described the code in enough details				
	Students responded well to questions about the code				

Code Review Score				() out of 20	
	Item	Yes	No	Score	Comments
Presentation and Report	Presentation skill				
	Teamwork cohesiveness				
	Final report and documentation				
Presentation and Report Score				() out of 15	
Committee Score				() out of 50	
Advisors' Score				() out of 50	
Final Score				() out of 100	

Weekly Meeting Report Form

Supervisor Meeting

Meeting No: ()

Project Title:

MEETING DETAILS:

Discussed Topics/ideas/items:

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Next week tasks:

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Names of attendees:		Absent students:	
1		1	
2		2	

1. Supervisor Name:

Supervisor Signature:

2. Supervisor Name:

Supervisor Signature:



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