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Developing a Web-based Advising Application for an Engineering Program

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Abstract

Efficient academic advising is essential for college students regardless of major. For a successful college experience, academic advising is needed to build a solid foundation. Students receive guidance through advising sessions so they can stay on track to graduate on time. To make the advising process the most effective, computer or web-based tools are used to make course plans for students at many institutions. An effective advising tool as well as the proper guidance from an adviser not only enhances the quality of education for students in four-year degree programs but also helps to ensure the success of the institution overall. There are many tools available in academia developed by both commercial businesses and individuals in academia. In the current research, an innovative web-based advising tool has been developed and successfully used to advise students in a mechanical engineering-focused program at Southern Arkansas University, where this web app has been specifically customized for this curriculum. The application takes the necessary input, such as a student's ACT Math score, the courses the student completed, and the courses the student is taking currently (if any). Once the required information is entered in the corresponding fields, the application provides a detailed output of semester-wise proposed courses that the student needs to take to graduate on time.

The application has options for adding summer courses, reordering specific courses, and changing the anticipated hours per semester. Thus, a student can vary the parameters and create the optimum semester-wise course plan for the remainder of their education at Southern Arkansas University. The adviser can print it for record-keeping in the student's folder or save it as an electronic pdf file for later use. The application has a user-friendly graphical user interface that shows all courses relevant to the engineering program. Course selections are also color-coded for better visualization purposes. The application can be used at any level, from freshman through senior, and anytime during the year. For example, if the application is used in October, it will assume that Fall is the current semester. Therefore, the application will propose courses for Spring (as the advising semester) as well as for the subsequent semesters until graduation, based on the course offering by the department and the courses the student needs to take to graduate. Also, there is a unique feature that if the user wants to exclude a course or courses from the advising semester, he/she can check the relevant box(es), and the application will provide alternate courses based on the course offerings in the advising semester. The detailed developing process is described in this work.

Motivation

Each student deserves an error-free course plan each semester so that they can graduate in a timely manner. However, with numerous constraints being present in the entire span of the 4-years of study, uncertainties could hamper the timing of their graduation. Moreover, students often need to see an overall picture of their graduation, i.e., when exactly they can graduate, how many hours need to be taken per semester, can summer courses be taken to expedite the graduation time, etc. In order to address all these potential needs, this application was developed not only so that a faculty advisor could make an error-free schedule but also to empower the students to allow them to control their graduation timeline.

Introduction

To ensure that students have a successful academic experience while at university, they need to start with a strong foundation to get set on the path to success. Academic advising is one of the most important ways to establish this solid foundation, and this is why efficient academic advising is essential for all students in higher education. In academic advising, students meet with a faculty member outside of the classroom to receive guidance on how to plan for the upcoming semester and to register for the courses the student will enroll for the next semester. It is also a way that the student's advisor can monitor their academic progress and make suggestions to help them be a more successful student. The academic advising process is a very time-intensive task for many faculty that are already maintaining full loads. As a result, there is a need to bring more automation into the academic advising process for the benefit of both faculty and students.

There are many reasons that proper academic advising is important not only for students but also for the institution. Effective academic advising supports students to ensure a satisfactory educational experience while they are attending university. For students, one of the most important benefits of proper academic advising is that they can proceed through their degree program efficiently. Academic advising ensures students are taking the proper courses in the correct order and in the correct semester. This prevents them from taking extra courses that will not count for credit towards their degree program, as well as avoiding wasted time waiting for a course to be offered in a later semester because it was missed. According to Forbes [1], in the United States of America, the average bachelor's degree graduate has almost $38,000 in student loans. Proper academic advising can help to save students time and money by ensuring the courses they take are the necessary courses and unnecessary extra courses are avoided. This also helps them to graduate on time and get to the job market faster. In their article, Perez et al. [2] state that the time it takes for a student to graduate is one of the most important metrics used by universities and that this metric is influenced by several factors like social, economic, and planning. Thus, another benefit of efficient advising for students is that it can help to minimize the effects of economic and planning factors for students.

For academic institutions, one of the most important benefits of proper academic advising is that they can maintain better retention numbers. With academic advising, students gain interaction outside of the classroom with their department's faculty. Having meaningful interactions outside of the classroom increases student satisfaction with their education which makes them less likely to leave their program and/or the academic institution. According to Habley [3], one of the greatest factors of student retention is academic advising. In another article by Drake [4], the author lists three critical elements to retention. The first is connecting with students early on through learning support systems, the second is first-year programs, and the third is academic advising. Drake also mentions that advising is "positioned squarely as the vital link in this retention equation." Effective academic advising with regular meetings with their faculty advisor from the beginning of their course of study can help to build strong connections with students and their advisors. Another benefit to academic institutions is that they will achieve better metrics for having students graduate on time, as mentioned in the article by Perez et al. [2]. Efficient advising optimizes the time to graduate, thus improving universities' graduation time metrics. An adequate and effective advising process is crucial for a program to provide not only curricular guidance to the students but also improve the retention of the program in general.

With academic advising being such an integral part of higher education, it is important to find ways that can streamline the process and make the process the most efficient possible. Academic advising programs and apps are helping to solve this. There are many benefits from using academic advising programs and apps. They can help faculty to minimize the effort and mental load that it takes to find the best courses for each student to take so that faculty can have more time to build connections with the students in their advising appointments. This also allows the faculty to better monitor the student's progress more closely and see where the student may need extra support from the university in their education. As Feghali et al. [5] mention in their work, these tools should be used to enhance advising and cannot and should not replace the one-on-one human interaction that students need from their advisors. Using these apps and expert systems also reduces the work and mental load that faculty need to do to prepare ahead of time for the numerous advising appointments they have each semester, especially as that number of appointments grows each semester. Another way that it saves faculty advisors time and effort is that such apps can answer routine questions that students may have regarding their program of study. For example, students can refer to the app to see what courses they have taken and what courses remain. Another example is that students can look to see the list of courses that can be chosen to satisfy a particular degree requirement.

Additionally, such programs and apps reduce the number of errors that could be made. In his article, Laghari [6] states that the most common errors in academic advising include the following: chosen courses have time conflicts, missed out on essential courses with alternate semester schedules, chosen unnecessary electives, and choosing too many credit hours a semester or too few credit hours per semester. Another benefit of using an advising app is that it enhances collaboration between faculty members and students. Such collaboration allows students to become more invested in their progress and making their schedules, thus increasing student satisfaction. With this collaboration, students feel more in control of their education and experience at university.

There have been numerous apps and expert systems developed for academia by both commercial businesses and individuals in academia. One example of an expert system developed academically is in use at the University of Arizona in Tucson, where they have developed an expert program called Advice [7]. Advice is used to evaluate study plans for Systems and Industrial Engineering graduate students. The program checks for errors in the students' study plans before graduation. With the use of the Advice system, they found that it saved time for faculty and students alike. Another example of an academically developed expert system comes from Covenant University [8]. Their program, Course Advisory Expert System or CAES, was not only found to be relatively cheap, but it also had a satisfaction level of 77.8%. Another example of the successful use of an expert system in the academic advising process was the CLIPS system at the University of West Georgia [9]. A final example of a system being used is the Online Advisor program at the American University of Beirut [5]. The Online Advisor system creates academic schedules, shows what courses have been completed and which courses remain to be taken. According to their study, 79% of students surveyed about the Online Advisor system found it useful and helpful, and 90% of the students rated it as being effective.

An effective advising tool as well as the proper guidance from an advisor not only enhances the quality of education for students in four-year degree programs but also helps to ensure the success of the institution overall.

Curriculum requirements and course availability

The application was intended to provide a detailed semester-wise course listing for an engineering student following all curriculum rules and course sequences and following the course rotation plan set by the department. A thorough understanding of the engineering curriculum and the course rotation, as well as some basic knowledge of programming and web development, were needed in developing the app. When a user enters the necessary inputs such as ACT Math score, the courses that were completed, the courses that are being taken currently, and the anticipated number of credit hours in future semesters, etc., the proposed app would create a detailed plan for the student for the remaining time until the student graduates. The user can print this page or save it as a pdf for future records. The user will also have options to select a minor from Mathematics and Computer Science. These minor options will provide additional paths towards degree completion while using the application. It is noted that usually, engineering students prefer a math minor over a computer science minor since only a handful of additional math courses are required to complete a math minor degree in most cases.

Mathematics Requirements

The Bachelor of Science in Engineering (BSE) program at Southern Arkansas University is primarily focused on mechanical engineering. Though the program is not called a Bachelor of Science in Mechanical Engineering (BSME) program, most of the coursework is aligned with that of a traditional BSME program. The traditional mathematics requirements in this program are Calculus I, Calculus II, Calculus III, and Differential Equations. Calculus I is a prerequisite for Calculus II, where Calculus II is a prerequisite for both Calculus III and Differential Equations. It is noted that Calculus I needs to be taken either concurrently (as a co-requisite) with University Physics I (calculus-based) or be completed before taking Physics I. Similarly, Differential Equations is a required course for taking other upper-level engineering courses. Thus, the math courses play a major role in completing the engineering degree requirements successfully. If a student fails to take any of these math courses in a timely fashion, it may delay his or her graduation.

A freshman student is usually placed in Calculus I with an ACT Math score (or an equivalent SAT math score) of 28 or higher. However, many students do not meet this requirement and are placed in some remedial math courses until they are ready to take calculus I. For example, if a student makes an ACT Math score of 26, the student will be required to take Pre-Calculus I. A detailed remedial math placement based on the ACT Math score is shown in Figure 1 below. Currently, there is no set admission requirement based on the ACT Math score, and a student with any ACT Math score can be admitted to the program. However, students with low ACT Math scores must complete all the remedial math courses before being eligible to take Calculus I and should anticipate longer time to complete the mathematics requirements and a longer than usual time to graduate.

Engineering and science course sequence

Like most engineering programs, the science and engineering courses progress in sequences in the curriculum. This sequence is extremely important to maintain the progression of learning and the standards of the curriculum. For example, as shown in Figure 2, engineering students must follow the sequence of Physics I, Statics, Mechanics of Materials, and Machine Design. For instance, Statics is a pre-requisite for Mechanics of Materials, and without completing Statics in

a prior semester, a student cannot enroll in Mechanics of Materials. Here 'P' stands for pre-requisite, and 'C' stands for co-requisite in the figure. Similarly, they follow another sequence of Chemistry I, Properties of Materials, and Manufacturing Processes. A course can have multiple pre-requisite and co-requisite courses. For example, as shown in the figure below, both Fluid Mechanics and Thermodynamics are pre-requisite courses, and Differential Equations is a co-requisite course for Heat Transfer. Since many of the upper-level courses are offered once a year, any human error while advising a student can cause an unnecessary delay in the student's graduation.

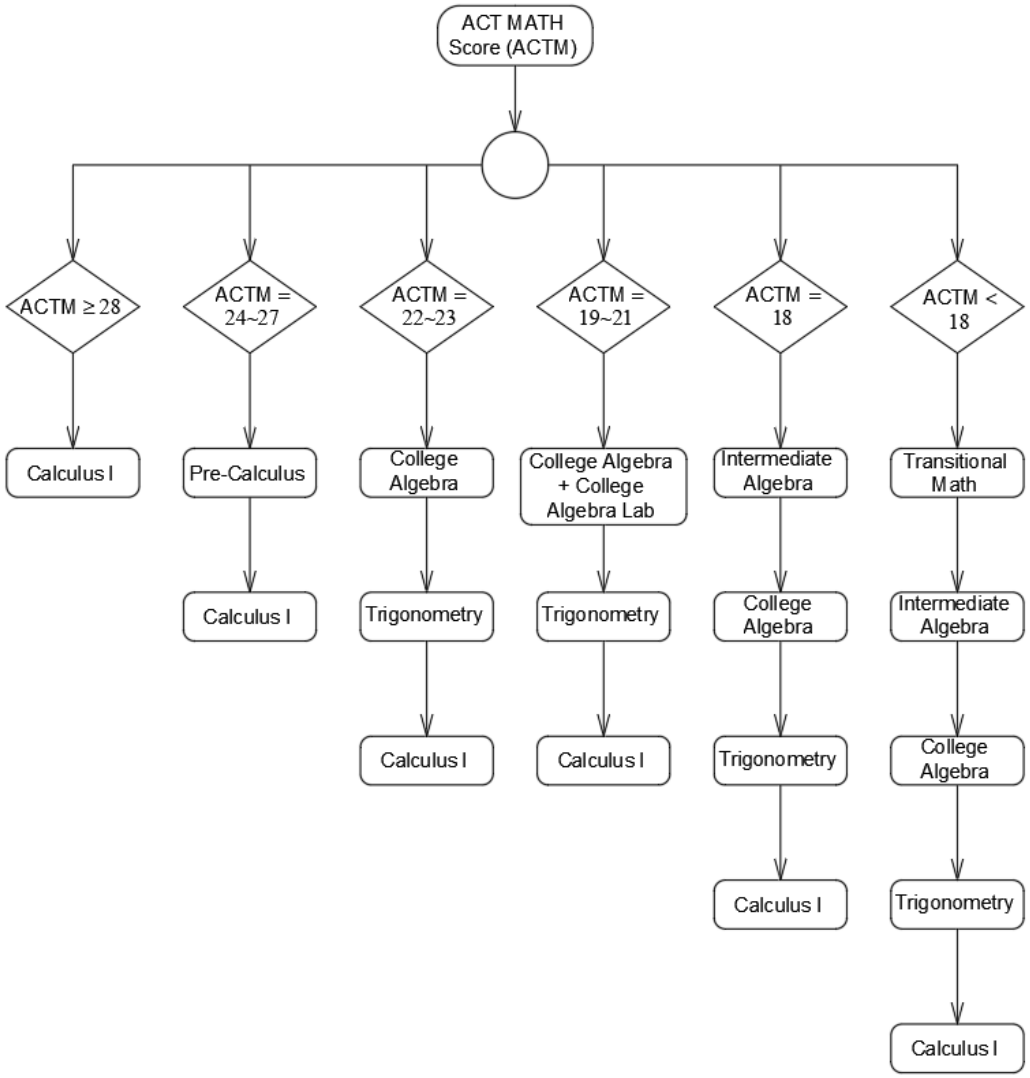


Figure 1: Mathematics placement based on ACT Math score

Course availability (course rotation)

Many courses in the Engineering program are offered once a year only, especially the upper-level engineering courses. However, some lower-level engineering and math courses such as Engineering Graphics, Computer Science I, Introduction to Engineering, Calculus I, Calculus II, etc., are offered twice a year, i.e., in both fall and spring semesters. Most general education

courses, such as Composition I or II, Social science courses, and Arts and Humanities courses, are offered three times a year, i.e., fall, spring, and summer. While developing the app, the information regarding the course rotation is extremely important and must be incorporated into the algorithm.

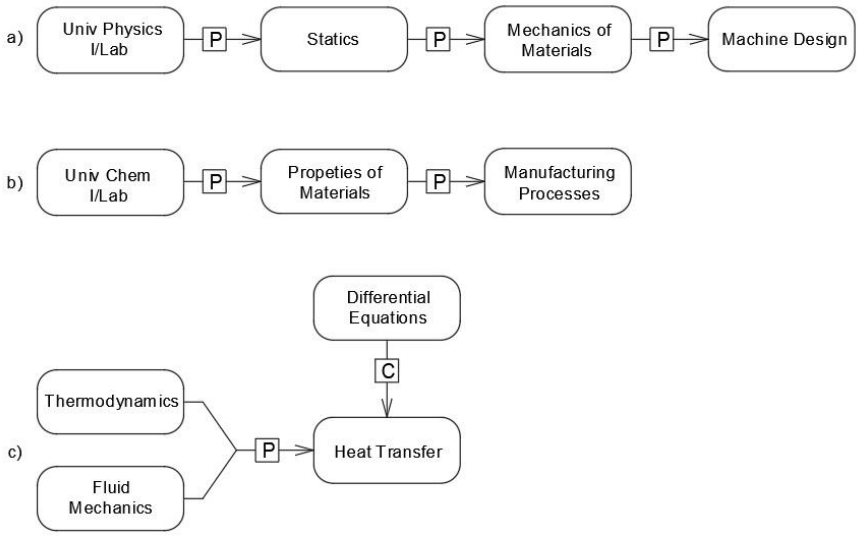


Figure 2: Examples of course sequences in the Engineering curriculum

Development process

Initially, a windows-based application (software) was developed for advising Bachelor of Science in Engineering students by the lead author. The app takes the input of a student's ACT Math score, the courses the student completed, and the courses the student is taking currently (if any). Once the required information is entered in the corresponding field, the app provides a detailed output of semester-wise proposed courses that the student needs to take to graduate on time. However, this initial app was limited to the Windows operating system only - the user was required to install and run it on the windows operating system. It was found that many of the engineering students use the MAC operating system. Thus, a web version of the same app was developed by the lead author so that it can be opened using any browser, whether it is a desktop computer, or a laptop, or a smartphone. The web version of the advising application was developed using the ASP.Net platform of Microsoft Visual Studio. The programming language that was used was Visual Basic, and the web design was made using HTML/CSS within ASP.Net. The web app was deployed on Microsoft Azure for free. It is noted that no external database has been used in developing the application to keep it simple, and thus no student data is saved during the runtime on the server.

The basic structure of the algorithm is very straightforward and shown below in Figure 3. Courses in each semester are listed in a separate data table and are displayed on the webpage through the GridView option in Asp.Net. A set of DataTable type variables such as DataTable 1, DataTable 2, etc. were created to store the course-related data. For each course, in a datable variable, the course prefix, the course number, and the title of the course are stored. DataTable 1 is dedicated to the courses taken in the current semester. In the app, the current semester was set as a span of time from the day a student cannot add any more classes until the end of the

semester. All future courses in the degree plan will be placed in DataTable 2, DataTable 3, and so on. If a user uses the app in October 2021, Fall 2021 will be considered as the current semester, and the courses taken currently will be placed in DataTable 1.

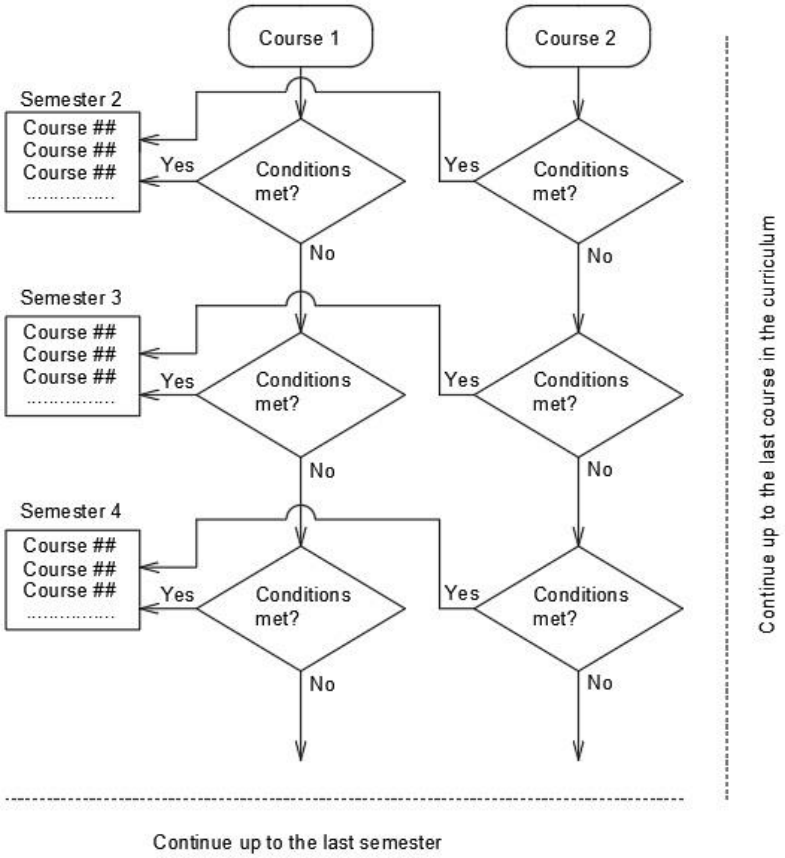


Figure 3: Course selection process

The app will look for appropriate courses for Spring 2022, Fall 2022, and so on that meet the conditions. Here Spring 2022, Fall 2022, and so on represent the course data for DataTable 2, DataTable 3, and so on, respectively. For each course to be placed in a DataTable, it is first passed to a function where it is tested for several conditions such as if the pre-requisite courses were taken previously, if it is not exceeding the maximum semester hours set by the user, or if the course is available in that semester, etc. For Calculus I and other remedial math courses, the ACT Math course is also used as an additional condition that needs to be met separately, as per Figure 1. Once these conditions are met, the course is placed in that DataTable. The process continues for all courses in the curriculum. The courses are passed through the function in the order from freshman through senior. By the time all courses are passed through this function, all DataTables are populated with the corresponding courses and are displayed through the GridViews on the web page. The arts and humanities courses are usually placed after the senior level engineering courses to pass through this function so that when a semester has insufficient courses for not meeting the pre-requisite and co-requisite requirements, these courses will be placed in. The app has options for adding some summer courses; if a course is selected as a

summer course, it can be placed in an appropriate DataTable allocated for summer courses after the conditions are met. If the user selects a minor, the courses related to that minor will be checked through the function and will be placed in the appropriate DataTable.

The app has a user-friendly graphical user interface (GUI) that shows all courses that are relevant to the Engineering program. Course selections are color-coded for better visualization purposes. A course selection status has four options - 'Not taken' as no color, 'In progress' as yellow, 'C or better' as green, and 'D only' as dark purple. The courses with the 'In progress' statuses go directly in DataTable 1 and are displayed in the current semester. The course status drop-down list for each course is disabled until the status for the relevant pre-requisite course is changed to 'C or better'. That way, the user enters the input in an organized fashion and does not select the status of a course by mistake whose pre-requisite has not been met yet. Two additional DataTables are used to contain the course information with 'C or better' status and placed at the bottom of the page.

The app provides more flexibility in the advising semester than the other semesters to select what courses can be included. Considering this month as October (the year 2021), Spring 2022 is considered as the advising semester. DataTable 2 is allocated for the advising semester in the program, and any course can be excluded from this data table by simply checking the relevant box, and an alternative course can be placed. By excluding a course from the advising semester, the user can see how this affects the overall graduation plan. The other features of the app are the ability to reorder certain courses and to change the total anticipated hours in the summer semesters. Thus, a student can vary these parameters and create an optimum semester-wise course plan for the remainder of their education at the institution.

A case study

A case study is examined for an example student, 'James Smith' in this section whose advisor is Laura Brown. Suppose the student's ACT Math score is 28, and he chose not to add a minor degree to his course of study. The basic information such as student's name, advisor's name, ACT math score, and choice of minor (if any) are entered initially as shown in Figure 4. It is noted that this information is not saved in any database or on any server, so there is no risk of identity theft.

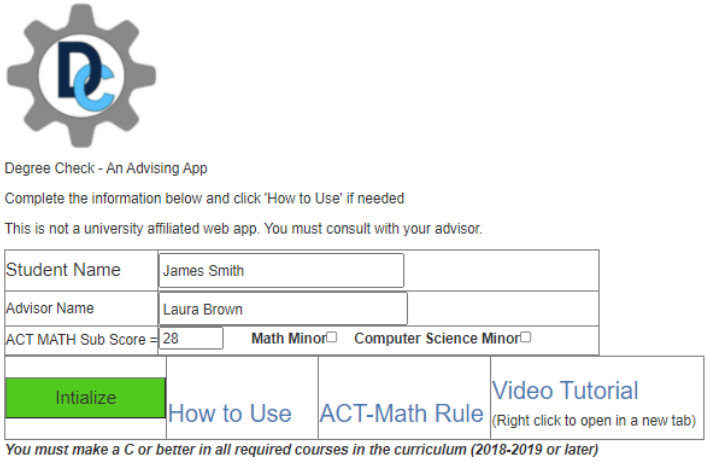
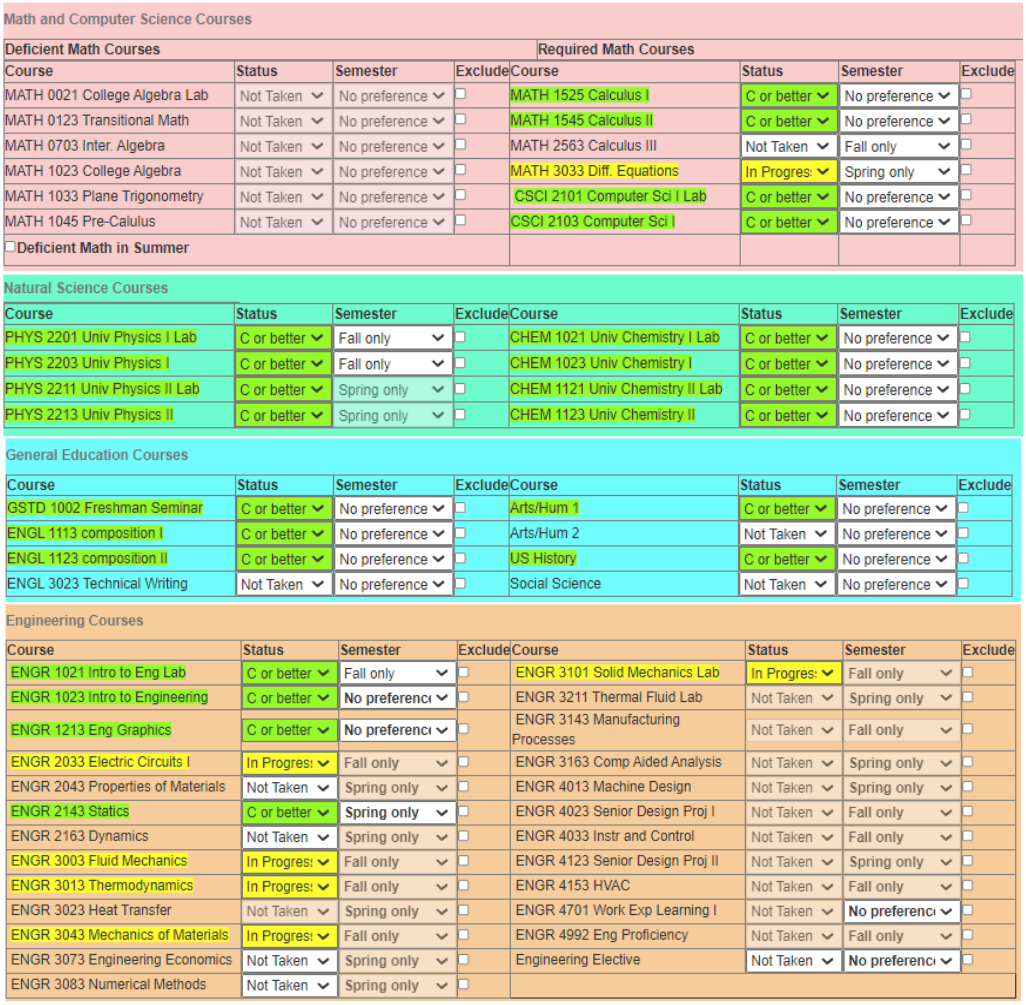


Figure 4: Introduction section of the advising app

The initialize button has been pressed so that the app is reset, and the relevant remedial math course status are enabled as per the rules, as shown in Figure 1. In this example, no remedial courses are enabled, rather Calculus I is enabled since a score of 28 in ACT Math allows a student to take Calculus I directly.

The student completed a handful of courses with 'C or better' grades. The course statuses for these courses are selected as 'C or better' status from the corresponding drop-down lists manually, and the colors were highlighted to green automatically, as shown in Figure 5. Similarly, the courses the student is taking in the current semester are selected as 'In progress', and they became yellow as soon as the selections were made. As some courses are offered more than once a year, they could be selected as 'Fall only', 'Spring only', 'Summer only', or 'No preference'. These selections are shown in Figure 5 as well.



Math and Computer Science Courses

Deficient Math Courses				Required Math Courses			
Course	Status	Semester	Exclude	Course	Status	Semester	Exclude
MATH 0021 College Algebra Lab	Not Taken	No preference	☐	MATH 1525 Calculus I	C or better	No preference	☐
MATH 0123 Transitional Math	Not Taken	No preference	☐	MATH 1545 Calculus II	C or better	No preference	☐
MATH 0703 Inter. Algebra	Not Taken	No preference	☐	MATH 2563 Calculus III	Not Taken	Fall only	☐
MATH 1023 College Algebra	Not Taken	No preference	☐	MATH 3033 Diff. Equations	In Progres	Spring only	☐
MATH 1033 Plane Trigonometry	Not Taken	No preference	☐	CSCI 2101 Computer Sci I Lab	C or better	No preference	☐
MATH 1045 Pre-Calulus	Not Taken	No preference	☐	CSCI 2103 Computer Sci I	C or better	No preference	☐
☐ Deficient Math in Summer							

Natural Science Courses

Course	Status	Semester	Exclude	Course	Status	Semester	Exclude
PHYS 2201 Univ Physics I Lab	C or better	Fall only	☐	CHEM 1021 Univ Chemistry I Lab	C or better	No preference	☐
PHYS 2203 Univ Physics I	C or better	Fall only	☐	CHEM 1023 Univ Chemistry I	C or better	No preference	☐
PHYS 2211 Univ Physics II Lab	C or better	Spring only	☐	CHEM 1121 Univ Chemistry II Lab	C or better	No preference	☐
PHYS 2213 Univ Physics II	C or better	Spring only	☐	CHEM 1123 Univ Chemistry II	C or better	No preference	☐

General Education Courses

Course	Status	Semester	Exclude	Course	Status	Semester	Exclude
GSTD 1002 Freshman Seminar	C or better	No preference	☐	Arts/Hum 1	C or better	No preference	☐
ENGL 1113 composition I	C or better	No preference	☐	Arts/Hum 2	Not Taken	No preference	☐
ENGL 1123 composition II	C or better	No preference	☐	US History	C or better	No preference	☐
ENGL 3023 Technical Writing	Not Taken	No preference	☐	Social Science	Not Taken	No preference	☐

Engineering Courses

Course	Status	Semester	Exclude	Course	Status	Semester	Exclude
ENGR 1021 Intro to Eng Lab	C or better	Fall only	☐	ENGR 3101 Solid Mechanics Lab	In Progres	Fall only	☐
ENGR 1023 Intro to Engineering	C or better	No preferenc	☐	ENGR 3211 Thermal Fluid Lab	Not Taken	Spring only	☐
ENGR 1213 Eng Graphics	C or better	No preferenc	☐	ENGR 3143 Manufacturing Processes	Not Taken	Fall only	☐
ENGR 2033 Electric Circuits I	In Progres	Fall only	☐	ENGR 3163 Comp Aided Analysis	Not Taken	Spring only	☐
ENGR 2043 Properties of Materials	Not Taken	Spring only	☐	ENGR 4013 Machine Design	Not Taken	Spring only	☐
ENGR 2143 Statics	C or better	Spring only	☐	ENGR 4023 Senior Design Proj I	Not Taken	Fall only	☐
ENGR 2163 Dynamics	Not Taken	Spring only	☐	ENGR 4033 Instr and Control	Not Taken	Fall only	☐
ENGR 3003 Fluid Mechanics	In Progres	Fall only	☐	ENGR 4123 Senior Design Proj II	Not Taken	Spring only	☐
ENGR 3013 Thermodynamics	In Progres	Fall only	☐	ENGR 4153 HVAC	Not Taken	Fall only	☐
ENGR 3023 Heat Transfer	Not Taken	Spring only	☐	ENGR 4701 Work Exp Learning I	Not Taken	No preferenc	☐
ENGR 3043 Mechanics of Materials	In Progres	Fall only	☐	ENGR 4992 Eng Proficiency	Not Taken	Fall only	☐
ENGR 3073 Engineering Economics	Not Taken	Spring only	☐	Engineering Elective	Not Taken	No preferenc	☐
ENGR 3083 Numerical Methods	Not Taken	Spring only	☐				

Figure 5: Graphical interfaces for entering course information for math and computer science, natural science, general education, and engineering courses in the order from top to bottom

The default semester load was 16 hours, and it was kept as such. Once the app was run by pressing the 'Run' button, a detailed list of courses the student needs to be taking each semester until he graduates is displayed, as shown in Figure 6.

Student: James Smith Total Hours to Complete: 55 Hours
Advisor: Laura Brown Date: 10/11/2021

Fall 2021	16 Hours	
Course	Number	Title
MATH	3033	Diff Equations
ENGR	2033	Electric Circuits I
ENGR	3003	Fluid Mechanics
ENGR	3013	Thermodynamics
ENGR	3043	Mechanics of Materials
ENGR	3101	Solid Mechanics Lab

Spring 2022	16 Hours	
Course	Number	Title
ENGR	2163	Dynamics
ENGR	2043	Properties of Materials
ENGR	4013	Machine Design
ENGR	3023	Heat Transfer
ENGR	3211	Thermal Fluid Science Lab
ENGR	3083	Numerical Methods

Fall 2022	16 Hours	
Course	Number	Title
MATH	2563	Calculus III
ENGR	3143	Manufacturing Processes
ENGR	4023	Senior Design Project I
ENGR	4033	Control Systems
ENGR	4153	HVAC
ENGR	4701	Work Experience Learning I

Spring 2023	15 Hours	
Course	Number	Title
ENGR	3073	Engineering Economics
ENGR	3163	Comp Aided Eng Analysis
ENGR	4123	Senior Design Project II
ENGL	3023	Technical Writing
ART/HUM 2	3	Fine Arts/Humanities

Fall 2023	8 Hours	
Course	Number	Title
ENGR	4992	Engineering Proficiency
Social	3	Social Science Choice
ENGR/PHYS	3	UL Eng/Phys Elective

Figure 6: Semester-wise course plan generated by the app

It shows that the example student, James Smith, will graduate at the end of Fall 2023, and a total of 55 hours needs to be completed for his graduation. After running the app, a list of completed courses is also placed at the bottom of the page, as shown in Figure 7.

Student: James SmithTotal Hours to Complete: 55 Hours
Advisor: Laura Brown Date: 10/11/2021

Completed Courses			56 Hours		
Course	Number	Title	Course	Number	Title
GSTD	1002	Freshman Seminar	CHEM	1023	Univ Chemistry I
ENGL	1113	Composition I	CHEM	1021	Univ Chem I Lab
ENGL	1123	Composition II	CHEM	1123	Univ Chemistry II
MATH	1525	Calculus I	CHEM	1123	Univ Chem II Lab
MATH	1545	Calculus II	ENGR	1023	Intro to Engineering
CSCI	2103	Comp Science I	ENGR	1021	Intro to Eng Lab
CSCI	2101	Comp Science I Lab	ENGR	1213	Engineering Graphics
PHYS	2203	Univ Physics I	ENGR	2143	Statics
PHYS	2201	Univ Physics I Lab	ART/HUM	3	Fine Arts/Humanities I
PHYS	2213	Univ Physics II	HIST	3	US History/Gov
PHYS	2211	Univ Physics II Lab			

Figure 7: The completed course list generated by the app

Role of the advising app in allocating resources

This app has been used for several years by the lead author to advise students and make their schedules every semester. The lead author has been advising 40 to 50 students every semester, and the app is tremendously helpful while making error-free schedules within a very short amount of time. Several students were convinced to add a math minor once they saw that a math minor does not add extra time to graduate while adjusting some course loads.

In September 2021, during planning for the upcoming department schedule, the app was used to make tentative plans for the majority of the students in the department. Once all the students'

plans were made, the number of students in some engineering courses to be offered by the department in Spring 2022 were counted from the Spring 2022 plan for each student. Table 1 shows the tentative number of students in these courses.

Table 1: Tentative number of students in some engineering courses in spring 2022

Engineering Graphics	Properties of Materials	Statics	Dynamics	Heat Transfer	Engineering Economics	Numerical Methods in Eng	Thermal Fluid Science Lab	Computer-Aided Eng Analysis	Machine Design	Senior Design Project II
29	34	36	25	23	15	28	23	20	23	17

These estimates are extremely helpful to allocate resources effectively, such as assigning classrooms, assigning instructors, allocating computers and licenses for engineering software, deciding the number of sections for a particular course, etc. These estimates are especially helpful during this pandemic time to decide what classroom to use for each course while still maintaining social distancing.

Conclusion

This paper describes the development of a web-based advising app for an engineering program with a detailed case study of how it works. Since its creation, the app has been used extensively to make course plans for engineering students at Southern Arkansas University. If the inputs are entered correctly, the app can provide a detailed plan for a student by following the course sequences as per the curriculum and the course rotations set by the department. The app has several other options, such as choosing a particular semester for a course, excluding a course from the advising semester, reordering certain courses, changing the desired hours per semester, etc. The app reduces the time that it would take to check for a prerequisite or corequisite violation of a course to be taken. It will also ensure that the student is not missing any crucial course in the curriculum that would make the student fall behind schedule. The app can be used to see different graduation paths by reordering courses and even including different minor degree options. Finally, through the collective uses, it can help to allocate resources while making course schedules for an upcoming semester, such as how many students need a particular class, what size classroom to assign, the number of licenses of an engineering application to purchase, etc.

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