

## STUDENT ADVISING & PLANNING SOFTWARE

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### ABSTRACT

Student course registration is an important as well as a trivial process that may encounter unnecessary graduation delays. United Arab Emirates University (*UAEU*) is one such institution where students have faced problems depending on number of factors which may include; a lack of a proper advising system, understanding and experience of Advisers, students' ability to seek good advice, etc. Students not advised fittingly may suffer with losing time in selecting unnecessary and wrong courses. Students usually suffer with problems which may include: course selection with time conflicts, missing out on specific courses for appropriate semesters, selecting department electives bypassing track restrictions, selecting too many or less courses, etc. A Student Advising & Planning Software (*SAPS*) is devised to guide students in selecting appropriate courses suitable to register online with the University Registration System. *SAPS* is developed using JAVA computer programming language. The outcome of the course selection is stored (semester-wise) to show a complete typical plan. The system is under test and has been used successively on many student cases. Three typical case studies included with their course plans and analysis is reported in the paper.

**Key Words:** Advising, course planning, software package, JAVA.

### INTRODUCTION

The purpose of the registration process at an academic institution is commonly to determine which students will be taking what courses within the university education system as well as for the administration to keep its records up-to-date. From the students' point of view, the registration process enables them to acquire the necessary authorized membership of the University and enables them to obtain their legal & authorized benefits and privileges. Typically, students register for particular courses, or modules, and this registration information is collected by members of the teaching staff and administration to construct class lists and offer other academic activities, etc.

The devised Student Advising & Planning System at the Department of Electrical Engineering, Faculty of Engineering, United Arab Emirates University, helps and guides students in selecting appropriate courses suitable to register with the online University Registration System.

Course registration is a common procedure at the University where students need to consult their Academic Advisers before the start of registration period. This consultation is however, regularly experienced with delays or a complete miss out with either Adviser too busy or student too lazy to seek advice. Although, the

registration system ascertains an academic hold on the online course selection but this hold is automatically released on the second day of registration due to some administrative preferences.

Most of these losing out students experience typical problems which may include: courses registered without completing prerequisites (this problem is almost resolved with the recent improvements to the banner system), course selection with time conflicts, missed out on specific courses which may only be offered for alternate semesters, selecting department electives bypassing track requirements and restrictions, selection of general education courses restricted for specific colleges, selecting more than one general education course from the same basket whereas only one course from each three tracks needs to be selected, selecting too many courses in a specific semester whereas this selection is based on academic warnings and low grade point averages, or too less courses which again is based on minimum credit hour (*CH*) requirements and grade point averages, etc.

Students in some of these categories suffer with problems such as, class expulsion after two or three weeks of the start because of prerequisites requirement, delayed graduation due to unnecessary additional taken courses, drop of a complete semester because of minimum number of courses requirement, etc. The SAPS is devised to counter such missing out or losing students to solve their advising and course planning problems. The advising system helps and guides students in selecting the precise and appropriate courses suitable for online registration.

The paper describes complete operation of the advising package which includes prioritized course selection, course hierarchies, graphical charts, program restrictions, filing of the complete course plan, etc. Students can run the advising program through any the department computer laboratories and create a typical course plan for the remaining semesters until graduation. The outcome is in the form of semester-wise course selection stored in a file to show a complete typical plan. Case studies of three typical students have been reported and analyzed in the paper.

The system is currently being used in the Electrical Engineering Department on a trial basis and modifications are under process to suit the department and student needs. Majority of these test trials have resulted in a success. Once the testing phase is complete, then the advising program will be investigated to be implemented in all departments of the Faculty of Engineering. Work is also in progress to convert the advising JAVA application program into a JAVA applet. This completed applet will mount on the Faculty web server for students to access the advising system online.

## **COURSE REGISTRATION**

Before the early nineties, at most of the academic institutions throughout the world, the registration process used to involve student registrations at a single place, where most of the registration related activities were performed after the requisite form was filled and processed by the concerned department. This (centralized) single point activity used to generate many concerns for queues, fee payments, query handling, and other related issues.

In mid nineties, the majority of the well-known academic institutions throughout the world started to address this perspective of registration from many different angles including student advising, student course registration, class scheduling, administrative purposes, etc. Obviously, the objective seemed to produce a highly available application that required working in a distributed environment.

In the beginning twenties, institutions throughout the world saw a rapid expansion of tertiary education. As the twenty first century approached, this trend increased nearly doubled. This rapid expansion has an indirect effect on the institution's enrolment. The average age of prospective students has increased as well as the

number of students. As the demand is stabilized, so is a need to streamline the registration process that maximizes the allocation of course places and increases the number of registered students.

Additionally, the institutions, in general, have progressed to offer programs that are specialized as well as multidisciplinary. This variety of programs has introduced time conflicts vis-à-vis chosen courses. The required registration system(s) are to be developed to provide on-line real time registration for students and enable students to maximize their opportunities in registering courses of their own interest as well as advising students in completing their degree requirements in a best possible way.

The multidisciplinary nature of modern day universities where faculties and departments can typically number as high as 10 and 50, respectively, course registration systems need to be smart enough to comprehend multiple course selections from different faculties and departments. A decent course advising system in this regard can prevent and resolve such conflicts.

The concept of computerized registration system has been to tolerate machine and network failures. Hopes were pinned that most human errors, such as incorrectly inputting data, would be detected by the system as they occurred, but it was expected that some "off-line" data manipulation would be necessary for errors which had not been foreseen.

Therefore, the success of any attempt to computerize this activity depends on the reliability, availability and integrity of the computer systems, both software and hardware, on which the registration programs are run. Because many of the departments at any university have most likely made significant investments in computer hardware, it is logical that no specialized hardware needs to be purchased and software fault-tolerance is to be used instead. The following section looks at some of similar old and recent advising systems.

#### **COURSE ADVISING & REGISTRATION SYSTEMS**

The PACE advising system is a decision model representation for course advising based on student's need to know "what to do" and "how to do it". It consisted of profiling a student's strengths and weakness, generating a personal curriculum customized to each person's needs, and producing a schedule for the courses chosen (Gunadhi, Lim, & Yeong, 1995).

The advising software at the Electrical Engineering, Texas Tech University featured a graphical user interface, that allowed students to request only courses for which they have appropriate prerequisites, co-requisites, and standing (Hagler, 1995). Similar work has been investigated by Laghari, Memon, & Habib ur Rehman (2005) on an old and phased out curriculum.

A Student Advising Software (SAS) is developed using JAVA computer programming language. It is a manual procedure, which helps and guides students in selecting appropriate courses suitable for online registration with the Banner University Registration System (Laghari & Khuwaja, 2012). Another Student Auto Advising System is developed at the Electrical Engineering Department, UAE University. It is an automated system with limited functionality and with approximately a 20% error rate (Laghari & Khuwaja, 2012). The academics at the Florida Atlantic University developed a similar web-based advising system that supplemented the conventional advising process (Marques, Ding, & Hsu, 2001).

A Bayesian Network model for planning course registration and advising by using a data mining technique is developed to predict the sequences of courses to be registered by undergraduate students whose majors are computer science or engineering (Pumpuang, Srivihok, Praneetpolgrang, & Numprasertchai, 2008).

A SASSY advising system is developed at the Armstrong Atlantic State University. This system suggests courses for an advisee based on; frequency of the course offering, balancing the course load, shortening the path length to graduation, preference of advisee and entertaining different scenarios of course loads for the entire duration of the advisee's university life (Hashemi & Blondin, 2010).

An expert system using JESS (a JAVA based rule engine and scripting environment) is developed that allows students to seek quick responses to their queries regarding their plan of study and progress in the program (Nambiar & Dutta, 2010).

Two project management tools are designed to help the students complete their degree plan sooner. The first tool provides a visualization map of course sequences, customized for each student, making advising adjustments that will optimize the time to obtain the degree under a constrained set of resources. The second tool collects information from multiple students through several semesters and it can be used to identify bottlenecks in the curriculum (Gonzalez & Esparza, 2010).

The Arjuna distributed system was developed at The University of Newcastle upon Tyne, UK. Its design aims were to provide tools to assist in the construction of highly available, fault tolerant distributed applications using atomic actions. Shrivastava, Dixon, & Parrington (1991), have discussed the design and implementation of the registration system that successfully met their requirements (Shrivastava & Panzieri, 1988) & (Parrington et al., 1995).

Another development was completed at the Wylie College IT for software architectural development of a course registration system using the specifications created for the college requirements. The Software Architecture Document provides an architectural overview of the C-Registration System. The C-Registration System was initiated by Wylie College IT to support online course registration (Johnson, 1999), (WylIT387, V1.0, Wylie College IT., 1998), (WylIT406, V2.0, 1999), & (WylIT418, V1.0, 1999).

As from one advising and registration system to another are browsed, it has been speculated that specification document is fundamental and the key to further developing a customized university course registration. Furthermore, as programs to be offered vary from institution to institution, and at the same time, universities continuously revise their curriculum as well as program requirements in order to meet market demands, the flexibility and reliability of the registration system to accommodate such changes in the program offerings has been deemed necessary for such a system to survive and evolve.

Thus, the required development work involves customized design of a network-enabled university student registration system that is capable of handling scenarios such as add/drop requests, student advising, availability of courses per term, student's registration status, enrolment summary, reports, etc.

Furthermore, the devised advising system which is under test phase in the department has shown representational efficiency and flexibility, improved performance, and ease of software development and maintenance when compared with some of the mentioned systems.

#### THE SAPS PACKAGE

There are nine United Arab Emirates University Faculties, which accommodate approximately 12,279 students. The Faculty of Engineering (FOE) has 1854 students distributed among five departments. Students from Electrical Engineering Department (200 students) take 168 credit hours of course work to fulfill the requirements for a B.Sc. degree in either of the two tracks of: Electrical Engineering or Communications Engineering. An average course work of 15 to 18 credits comprising of 4 to 6 courses per semester and from a minimum of 11 to a maximum of 16 semesters is typical to complete their degree requirements.

The 168 credit hours of course work is divided into;

*UGRU* (University General Requirements Unit) - 42 credits is based on 21 CH of university preparatory courses and the remaining of general education, culture, and society courses,

*ERU* (Engineering Requirements Unit) - 41 credits is based on basic level of engineering, science, and math courses common to all engineering departments,

Department Compulsory Specialization Requirements - 52 credits,

Department Elective Specialization Requirements - 12 credits,

Industrial Training - 15 credits is based on student spending a complete semesters load in an industry, and the

Graduation Projects - 6 credits is distributed in the last two semesters after industrial training.

The student advising software package consists of the interface as shown in Figure 1. The package interface window is designed consisting of four sections. The top section displays the package heading with university and department names. The center section displays three text columns of course selections with the labels as *Student Courses*, *Suggested Courses*, and *Selected Courses*, respectively. A set of six buttons are accommodated on the east section of the package and these are; *Student Info.*, *Earned Courses*, *Course Chart*, *Course Hierarchy*, *Hierarchies*, & *Instructions* (give instructions on how to use the SAPS package). Another set of course buttons are displayed in the bottom, which also includes *delete*, *clear*, and *save* buttons. The system is also equipped with a current semester credit points and total credit points windows.

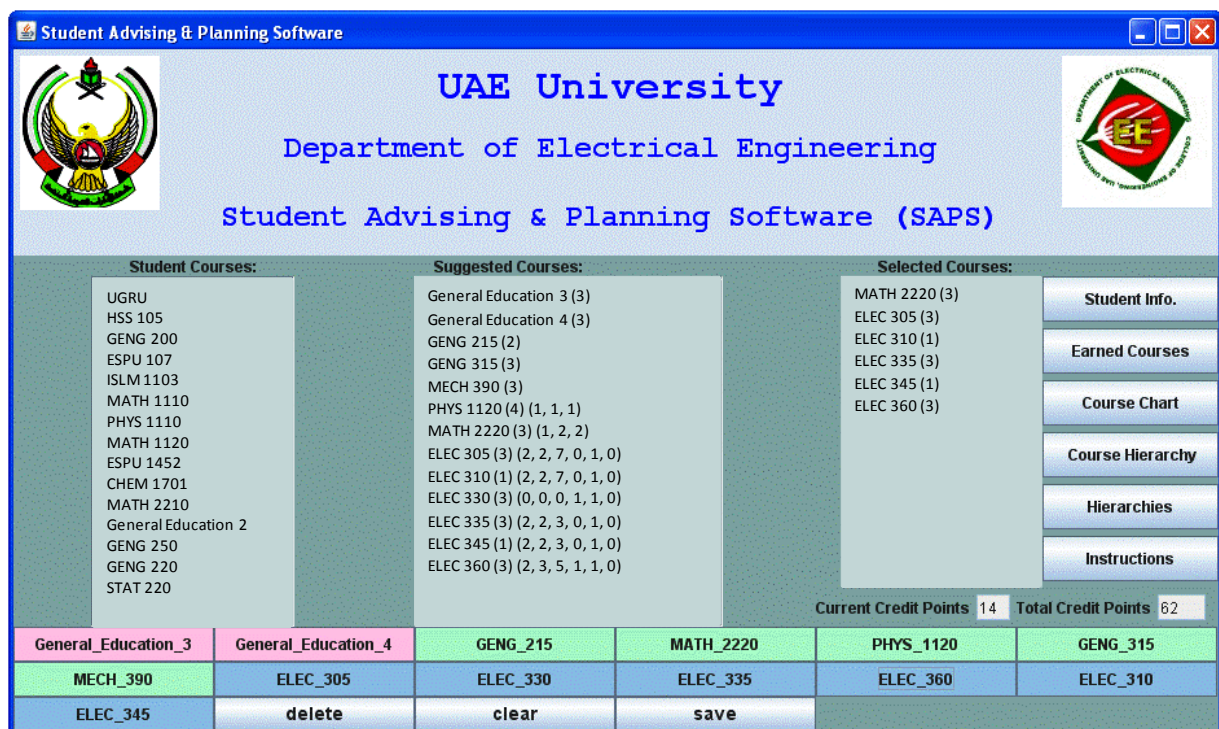


Figure 1: Interface of the SAPS package.

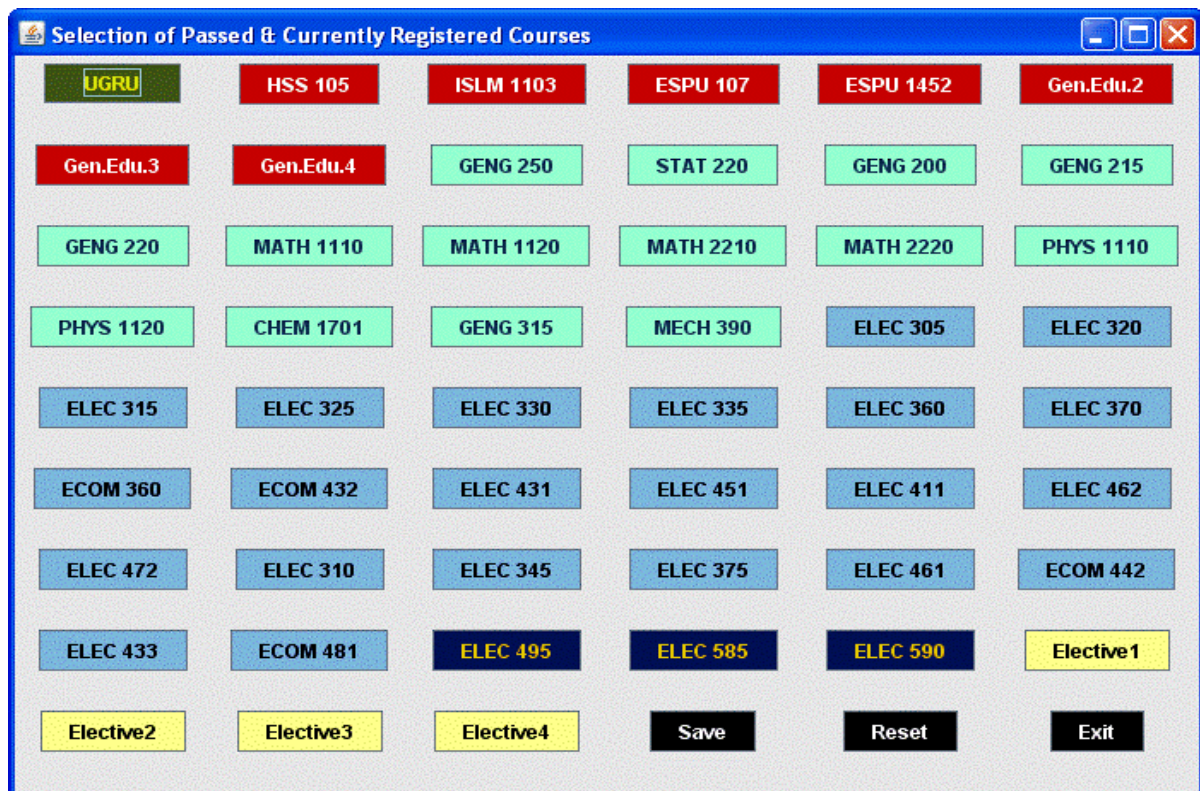
A typical advising session starts with the student clicking the *Student Info.(rmation)* button. This allows the user to enter information such as the student name, ID, GPA (*Grade Point Average*), degree major, current date, and the advising start semester. *Earned Courses* button is used next to input all passed as well as currently registered courses. This information is input through another display window as shown in Figure 2.

The color coding in the Figure is based on red color for university courses, green for engineering requirements, blue for department compulsory, yellow are for department electives, and the remaining for UGRU, industrial training and graduation projects. All courses Figure 2 are shown as interactive buttons. Clicking a course button makes the button disappear from the display as well as lists the course. Figure 3 shows a course list of a typical student passed and currently register courses. *Save* button is then used to save the list in a file. *Reset* button can be used to remedy for mistakes as it restarts the whole process again.

Exiting the *Passed Courses* menu inputs and prints the saved file in the *Student Courses* text area column of the SAPS package. The following section describes the package in detail in terms of the three arbitrarily picked student-advising cases. These cases were investigated in the month of January so the first advising semester is Spring of 2012.

### TEST CASE # 1

A typical student case is shown with the initial courses list with 62 credit hours in the first text column of Figure 1. The student is then advised of the average credit hours/semester as well as the total number of semesters required for degree completion which is calculated by the system based on the student's entered course data. For the example from Figure 1, the remaining # of credit hours is  $168 - 62 = 106$ . Deleting another 15 (industrial training semester) leaves 91 credit hours. With a typical student's GPA of say 3.00, an average of 15 credit hours of course work is required, and based on this average the student needs a total of seven semesters including industrial training as shown in Figure 4.



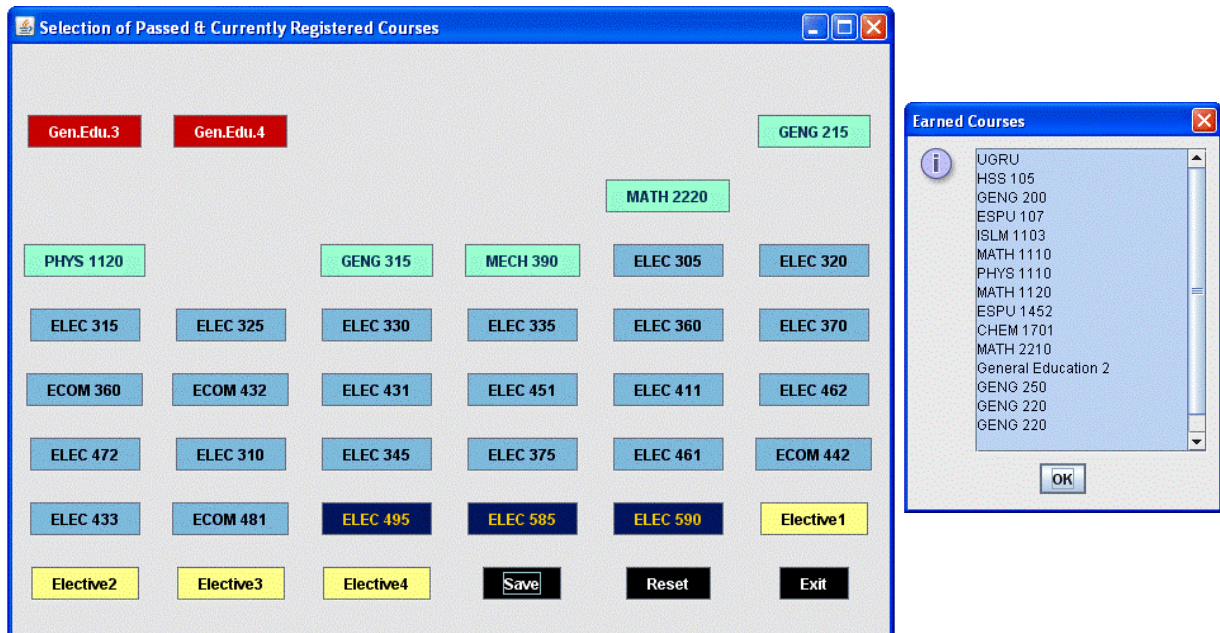


Figure 3: Selection of passed and currently registered courses.

Text column of *Suggested Courses* of Figure 1 prints all eligible courses that the student can select. This list of 13 qualified courses from a 23+ offered courses are the one whose prerequisites have already been taken by the student. Therefore, the choice for next semester courses is narrowed to a shorter list. This list is shown as interactive buttons in the bottom section of the package. Clicking a course button adds the course in the *Selected Course* text column. Any selection can be deleted as well as all selections can be cleared. The selected courses list can then be saved. This saved selection is now added to *Student Courses* column and a new set of *Suggested Courses* as well as the course buttons for the next semester (Fall 2012) are displayed. This completes one cycle of course selection and now the system is ready for the next semester courses.

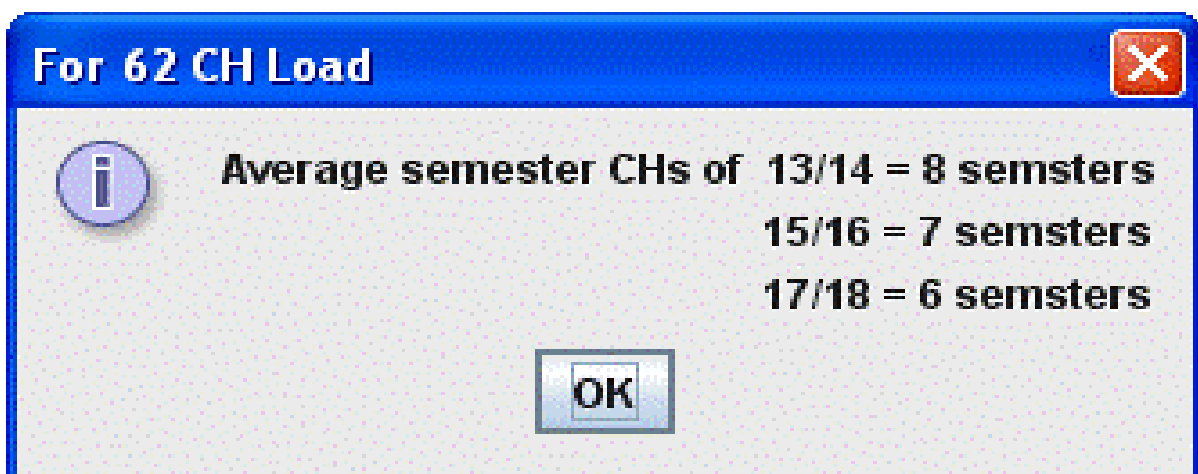


Figure 4: Average credit hours load per semester and # of semesters.

The total number of courses offered in a specific semester is based on the syllabus as shown from Figure 5. This all courses chart can also be displayed with the *Course Chart* button from Figure 1. It is a complete course hierarchal chart showing the course separation by color coding, course hierarchies with colored arrows, courses offered in either both semesters or 1<sup>st</sup> and 2<sup>nd</sup> with appropriate numbers on top of the course, courses prerequisite for industrial training with asterisks beside the course, and 114 credit hours as a prerequisite for training. Courses such as ELEC 335 and ELEC 345 are the theory and the associated laboratory courses.

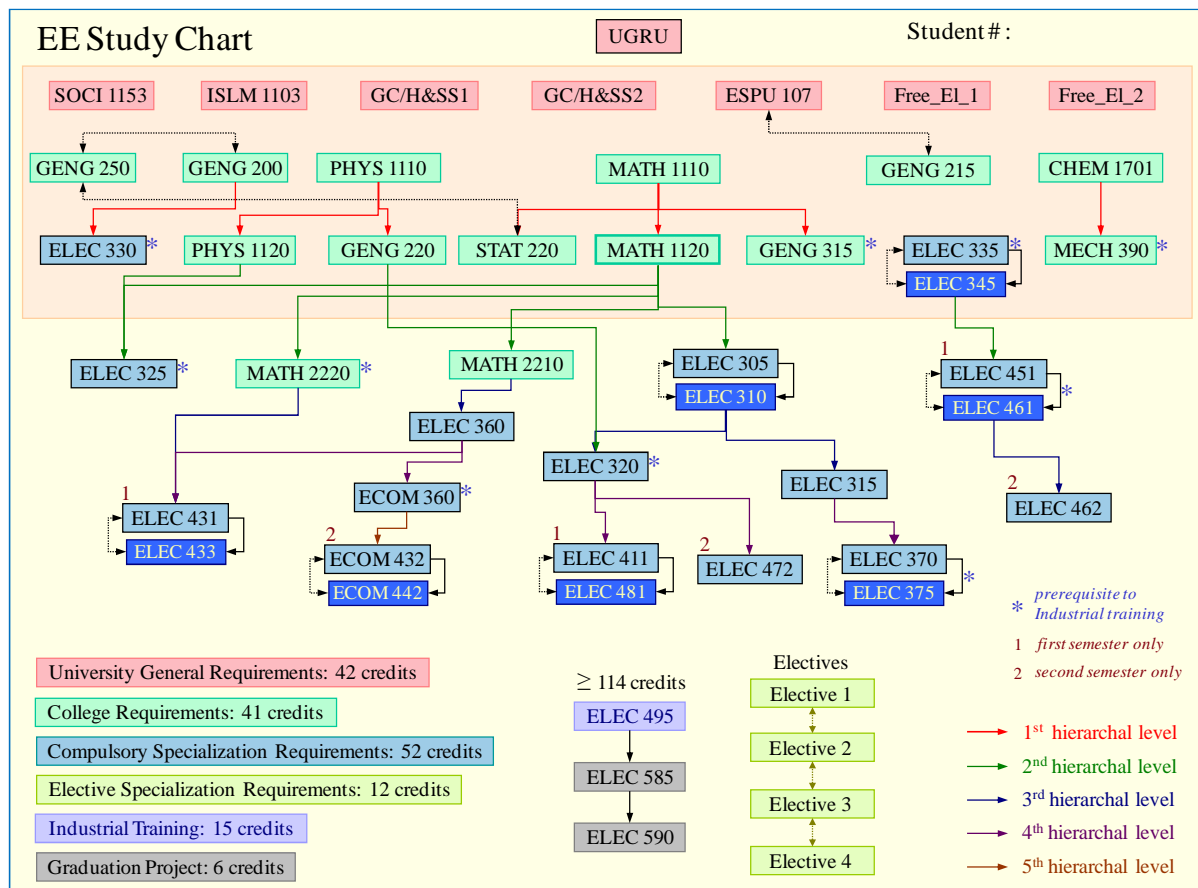


Figure 5: Course syllabus with hierarchies.

The main theme of SAPS package is the student's ability and choice of course selection. An advising student needs to beware of course priorities meaning which courses are necessary and beneficial to be taken earlier or even delayed so that he/she may not be burdened with heavy course loads as well as too slow to delay the degree completion. The next sub-section describes the knowledge area built around each course for the student to decide on selecting a specific course before a course selection procedure of a complete advising plan is shown.

### Course Knowledge Area

The student's decision to choose a specific course from a pool of offered and appropriate courses is based on the knowledge area built around each course. Figure 6 shows the ELEC 360 department course with its associated knowledge area. All department courses are appended with six additional fields of:

A '2' in the first field of the example course indicates that the course has two forward hierarchical levels,



A '3' in the second field indicates the number of opened compulsory course(s) in the next semester, which is dependent on this particular course,  
 A '5' in the third indicates that this course opens five compulsory courses in the following semesters,  
 The fourth field indicates the number of department electives dependent on this course and is shown in the Figure by the single course of 'Digital Image Processing',  
 A '1' in the fifth field indicates that this course is required for industrial training or a '0' is otherwise, and  
 The last field indicates the offering semester; a '0' means in both semesters, a '1' for 1st, and a '2' for 2nd

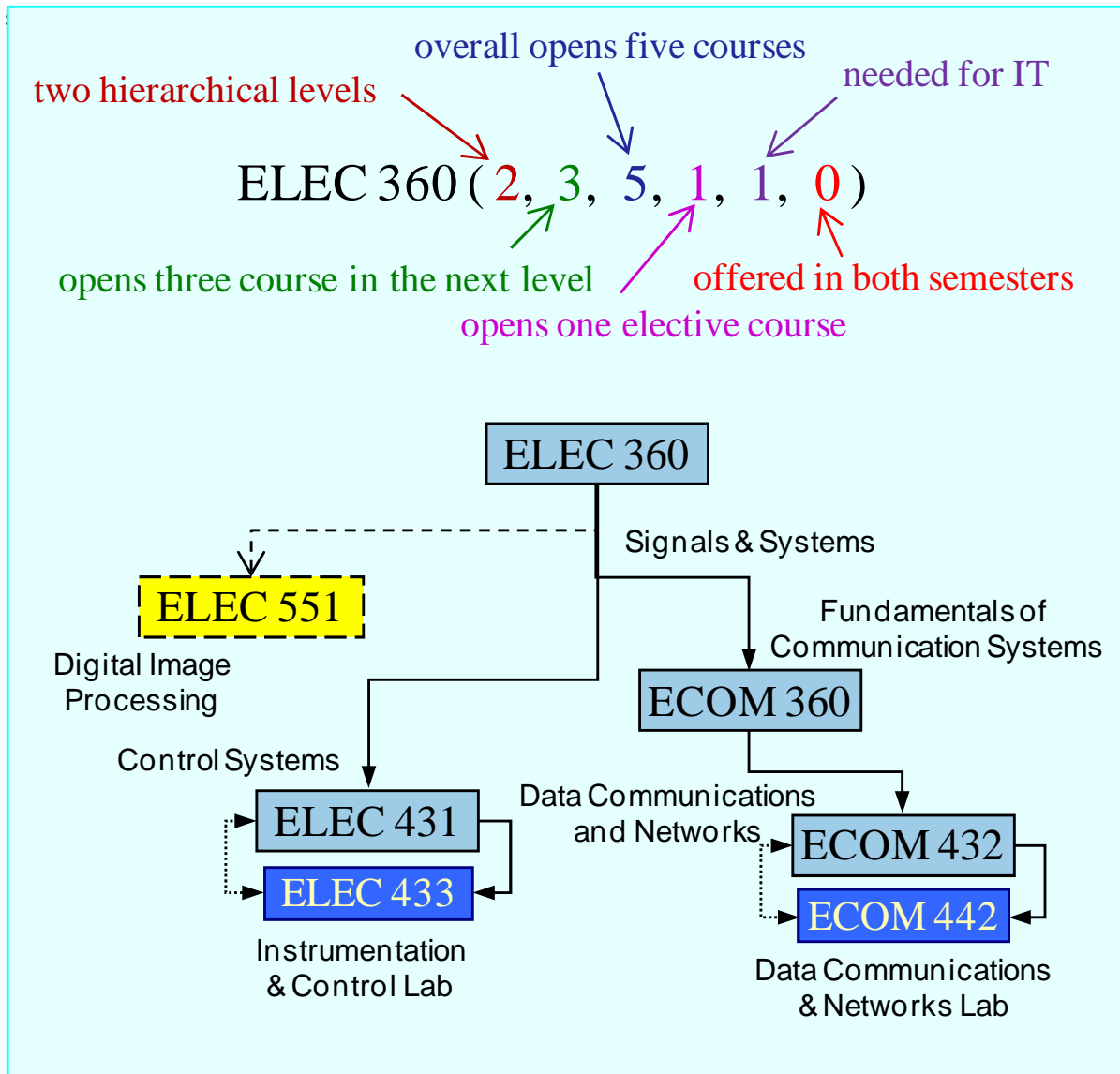


Figure 6: Course knowledge area with appended fields.

The six associated fields are prioritized in the system with the first field having the highest priority. The advising selection procedure performs a field wise comparison of all eligible courses. Courses with a higher first field value are chosen first as course hierarchal level is important. It is like a critical path and a delay in this path delays the degree completion. Figure 7 shows all courses with more than two hierarchical levels which can also be displayed by the *Hierarchies* button of the main package. If there are courses, remaining to fit in a semester

and the first field value is same for many such courses then second field is considered for selection. The second level of selection is the choice of a course opening more of the next semester courses. If still more courses are required then the third field is considered which is the total number of dependant courses.

The next three fields have like negotiable priorities. The selection decision is left on student's choice of interest and necessity. An industrial training course may be more important to take before a course for electives is chosen as electives are regularly considered after training. Alternately, it may be important to choose such a course that is offered in alternate semesters as well as opens department electives.

Some of the ERU courses are also appended with the additional first three fields. These are similar to the first three fields of department courses. All ERU courses are a prerequisite for training so the only priority is that these have to completed before training except that some are taken earlier in the course work hence the first three field priority. Courses like Physics and Math are examples.

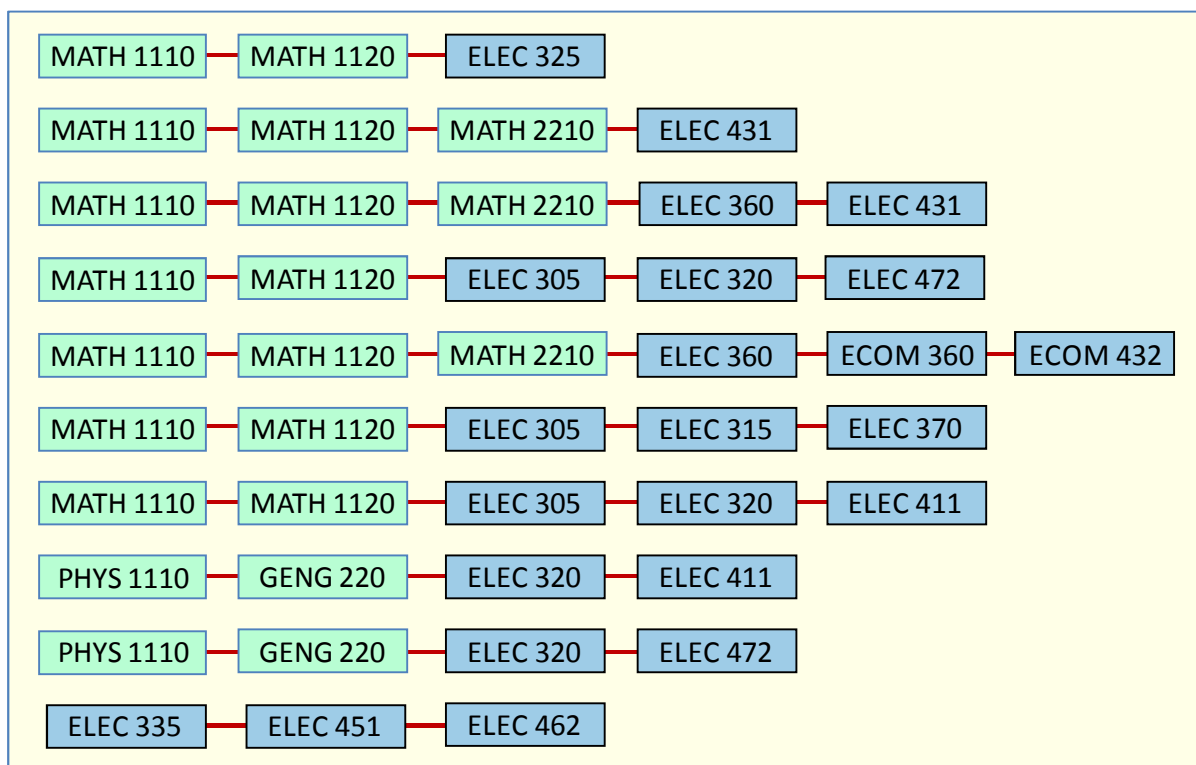


Figure 7: Course level hierarchies.

### A Complete Course Plan

After the initial interface of showing student courses and suggested courses, the system is now ready for course selection mode. A student can select courses to complete a semester requirement. Subsequently, each next semester courses are displayed in the *Selected Courses* text column by clicking the save button until the last semester to complete 168 credit hours of degree requirements. All succeeding displays are saved in a file to keep a record of advising to be used later for the registration purpose. A complete course plan of the example student presenting all eligible courses and their associated selections (arrows) for seven semesters is shown in Figure 8.

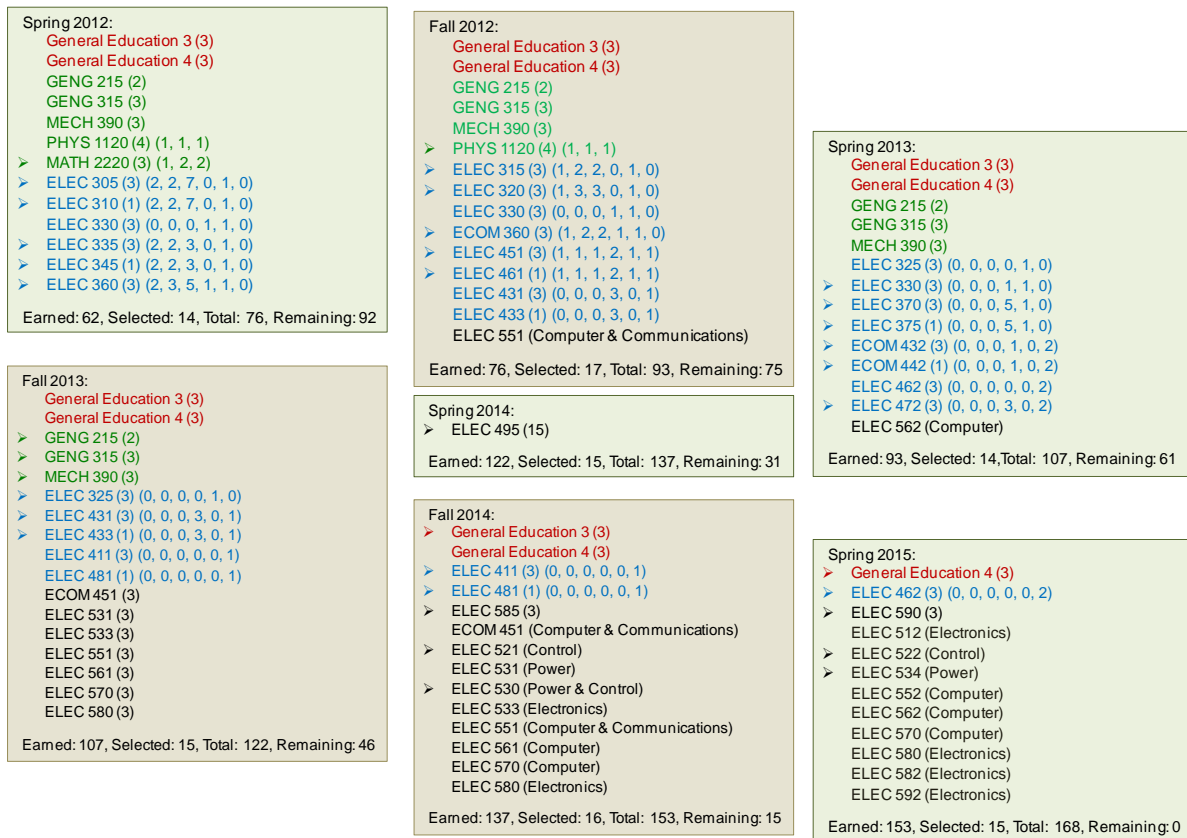


Figure 8: A complete course plan consisting of seven semesters.

Analyzing courses for Spring 2012 semester shows that instead of 23+ courses only 13 are considered based on the prerequisite information. From these six courses are selected again based on the field priorities and the credit hours approaching the semester average. PHYS 1120 could have been considered but then the total number of semester credits would zone out from the average.

In case of near similar field priorities, the *Course Hierarchy* button from Figure 1 can be used to clear any doubts in the selection procedure. Figure 9 shows the 2012 semester courses in a graphical chart. The display shows all remaining courses other than the initially passed or currently registered. All 13 eligible courses come out to be highlighted whereas the remaining ones as dimmed. Now, clicking on any of the highlighted courses shows a course hierarchical chart of Figure 10. The Figure shows the ELEC 305 hierarchical chart. This help procedure can clarify any confusion between similar field priorities and the student can make the right course selection choice.

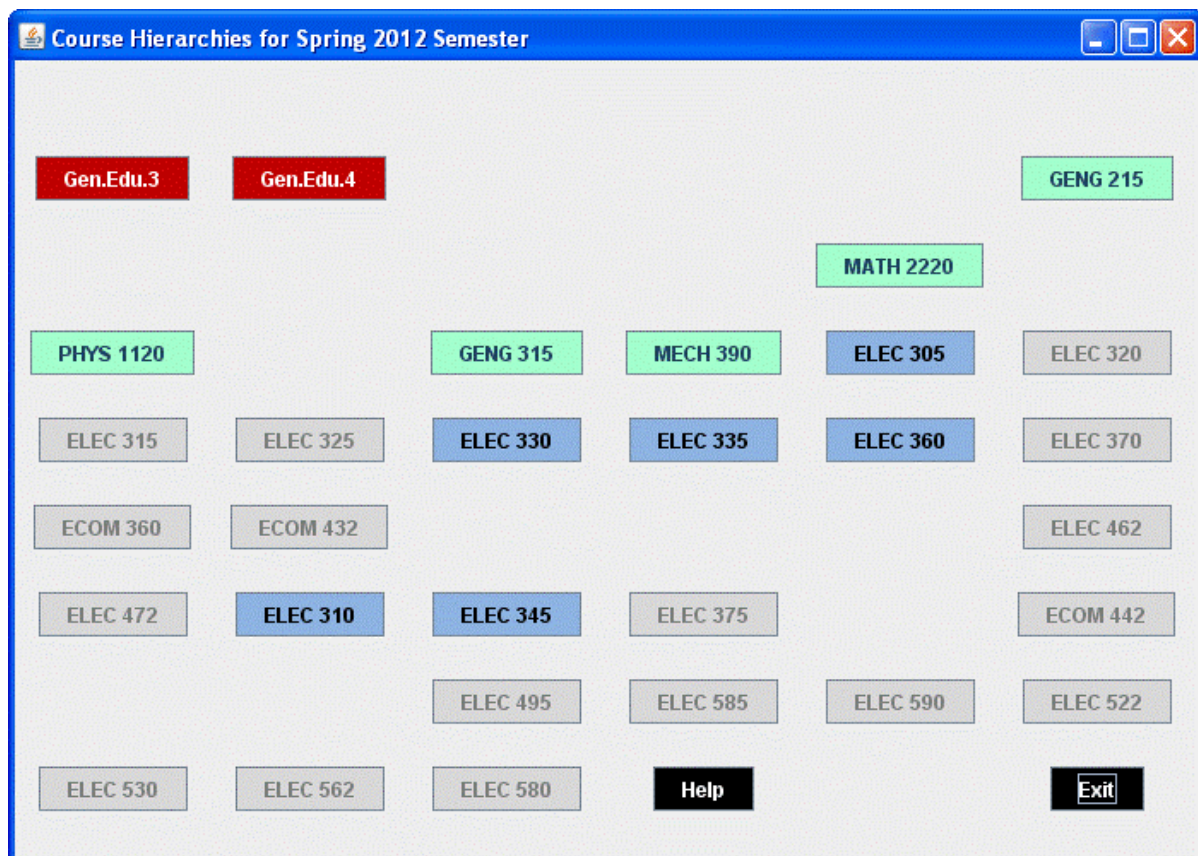


Figure 9: All eligible courses for the Spring 2012 semester.

The student selects courses equaling 17 CH for the Fall 2012 semester. Although heavier load but the selection is based on the balanced load of the remaining semesters and more importantly selecting courses based on the prioritized first three fields. The listing also shows an elective course (ELEC 551) being offered for selection. Such elective offerings in the earlier semesters are commonly ignored except if there is nothing else to choose.

Spring 2013 semester prefer course selections more on elective openings rather than courses suitable for industrial training. Training prerequisite courses can be managed in next (last) semester before training.

Fall 2013 semester selects all courses suitable for industrial training as well as any other course, which opens electives. The student understands that this is the last semester before training as the total is equal to or more than 114 credit hours, which is the prerequisite for training. Although electives are again considered for selection, however priority to select an elective before training is lower than any other compulsory course.

Spring 2014 semester is the industrial training semester based on the total number of 122 credit hours.

For the Fall 2014 and Spring 2015 semesters student selects all the remaining as well as at least two department electives each semester. Similar to some compulsory courses, department electives are also separated offer in two semesters. The system automatically displays all electives eligible and specific for the offering semester. The student selects an appropriate elective(s) of interests (Power & Control track for the typical student) as shown in Figures 8. However, at the course offering semester time the chances are that the earlier chosen electives may not be offered because not all semester electives are offered at all times. Then

most definitely, the student has to choose another department elective being offered. Alternately, he/she may request a particular elective to be offered.

All engineering students take four General Education courses including the ESPU 1452 from other Faculties. Similar to the department electives not all university General Education courses are also offered in both semesters. Therefore, the system automatically selects courses with generic names such as General Education 2, etc. At the time of registration, student chooses courses of interest from a pool of university offered courses.

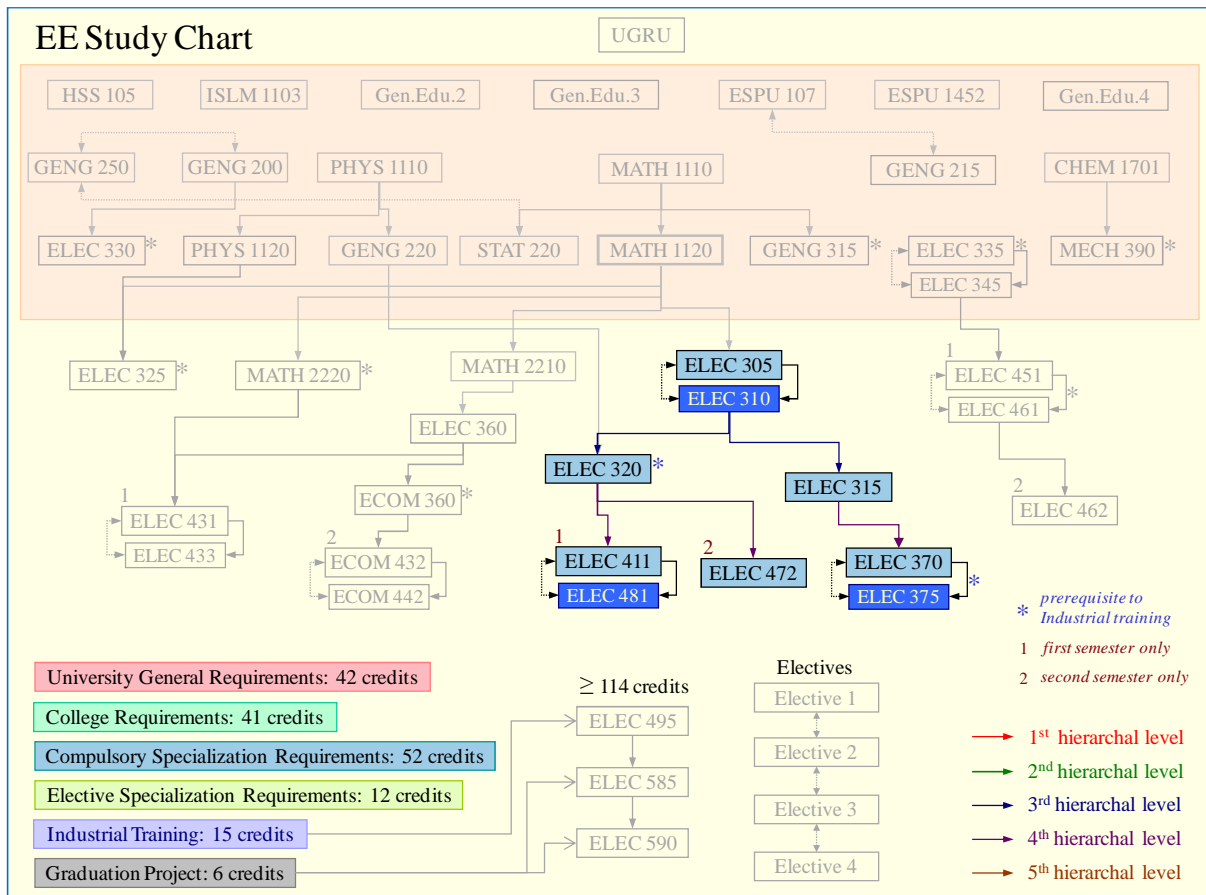


Figure 10: An individual course hierarchal chart.

**TEST CASE # 2**

This case is similar to Test Case # 1 except for the fact that the student using the advising system has now more credit hours to start with. This student has completed 73 credit hours of course work. The remaining # of credit hours is 168 – 73 = 95. Deleting another 15 (industrial training semester) leaves 80 credit hours to complete. The student’s GPA of 3.9 has given an hint of 16 credit hours of course work per semester, and based on this average the student needs a total of six semesters including industrial training.

### A Complete Course Plan

Another complete course plan signifying all eligible courses that the student may pursue and their associated selections for six semesters is shown in Figures 11. Figure 12 in the Appendix shows the file format of the student's complete course plan as saved from the SAPS package.

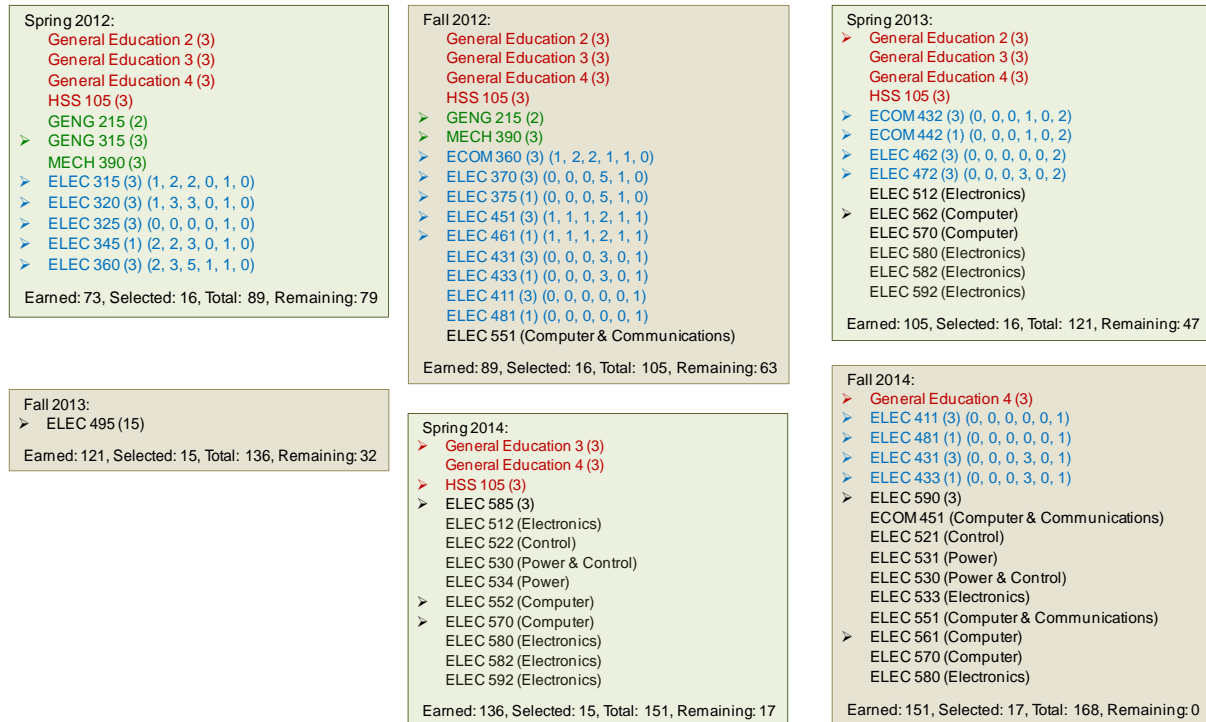


Figure 11: A complete course plan consisting of six semesters.

Analyzing courses for Spring 2012 semester shows that instead of again 23+ courses offered only twelve are fitting for the student to be selected based on the prerequisite information. From these, five department courses are selected based on the field priorities. One more course is needed to match the semester average. The four university courses have the lowest priority and it can be taken any time in the whole course of study. The remaining three ERU courses have the same priority level, which is prerequisite for industrial training. The student selects an ERU course of convenience.

Course selection for Fall 2012 semester has a minute complication associated with it. The student initially selects all courses based on the first three field priorities, which are ECOM 360, ELEC 451, and ELEC 461. The next level of selection is ELEC 370 & ELEC 375 both courses with opening of five electives and prerequisite for training. The courses ELEC 431 & ELEC 433 are an obvious next choice but the student selects from others. There are three main reasons for this selection; firstly, selecting the courses would be three laboratories in the same semester which is considered a heavy load, secondly, these courses are not required for industrial training whereas the others are, and lastly, the total credit hours would count to 15 whereas the selecting other two courses match the average.

Course selection for Spring 2013 semester shows one department elective and a General Education course being selected for the reason to reduce the final semester load of two electives and two remaining Labs.

Fall 2013 semester is the industrial training semester based on the total number of 121 credit hours of course work completed.

Course selection for last two semesters after industrial training is apparent with no associated complications.

### TEST CASE # 3

The student for this test case has completed 88 credit hours of course work. The remaining # of credit hours is  $168 - 88 = 80$ . Deleting another 15 (industrial training semester) leaves 65 credit hours to complete. Four semesters other than the training semester is needed with an average course load of 16 credit hours per semester.

### A Complete Course Plan

Another complete course plan signifying all eligible courses that the student may pursue and their associated selections for five semesters is shown in Figures 13.

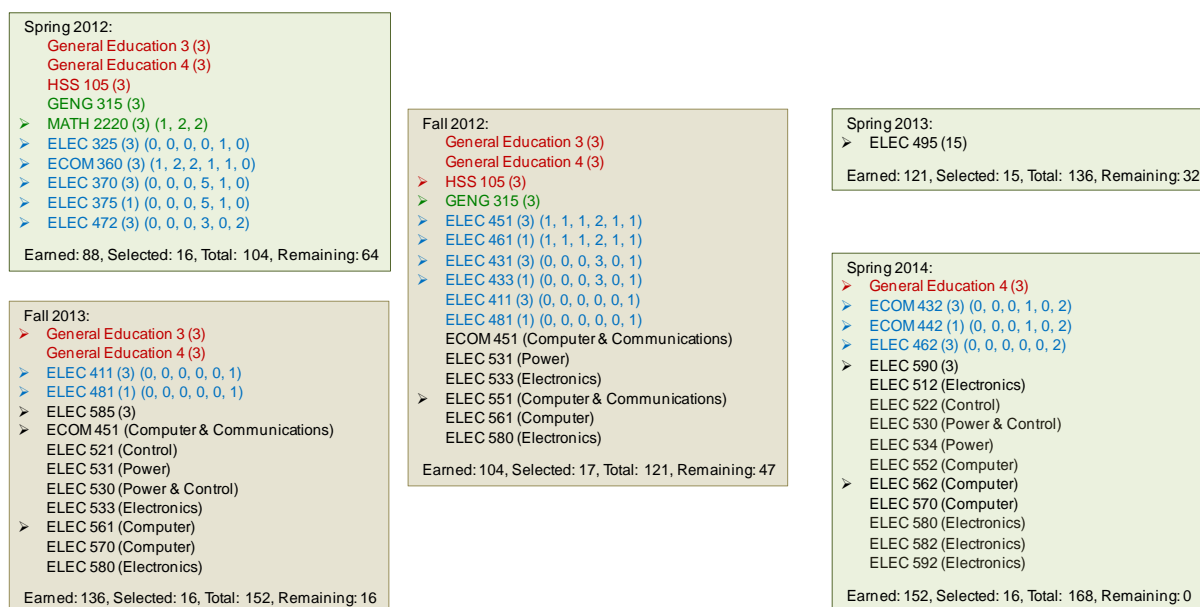


Figure 13: Another complete course plan consisting of five semesters.

The course selection for this typical student is as normal as it can be. Except of Fall 2012 semesters load all other semester matches the calculated average.

### CONCLUSION

Student course registration is an important as well as a trivial process, which may encounter unnecessary graduation delays. United Arab Emirates University is one such institution where students have faced problems with advising and course registration. The Student Advising & Planning Software system has been devised to guide students in selecting appropriate courses suitable to register online with the University Registration System. SAPS is developed using JAVA computer programming language. The outcome of the course selection is stored (semester wise) to show a complete typical plan. Future work will concentrate on integrating the advising package for other department of the Faculty.

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APPENDIX


ID #:	200912373	
NAME:	Eiman Saeed Abdulla	
MAJOR:	Electrical Engineering	
GPA:	3.91	
Date:	09 - 01 - 2012	
Total of earned and current courses:		
UGRU, ESPU 107, MATH 1110, ISLM 1103, PHYS 1110, GENG 220, GENG 200, CHEM 1701, MATH 1120, STAT 220, PHYS 1120, MATH 2210, ESPU 1452, ELEC 305, ELEC 310, ELEC 330, ELEC 335, GENG 250, MATH_2220.		
		Total Credits: 73
Spring 2012:	GENG 315 Engg. Practice & Entrepreneurship (3) ELEC 315 Fund. Microelectronic Devices (3) ELEC 320 Electric Circuits II (3) ELEC 325 Engineering Electromagnetics (3) ELEC 345 Digital Logic Design Lab (1) ELEC 360 Signals & Systems (3)	Current Semester: 16, Total: 89
Fall 2012:	GENG 215 Introduction to Engg. Design & Ethics (2) MECH 390 Engineering Materials (3) ECOM 360 Fund. of Communication Systems (3) ELEC 370 Electronic Circuits (3) ELEC 375 Electronic Circuits Lab (1) ELEC 451 Microprocessors (3) ELEC 461 Microprocessors Lab (1)	Current Semester : 16, Total: 105
Spring 2013:	General Education 2 (3) ECOM 432 Data Communications & Networks (3) ECOM 442 Data Communications & Networks Lab (1) ELEC 462 Computer Architecture and Organization (3) ELEC 472 Power Systems (3) ELEC 562 Embedded Systems Design (3)	Current Semester: 16, Total: 121
Fall 2013:	ELEC 495 Industrial training (15)	Current Semester: 15, Total: 136
Spring 2014:	General Education 3 (3) HSS 105 Emirates Society (3) ELEC 585 Graduation Project I (3) ELEC 552 Computer Networks (3) ELEC 570 Special Topics in Computer Engg. (3)	Current Semester: 15, Total: 151
Fall 2014:	General Education 4 (3) ELEC 431 Control Systems (3) ELEC 433 Instrumentation and Control Lab (1) ELEC 411 Electric Energy Conversion (3) ELEC 481 Electric Energy Conversion Lab (1) ELEC 590 Graduation Project I (3) ELEC 561 JAVA Programming Applications (3)	Current Semester: 17, Total: 168

Figure 12: Saved file of the Test Case # 2 completed course plan.