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# An Automated Student Advisement and Projected Course Enrollments

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# AN AUTOMATED STUDENT ADVISEMENT AND PROJECTED COURSE ENROLLMENTS

BY

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THESIS

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Distribution of this paper is provided in the interest of information exchange. Responsibility for the contents and the program resides solely in the author.

## ABSTRACT

One of the major problems of the modern univeristy is the process of student advisement and course scheduling. The purpose of this paper is to write a computer program which will aid in solving this problem of student advisement and course scheduling for the undergraduate students of the College of Engineering at Florida Technological University.

The computer program which is developed in this paper, aids in the problem of student advisement by producing a one page output for each student. This output page, which is separated by department, lists all courses the student has taken and passed, all transfer hours, and a list of courses recommended to be taken in the next three sequential quarters. The input data is taken from the master student file and the approved petitions for transfer hours which are kept in the Dean's office.

In addition the program produces projected enrollment figures for the next three sequential quarters. This output is intended for the administrative personnel responsible for course scheduling.

Future developement using this program could be the development of a program to help advise students for the entire university and to schedule courses, faculty members and rooms.

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# INTRODUCTION

The college student in pursuit of a degree faces a critical path, often shrouded by the enigma of the college catalog. This critical path begins when the student enters the university and continues as a student must negotiate his way between courses, course prerequisites, course corequisites, and the consent of a faculty advisor. In order to assist the student along this path, the author has developed a computer program designed for the students in the undergraduate program of the College of Engineering to enable the students and the faculty advisor to perceive where the student is in his particular critical path. This is accomplished by providing a comprehensive computer printout which lists all courses the student has taken (separated into the areas of environmental studies, engineering core, and option area), all accepted transfer hours, all accepted course substitutions, and a recommended schedule of courses for the next three quarters.

At Florida Technological University each engineering student is assigned a faculty advisor who aids in the student's guidance. This service is provided to help the student select courses that follow the required program of study and insure that the student maintains satisfactory academic progress. The student can sometimes be misunderstood or misinformed resulting in a loss of his time and money. The printout of the previously mentioned student

scheduling program could help eliminate this problem.

The computer printout sheet is designed to provide the student and his faculty advisor with a comprehensive, rapid, and accurate method of evaluating the student's progress toward a degree and can be made available to the faculty advisor prior to the student/advisor interview. The printout is easier to read and follow than the quarter-by-quarter grade reports and allows the faculty advisor to check and insure that a student is credited with all transfer hours and substitution courses that the student has been allowed by petition. The printout also gives a recommended course schedule for the student for the next three quarters. It is not expected that the recommended course schedule for the student will be followed exactly, however, the printout sheet will allow the student to make sure that all recommended courses have been or are taken.

In addition to guidance and course scheduling, the program also maintains a record of the number of students projected to take each course required for an engineering degree. This record is derived from the projection analysis done by the program and is kept separatly for each of the subsequent three (3) quarters. This listing, which includes figures for the option areas as well as all engineering core courses, is designed to aid the administrative personnel in determining what courses and

how many sections of each course to offer each quarter during the school year.

It is anticipated that the program will be run each quarter after add/drop so that inputs can be updated quarterly.

## PROBLEM ANALYSIS

Several problems needed to be solved before the student counseling prediction program could be written. The problems were transfer data-how it was to be handled, sequencing of courses, and output formating. Additional problems were encountered by the change of degree requirements in the environmental studies program and the option areas.

The solution of each of the problems dictated the manner in which the program would be setup and run and the type of output produced.

### Transfer Data

The master student file kept by the Information Services Division of Florida Technological University contains information on all students attending the university and all courses taken by these students. Transfer students presented the greatest problem since the transfer data needed to be evaluated by the College of Engineering before any courses or hours could be accepted. The master file, however, contained all courses transfered not just the accepted courses. In order to simplify the input process it was decided to extract only the engineering students and the courses taken at FTU from the master student file. The transfer data that was accepted by the College of Engineering would be punched from the petitions to accept transfer environmental studies hours and core

or option substitutions.

The environmental studies transfers consisted of the hours accepted in each portion of the environmental studies program and an indication whether the student has an A.A. degree. The data from these petitions are punched one per card and the social security number of the student is used as the key for matching students with their transfer data.

Core or option substitution petitions are used to determine if the student has any substituted courses that are accepted by the College of Engineering. The data from these petitions are punched in cards and the information used includes the student's social security number, an indication whether the course is an option or core course, and the name and number of each course substituted.

These transfer inputs are read into the computer and are used along with the student's course data inputs to determine which courses the student has taken or is taking.

## Sequence of Courses

The sequence of courses is important since the program will predict courses and, therefore, prerequisits and corequisits needed to be considered in order to arrange the courses in the proper sequence.

Two tables of courses were developed using the college catalogue as an guide. One table was developed for all courses required by the College of Ebgineering, the other table was developed for each of the option areas

that are offered (see Table 1 and 2).

Output Format

Due to the large number of students attending the College of Engineering it was decided to limit each student's output data to one page.

The student's identification (his social security number, name, and the major code) is printed at the top of each output sheet. The transfer information follows next and is used to determine if the student has any accepted transfer information. In order to clearify the output, the transfer data is listed first by the environmental studies area that the courses belong in. The substitution information is also listed by having the course name and number followed by a 't' to indicate that the course has been fulfilled by substitution another course in its place.

Courses that have been taken by the student are separated into three areas (environmental studies, engineering core and option area). These courses are printed in three separate columns listing all courses taken by the student at FTU. This information is followed by a recommended schedule of courses to be taken by the student for the next three sequential quarters.

The enrollment figures are listed at the end of the listing to assure ease of separation and distribution to the various proper administrative personnel.

## PROGRAM ANALYSIS

The student counselling prediction program is written in Fortran IV compiler language for use on any large-scale computer. The program is designed to run under G and H level Fortran compilers and may also be run using the WATFIV compiler. Running under the WATFIV compiler, complilation time is about two seconds. Using G or H level Fortran, compilation time is increased to twelve seconds. The program is designed to run in 256K core (class M), and depending on the number of inputs and type computer used, will run about three to five minutes.

The program was run under WATFIV using the 200 engineering students that attended the summer quarter, 1972, at Florida Technological University as input data. Compile and execution time for this run was one minute and forty-four seconds at a cost of seventy-two dollars (on the Univeristy of Florida 370/165) and produced 10,000 lines of output.

The program itself consists of six routines, the main program and five (5) subroutines. In order to reduce storage requirements, most of the arrays and flags used in the program are held in common. Disk is used throughout the program to keep the two tables of sequenced courses. This is necessary because during the prediction analysis the tables are destroyed and need to be read back into memory before processing can begin on the next student's

data. The nomenclature used in the program and a listing of the program are presented in Appendix A.

## Main Program

The main program is primarily used to read in student data cards and print most of the processed information. The flowchart showing the logic used in the main program is presented in Figure 1. This routine checks each student's major code to determine if it is valid. If the code is valid, it is converted to alpha and a flag is set indicating the department. If the major code is invalid, the student is ignored and all data cards for that student are flushed. This routine also prints the the courses a student has taken. These courses are separated into three areas-- environmental studies, engineering core, and option area. At the end of the run, the main program prints the projected course enrollment figures for the next three (3) quarters and any unused input transfer information.

## Subroutine "Init"

The "init" subroutine (for flowchart see Figure 2) initializes all arrays with the proper data, echo prints the environmental studies and core transfer input cards, and reads in the sequenced tables of courses. This routine is used only once during the program. This routine sets two flags indicating the number of input cards that have been read. A maximum of 400 cards each are allowed for

environmental studies and core transfers. Additional cards will be ignored by the program. The routine also writes the sequenced tables of courses on disk which will be read in later in the program.

The sequencing of courses, course names, and course numbers are based on the Fall 1972-1973 catalogue which includes the thirty-four hours of option courses and the revised environmental studies program.

The sequence of required courses for each student is based on course prerequisites and corequisites. This information is stored in the form of a core table (for example see Table 1) and gives a sequential listing of courses required by each student. Option curriculum is based upon each department's requirements and is stored in an option table (see Table 2 for Option Tables) which also gives a sequential listing of the courses.

The sequencing of courses may be changed by changing the sequence of cards or by repunching one of the data cards and adding new course names. This allows for program flexibility.

Data in both sets of table input cards are punched in the same fashion (ie. course name, course number, hours). The core course table is set up to take a maximum of eighteen rows of courses and six courses per row. The option course table is set up to take six options and a maximum of eleven courses in each option.

Data for the option courses must be separated into two cards.

Both tables remain with the program deck and are to be considered part of that deck.

## Subroutine "Convt"

The "convt" subroutine (for flowchart see Figure 3) is used to assign the area (environmental studies, engineering core, or option) in which a course belongs and then convert the course name to an alpha prefix. The cards, input from the master student file, are specified by their numeric prefix only, therefore any course name that has an unknown numeric prefix will be ignored by the program and printed with the message "unknown course name."

## Subroutine "Work"

The "work" subroutine is used to determine if a student has any transfer environmental studies hours, has an AA degree, or has substituted courses for engineering core or option courses.

This routine ( see Figure 4 for flowchart) compares the student's social security number with the social security number in the environmental studies cards. A match indicates the student has some transfer hours. The subroutine then checks if the student has an A.A. degree. If a student has an A.A. degree, all courses fulfilled

by the degree are eliminated from the core table. Transfer hours are separated into circulum areas of (communications, humanities, science, social science, etc), and depending on the number of hours in each area, courses are eliminated from the core table.

The core and option substitution inputs are also checked for a match in social security numbers. If a match is found, the courses are added to the student's list of completed courses and in the core or option arrays depending on the value of the course indicator in the input card.

If a match of social security numbers is found in either type of input card the social security number is eliminated. This is done to help determine the unused inputs to be printed later in the program.

Subroutine "Prod"

The "prod" subroutine is used to prepare the two tables (Tables 1 and 2) for the prediction analysis section of the program (see flowchart in Figure 5). This is done by comparing all courses, including transfer hours, a student has taken and passed to the core table. Whenever a match is found, the course is eliminated from the core table. The option table is also checked for matching courses, and if a match is found, the course is eliminated from the option table.

When the pregram exits from this subroutine, all courses the student has transferred, taken, or substituted

have been eliminated from the two tables of courses, leaving a sequential list of courses required to be taken by the student for graduation.

Subroutine "Next"

The "next" subroutine (see Figure 6 for flowchart) is used to produce a recommended list of courses the student needs to take to fulfill degree requirements. The program does this by traversing the core table until the first available course is found. This course is placed into a separate table and is eliminated from the core table. Whenever it is noted that an option course is required, the program will switch to the option table to locate the first available course in the student's major or option area. This course is placed in the prediction table and is eliminated from the option table. The option indicator (the word 'opt' in the core table) is also eliminated from the core table.

The process of course selection is continued until the student has at least fifteen (15) hours or seven (7) courses. At this point, the list of courses is printed and the process of course selection begins again. The program will recommend courses for three (3) sequential quarters. If, during the running of this subroutine, the program notes that all courses have been eliminated from the core table, it will print the courses recommended for that quarter, if any, and note that the student is ready

to graduate by printing the appropiate message on the output listing (see example in Figure 16).

## PROGRAM INPUTS

The input data for the student counselling and prediction program are in two main sections. The first part of the input consists of transfer data. This segment will require updating each quarter as new environmental studies transfers and core or option substitutions are approved. The second part of the input data consists of each student's completed anc current course work.

### Transfer Data

The student transfer data are separated into two catagories, environmental studies course transfers and core or option course substitutions.

Environmental studies transfers are obtained from approved "Petition to Substitute Courses for Standard Requirements in Environmental Studies." The information which is in the College of Engineering Dean's office file, that is required from each petition is the student's social security number, whether or not the student has an A.A. degree, and the number of transfer hours in each of the academic areas of communications, humanities, science, social science, and the advanced environmental studies areas of engineering, business, and education. This information is punched on one card for each student in the format shown in Figure 7. The last card of this data deck is blank and is used as a separator between this data and the data deck for the core or option substitutions.

Engineering core or option course substitutions are also obtained from approved "Petition to Substitute Courses for Stated Requirements in the College of Engineering Program," which are in the College of Engineering Dean's office file. The information required from these petitions include the student's social security number, whether the courses are core or option courses (only one type per card), and the name and number of the course being substituted. The card also contains an indicator showing whether the card is continued. Continuation cards are frequently needed and are identified by having no social security number punched in them (these are the only cards that have no social security number.) This information is punched on computer cards as shown in Figure 8. The last card in this data must have a social security number of "-99-99-99".

All transfer data are listed at the beginning of the program output and unused transfer data cards are listed by social security number at the end of the output. The input cards should be updated for each run and unused data cards need to be eliminated as students graduate.

Student Completed Course Work

The second part of the input consists of a deck of data for all undergraduate students of the College of Engineering who are to be evaluated. This input is the most critical, since it is the basis for the course

enrollment projection, and must be prepared by running a special program which extracts the required College of Engineering student data from the University master student file.

This program, which must be written and executed by the Florida Technological University Information Systems Division, takes all students currently enrolled in the College of Engineering, and first sorts the students by their major. The students are separated according to their major cores, that is,Mechanical Engineering and Aerospace Sciences (code number 902),Civil Engineering and Environmental Sciences ( code number 908), Electrical Engineering and Communications Sciences ( code number 909), Engineering Mechanics and Materials Sciences ( code number 910), Industrial Engineering and Management Systems ( code number 913), Engineering Mathematics and Computer Sciences ( code number 926), and College of Engineering Unknown Major ( code number 990). All other cards are ignored. For each student, the Florida Technological University courses taken and currently enrolled in are sorted into ascending order by course number. This data must be punched onto two or more cards( see Figure 9 for an example), in the following format: the first card contains the student's social security number in columns 2-10, his name in columns 20-60, and his major code in columns 70-73. The second thru last cards contain the student's social

security number in columns 2-10 and the courses taken (in the form course name,course number, and hours passed). Seven courses are punched per card ( refer to Figure 9 for an example). Course cards are punched in this format until all courses are punched, including the current quarter's courses and the hours of these courses. The last card of each student's data is punched with a "1" in column 1. This card is used as a separator between student data cards.

In order for the input data to be complete, the courses for which the student is currently enrolled in must be included in the student course data.

The last data card in the data deck must have a social security number of "-99-99-99".

The program allows a maximum number of eighty (80) courses per student. Eighty is more courses than the student needs to complete for a degree and also leaves room for any courses that the student may not pass. If any student should take more than eighty courses, the remaining courses will be ignored.

## PROGRAM SETUP

The program input data must be entered in the program in the following format: the environmental studies inputs ( followed by a blank card), the core or option inputs ( followed by a card with a social security of "-99-99-99") , a title card ( a card with any eighty alpha characters ), and the student data deck to be evaluated. The inputs must be in the specified sequence, if not the program will terminate with a format error.

Figure 10 shows the sequence of the program and the data cards as they are ready to be read into the computer.

## PROGRAM OUTPUT

The program output is separated into four parts: transfer input listings ( Figure 11 and 12 ), student recommended schedules, projected course enrollments, and a listing of unused transfer data.

The first listing is an echo print of the transfer input data cards. This is to be used as a guide for updating the inputs for the next run.

The second part of the output is a listing for each student in the College of Engineering, by department, indicating the courses taken, transfer hours, substitute courses, and a recommended schedule of courses for the next three quarters (Figures 13,14,15,16,17,18).

The third section of the output is designed for use by the adminstrative presonnel responsible for course scheduling ( Figure 19). This section is designed to assist adminstrative presonnel in determining how many sections of a course to offer and what courses are needed by the students.

The fourth and final section of the output consists of a listing of the unused transfer inputs ( Figure 20 ). This part is to be used as a guide for updating the transfer input data cards.

## FUTURE DEVELOPEMENT

The development of this student scheduling program may be used as a guide for simular type programs that could be written for students in other Colleges of the University. For the development the program would have to be expanded to include the curriculm for all departments in the university. This development would obviously give, as a byproduct, the projected course enrollments for all courses offered by the university.

Another development of this program would be to use it's predicted course enrollment data as input to another program thatwould schedule courses and faculty. This phase would probably be the next step of development.

## CONCLUDING REMARKS

The purpose of this paper was to write a computer program designed to aid in student advisement and course scheduling for the undergraduate students of the College of Engineering at Florida Technological University.

The computer program which was presented in this paper should aid in the problem of student advisement by producing a single output page for each student, listing all courses the student has taken, all transfer data, and a recommended schedule of courses for the student to take for the next three sequential quarters.

The computer program should also aid in course scheduling by producing a list of projected enrollment figures for the next three sequential quarters for the administrative personnel responsible for course scheduling.

This program is designed to be used as an aid and guide to the student, his faculty advisor, and administrative presonnel responsible for course scheduling. It is not expected to be used as the sole basis for desision making, however, it should be a useful and beneficial tool by presenting more accurate information in a concise easy to use format.

# APPENDIX A

# NOMENCLATURE

## I. Main Program

| | | |
|---|---|---|
| 1 | SUB | array of subject names |
| 2 | CNO | array of course numbers |
| 3 | HSP | array of hours passed |
| 4 | SS | array for social security number |
| 5 | CS | array for conversion from numeric subject names to alpha names |
| 6 | ENVR | array for environmental studies course names |
| 7 | ENC | array for environmental studies course numbers |
| 8 | EVHP | array for environmental studies hours passed |
| 9 | CORE | array for core course names |
| 10 | CCN | array for core course numbers |
| 11 | CHP | array for core hours passed |
| 12 | OPT | array for option course names |
| 13 | OPC | array for option course numbers |
| 14 | OHP | array for option hours passed |
| 15 | TABLE | array of sequenced courses |
| 16 | OXT | array of sequenced option courses |
| 17 | TITLE | array for the title card |
| 18 | NAME | array for the student's name |

19 DPT numeric department code

20 DPTX alpha department code

21 IO code for input device

22 MO code for output device

23 IFLG code for option area

24 CTR counter for number of students

25 K counter for number of courses a student has taken

26 OXT array for projected option course figures

27 TABHL array for projected course figures

28 KEY code indicating last student data card

II. Subroutine Init

1 ANUM array for alpha to numeric conversion

2 STAR array of '*' for line separation

3 NSS array of social security numbers for environmental studies substitutes

4 ENUSB array of environmental studies transfers

5 KEND code for number of environmental studies substitute cards

6 MSS array of social security number for core and option substitutes

7 CRSUB array of core and option substitute courses

8 LEND code for number of core and option cards

9 THRS array for total hours required in each environmental studies area

III. Subroutine Convt

| | | |
|---|---|---|
| 1 | BK | code for alpha blank |
| 2 | TRNS | code for alpha 'T' |

IV. Subroutine Work

| | | |
|---|---|---|
| 1 | DIF | array for storing difference between required and transferred hours |
| 2 | HUM | code for humanities hours transferred |
| 3 | COMM | code for communications hours transferred |
| 4 | SCI | code for science hours transferred |
| 5 | SOSCI | code for social science hours transferred |
| 6 | E48X | code for advanced engineering hours transferred |
| 7 | BADM | code for business hours transferred |
| 8 | EDSM | code for education hours transferred |
| 9 | I3 | index for indicating where in NSS social security number matches |
| 10 | I2 | index for indicating if a social security number match was found in NSS |
| 11 | I1 | index for indicating where in ENVSB currently |
| 12 | J1 | index for indicating where in MSS social security number matches |
| 13 | J2 | index for indicating if a social security number match was found |
| 14 | J3 | index for indicating where in CRSUB currently |
| 15 | LM | index for where in OPT currently |
| 16 | KL | index for where in CORE currently |

V. Subroutine Prod

| | | |
|---|---|---|
| 1 | K1 | index used for determination of where in course table a course should be eliminated |
| 2 | IRT | index used for determination of whether a course should be eliminated from the option table |

VI. Subroutine Next

| | | |
|---|---|---|
| 1 | TEXT | array of projected courses |
| 2 | INT | index indicating if entire table is blank |
| 3 | TOT | counter indicating the total projected hours for a student |
| 4 | ICNT | index used to determine which quarter program projecting |

```
      COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
      COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
      COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
         COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),OPC(4
     15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
      COMMON ANUM(10),I2,I3
      DIMENSION TITLE(20)
      INTEGER SS,SSN,CTR,DPT
      DATA BK/'  '/,YEMS/'IEMS'/,EEAS/'MEAS'/,CEES/'CEES'/,EECS/'EECS'/,
     1EMCS/'EMCS'/,EMMS/'EMMS'/,UNKN/'UNKN'/,AST/'*'/,ONE/'1'/,LP/'('/,
     2RP/')'/,XXX/'XXX'/,X48/'479'/,X49/'490'/,ZERO/'0'/,TRNS/'T'/
      IO=5
      MO=6
      CTR=0
      DO 10 I=1,51
   10 READ(IO,1500)(CS(I,J),J=1,2)
 1500 FORMAT(A3,A4)
      CALL INIT
C
C     READ AND WRITE THE TITLE CARD
C
      READ(IO,9000)(TITLE(I),I=1,20)
 9000 FORMAT(20A4)
      WRITE(MO,9010)(TITLE(I),I=1,20)
 9010 FORMAT(1H1,20X,20A4)
C
C    INITALIZE ALL ARRAYS TO ZERO
C
   15 DO 17 I=1,45
      SUB(I)=BK
      CNO(I)=BK
      HSP(I)=BK
      ENVR(I)=BK
      ENC(I)=BK
      EVHP(I)=BK
      CORE(I)=BK
      CCN(I)=BK
      CHP(I)=BK
      OPT(I)=BK
      OPC(I)=BK
   17 OHP(I)=BK
      ICT=0
C
C     READ THE STUDENT CARD
C
   26 READ(IO,1000)(SS(J),J=1,3),(NAME(I),I=1,10),DPT
 1000 FORMAT(1X,3I3,9X,10A4,10X,I4)
C
C     IF THE SOCIAL SECURITY NUMBER EQUALS -99  THEN LAST DATA CARD
C
      IF(SS(1).EQ.-99)GOTO999
      CTR=CTR+1
C
C     READ THE TABLE OF COURSES FROM TAPE
C
      REWIND 9
      DO 400 I=1,18
  400 READ(9,3000)(TABLE(I,J),J=1,18)
 3000 FORMAT(6(A4,A3,A1))
C
```

```
      C     READ THE LIST OF OPTION COURSES FROM TAPE
      C
   42       DO 300 I=1,6
   43     300 READ(9,3100) (OPTS(I,L),L=1,33)
   44    3100 FORMAT(9(A4,A3,A1),/,2(A4,A3,A1))
      C
      C     DETERMAIN WHAT DEPARTMENT THE STUDENT IS IN AND  CONVERT TO ALPHA CODE
      C
      C     MEAS
      C
   45       IF(DPT.EQ.902)GOTO 18
      C
      C     CEES
      C
   46       IF(DPT.EQ.908)GOTO 19
      C
      C     EECS
      C
   47       IF(DPT.EQ.909)GOTO 20
      C
      C     EMMS
      C
   48       IF(DPT.EQ.910)GOTO 21
      C
      C     IEMS
      C
   49       IF(DPT.EQ.913)GOTO 22
      C
      C     EMCS
      C
   50       IF(DPT.EQ.926)GOTO 23
      C
      C     UNKNOWN
      C
   51       IF(DPT.EQ.990)GOTO 24
      C
      C     IGNORE ALL OTHERS AND FLUSH THE COURSE CARDS
      C
   52     27 READ(10,1200) KEY
   53   1200 FORMAT(I1)
   54       IF(KEY.EQ.1)GO TO 26
   55       GO TO 27
   56     18 DPTX=EEAS
   57       IFLG=5
   58       GO TO 69
   59     19 DPTX=CEES
   60       IFLG=1
   61       GO TO 69
   62     20 DPTX=EECS
   63       IFLG=2
   64       GO TO 69
   65     21 DPTX=EMMS
   66       IFLG=3
   67       GO TO 69
   68     22 DPTX=YEMS
   69       IFLG=4
   70       GO TO 69
   71     23 DPTX=EMCS
   72       IFLG=6
   73       GO TO 69
   74     24 DPTX=UNKN
```

```
      IFLG=7
C
C     WRITE THE STUDENT ID CARD ON THE PRINTER
C
   69 WRITE(MO,2000)SS,(NAME(I),I=1,10),DPTX
 2000 FORMAT(1H1,'SS NO.',3I3,10X,10A4,10X,'MAJOR ',A4)
      CALL WORK
      J=K
      K=K+6
C
C     READ STUDENTS COURSE CARDS
C
   25 READ(IO,1100)KEY,SSN,(SUB(I),CNO(I),HSP(I),I=J,K)
 1100 FORMAT(I1,3I3,7(1X,A3,A3,1X,A1,1X))
      ICT=ICT+1
C
C     SEE IF LAST COURSE CARD HAS BEEN READ
C
      IF(KEY.EQ.1)GO TO 40
   29 J=J+7
      K=K+7
      GOTO 25
C
C     IF STUDENT HAS NO COURSE CARDS SET UP SCHEDULE OF COURSES
C
   40 IF(ICT.EQ.1)GO TO 51
      K=K-7
      CALL CONVT
C
C     WRITE EACH OF THE AREAS AND THE COURSES TAKEN IN THOSE AREAS
C
      WRITE(MO,2100)
 2100 FORMAT(/,' ENVIRONMENTAL',T35,'ENGINEERING CORE',T80,'OPTION',/,T4
     1,'STUDIES',T82,'AREA')
      DO 600 I=1,22
      J=I+22
      WRITE(MO,2200)ENVR(I),ENC(I),EVHP(I),CORE(I),CCN(I),CHP(I),CORE(J)
     1,CCN(J),CHP(J),OPT(I),OPC(I),OHP(I)
 2200 FORMAT(1X,A4,A3,1X,A1,T35,A4,A3,1X,A1,3X,A4,A3,1X,A1,T80,A4,A3,1X,
     1A1)
  600 CONTINUE
      CALL PROD
   51 CALL NEXT
      GOTO 15
C
C     WRITE PROJECTED COURSE ENROLLMENT FIGURES BY QUARTERS
C
  999 WRITE(MO,2400)
 2400 FORMAT(1H1,' PROJECTED COURSE ENROLLMENTS')
      DO 5000 ICNT=1,3
      WRITE(MO,2700)ICNT
 2700 FORMAT(1H1,40X,'QUARTER NO.',I2)
      DO 5010 I=1,18
      WRITE(MO,2500)(TABHL(ICNT,I,J),J=1,18)
 2500 FORMAT(5X,6(5X,A4,A3,1X,F5.0))
 5010 CONTINUE
      DO 5020 I=1,6
      WRITE(MO,2600)(OXT(ICNT,I,J),J=1,33)
 2600 FORMAT(//,6(1X,A4,A3,2X,F5.0),/,5(1X,A4,A3,2X,F5.0))
 5020 CONTINUE
 5000 CONTINUE
```

```
      C
      C     WRITE THE COUNTER OF THE NUMBER OF STUDENTS
      C
  115       WRITE(MO,2300)CTR
  116  2300 FORMAT(1H1,'  THERE ARE ',I4,' STUDENTS IN THE COLLEGE OF ENGINEER
           1ING')
      C
      C     WRITE THE UNUSED ENVIRONMENTAL STUDIES TRANSFER CARDS
      C
  117       WRITE(MO,9020)
  118  9020 FORMAT(T40,'UNUSED ENVIRONMENTAL STUDIES INPUTS')
  119       DO 100 I=1,KEND
  120       IF(NSS(I,1).EQ.0)GO TO 100
  121       WRITE(MO,9030)(NSS(I,J),J=1,3)
  122  9030 FORMAT(1X,3I3)
  123   100 CONTINUE
      C
      C     WRITE THE UNUSED OPTION SUBSTITUTE COURSE CARDS
      C
  124       WRITE(MO,9040)
  125  9040 FORMAT(1H1,T40,'UNUSED CORE INPUTS')
  126       DO 200 I=1,LEND
  127       IF(MSS(I,1).EQ.0)GO TO 200
  128       WRITE(MO,9050)(MSS(I,J),J=1,3)
  129  9050 FORMAT(1X,3I3)
  130   200 CONTINUE
  131       GO TO 988
  132   988 CALL EXIT
  133       END
**WARNING**  END STATEMENT NOT PRECEDED BY A TRANSFER
```

```
134           SUBROUTINE INIT
135           COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
136           COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
137           COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
138              COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),OPC(4
             15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
139           COMMON ANUM(10),I2,I3
140           INTEGER SS
141           DATA BK/'  '/,ONE/'1'/,ZERO/'0'/,AST/'*'/
      C
      C       THIS ROUTINE INITALIZES ALL ARRAYS WITH THE PROPER DATA AND SETS
      C       AND SETS ALL NECESSARY FLAGS  FOR FUTURE USE
      C
      C
      C       SET UP AN ARRAY WITH *'S
      C
142           DO 5 I=1,119
143         5 STAR(I)=AST
      C
      C       READ IN THE NUMBERS 1-10 FOR ALPHA TO NUMERIC CONVERSION
      C
144           READ(IO,6000)(ANUM(I),I=1,10)
145      6000 FORMAT(10A1)
      C
      C       READ IN THE HOURS NEEDED FOR EACH SECTION OF ENVIRONMENTAL STUDIES
      C
146           READ(IO,1100)(THRS(I),I=1,8)
147      1100 FORMAT(8F5.0)
      C
      C       READ IN THE SEQUENCED LIST OF COURSES
      C
148           DO 100 I=1,18
149       100 READ(IO,1300) (TABLE(I,J),J=1,18)
150      1300 FORMAT(6(A4,A3,A1))
      C
      C       READ IN THE SEQUENCED LIST OF OPTION COURSES
      C
151           DO 125 I=1,6
152       125 READ(IO,1400) (OPTS(I,J),J=1,33)
153      1400 FORMAT(9(A4,A3,A1),/,2(A4,A3,A1))
      C
      C       READ IN THE ENVIRONMENTAL SUBSTITUTE CARDS
      C
154           DO 20 I=1,400
155           READ(IO,1000) (NSS(I,J),J=1,3),(ENVSB(I,L),L=1,8)
156      1000 FORMAT(3I3,A1,7F5.1)
      C
      C       A BLANK CARD INDICATES THE LAST CARD
      C
157           IF(NSS(I,1).NE.0.0)GO TO 20
      C
      C       SET A COUNTER  WITH THE NUMBER OF CARDS READ
      C
158           KEND=I-1
159           GO TO 24
160        20 CONTINUE
161        24 WRITE(MO,2200)
162      2200 FORMAT(1H1)
163           WRITE(MO,2300)
164      2300 FORMAT(15X,'ENVIRONMENTAL STUDIES SUBSTITUTE')
165           DO 30 I=1,KEND
```

```
166       30 WRITE(MO,2000)(NSS(I,J),J=1,3),(ENVSB(I,L),L=1,8)
167     2000 FORMAT(5X,3I3,2X,A1,2X,7F5.1)
          C
          C      READ THE CORE AND OPTION SUBSTITUTE CARDS
          C
168       25 DO 40 I=1,400
169          READ(IO,1200)(MSS(I,J),J=1,3),(CRSUB(I,L),L=1,16)
170     1200 FORMAT(3I3,A1,6(A4,A3,3X),A4,A3,2X,A1)
171          IF(I.EQ.1)GO TO 40
172          IF(MSS(I,1).EQ.0.AND.CRSUB(I-1,16).NE.ONE)GO TO 50
          C
          C      A -99 INDICATES THE LAST CARD
          C
173          IF(MSS(I,2).EQ.-99)GO TO 50
174       40 CONTINUE
          C
          C      SET A COUNTER WITH THE NUMBER OF CARDS READ
          C
175       50 LEND=I-1
176          WRITE(MO,2200)
177          WRITE(MO,2400)
178     2400 FORMAT(15X,'CORE COURSE SUBSTITUTIONS')
179          DO 60 I=1,LEND
180       60 WRITE(MO,2100)(MSS(I,J),J=1,3),(CRSUB(I,L),L=1,16)
181     2100 FORMAT(5X,3I3,A2,6(A4,A3,3X),A4,A3,2X,A1)
          C
          C      WRITE THE LISTS OF COURSES ON TAPE FOR READING LATER
          C
182          DO 300 I=1,18
183      300 WRITE(9,1300)(TABLE(I,J),J=1,18)
184          DO 400 I=1,6
185      400 WRITE(9,1400)(OPTS(I,J),J=1,33)
186          REWIND 9
          C
          C      SET UP TABLES FOR THE PROJECTED ENROLLMENT FIGURES
          C
187          DO 600 ICNT=1,3
188          DO 620 I=1,18
189          DO 630 J=1,16,3
190      630 TABHL(ICNT,I,J)=TABLE(I,J)
191          DO 640 J=2,17,3
192      640 TABHL(ICNT,I,J)=TABLE(I,J)
193          DO 650 J=3,18,3
194      650 TABHL(ICNT,I,J)=0
195      620 CONTINUE
196      600 CONTINUE
197          DO 500 ICNT=1,3
198          DO 510 I=1,6
199          DO 520 J=1,31,3
200      520 OXT(ICNT,I,J)=OPTS(I,J)
201          DO 530 J=2,32,3
202      530 OXT(ICNT,I,J)=OPTS(I,J)
203          DO 540 J=3,33,3
204      540 OXT(ICNT,I,J)=0
205      510 CONTINUE
206      500 CONTINUE
207          RETURN
208          END
```

```
209          SUBROUTINE CONVT
210          COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
211          COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
212          COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
213             COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),OPC(4
            15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
214          COMMON ANUM(10),I2,I3
215          INTEGER SS
216          DATA BK/'  '/,ONE/'1'/,ZERO/'0'/,TRNS/'T'/
217          DATA A141/'141'/,A421/'421'/,A131/'131'/,A200/'200'/,A511/'511'/,
            1A560/'560'/,A501/'501'/,A521/'521'/,A531/'531'/,A541/'541'/,A551/'
            3551'/,A310/'310'/,A211/'211'/,A321/'321'/,A323/'323'/,A322/'322'/,
            4A324/'324'/,A331/'331'/,A344/'344'/,A345/'354'/,A133/'133'/
218          DATA A480/'480'/,A481/'481'/,A482/'482'/,A483/'483'/,A484/'484'/,A
            2485/'485'/,A486/'486'/,A487/'487'/,A488/'488'/,A489/'489'/,A102/'1
            302'/
      C      PULL THE NEXT TWO CARDS AFTER ALL STUDENTS ARE IN THE NEW MATH SERIES
219          DATA A222/'222'/,A223/'223'/,A221/'221'/
      C
      C      THIS ROUTINE DETERMAINS WHICH AREA THE COURSE BELONGS IN AND
      C      ASSIGNS THE COURSE TO THAT AREA AND CONVERTS THE COURSE NAME FROM
      C      NUMERIC TO ALPHA
      C
220          I1=1
221          DO 30 I=1,K
222          IF(SUB(I).EQ.BK)GO TO 40
223       30 CONTINUE
224       40 K=I
225          DO 900 I=1,K
226          IF(HSP(I).EQ.TRNS)GO TO 900
      C
      C      WHICH AREA DOES THE COURSE BELONG IN
      C
227          IF(SUB(I).EQ.BK)GO TO 900
      C      PULL THE NEXT 6   CARDS AFTER ALL STUDENTS ARE IN THE NEW MATH SERIES
228          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A211)GO TO 120
229          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A221)GO TO 120
230          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A222)GO TO 120
231          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A223)GO TO 120
232          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A321)GO TO 120
233          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A331)GO TO 120
234          IF(SUB(I).EQ.A501)GOTO 100
235          IF(SUB(I).EQ.A421.AND.CNO(I).EQ.A310)GO TO 300
236          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A211)GO TO 120
237          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A321)GO TO 120
238          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A322)GO TO 120
239          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A323)GO TO 120
240          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A324)GO TO 120
241          IF(SUB(I).EQ.A131.AND.CNO(I).EQ.A331)GO TO 120
242          IF(SUB(I).EQ.A511)GO TO 200
243          IF(SUB(I).EQ.A521)GO TO 200
244          IF(SUB(I).EQ.A531)GO TO 200
245          IF(SUB(I).EQ.A541)GO TO 200
246          IF(SUB(I).EQ.A551)GO TO 200
247          IF(SUB(I).EQ.A560)GO TO 200
248          IF(SUB(I).EQ.A141.AND.CNO(I).EQ.A344)GO TO 120
249          IF(SUB(I).EQ.A141.AND.CNO(I).EQ.A345)GO TO 120
250          IF(SUB(I).EQ.A133.AND.CNO(I).EQ.A102)GO TO 120
      C
      C      ENVIRONMENTAL STUDIES COURSE
      C
```

```
      300 DO 350 L=1,51
          IF(SUB(I).NE.CS(L,1))GO TO 350
          SUB(I)=CS(L,2)
          ENVR(I1)=SUB(I)
          ENC(I1)=CNO(I)
          EVHP(I1)=HSP(I)
          I1=I1+1
          GO TO 900
      350 CONTINUE
       50 WRITE(MO,1000) SUB(I)
     1000 FORMAT('  UNKNOWN COURSE NAME',2X,A3)
          GO TO 900
C
C     IF THE COURSE IS AN ENGINEERING ENVIRONMANTAL COURSE PLACE IN
C     ENVIRONMENTAL STUDIES
C
      100 IF(CNO(I).EQ.A481)GO TO 300
          IF(CNO(I).EQ.A482)GO TO 300
          IF(CNO(I).EQ.A483)GO TO 300
          IF(CNO(I).EQ.A484)GO TO 300
          IF(CNO(I).EQ.A485)GO TO 300
          IF(CNO(I).EQ.A486)GO TO 300
          IF(CNO(I).EQ.A487)GO TO 300
          IF(CNO(I).EQ.A488)GO TO 300
          IF(CNO(I).EQ.A489)GO TO 300
          GO TO 120
      120 DO 150 L=1,51
          IF(SUB(I).NE.CS(L,1))GO TO 150
C
C     ENGINEERING CORE COURSE
C
          SUB(I)=CS(L,2)
          CORE(I2)=SUB(I)
          CCN(I2)=CNO(I)
          CHP(I2)=HSP(I)
          I2=I2+1
          GO TO 900
      150 CONTINUE
          GO TO 50
      200 DO 250 L=1,51
          IF(SUB(I).NE.CS(L,1))GO TO 250
C
C     OPTION AREA COURSE
C
          SUB(I)=CS(L,2)
          OPT(I3)=SUB(I)
          OPC(I3)=CNO(I)
          OHP(I3)=HSP(I)
          I3=I3+1
          GO TO 900
      250 CONTINUE
          GO TO 50
      900 CONTINUE
          RETURN
          END
```

```
296           SUBROUTINE WORK
297           COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
298           COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
299           COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
300              COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),OPC(4
             15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
301           COMMON ANUM(10),I2,I3
302           INTEGER SS
303           DATA BK/'  '/,ONE/'1'/,ZERO/'0'/,TRNS/'T'/
304           DIMENSION DIF(7)
      C
      C       THIS ROUTINE TAKES ANY TRANSFER HOURS AND ASSIGNS THEM INTO
      C       THE PROPER AREA AND MAKES ALL NECESSARY CHANGES REQUIRED
      C
      C
      C       INITALIZE ALL FLAGS AND COUNTERS
      C
305           K=1
306           KL=1
307           LM=1
308           HUM=0.0
309           COMM=0.0
310           SCI=0.0
311           SOSCI=0.0
312           E48X=0.0
313           BADM=0.0
314           EDSM=0.0
315           I1=1
316           J1=1
317           II=0
318        20 I3=I1
319           DO 50 I=I3,KEND
320           I2=0
      C
      C       MATCH SOCIAL SECURITY NUMBERS FOR ENVIRONMENTAL STUDIES COURSES
      C
321           IF(SS(1).NE.NSS(I,1))GO TO 50
322           IF(SS(2).NE.NSS(I,2))GO TO 50
323           IF(SS(3).NE.NSS(I,3))GO TO 50
324           II=1
325           I2=1
326           I1=I
327           GO TO 60
328        50 CONTINUE
329        60 IF(I2.EQ.0)GO TO 110
      C
      C       THE STUDENT HAS AN A.A DEGREE
      C
330           IF(ENVSB(I1,1).EQ.ONE)GO TO 400
      C
      C       ELIMINATE THE PROPER NUMBER OF HOURS FROM THE COURSE TABLE
      C       FOR EACH COURSE THAT IS TRANSFERED IN
      C
331           COMM=ENVSB(I1,2)+COMM
332           IF(COMM.GE.3)TABLE(4,1)=BK
333           IF(COMM.GE.6)TABLE(4,4)=BK
334           IF(COMM.GE.9)TABLE(4,7)=BK
335           HUM=HUM+ENVSB(I1,3)
336           IF(HUM.GE.4)TABLE(13,1)=BK
337           IF(HUM.GE.8)TABLE(13,4)=BK
338           SCI=SCI+ENVSB(I1,4)
```

```
339           IF(SCI.GE.3)TABLE(5,7)=BK
340           SOSCI=SOSCI+ENVSB(I1,5)
341           IF(SOSCI.GE.3)TABLE(5,1)=BK
342           IF(SOSCI.GE.6)TABLE(5,4)=BK
343           IF(SOSCI.GE.9)TABLE(5,13)=BK
344           IF(SOSCI.GE.12)TABLE(14,1)=BK
345           E48X=E48X+ENVSB(I1,6)
346           IF(E48X.GE.3)TABLE(17,1)=BK
347           BADM=BADM+ENVSB(I1,7)
348           IF(BADM.GE.3)TABLE(17,4)=BK
349           EDSM=EDSM+ENVSB(I1,8)
350           IF(EDSM.GE.3)TABLE(15,7)=BK
      C
      C       DETERMAIN THE DIFFERENCE BETWEEN REQUIRED HOURS AND TRANSFERED
      C       HOURS TO DETERMAIN THE NUMBER OF HOURS REMAINING TO BE TAKEN
      C
351        65 DIF(1)=THRS(1)-COMM
352           DIF(2)=THRS(2)-HUM
353           DIF(3)=THRS(3)-SCI
354           DIF(4)=THRS(4)-SOSCI
355           DIF(5)=THRS(5)-E48X
356           DIF(6)=THRS(6)-BADM
357           DIF(7)=THRS(7)-EDSM
358        90 NSS(I1,1)=0
359           I1=I1+1
360           I2=0
361           GO TO 20
362       110 J3=J1
363           IF(II.EQ.0)GO TO 111
      C
      C       WRITE THE HOURS TRANSFERED AND THE HOURS REMAINING
      C
364           WRITE(MO,9000)
365     9000  FORMAT(T40,'TRANSFERED ENVIRONMENTAL STUDIES HOURS',/,T24,'COMM',T
              134,'HUM',T41,'SCIENCE',T52,'SOC SCI',T64,'ENGR',T74,'BADM',T84,'ED
              2XX')
366           WRITE(MO,9010)(THRS(I),I=1,7)
367     9010  FORMAT(1X,'REQUIRED HRS',8X,F5.1,6(5X,F5.1))
368           WRITE(MO,9020)COMM,HUM,SCI,SOSCI,E48X,BADM,EDSM
369     9020  FORMAT(1X,'TRANSFERED HRS',6X,F5.1,6(5X,F5.1))
370           WRITE(MO,9030)(DIF(I),I=1,7)
371     9030  FORMAT(1X,'REMAINING HRS',7X,F5.1,6(5X,F5.1))
372           II=0
373      111  DO 100 J=J3,LEND
374           J2=0
      C
      C       MATCH SOCIAL SECURITY NUMBERS FOR CORE AND OPTION COURSES
      C
375           IF(SS(1).NE.MSS(J,1))GO TO 100
376           IF(SS(2).NE.MSS(J,2))GO TO 100
377           IF(SS(3).NE.MSS(J,3))GO TO 100
378           J2=1
379           J1=J
380           GO TO 200
381       100 CONTINUE
382       200 IF(J2.EQ.0)GO TO 500
383       280 DO 300 I=2,14,2
      C
      C       SEE IF THE COURSE IS A CORE COURSE OR AN OPTION COURSE
      C
384           IF(CRSUB(J1,1).EQ.ONE)GO TO 600
```

```
385           IF(CRSUB(J1,I).EQ.BK)GO TO 305
      C
      C       CORE COURSE  ADD THE COURSE IN TO THE LIST OF COURSES TAKEN
      C
386           CORE(KL)=CRSUB(J1,I)
387           CCN(KL)=CRSUB(J1,I+1)
388           CHP(KL)=TRNS
389           SUB(K)=CORE(KL)
390           CNO(K)=CCN(KL)
391           HSP(K)=CHP(KL)
392           K=K+1
393           KL=KL+1
394           IF(KL.EQ.46)GO TO 500
395       300 CONTINUE
396       305 IF(CRSUB(J1,16).EQ.ONE)GO TO 310
397           GO TO 325
398       310 MSS(J1,1)=0
399           J1=J1+1
400           GO TO 280
401       325 MSS(J1,1)=0
402           J1=J1+1
403           J2=0
404           GO TO 110
405       600 DO 700 I=2,14,2
      C
      C       OPTION COURSE  ADD INTO THE COURSES TAKEN IN THE OPTION AREA
      C
406           OPT(LM)=CRSUB(J1,I)
407           OPC(LM)=CRSUB(J1,I+1)
408           OHP(LM)=TRNS
409           SUB(K)=OPT(LM)
410           CNO(K)=OPC(LM)
411           HSP(K)=OHP(LM)
412           K=K+1
413           LM=LM+1
414           IF(LM.EQ.46)GO TO 500
415       700 CONTINUE
416           J1=J1+1
417           GO TO 110
      C
      C       MAKE ALL CHANGES NECESSARY FOR THE A.A. DEGREE AND NOTE THAT
      C       THE STUDENT HAS AN A.A. DEGREE
      C
418       400 DO 410 I=1,4,3
419       410 TABLE(4,I)=BK
420           DO 420 I=1,16,3
421       420 TABLE(5,I)=BK
422           DO 430 I=1,7,3
423       430 TABLE(14,I)=BK
424           TABLE(12,1)=BK
425           WRITE(MO,9040)
426      9040 FORMAT(10X,'THIS STUDENT HAS AN A.A. DEGREE WHICH SATISFIES THE BA
             1SIC ENVIRONMENTAL STUDIES REQUIREMENTS')
427           II=0
428           GO TO 110
429       500 I2=KL
430           I3=LM
431           RETURN
432           END
```

```
433           SUBROUTINE PROD
434           COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
435           COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
436           COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
437              COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),OPC(4
             15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
438           COMMON ANUM(10),I2,I3
439           INTEGER SS
440           DATA ENGR/'ENGR'/,PHYS/'PHYS'/,PSY/'PSY '/,HIST/'HIST'/,GER/'GER'/
441           DATA SOC/'SOC '/,FRE/'FRE '/,PCL/'PCL '/,SPA/'SPA '/,MATH/'MATH'/,
             1COMP/'COMP'/,ENG/'ENG '/,SPE/'SPE '/,BADM/'BADM'/,HUM/'HUM '/,ECON
             2/'ECON'/,A49/'490'/,A3/'3'/
442           DATA GEOG/'GEOG'/,GEOL/'GEOL'/,BIOL/'BIOL'/,BOT/'BOT'/,ZOOL/'ZOOL'
             1/,EDEL/'EDEL'/,EDTA/'EDTA'/,MICR/'MICR'/
443           DATA BK/'  '/,XXX/'XXX'/,ZERO/'0'/,TOP/'OPT'/
444           DATA A222/'222'/,A223/'223'/,A221/'221'/,A211/'211'/,A331/'331'/
445           DATA A321/'321'/,ARIT/'MATH'/
      C
      C       THIS ROUTINE PREPARES ALL TABLES FOR PREDICTION ANALYSIS
      C
      C
      C       INITIALIZE ALL COUNTERS
      C
446           K1=1
447           L1=1
      C
      C       FIND THE COURSE IN THE TABLE
      C
448           DO925 L=1,K
449           DO 30 I=1,18
450           DO 40 J=1,16,3
451           IF(HSP(L).EQ.ZERO)GO TO 925
452           IF(SUB(L).EQ.TABLE(I,J))GO TO 55
453           IF(SUB(L).EQ.PSY.OR.SUB(L).EQ.SOC.OR.SUB(L).EQ.PCL)GO TO 25
454           IF(SUB(L).EQ.SPA)GO TO 25
455           IF(SUB(L).EQ.GER.OR.SUB(L).EQ.FRE)GO TO 25
456           IF(SUB(L).EQ.GEOG)TABLE(5,7)=BK
457           IF(SUB(L).EQ.GEOL)TABLE(5,7)=BK
458           IF(SUB(L).EQ.BIOL)TABLE(5,7)=BK
459           IF(SUB(L).EQ.ZOOL)TABLE(5,7)=BK
460           IF(SUB(L).EQ.MICR)TABLE(5,7)=BK
461           IF(SUB(L).EQ.BOT)TABLE(5,7)=BK
462           IF(SUB(L).EQ.EDEL)TABLE(15,7)=BK
463           IF(SUB(L).EQ.EDTA)TABLE(15,7)=BK
464           GO TO 40
      C
      C       SET THE PROPER ELEMENTS TO BLANKS
      C
      C
465        25 K1=K1+3
466           IF(K1.GE.16)GO TO 26
467           TABLE(5,K1)=BK
468           IF(K1.EQ.4)K1=10
469           GO TO 925
470        26 TABLE(14,1)=BK
471           GO TO 925
472        55 IF(CNO(L).EQ.TABLE(I,J+1))GO TO 35
473           IF(TABLE(I,J+1).EQ.XXX.AND.HSP(L).EQ.TABLE(I,J+2))GO TO 35
474           IF(CNO(L).EQ.A211.AND.SUB(L).EQ.ARIT)TABLE(1,1)=BK
475           IF(CNO(L).EQ.A221.AND.SUB(L).EQ.ARIT)TABLE(1,4)=BK
476           IF(CNO(L).EQ.A222.AND.SUB(L).EQ.ARIT)TABLE(1,7)=BK
```

```
477          IF(CNO(L).EQ.A223.AND.SUB(L).EQ.ARIT)TABLE(1,10)=BK
478          IF(CNO(L).EQ.A321.AND.SUB(L).EQ.ARIT)TABLE(1,13)=BK
479          IF(CNO(L).EQ.A331.AND.SUB(L).EQ.ARIT)TABLE(1,16)=BK
480          GO TO 40
481       35 IF(TABLE(I ,J).EQ.TOP)GO TO 40
482          TABLE(I,J)=BK
483          GO TO 925
484       40 CONTINUE
485       30 CONTINUE
486          IF(SUB(L).EQ.ENGR.AND.HSP(L).EQ.A3)TABLE(15,1)=BK
487          IF(SUB(L).EQ.BADM.AND.HSP(L).EQ.A3)TABLE(15,4)=BK
488      925 CONTINUE
         C
         C     GO THROUGH ALL THE COURSES FOR ANY OPTION COURSES
         C
489      100 DO 500 L=1,K
490          IF(HSP(L).EQ.ZERO)GO TO 500
491          I=IFLG
492          IF(I.EQ.7)GO TO 600
493          IRT=0
494          DO 140 J=1,31,3
495          IF(SUB(L).EQ.OPTS(I,J))GO TO 130
496          GO TO 140
497      130 IRT=2
498          IF(CNO(L).EQ.OPTS(I,J+1))GO TO 135
499          GO TO 140
         C
         C     ELIMINATE THE COURSE FROM THE OPTION TABLE
         C
500      135 OPTS(I,J)=BK
501          IRT=1
502      140 CONTINUE
503          IF(IRT.EQ.0)GO TO 500
504          IF(IRT.EQ.1)GO TO 250
505          DO 160 J=1,31,3
506          IF(OPTS(I,J+1).EQ.XXX.AND.HSP(L).EQ.OPTS(I,J+2))GO TO 155
507          GO TO 160
508      155 OPTS(I,J)=BK
509          IRT=1
510      160 CONTINUE
511          IF(IRT.EQ.1)GO TO 250
512          GO TO 500
         C
         C     SET THE OPTION COURSE IN THE TABLE TO BLANK
         C
513      250 DO 260 M=11,18
514          DO 260 N=1,16,3
515          IF(TABLE(M,N).EQ.TOP)GO TO 270
516          GO TO 260
517      270 TABLE(M,N)=BK
518          GO TO 500
519      260 CONTINUE
520      500 CONTINUE
521      600 RETURN
522          END
```

```
523           SUBROUTINE NEXT
524           COMMON SUB(80),CNO(80),HSP(80),SS(3),SSN(3),NSS(400,3),MSS(400,3)
525           COMMON TABLE(18,18),THRS(8),ENVSB(400,8),CRSUB(400,16),OPTS(6,33)
526           COMMON IO,MO,STAR(119),IFLG,K,KEND,LEND
527              COMMON CS(51,2),ENVR(45),EVHP(45),ENC(45),OPT(45),OHP(45),CPC(4
             15),CCN(45),CORE(45),CHP(45),NAME(10),TABHL(3,18,18),OXT(3,6,33)
528           COMMON ANUM(10),I2,I3
529           INTEGER SS
530           INTEGER TOT
531           DIMENSION TEXT(21)
532           DATA OUT/'OPT'/,BK/'  '/,AST/'*'/
      C
      C       THIS ROUTINE PROJECTS COURSES FOR THE NEXT THREE QUARTERS
      C
533           WRITE(MO,2600)
534       2600 FORMAT(15X,'RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS')
      C
      C       INITALIZE ALL NECESSARY ARRAYS
      C
535           ICNT=1
536          25 WRITE(MO,2000) (STAR(I),I=1,119)
537       2000 FORMAT(//,1X,119A1)
538           L=1
539           TOT=0
540           DO 50 I=1,21
541          50 TEXT(I)=BK
542           INT=3
      C
      C       GO THROUGT THE LIST OF COURSES TO FIND THE FIRST AVAILABLE COURSE
      C
543          52 DO 175 I=1,18
544           DO 170 J=1,16,3
545           IF(TABLE(I,J).EQ.BK)GO TO 160
      C
      C       SHOULD THE COURSE COME FROM THE OPTION TABLE
      C
546           IF(TABLE(I,J).EQ.OUT)GOTO 100
547           IF(L.GE.21)GO TO 200
      C
      C       PLACE THE COURSE IN THE TABLE FOR PREDICTION COURSES
      C
548          60 TEXT(L)=TABLE(I,J)
549           TEXT(L+1)=TABLE(I,J+1)
550           TEXT(L+2)=TABLE(I,J+2)
      C
      C       ELIMINATE THE COURSE FROM THE LIST OF AVAILABLE COURSES
      C
551           TABLE(I,J)=BK
552           TABHL(ICNT,I,J+2)=TABHL(ICNT,I,J+2)+1
553           INT=0
      C
      C       TOTAL THE HOURS AFTER CONVERTING TO NUMERIC
      C
554          55 DO 15 JK=1,10
555           IF(TEXT(L+2).EQ.ANUM(JK))TOT=TOT+JK
556          15 CONTINUE
557           L=L+3
      C
      C       IS THE TOTAL HOURS GREATER THAN 15
      C
558           IF(TOT.GE.15)GO TO 200
```

```
559           GO TO 175
560       160 INT=INT+1
561           IF(INT.GE.108)GO TO 200
562           GO TO 170
563       100 DO 150 M=1,31,3
564           IF(IFLG.EQ.7)GO TO 60
565           IF(OPTS(IFLG,M).EQ.BK)GO TO 150
566           TEXT(L)=OPTS(IFLG,M)
567           TEXT(L+1)=OPTS(IFLG,M+1)
568           TEXT(L+2)=OPTS(IFLG,M+2)
569           OXT(ICNT,IFLG,M+2)=OXT(ICNT,IFLG,M+2)+1
      C
      C       ELIMINATE THE COURSE FROM THE LIST OF AVAILABLE COURSES
      C
570           TABLE(I,J)=BK
571           OPTS(IFLG,M)=BK
572           INT=0
573           GO TO 55
574       150 CONTINUE
575           GO TO 60
576       170 CONTINUE
577       175 CONTINUE
578           IF(TOT.LE.15)GO TO 52
      C
      C       IS THE STUDENT READY TO GRADUATE
      C
579       200 IF(TEXT(1).EQ.BK)GO TO 300
      C
      C       PRINT THE PREJECTED COURSES FOR THE NEXT QUARTER
      C
580           WRITE(MO,2100)(TEXT(I),I=1,21),TOT
581      2100 FORMAT(1X,7(A4,A3,1X,A1,2X),13X,'TOTAL HOURS=',I4)
582           ICNT=ICNT+1
      C
      C       HAVE WE PROJECTED THREE QUARTERS
      C
583           IF(ICNT.GE.4)RETURN
584           GO TO 25
      C
      C       PRINT THAT THE STUDENT IS READY TO GRADUATE
      C
585       300 WRITE(MO,2200)
586      2200 FORMAT(///,1X,'R E A D Y  T O  G R A D U A T E')
587           RETURN
588           END
```

SYSTEM FLOWCHART

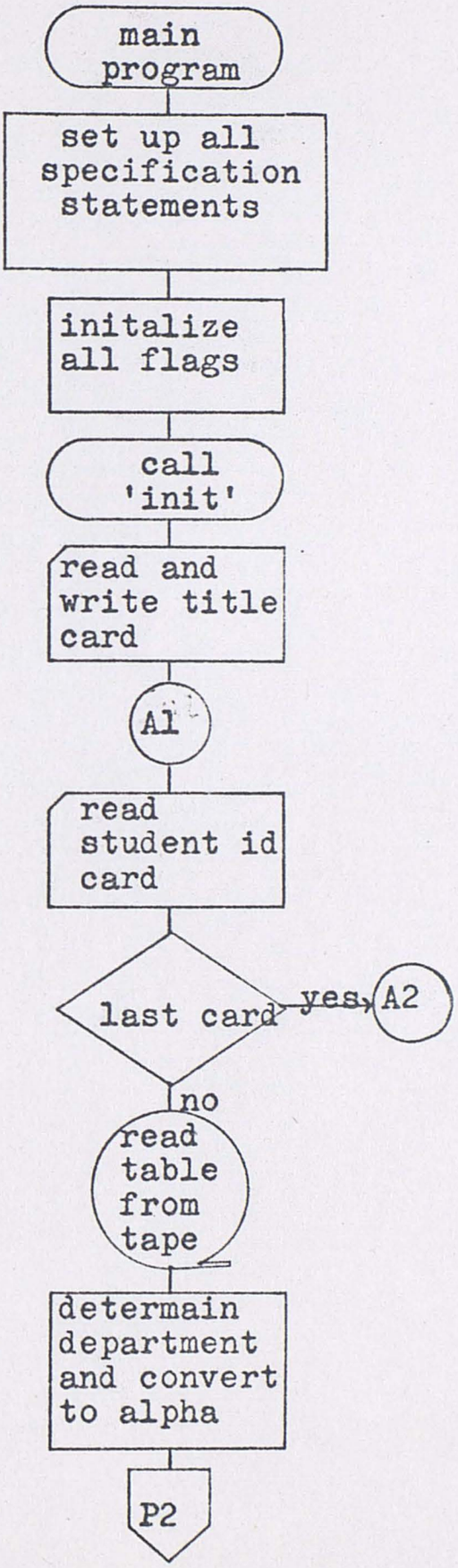



Figure 1. Flowchart of Main Program

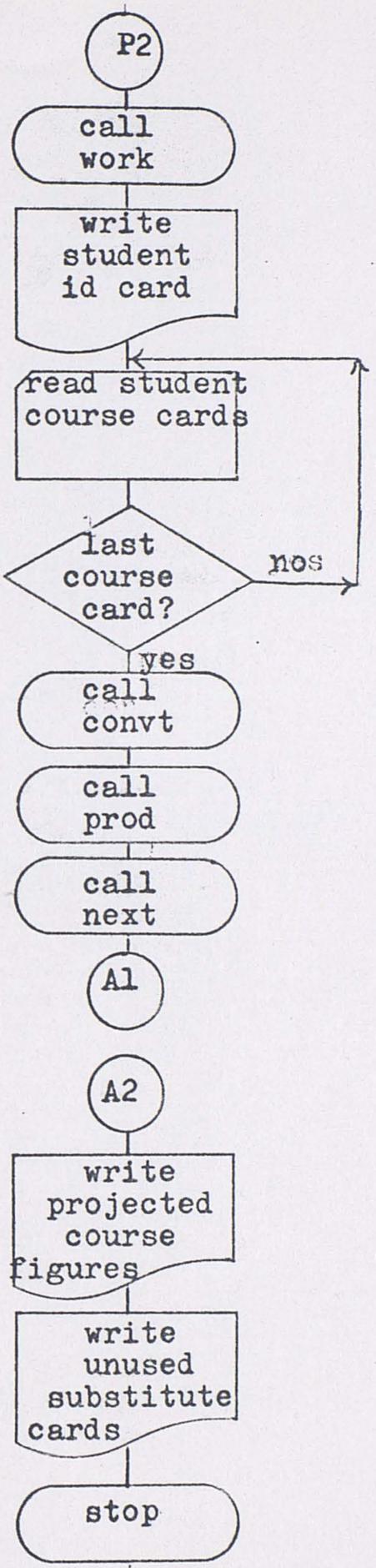



Figure 1. Continued

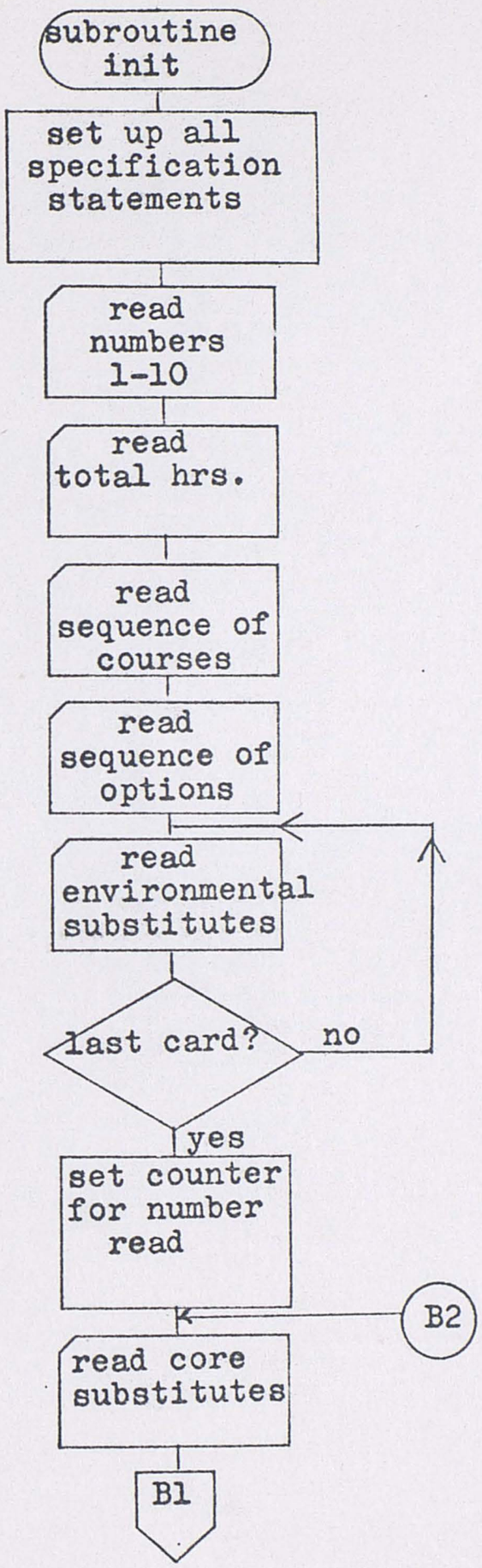



Figure 2. Flowchart of Subroutine "Init"

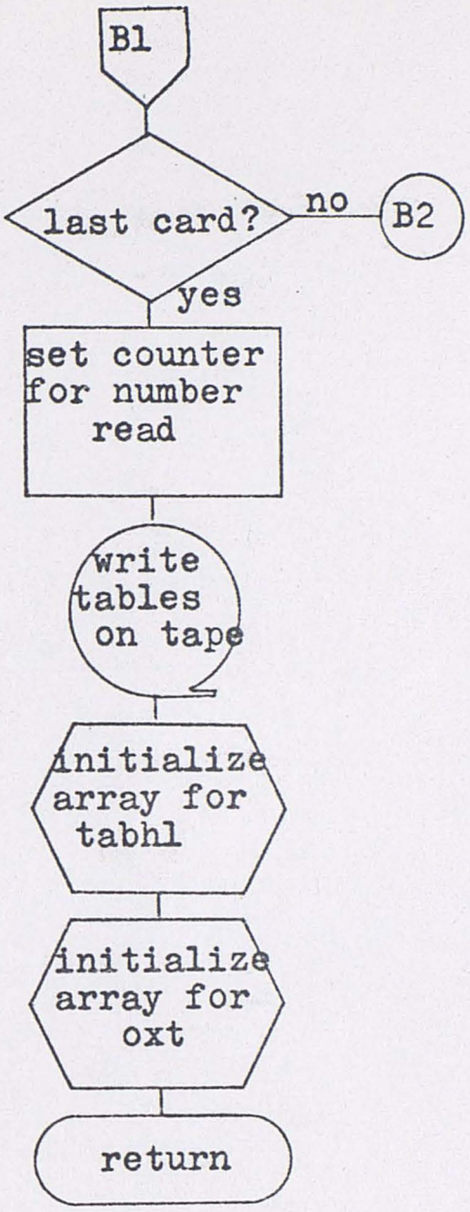



Figure 2. Continued

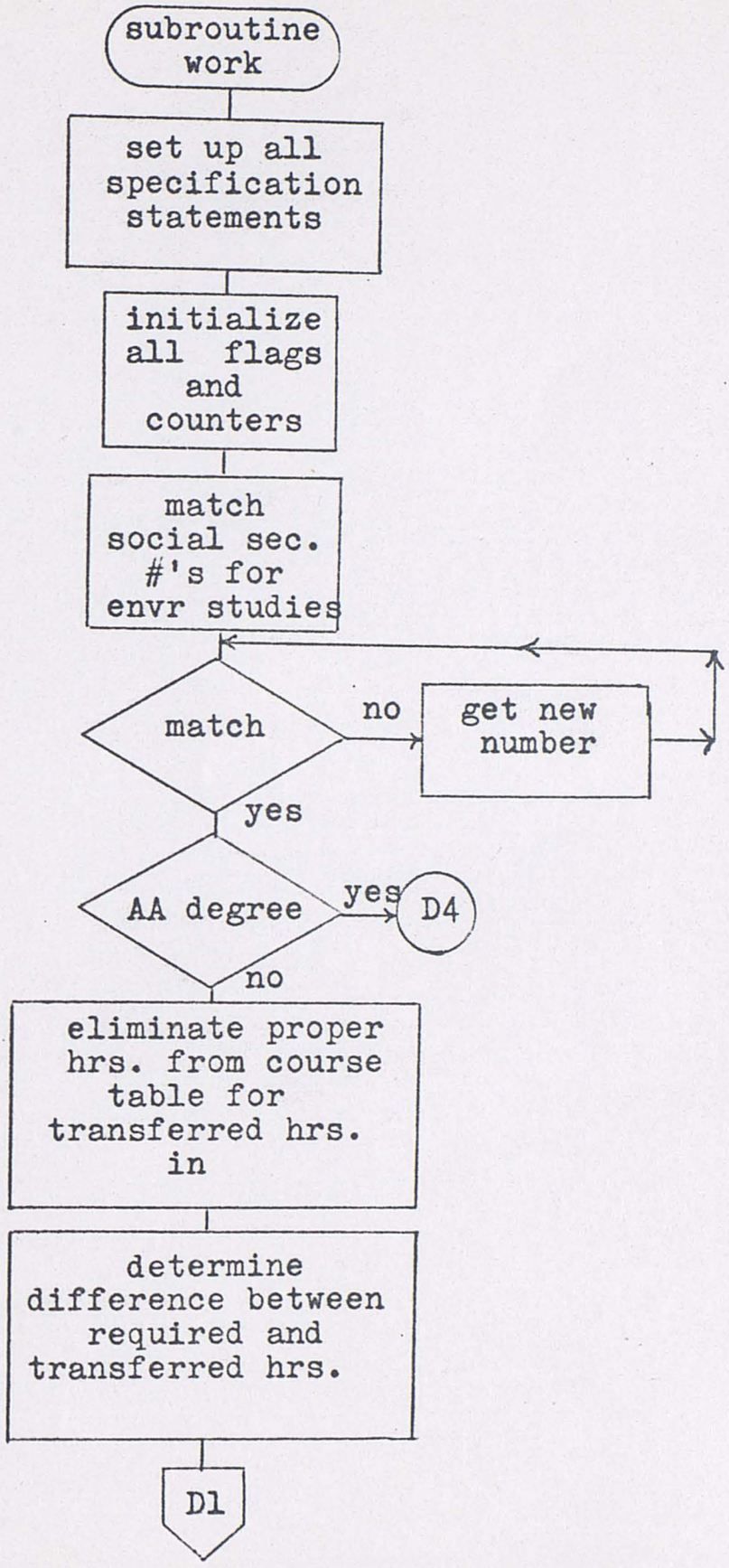



Figure 3. Flowchart of Subroutine "Work"

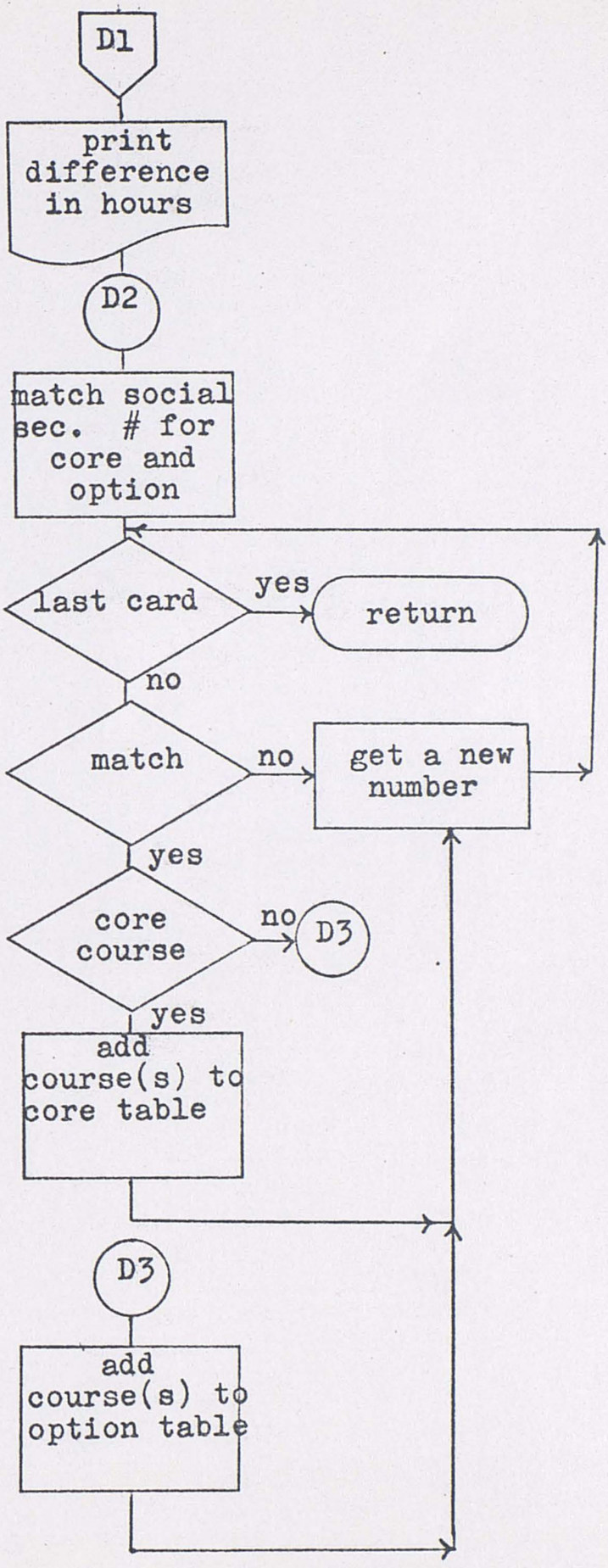



Figure 3. Continued

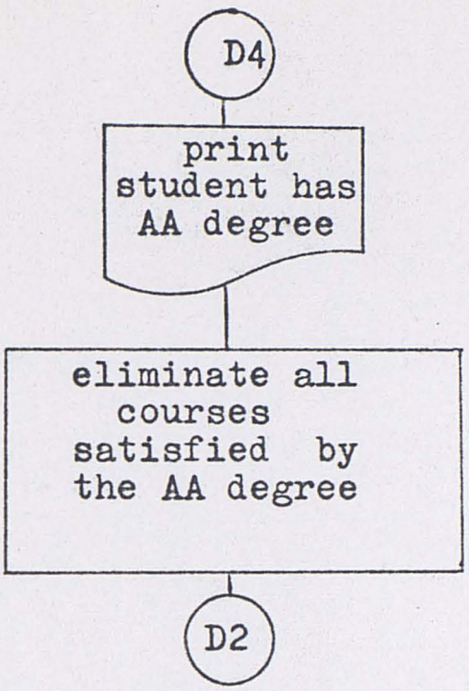



Figure 3. Continued

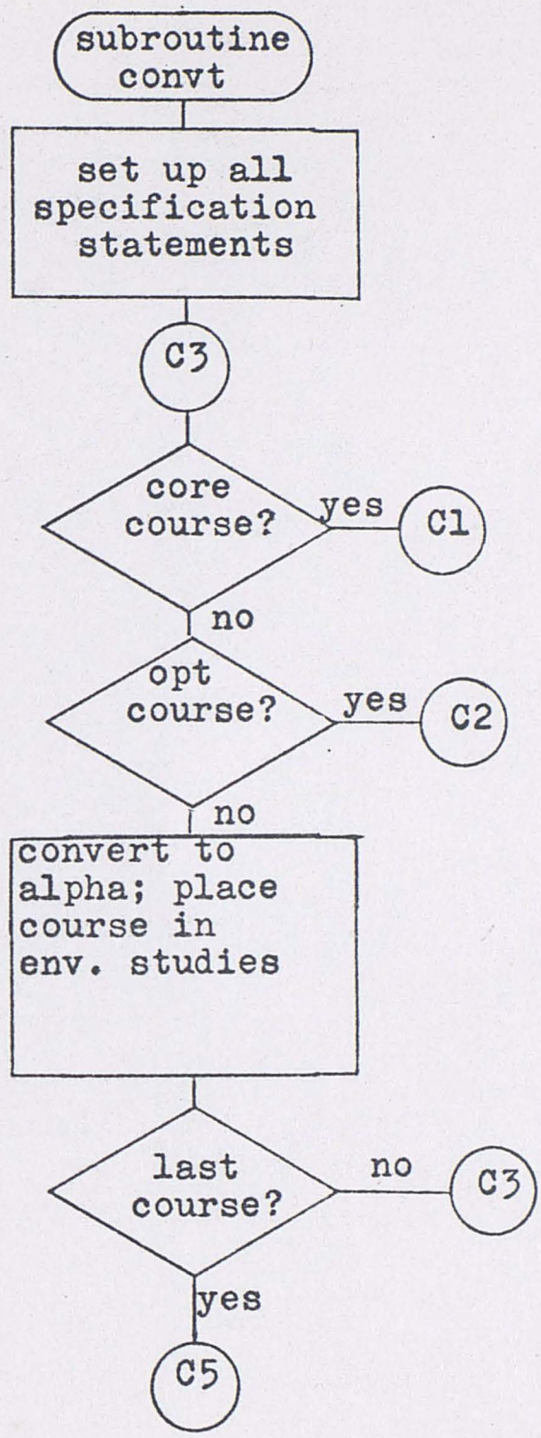



Figure 4. Flowchart of Subroutine "Convt"

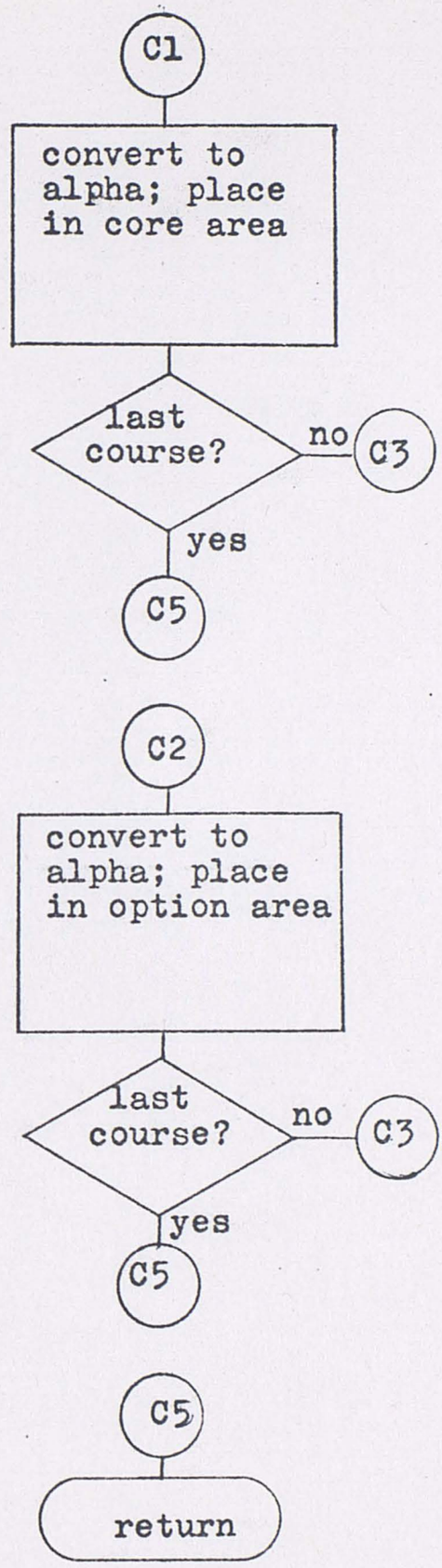



Figure 4. Continued

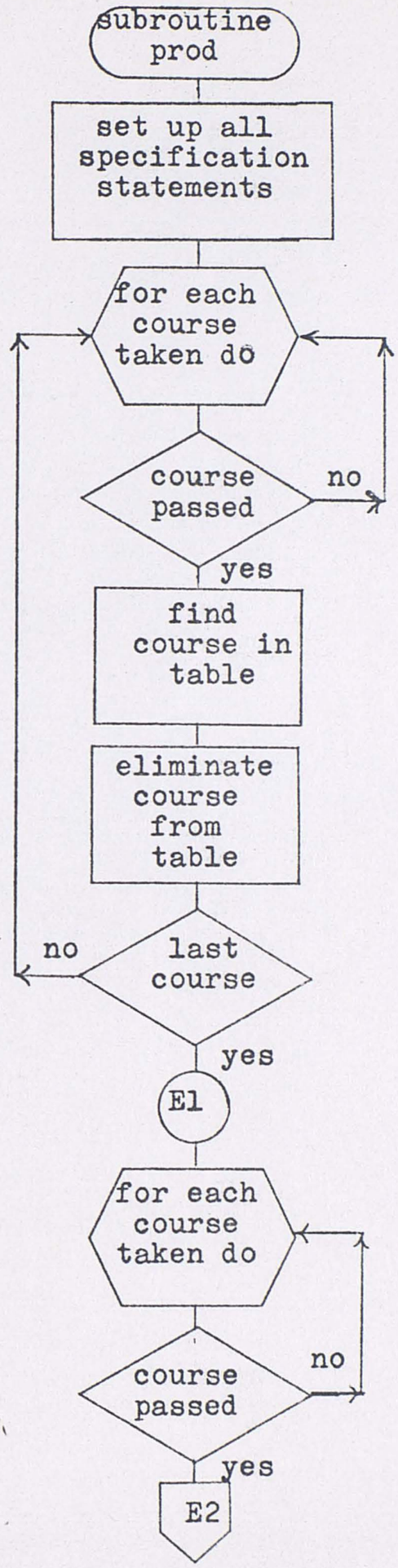



Figure 5. Flowchart of Subroutine "Prod"

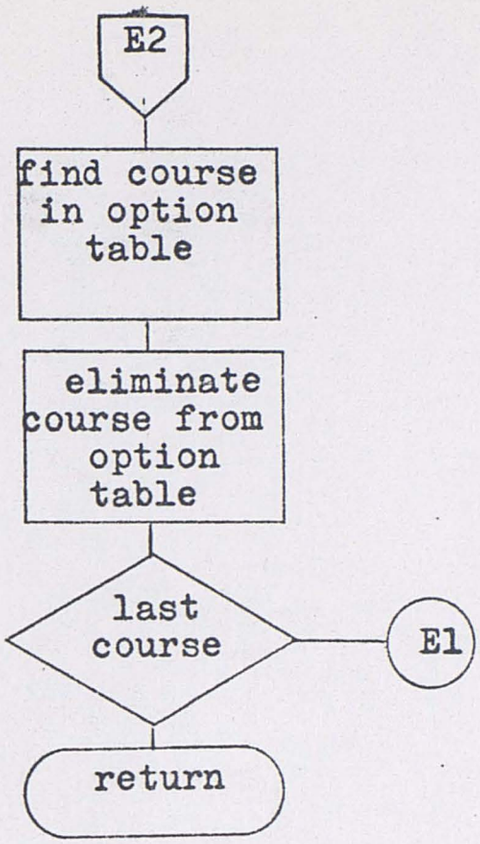



Figure 5. Continued

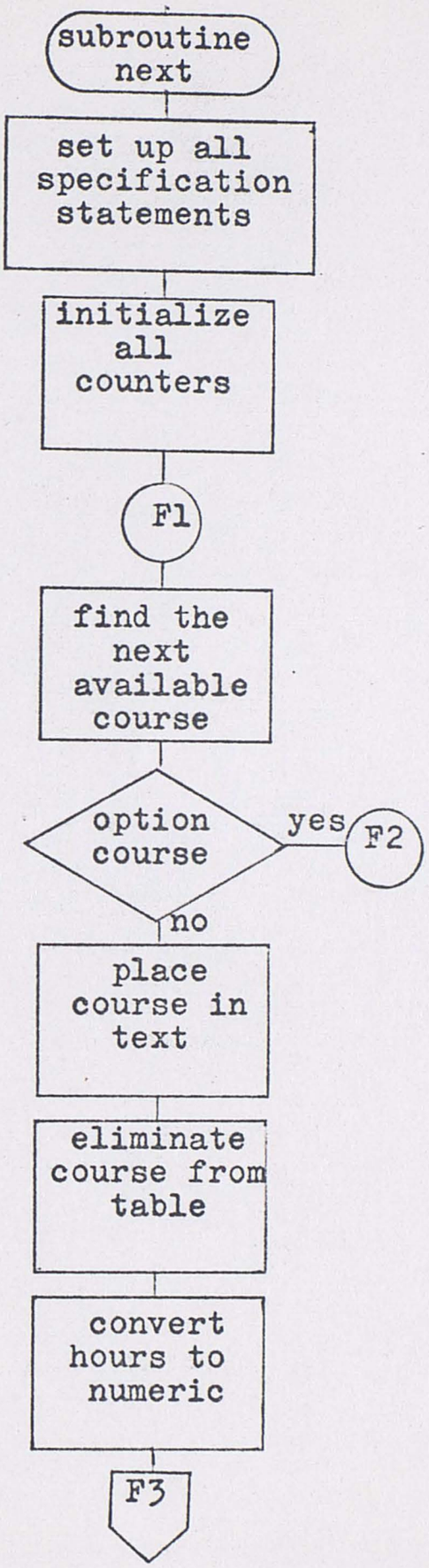



Figure 6. Flowchart of Subroutine "Next"

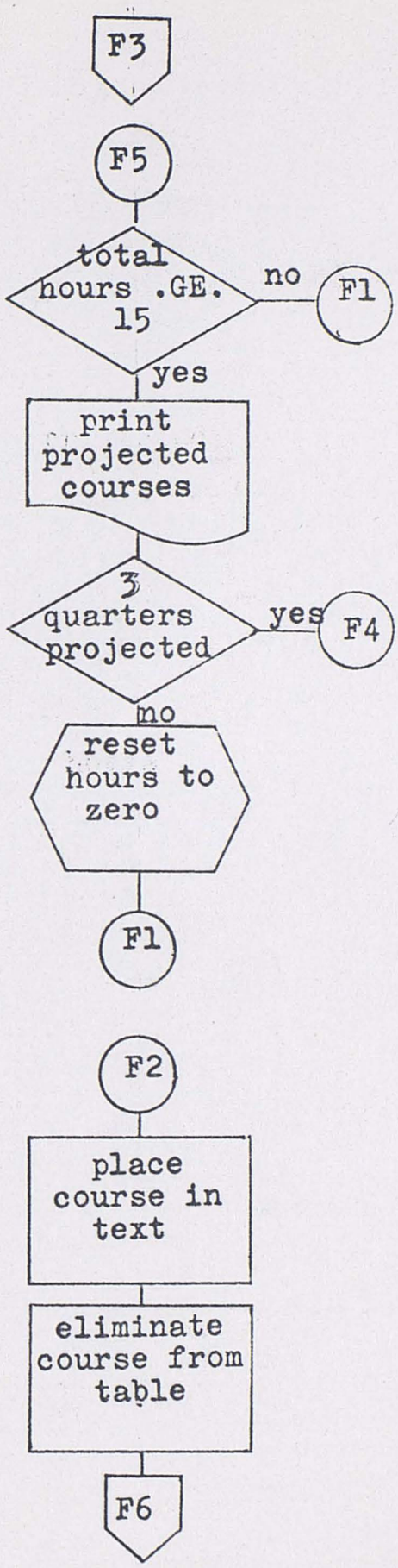



Figure 6. Continued

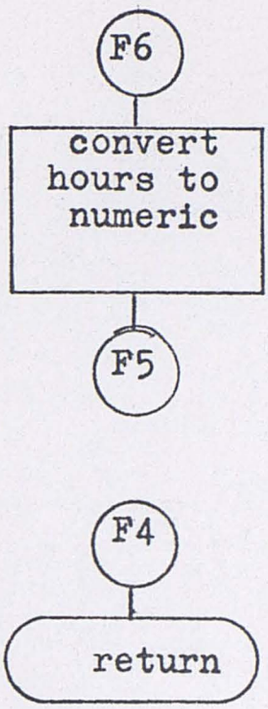
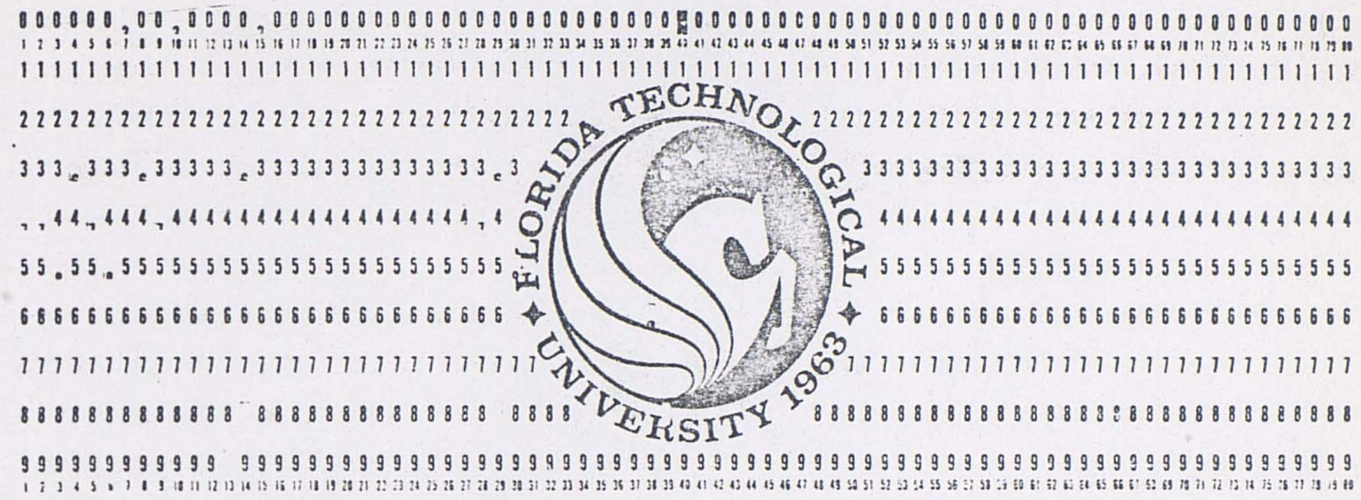



Figure 6. Continued

2618638911

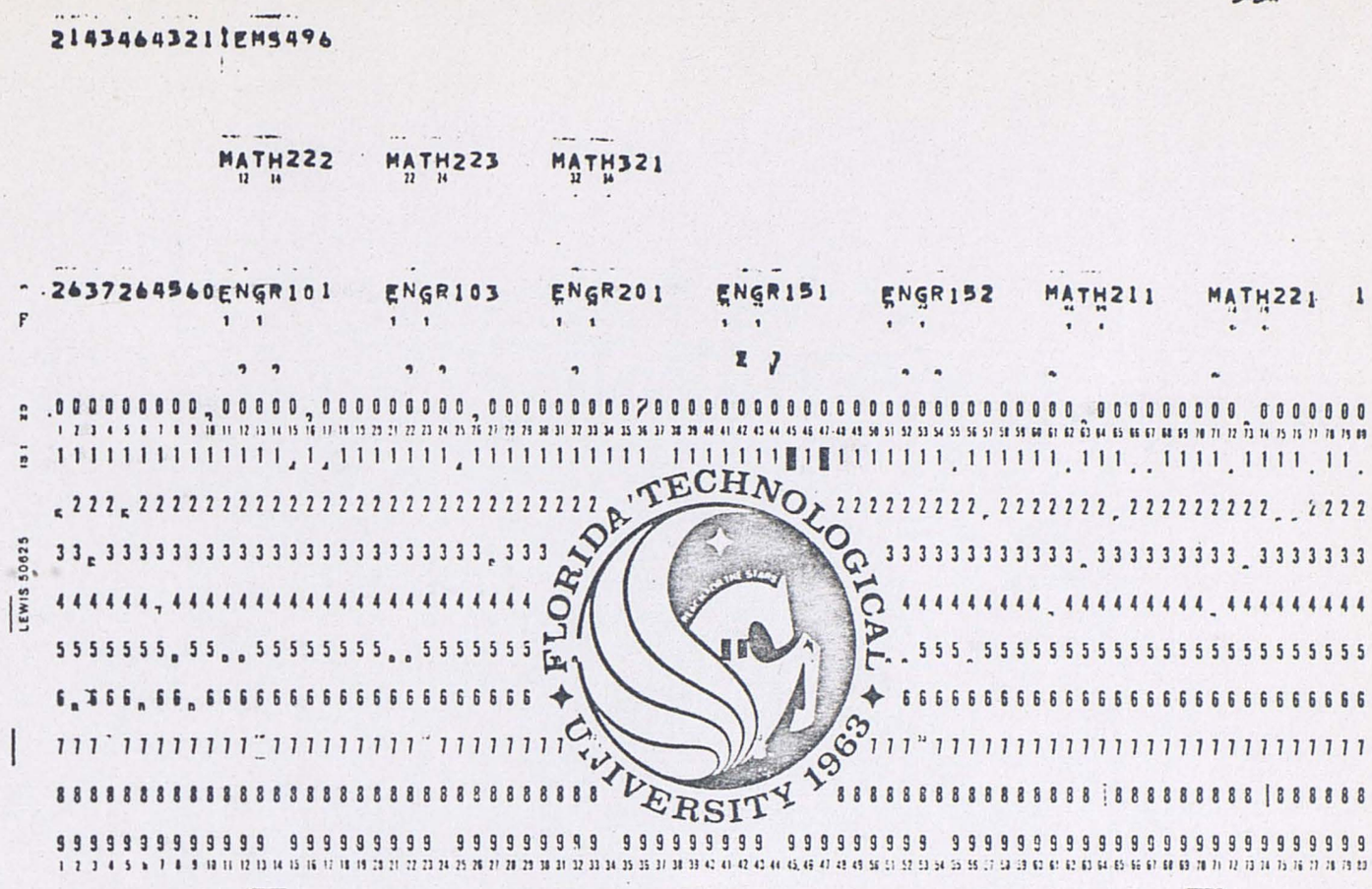
4453450340 9.0 4.5 6.0




| | |
|---|---|
| Column 1-9 | Social Security Number |
| Column 10 | A.A. Degree<br>ie: No Degree--0<br>Degree--1 |
| Column 11-15 | Communications |
| Column 16-20 | Humanities |
| Column 21-25 | Science |
| Column 26-30 | Social Science |
| Column 31-35 | Advanced Engineering Elective |
| Column 36-40 | Advanced Business Elective |
| Column 41-45 | Advanced Education Elective |

Format(3I3,I1,7F5.1)

Figure 7. Environmental Studies Transfer Inputs




Format(3I3,I1,7(A4,A3))

Column 1-9 Social Security Number

Column 10 Course Code

ie: Option--1
Core--0

Column 11-17 Course Name and Number

Column 21-27 Course Name and Number

Column 31-37 Course Name and Number

Column 41-47 Course Name and Number

Column 51-57 Course Name and Number

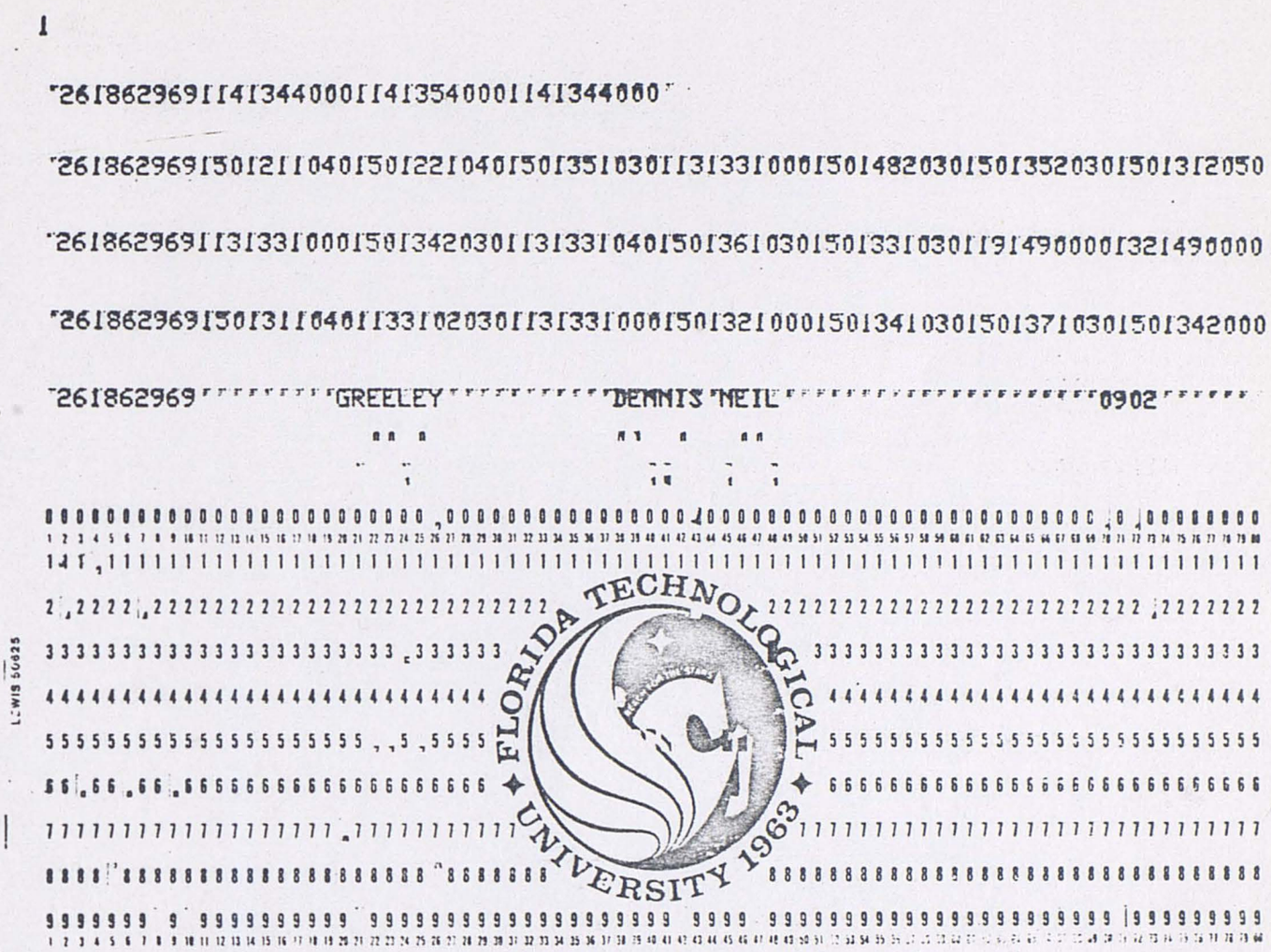
Column 61-67 Course Name and Number

Column 71-77 Course Name and Number

Column 80 Continuation Code

ie: Continued--1
Not Continued--Blank

Figure 8. Core and Option Substitution Inputs




Card 1 Format(1X,3I3,10X,10A4,10X,I4)

Card 2 Format(1X,3I3,7(1X,A3,A3,1X,A1,1X))

Figure 9. Sample Student Input Deck

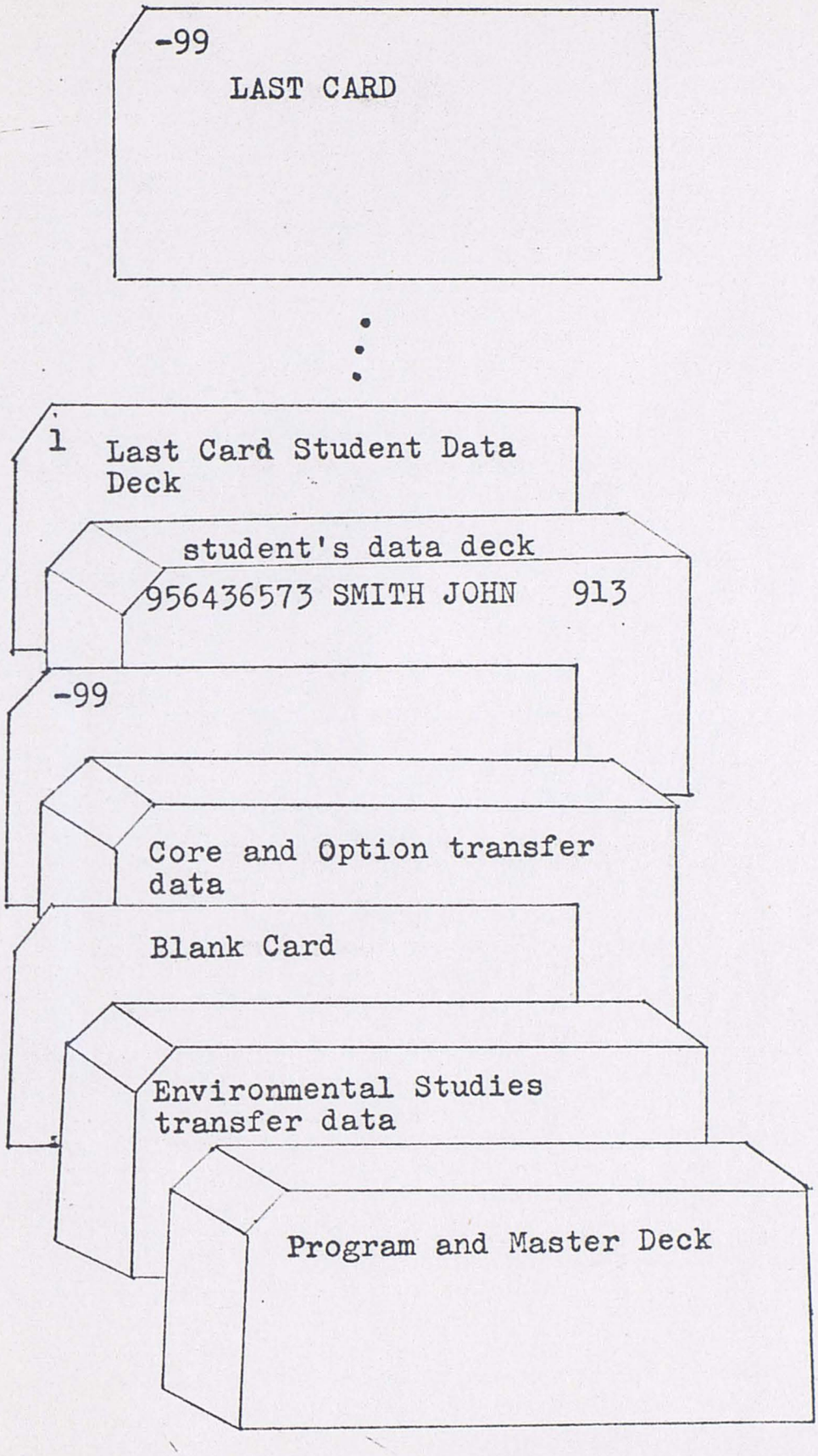



Figure 10. Deck Setup Prior to Processing

ENVIRONMENTAL STUDIES SUBSTITUTE

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 362425381 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 261821146 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 267746361 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 266742367 | 0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 307449555 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 193364656 | 0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9281507 | 0 | 9.0 | 0.0 | 6.0 | 4.0 | 0.0 | 0.0 | 0.0 |
| 9281507 | 0 | 0.0 | 0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 267888675 | 0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 263781563 | 0 | 0.0 | 0.0 | 6.0 | 4.5 | 0.0 | 0.0 | 0.0 |
| 436863269 | 0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 261865319 | 0 | 9.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 83403608 | 0 | 9.0 | 9.0 | 4.5 | 13.5 | 0.0 | 0.0 | 0.0 |
| 163247920 | 0 | 9.0 | 9.0 | 4.5 | 22.5 | 0.0 | 0.0 | 0.0 |
| 267746257 | 0 | 13.5 | 12.0 | 4.5 | 21.0 | 0.0 | 4.5 | 0.0 |
| 70380 17 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 |
| 264721986 | 0 | 4.5 | 10.0 | 6.0 | 22.5 | 0.0 | 0.0 | 0.0 |
| 264681944 | 0 | 10.0 | 0.0 | 4.5 | 18.0 | 0.0 | 0.0 | 0.0 |
| 411767781 | 0 | 9.0 | 9.0 | 5.0 | 18.0 | 0.0 | 6.0 | 8.0 |
| 261863109 | 0 | 10.0 | 4.5 | 4.0 | 16.0 | 0.0 | 4.5 | 0.0 |
| 267889682 | 0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 100403520 | 0 | 7.0 | 0.0 | 4.5 | 10.0 | 0.0 | 0.0 | 0.0 |
| 263963318 | 0 | 10.5 | 10.0 | 4.5 | 16.5 | 0.0 | 6.0 | 8.0 |
| 219560277 | 0 | 13.5 | 13.5 | 6.0 | 18.0 | 0.0 | 0.0 | 0.0 |
| 264648 22 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 262945447 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 266861 68 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 409661250 | 0 | 6.0 | 3.0 | 3.0 | 3.0 | 0.0 | 0.0 | 0.0 |
| 266720629 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 267765 38 | 0 | 7.5 | 10.5 | 4.5 | 22.5 | 0.0 | 0.0 | 0.0 |
| 184341678 | 0 | 10.0 | 4.5 | 4.5 | 10.5 | 0.0 | 4.5 | 0.0 |
| 265863 86 | 0 | 0.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
| 17341363 | 0 | 4.5 | 0.0 | 4.5 | 4.5 | 0.0 | 0.0 | 0.0 |
| 267649817 | 0 | 10.5 | 10.5 | 6.0 | 27.0 | 0.0 | 0.0 | 0.0 |
| 231601426 | 0 | 4.5 | 9.0 | 6.0 | 4.5 | 0.0 | 0.0 | 0.0 |
| 262204759 | 0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 265922737 | 0 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 0.0 |
| 466903448 | 0 | 2.3 | 0.0 | 1.5 | 4.5 | 0.0 | 0.0 | 0.0 |
| 507409247 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 157321561 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 261864370 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 7.5 |
| 264807749 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 |
| 266688270 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 429 65230 | 0 | 4.5 | 0.0 | 6.0 | 4.5 | 0.0 | 0.0 | 0.0 |
| 362425381 | 1 | 2.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 0.0 |
| 266641319 | 0 | 4.5 | 9.0 | 4.5 | 18.0 | 0.0 | 0.0 | 0.0 |
| 265660134 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| 267644892 | 0 | 0.0 | 6.0 | 0.0 | 12.0 | 0.0 | 0.0 | 0.0 |
| 457488938 | 0 | 0.0 | 9.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 265922737 | 0 | 6.0 | 9.0 | 4.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 84364934 | 0 | 0.0 | 0.0 | 7.0 | 10.5 | 0.0 | 0.0 | 0.0 |
| 262155589 | 0 | 4.5 | 0.0 | 6.0 | 4.5 | 0.0 | 4.5 | 0.0 |
| 263563920 | 0 | 10.5 | 9.0 | 4.5 | 18.0 | 0.0 | 0.0 | 0.0 |
| 266883657 | 0 | 9.0 | 9.0 | 3.0 | 18.0 | 0.0 | 0.0 | 0.0 |
| 267648973 | 0 | 3.0 | 3.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 264722 51 | 0 | 12.0 | 12.0 | 4.5 | 12.0 | 0.0 | 0.0 | 0.0 |
| 261806502 | 0 | 9.0 | 0.0 | 3.0 | 4.5 | 0.0 | 0.0 | 0.0 |
| 263860221 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 262660164 | 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Figure11. Listing of Environmental Studies Inputs

```
                CORE COURSE SUBSTITUTIONS
3624253810 ENGR101   ENGR103   ENGR151   ENGR152   ENGR201   MATH211   MATH221  1
  0  0  0 MATH222   MATH323   MATH321
2618211460 ENGR152   ENGR151   MATH211
2616855350 ENGR151   ENGR152   ENGR101   MATH221   MATH222   MATH223   MATH321  1
  0  0  0 MATH331
1933646560 ENGR101   ENGR103   ENGR111   ENGR151   ENGR152   ENGR201   MATH211  1
  0  0  0 MATH221   MATH222   MATH223   MATH331   ENGR211   ENGR221   ENGR351  1
  0  0  0 ENGR312
4206491500 ENGR101   ENGR103   ENGR201   ENGR202   ENGR203   MATH221   MATH222  1
  0  0  0 MATH223   ENGR111   ENGR151   ENGR152
2618673090 COMP102
2616855350 ENGR151   ENGR101   MATH221   MATH222   MATH321   MATH331
2638296880 ENGR151   ENGR152
4669034480 ENGR101
1004035200 MATH211   MATH221   MATH222   MATH223   MATH321   MATH331   ENGR101  1
  0  0  0 ENGR103   ENGR111   ENGR151   ENGR152   ENGR201   ENGR441   ENGR211  1
  0  0  0 ENGR311   ENGR351
2657206291 EECS496   EECS414
2657206290 ENGR312   ENGR221   ENGR321   ENGR322   ENGR323   MATH211   MATH221  1
  0  0  0 MATH222   MATH223   MATH321   MATH331   ENGR211   COMP102   ENGR101  1
  0  0  0 ENGR103   ENGR111   ENGR151   ENGR152   ENGR201
2665869650 ENGR101   ENGR102   ENGR103   ENGR111   ENGR121   ENGR131   ENGR151  1
  0  0  0 ENGR152   ENGR201   ENGR202   ENGR203   MATH212   MATH122   MATH123  1
  0  0  0 MATH221
2618659360 ENGR111   ENGR121   ENGR131   ENGR103   ENGR151   ENGR152   MATH121  1
  0  0  0 MATH122   MATH123   ENGR201   ENGR202   ENGR203   MATH221
2155047550 ENGR151   ENGR152
2671781750 MATH211   MATH221   MATH222   MATH223
2659262080 MATH223
3175042970 ENGR101   ENGR103   ENGR111   ENGR151   ENGR152   MATH211   MATH221  1
  0  0  0 MATH222   MATH223   MATH321
  92815070 MATH321   ENGR221   ENGR443
2637815630 ENGR202   ENGR203
2618618550 ENGR202   ENGR203
4368632690 COMP102   ENGR101   ENGR151   ENGR152   ENGR201   ENGR202
2635639200 ENGR151
4096612500 ENGR101   ENGR103   ENGR111   ENGR151   MATH222   MATH223   MATH331  1
  0  0  0 ENGR221   ENGR211   ENGR311   ENGR321   ENGR322   ENGR152
2618653190 ENGR101   ENGR103   ENGR111   ENGR151   ENGR152   MATH211   MATH221  1
  0  0  0 MATH222
2659269670 MATH221
1632479200 ENGR101   ENGR103   ENGR111   ENGR151   ENGR152   MATH211   MATH221  1
  0  0  0 MATH222   MATH223   MATH321   ENGR201   ENGR211   ENGR311   MATH331
2677462470 ENGR101   ENGR151   ENGR152   ENGR201   ENGR202   ENGR203   ENGR221
2647219860 ENGR202   ENGR203
 803215090 PHYS354
2639053710 ENGR201   ENGR211
2646819440 ENGR101   MATH211   MATH221
4244644050 ENGR221   ENGR321   ENGR322   ENGR323   ENGR371
2637264560 ENGR101   ENGR103   ENGR201   ENGR151   ENGR152
2629454480 ENGR101   ENGR103   ENGR201   ENGR111   ENGR221   ENGR222   ENGR223  1
  0  0  0 ENGR321   MATH331   ENGR151   ENGR152   ENGR211
2666444100 ENGR321   ENGR322   ENGR323
2666444101 EECS496
2618631090 COMP102   ENGR151   ENGR152   MATH211   MATH221   MATH222   MATH223  1
  0  0  0 MATH321
2676498170 ENGR202   ENGR203   ENGR101   ENGR103   ENGR151   ENGR152   ENGR201
2678896820 ENGR102   ENGR202   ENGR203
2428057540 ENGR151   ENGR152   ENGR201
```

Figure12. Listing of Core Course Substitutions

```
SS NO.265564345          BERRY              WALDO OSBORNE                MAJOR EECS
            RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

**********************************************************************************************************************************
MATH211 3  ENGR101 3  ENGR151 3  ENG 101 4  SOC SCI 3                                                  TOTAL HOURS=  16

**********************************************************************************************************************************
MATH321 4  ENGR103 3  ENGR152 3  SPE 101 3  SOC SCI 3                                                  TOTAL HOURS=  16

**********************************************************************************************************************************
MATH322 4  ENGR201 1  COMP102 3  SCIENCE 3  ENGR111 4                                                  TOTAL HOURS=  15
```

Figure 13. Sample Student Data Output Listing

SS NO.266866654 HANSON FRANK VALFRED MAJOR CEES

ENVIRONMENTAL STUDIES
BADM490 2
ENGR481 3
BADM302 3
EDTA490 2
ENG 310 3

ENGINEERING CORE
ENGR111 4
ENGR361 3
ENGR371 0
MATH331 4
COMP102 3
ENGR211 4
ENGR341 3
ENGR221 4
ENGR321 4
ENGR371 3
ENGR311 4
ENGR342 3
ENGR331 3
ENGR322 4
PHYS354 3
ENGR323 4
ENGR312 5
ENGR332 4
ENGR431 3

OPTION AREA
CEES412 4
CEES355 3
CEES351 4

RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

**********

MATH211 3 ENGR101 3 ENGR151 3 ENG 101 4 SOC SCI 3 TOTAL HOURS= 16

**********

MATH321 4 ENGR103 3 ENGR152 3 SPE 101 3 SOC SCI 3 TOTAL HOURS= 16

**********

MATH322 4 ENGR201 1 SCIENCE 3 ENGR351 3 PHYS344 3 SOC SCI 3 TOTAL HOURS= 17

Figure 14. Sample Student Data Output Listing

```
SS NO.466903448          BAIR              RICHARD WILLIAM              MAJOR EECS
                                  TRANSFERED ENVIRONMENTAL STUDIES HOURS
                    COMM      HUM     SCIENCE     SOC SCI     ENGR      BADM      EDXX
REQUIRED HRS       10.0      12.0        3.0        12.0      3.0       3.0       3.0
TRANSFERED HRS      2.3       0.0        1.5         4.5      0.0       0.0       0.0
REMAINING HRS       7.8      12.0        1.5         7.5      3.0       3.0       3.0

ENVIRONMENTAL                    ENGINEERING CORE                              OPTION
  STUDIES                                                                       AREA
HIST420 0                        ENGR101 T   ENGR322 4
ECON201 3                        ENGR103 3   ENGR331 3
PSY 202 0                        ENGR151 3   ENGR352 3
SPE 101 3                        MATH211 3   ENGR371 3
HUM 201 4                        ENGR111 4
PSY 202 3                        ENGR152 3
                                 MATH221 4
                                 ENGR201 1
                                 COMP102 0
                                 COMP102 3
                                 MATH222 4
                                 MATH223 4
                                 ENGR211 4
                                 ENGR311 4
                                 MATH321 4
                                 ENGR221 4
                                 ENGR321 4
                                 ENGR351 3
                                 ENGR361 3
                                 ENGR341 3
                                 MATH331 4
                                 ENGR342 3
          RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

**********************************************************************************************************************************
ENG 101 4  SCIENCE 3  ENGR312 5  ENGR323 4                                                    TOTAL HOURS=  16

**********************************************************************************************************************************
SOC SCI 3  ENGR332 4  ENG 310 3  PHYS354 3  SOC SCI 3                                         TOTAL HOURS=  16

**********************************************************************************************************************************
ENGR431 3  PHYS344 3  HISTXXX 4  ENGR48X 3  ENGR442 3                                         TOTAL HOURS=  16
```

Figure 15. Sample Student Data Output Listing

```
SS NO.157321561          REEBER              MICHAEL PETER                    MAJOR IEMS
        THIS STUDENT HAS AN A.A. DEGREE WHICH SATISFIES THE BASIC ENVIRONMENTAL STUDIES REQUIREMENTS

ENVIRONMENTAL                    ENGINEERING CORE                              OPTION
  STUDIES                                                                       AREA
ENGR481 3                        ENGR101 T   ENGR332 4                        IEMS431 3
BADM301 3                        ENGR111 T   ENGR323 4                        IEMS532 4
SCI 490 0                        ENGR151 T   ENGR351 3                        IEMS332 3
                                 ENGR221 T   PHYS344 3                        IEMS432 3
                                 MATH211 T   ENGR431 3                        IEMS414 3
                                 MATH221 T   ENGR352 3                        IEMS461 3
                                 MATH222 T   PHYS354 3                        IEMS422 3
                                 MATH223 T
                                 MATH321 T
                                 ENGR371 3
                                 MATH331 4
                                 ENGR211 4
                                 COMP102 3
                                 ENGR341 3
                                 ENGR321 4
                                 ENGR361 3
                                 ENGR311 4
                                 ENGR443 3
                                 ENGR342 3
                                 ENGR331 4
                                 ENGR322 4
                                 ENGR442 3
            RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

*****************************************************************************************************************************
ENGR103 3  ENGR152 3  ENGR312 5  EDXX48X 3  IEMS301 3                                          TOTAL HOURS=  17

*****************************************************************************************************************************
ENGR201 1  IEMS424 3  IEMS441 3  OPT XXX 3  OPT XXX 3                                          TOTAL HOURS=  13

*****************************************************************************************************************************

R E A D Y   T O   G R A D U A T E
```

Figure 16. Sample Student Data Output Listing

```
SS NO.157322170          SIMMONS          KENNETH HARRY                    MAJOR IEMS
        THIS STUDENT HAS AN A.A. DEGREE WHICH SATISFIES THE BASIC ENVIRONMENTAL STUDIES REQUIREMENTS
 UNKNOWN COURSE NAME  561

ENVIRONMENTAL                    ENGINEERING CORE                          OPTION
  STUDIES                                                                    AREA
ENGR482 3                        COMP102 0   ENGR331 3                     IEMS432 0
EDTA490 2                        ENGR211 0                                 IEMS324 3
                                 ENGR341 3                                 IEMS422 3
                                 MATH331 4                                 IEMS461 3
                                 ENGR211 4
                                 ENGR221 4
                                 ENGR321 0
                                 ENGR342 3
                                 ENGR371 3
                                 ENGR311 0
                                 COMP102 3
                                 ENGR321 4
                                 ENGR322 0
                                 ENGR442 0
                                 ENGR442 3
                                 ENGR322 0
                                 ENGR311 4
                                 ENGR323 4
                                 ENGR322 4
                                 ENGR312 5
                                 ENGR351 3
                                 ENGR331 0
            RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

**********************************************************************************************************************************
MATH211 3  ENGR101 3  ENGR151 3  ENGR111 4  ENGR332 4                                                  TOTAL HOURS=  17

**********************************************************************************************************************************
MATH321 4  ENGR103 3  ENGR152 3  ENGR431 3  ENGR361 3                                                  TOTAL HOURS=  16

**********************************************************************************************************************************
MATH322 4  ENGR201 1  ENGR352 3  PHYS354 3  BADMXXX 3  IEMS301 3                                       TOTAL HOURS=  17
```

Figure 17. Sample Student Data Uotput Listing

```
SS NO.264 48783          CADLE              ROBERT BRUCE                MAJOR UNKN

ENVIRONMENTAL                          ENGINEERING CORE                  OPTION
  STUDIES                                                                  AREA
PSY 201 3                              ENGR101 3
ENG 101 3                              ENGR151 3
PSY 202 3                              MATH211 3
ECON201 3                              ENGR103 3
SPE 101 3                              ENGR152 3
ENGR481 3                              MATH221 4
COED201 0                              COMP102 3
SCI 490 0                              MATH222 4
COED203 0                              ENGR201 1
SOC 201 3                              ENGR111 4
                                       MATH223 4
                                       ENGR211 4
                                       MATH321 4
                                       ENGR311 4
                                       ENGR221 4
                                       ENGR361 3


              RECOMMENDED COURSES FOR THE NEXT THREE QUARTERS

**********************************************************************************************************************
MATH331 4  SOC SCI 3  ENGR312 5  ENGR341 3                                                  TOTAL HOURS=  15

**********************************************************************************************************************
SCIENCE 3  ENGR331 3  ENGR371 3  ENGR321 4  ENGR351 3                                       TOTAL HOURS=  16

**********************************************************************************************************************
HUM 201 4  ENGR332 4  ENGR342 3  ENGR322 4                                                  TOTAL HOURS=  15
```

Figure 18. Sample Student Data Output Listing

QUARTER NO. 1

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MATH211 | 129. | MATH321 | 8. | MATH322 | 4. | MATH323 | 13. | MATH324 | 12. | MATH331 | 8. |
| ENGR101 | 62. | ENGR103 | 22. | ENGR201 | 22. | | 0. | | 0. | | 0. |
| ENGR151 | 69. | ENGR152 | 5. | COMP102 | 9. | | 0. | | 0. | | 0. |
| ENG 101 | 114. | SPE 101 | 10. | | 0. | | 0. | | 0. | | 0. |
| SOC SCI | 153. | SOC SCI | 1. | SCIENCE | 2. | HUM 201 | 18. | SOC SCI | 0. | | 0. |
| ENGR111 | 14. | | 0. | | 0. | | 0. | | 0. | | 0. |
| ENGR211 | 17. | ENGR311 | 17. | ENGR312 | 40. | ENGR331 | 6. | ENGR332 | 19. | ENGR431 | 9. |
| ENGR341 | 16. | ENGR361 | 17. | ENGR371 | 15. | ENGR342 | 5. | | 0. | | 0. |
| ENGR221 | 7. | ENGR321 | 10. | ENGR322 | 17. | ENGR323 | 9. | | 0. | | 0. |
| ENGR351 | 3. | ENGR352 | 14. | | 0. | | 0. | | 0. | | 0. |
| OPT XXX | 0. | OPT XXX | 0. | OPT XXX | 0. | | 0. | | 0. | | 0. |
| ENG 310 | 12. | | 0. | | 0. | | 0. | | 0. | | 0. |
| PHYS354 | 8. | PHYS344 | 8. | | 0. | | 0. | | 0. | | 0. |
| SOC SCI | 2. | HISTXXX | 4. | HISTXXX | 0. | | 0. | | 0. | | 0. |
| ENGR48X | 1. | BADMXXX | 2. | EDXX48X | 2. | | 0. | | 0. | | 0. |
| OPT XXX | 0. | OPT XXX | 0. | OPT XXX | 0. | OPT XXX | 0. | | 0. | | 0. |
| ENGR442 | 2. | ENGR443 | 0. | | 0. | | 0. | | 0. | | 0. |
| OPT XXX | 0. | OPT XXX | 0. | OPT XXX | 0. | OPT XXX | 0. | | 0. | | 0. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CEES411 | 3. | CEES412 | 0. | CEES414 | 0. | CEES501 | 0. | CEES502 | 0. | CEESXXX | 0. |
| CEESXXX | 0. | CEESXXX | 0. | CEESXXX | 0. | CEESXXX | 0. | | 0. | | |
| EECS321 | 0. | EECS322 | 0. | EECS341 | 0. | EECS411 | 0. | ENGR421 | 0. | EECSXXX | 0. |
| EECSXXX | 0. | EECSXXX | 0. | EECSXXX | 0. | | 0. | | 0. | | |
| EMMS413 | 1. | EMMS414 | 0. | EMMS421 | 0. | EMMS430 | 0. | EMMS433 | 0. | EMMS435 | 0. |
| EMMS412 | 0. | EMMS501 | 0. | EMMS511 | 0. | EMMSXXX | 0. | EMMSXXX | 0. | | |
| IEMS301 | 1. | IEMS424 | 0. | IEMS461 | 0. | IEMS432 | 0. | IEMS532 | 0. | IEMS414 | 0. |
| IEMS441 | 0. | IEMSXXX | 0. | IEMSXXX | 0. | IEMSXXX | 0. | IEMSXXX | 0. | | |
| MEAS341 | 4. | MEAS342 | 0. | MEAS351 | 0. | MEAS423 | 0. | MEAS482 | 0. | MEAS371 | 0. |
| MEAS382 | 0. | MEAS436 | 0. | MEASXXX | 0. | MEASXXX | 0. | | 0. | | |
| IEMS431 | 0. | IEMS447 | 0. | EMCS431 | 0. | EMCS434 | 0. | ENGR421 | 0. | EMCS470 | 0. |
| EECS414 | 0. | EMCSXXX | 0. | EMCSXXX | 0. | EMCSXXX | 0. | EMCSXXX | 0. | | |

Figure 19. Sample of Projected Course Enrollment Figures

```
  THERE ARE  196 STUDENTS IN THE COLLEGE OF ENGINEERING
                                  UNUSED ENVIRONMENTAL STUDIES INPUTS
362425381
261821146
267746361
307449555
  9281507
  9281507
267888675
263781563
436863269
261865319
 70380 17
411767781
267889682
100403520
263963318
219560277
264648 22
262945447
266861 68
266720629
184341678
265863 86
231601426
262204759
265922737
507409247
157321561
261864370
264807749
266688270
429 65230
362425381
265660134
267644892
457488938
265922737
262155589
266883657
267648973
261806502
263860221
262660164
267542178
409765671
266740920
265586965
261865936
219504755
266826897
264685935
266887 71
267422259
266961330
579624185
266988671
429 65230
261686491
263905371
263726456
```

Figure 20. Output Listing of Unused Environmental Studies Inputs

MATH211 3 MATH321 4 MATH322 4 MATH323 4 MATH324 4 MATH331 4

ENGR101 3 ENGR103 3 ENGR201 3

ENGR151 3 ENGR152 3 COMP102 3

ENG101 4 SPE101 3

SOC SCI 3 SOC SCI 3 SCIENCE 3 HUM201 4 SOC SCI 3

ENGR111 4

ENGR211 4 ENGR311 4 ENGR312 5 ENGR331 3 ENGR332 4 ENGR431 3

ENGR341 3 ENGR361 3 ENGR371 3 ENGR342 3

ENGR221 4 ENGR321 4 ENGR322 4 ENGR323 4

ENGR351 3 ENGR352 3

OPT 4 OPT 4 OPT 4

ENG310 4

PHYS354 3 PHYS344 3

SOC SCI 3 HIST 4 HIST 4

ENGR48X 3 BADMXXX 3 EDXX48X 3

OPT 3 OPT 3 OPT 3 OPT 3

ENGR442 3 ENGR443 3

OPT 3 OPT 3 OPT 3 OPT 3

Table 1. Sequenced Table of Core Courses

| | | | |
|---|---|---|---|
| CEES 411 4 | EECS 321 4 | EMMS 413 3 | IEMS 301 3 |
| CEES 412 4 | EECS 322 4 | EMMS 414 3 | IEMS 424 3 |
| CEES 414 3 | EECS 341 4 | EMMS 421 3 | IEMS 461 3 |
| CEES 501 3 | EECS 411 4 | EMMS 430 3 | IEMS 432 3 |
| CEES 502 3 | ENGR 421 4 | EMMS 433 3 | IEMS 532 4 |
| CEES XXX 4 | EECS XXX 4 | EMMS 435 3 | IEMS 414 4 |
| CEES XXX 4 | EECS XXX 3 | EMMS 412 3 | IEMS 447 3 |
| CEES XXX 3 | EECS XXX 4 | EMMS 501 3 | IEMS XXX 3 |
| CEES XXX 3 | EECS XXX 3 | EMMS 511 3 | IEMS XXX 3 |
| CEES XXX 3 | 34 | EMMS XXX 4 | IEMS XXX 3 |
| 34 | | EMMS XXX 3 | IEMS XXX 3 |
| | | 34 | 34 |

| | |
|---|---|
| MEAS 341 3 | IEMS 431 3 |
| MEAS 342 4 | IEMS 447 3 |
| MEAS 351 3 | EMCS 431 3 |
| MEAS 423 4 | EMCS 434 3 |
| MEAS 482 4 | ENGR 421 4 |
| MEAS 371 4 | EMCS 470 3 |
| MEAS 382 4 | EECS 414 3 |
| MEAS 436 3 | EMCS XXX 3 |
| MEAS XXX 3 | EMCS XXX 3 |
| MEAS XXX 3 | EMCS XXX 3 |
| 35 | EMCS XXX 3 |
| | 34 |

Table 2. Sequenced List of Option Courses