



A Systematic Approach for Generating the Prerequisite Charts Used in Student Advising in Universities

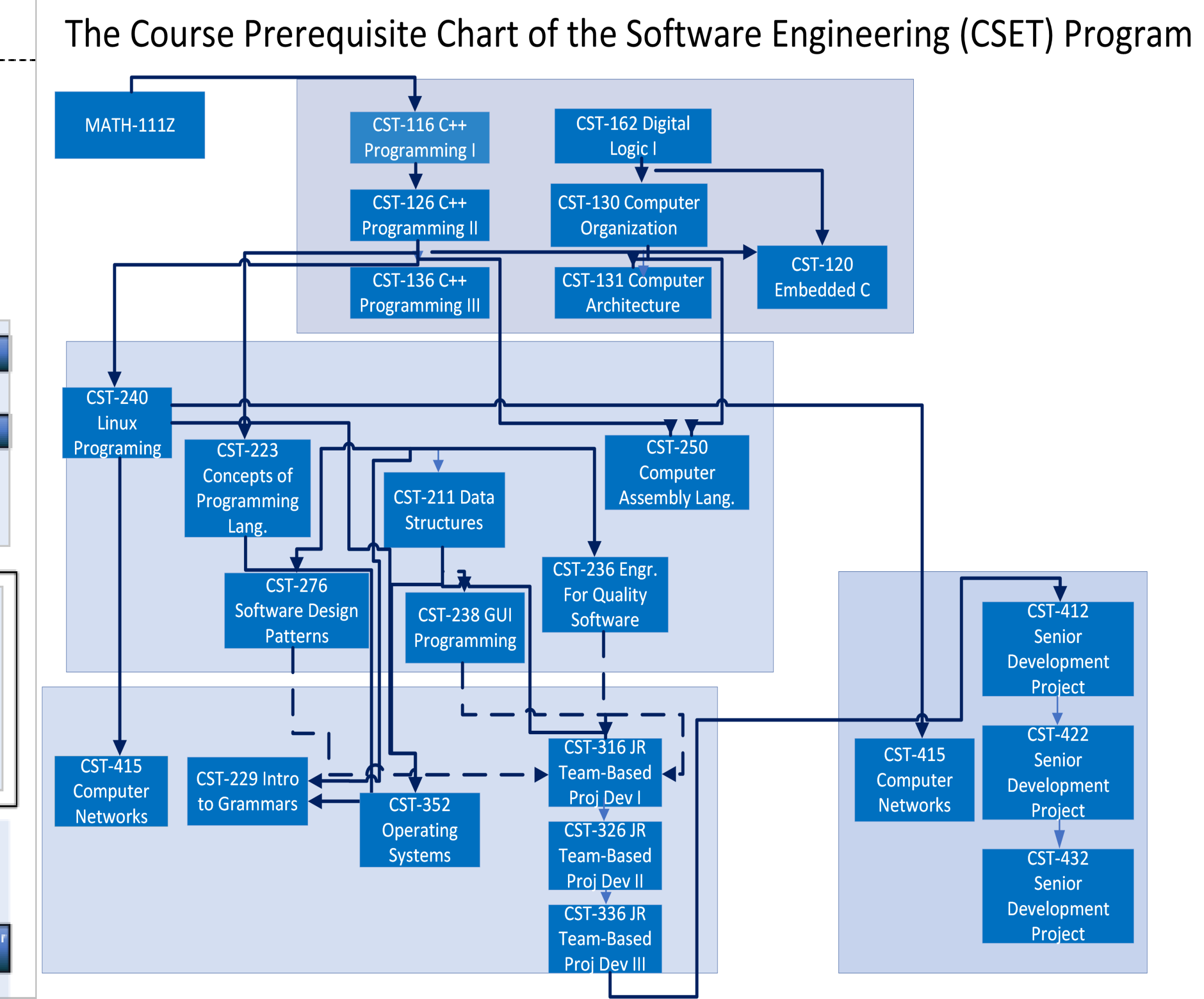
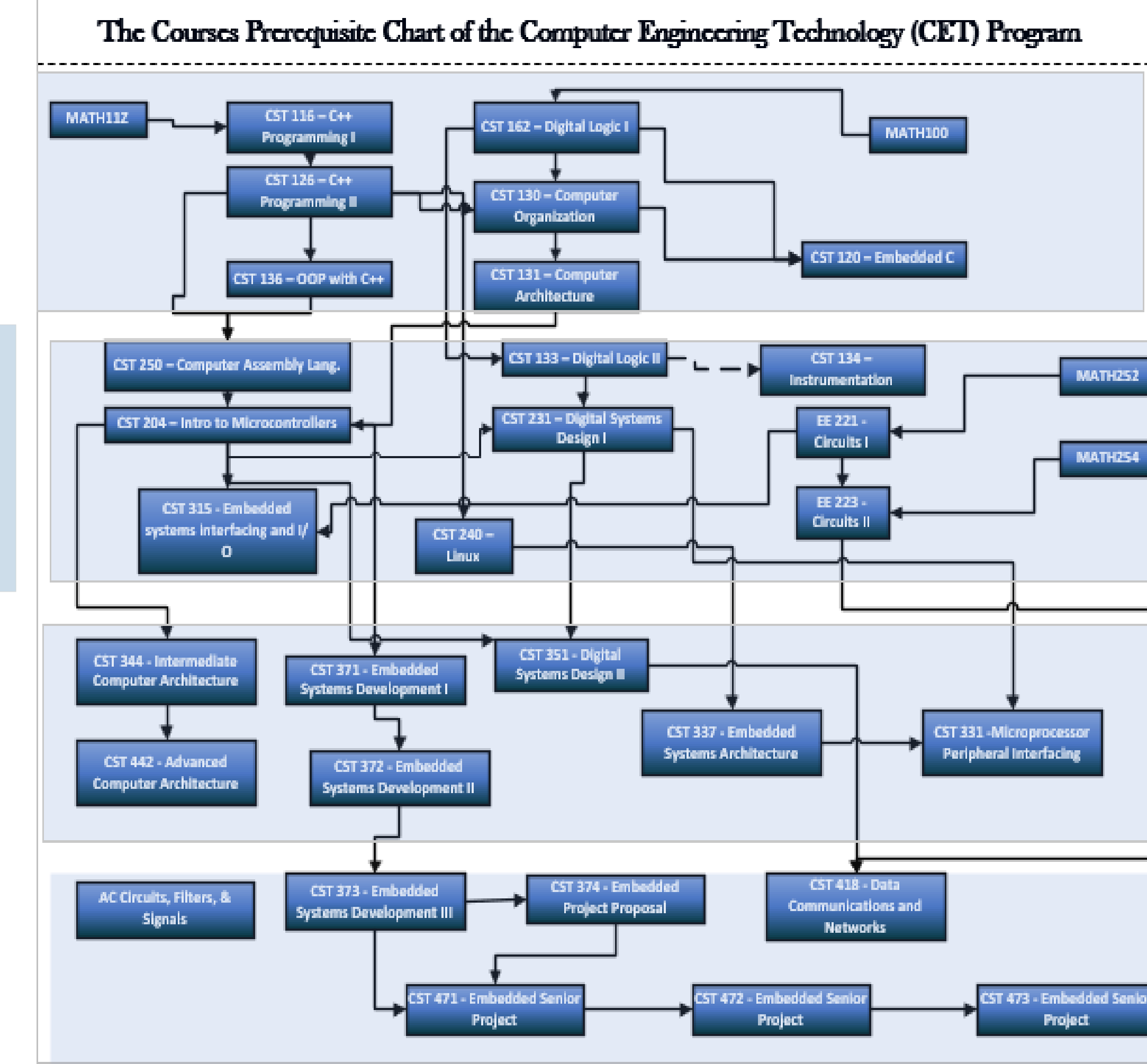
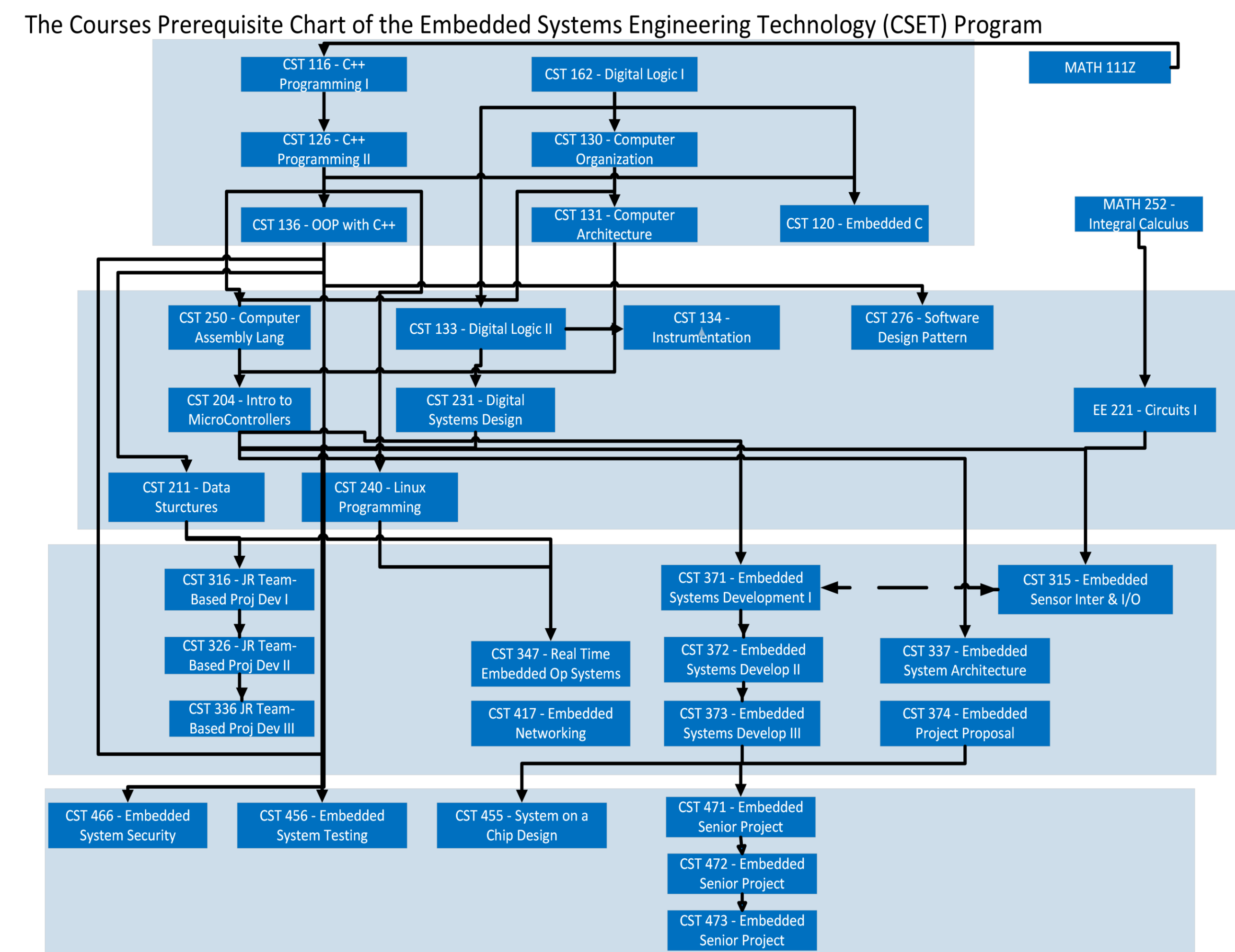


Alex Fenton (IEEE Member), Noe Valley (IEEE Member), Jasmine Wales (IEEE Member), Dr. Stefan Andrei Mentor (IEEE Member)

alex.fenton@oit.edu, noe.valley@oit.edu, jasmine.wales@oit.edu, stefan.andrei@oit.edu

1. Introduction

- If a course requires a prerequisite course or needs to be taken during a specific semester or term, an advisor is knowledgeable enough to guide students through that decision-making process. [1]
- ABET accreditation requires an outstanding advising process to help students graduate on time. This can be achieved using experienced Advisors, prerequisite charts, software assisting the student, and more.
- If the student has graduated from an CAC/EAC/ETAC of ABET-accredited Bachelor program, then the presumption is that these prerequisites/ corequisites have been satisfied. Otherwise, the program must ensure that each student attains these post-secondary educational and professional experiences. [2]



3. Methodology

Our systematic approach is simply searching in the database of courses of each program (Embedded Systems Technology, Computer Engineering Technology, Software Engineering Technology) and creating the dependencies relationships: prerequisite and corequisite. Let us denote by A and B two arbitrary courses. We say that A is a prerequisite of B, denoted as $A \rightarrow B$, if A is listed as a prerequisite course of B in the course catalog. We say A is a corequisite of B, denoted as $A \leftrightarrow B$, if A is listed as a corequisite of course B or B is listed as a corequisite of A in the course catalog.

Our work contains the *Prerequisite Relation (PR)* and *Corequisite Relationship (CR)*, as our data structure, denoted the *Prerequisite Corequisite Graph (PCG)*. Note that CR is a symmetric relationship, that is, if $A \leftrightarrow B$, then $B \leftrightarrow A$. Obviously, this is not the case in the PR relationship. The transitive closure of PCG is the relationship obtained by composing PR and CR in PCG, denoted PCG+.

For example, a level 1 course A is a prerequisite for a level 4 course B if there is a path in PCG from A to B. Graph PCG is a special one like the so-called traditional *Directed Acyclic Graph (DAG)*, but still different because it accepts cycles of size two. However, neither PCG nor DAG allows the paths to go back toward the first level of courses (freshman). We call this new data structure a *Bicycle Acyclic Graph (BAG)*. In other words, a PCG cannot go up likewise a DAG, but it can be on the same level due to the bicycle generated by the corequisite relationship. Formally, a BAG is a graph such that for any courses A and B from BAG, there is a path from A to B using PR and CR relationships.

6. Conclusions

Our work presented our systematic approach to generate the prerequisite chart for all three CSET programs at Oregon Tech. In the future, we intend to fully automate the process of extracting the prerequisite relations by automatically parsing the catalog of course files.

8. Acknowledgement

- We gratefully acknowledge the support of Dr. Stefan Andrei for the continuous support and guidance on the research project, for his patience, encouraging motivation and knowledge. His guidance helped us throughout the project.

7. References

- [1] U.S. Department of Education, The Importance of Academic Advising in Higher Education. August 10, 2022 [downloaded on February 1, 2024 from <https://blog.ed.gov/2022/08/the-importance-of-academic-advising-in-higher-education/>]
- [2] Criteria for Accrediting Engineering Programs, 2022 – 2023, [downloaded on February 1, 2024, from <https://www.abet.org/accreditation/aaccreditation-criteria/criteria-for-accrediting-engineering-programs-2022-2023/>]