A DECISION SUPPORT SYSTEM FOR THE FACULTY/COURSE ASSIGNMENT PROBLEM
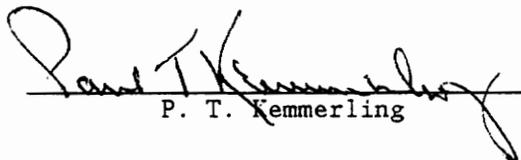
by

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(ABSTRACT)

This thesis presents a methodology for determining faculty/course as-signments based on preferences for the goals faculty members feel are important and seek to attain in selecting the courses they would like to teach. The heuristic procedure seeks to maximize faculty goal and pref-erence attainments for the courses.

Several operations research techniques have been used to solve this problem, but limitations of the techniques minimize their usefulness. A discussion of these techniques and their sources of information are given.

The assignment model uses faculty preferences for courses based on course-specific goals, faculty availability, and maximum teaching load as constraining factors.

The model was implemented using three Advanced BASIC programs with interactive capability. The model was tested in the Department of In-dustrial Engineering and Operations Research at Virginia Tech. System analysis was performed utilizing pre-test measures of satisfaction with

the teaching assignments determined by the current scheduling system and post-test measures of satisfaction with the teaching assignments determined by the proposed scheduling system. An analysis of the results is included.

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1.0 CHAPTER 1.   INTRODUCTION

Decision making, as an activity, must be carried out within the framework of organizational goals [12]. The extent to which those goals are met is the performance measure of the decision making activity [16]. For an optimal decision to be reached, the objectives or goals must be clearly identified and relationships between relevant variables must be explicitly analyzed [16].

The assignment of faculty members to teaching schedules is just one of many such decision making activities. Specific goals are identified by faculty members and limited by both administrators and students. Faculty members seek attainment of personal and professional goals through the courses they teach. For example, certain courses relate to their current research interests, have the "excellent" students in them, are small enough for a tutorial environment, and are offered at the "right" time on the "right" day. Administrators must face organizational goal achievement while satisfying all individuals concerned; they determine the decision rules and give final approval to schedules. Students have curriculum requirements to meet which place limitations not only the courses which must be taught, but when those courses are taught.

Basically, the problem consists of the decision maker trying to satisfy multiple conflicting goals given a variety of input factors, such as: departmental decision rules, faculty course preferences, current course

offerings, who will be available to teach, and how much time additional faculty responsibilities consume. This is not an easy task; an aid to assist the scheduler is needed.

1.1 PROBLEM STATEMENT

Current solution procedures for the faculty/course assignment problem neglect:

1. specific and reliable methods for determining faculty member preferences for teaching courses;
2. interactive scheduling capabilities for computer-based solutions; and
3. micro-computer application packages.

Consequently, far too many hours are being spent determining near-optimal faculty teaching schedules [22]. Additionally, faculty dissatisfaction may increase in such a situation. In fact, some of the faculty members interviewed prior to the case study were not completely satisfied with their assigned schedules; some of this discontent may be related to current course preference assignment techniques [23]. A system designed to overcome these problems is needed.

1.2 OBJECTIVE OF THE RESEARCH

The objective of this research encompasses determining a methodology to overcome current problems of the faculty/course assignment process, to include:

1. defining a technique to determine faculty goals upon which they determine/evaluate their course and schedule preferences;

2. determining a methodology to accurately reflect the value faculty members place on their course preferences;

3. maximizing faculty goal and preference attainments for courses utilizing an iterative heuristic procedure; and

4. developing an interactive, micro-computer based system to support the scheduler in his duties, leading to the reduction of time spent identifying alternative, near-optimal solutions (schedules).

1.3 INTRODUCTION TO THE SYSTEM

Scheduling is the allocation of resources over time to perform a collection of tasks [3]. The system under consideration is the assignment of faculty members to their courses, a subset of scheduling. Faculty/course assignment requires the allocation of scarce resources (faculty members) involving discrete units [12]. With respect to other scheduling systems, the faculty/course assignment problem has both similarities and differences. For example, in a job shop, the objective is to optimally schedule n jobs to m machines, where the jobs may or may not

change. In the faculty/course assignment problem, n courses are optimally scheduled to m professors. However, it is the resources (faculty members) which may change depending on their preferences, goals, and turnover/retention rates; the jobs (courses) remain the same with respect to the limited number of courses offered by a department. Aggarwal [1] provides an excellent comparative study of scheduling systems in the service industry, the classification under which faculty/course assignment exists.

1.4 ASSUMPTIONS

The following assumptions were made in the development of the system:

* · a maximum of fifty faculty members per department;
* a maximum of two hundred courses per department (including sections of courses); and
* a maximum of fifteen goals can be optimized.

1.5 DEFINITIONS

The following terms are referred to in this thesis:

EFFECTIVENESS RATING:

A rating which indicates the value placed on a faculty member's level of knowledge and his ability to convey that knowledge to his students. The rating may be determined by a variety of methods, e.g., committees, student questionnaires, or peer reviews. Although the rating is often

measured on a course-by-course basis, it is typically indicated by an overall effectiveness rating.

GAMING:

Attempts made by the faculty members to "out-guess" the system using a particular strategy in hopes of being assigned only certain courses.

OBJECTIVES:

The direction "to do better" as perceived by the decision maker. For example, Multiple Objective Decision Making (MODM) problems involve the design of alternatives which optimize or "best satisfy" the objectives of the decision maker [13].

GOALS:

What is desired by the decision maker, expressed in terms of a specific state in space and time. While objectives give the desired direction, goals give a desired level to achieve. This distinction is often blurred in the literature, and the two words are often used as meaning the same [13].

PREFERENCE:

The indication of desire made by a faculty member for a particular schedule or to teach a particular course.

PREPARATION:

The preparatory work which must be done by a faculty member prior to teaching a course. This includes preparation of teaching notes, visuals, and homework assignments. For example, if Course X has been taught by Professor Y previously, this implies that little preparation would be needed on the part of Professor Y prior to teaching that course again. However, if Professor Z has never taught Course X, significant effort

would be required by Professor Z to effectively and efficiently teach Course X. The importance of the preparation concept to faculty/course assignment is that, assuming a maximum teaching load per term of two courses, if Professor Z is given a new course to teach, his other course should be assigned on the basis of his familiarity with it so as to reduce his preparation load. Good preparation typically leads to a better managed and more effective course.

1.6 OUTLINE

Chapter 2 presents a review of the literature including appropriate techniques, theories, applications, and similar assignment situations with respect to system characteristics; Chapter 3 presents the methodology taken by this research; Chapter 4 presents the case study; Chapter 5 reflects the application of theories and techniques to the case example; Chapter 6 presents the case analysis; and Chapter 7 provides summary conclusions and suggests recommendations for further study.

2.0 CHAPTER 2. LITERATURE REVIEW

2.1 FACULTY ASSIGNMENT MODELS

Sometimes, scheduling is purely a matter of allocation and does not require consideration of sequencing decisions. In such cases, mathematical programming models can be used to determine optimal solutions [3]. The faculty/course assignment problem has been approached from a variety of angles within the Operations Research (OR) discipline, including:

- zero-one integer programming [7] [10] [20] [21],
- network optimization [9],
- Ford-Fulkerson dual transportation algorithm [2],
- revised SIMPLEX algorithm [4],
- linear programming [12] [18],
- goal programming [12], and
- mixed integer programming [12].

Although not specifically examined here, there exist a number of other techniques that have been used to solve this problem. A review of the literature reveals those aspects of the problem which have been studied as well as the techniques utilized.

To the best of this author's knowledge, the first published work in faculty/course assignment techniques is that of Andrew and Collins [2],

in 1971. Andrew and Collins formulate the problem as a special trans-
portation system, and maximize faculty member course preferences and ef-
fectiveness.

In determining faculty preference ratings for each course, each faculty
member rates every course on a scale of zero to one hundred. Two case
examples are used to illustrate the possible effects of preference indi-
cations to help prevent gaming by faculty members attempting to "beat"
the system.

Effectiveness ratings are determined by a committee using the same scale
as that for the preference ratings. However, in the problem formulation,
the effectiveness rating is determined for each course, i.e., it is
course-specific, meaning that if a faculty member has not taught a par-
ticular course, he does not have an effectiveness rating for that course.
No indication is made as to how this situation would be remedied if that
faculty member has a high preference for teaching that course.

Two mathematical constraints ensure all courses will be staffed and no
faculty member will be overloaded. This formulation is limited to a
single scheduling period, i.e., a quarter or semester.

Tillett [21] expands the model of Andrew and Collins [2] to reflect var-
iances in instructor preferences with respect to the number of sections
of a course that may be assigned. Additionally, Tillett increases the
constraint set to include a maximum number of preparations acceptable to

each faculty member. Tillett's algorithm requires an integer solution which limits the usefulness of the model for mainframe applications such as his.

The impracticality of Tillett's [21] model in using zero-one integer programming for mainframe computer solutions is the exorbitant amount of computing time required to solve problems of this size. Breslaw [4] overcomes this difficulty by utilizing the revised SIMPLEX method. He ensures integer solutions are achieved based on the structural form of the constraint set and the orientation of the feasible solution space.

Breslaw discusses administration dissatisfaction arising from the lack of system interaction. Without this interaction, the opportunity for achieving a truly optimal solution, both operationally and politically, is inhibited. Breslaw reduces this dissatisfaction by developing a package which allows the administration to become actively involved in the solution procedure. This "interactive" capability is achieved by programming a complete package: initial processing, linear programming, final processing, and printed outputs at each stage. Through the use of error messages, it is possible to discover where no feasible solution exists. The reports generated upon initial processing enable the scheduler and administration to effectively interact during the solution procedure and to save computer time in attempting to solve problems for which no feasible solution can be found. Three reports (a listing of course by faculty and term, a full timetable, and a normalized table of prefer-

ence values for each faculty member) are generated upon the completion of final processing.

Breslaw cites the lack of standards, due to differences between particular assignment problems, as being the source of difficulty in determining the usefulness of this program. He utilizes both a real world problem and a hypothetical problem as performance measures.

Breslaw reports that considerable gains can be achieved through the use of optimization techniques in solving the faculty/course assignment problem, but without allowing interaction, the gains can only be marginal. The effectiveness of the interaction is based upon program output that is simultaneously precise, informative, and familiar to the user.

The dynamic features of the faculty/course assignment problem at the university level are reflected in the model of Shih and Sullivan [20]. Formulated as a zero-one integer programming problem, it incorporates a multi-period scheduling technique useful for both long-range and short-range departmental planning. Shih and Sullivan explicitly include a broad range of constraints specifically developed to represent this dynamic situation.

Dyer and Mulvey [9] describe the formulation, implementation, and actual use of an integrated optimization/information system to aid in the task of allocating and assigning faculty resources in an academic department. Based on a network optimization model, Dyer and Mulvey report that the

model's practical usefulness is dependent upon imbedding the algorithm within a flexible information system. As a natural extension of the work of Andrew and Collins [2] and in a similar vein to that of Shih and Sullivan [20], this general network formulation creates faculty/course assignments for a full academic year.

The assignment model utilized by Harwood and Lawless [12] is linear programming combined with goal programming and mixed-integer programming. The use of the goal programming technique explicitly provides for conflict resolution arising from interactive administrative priorities, i.e., decision rules which may or may not conflict with each other. Mixed-integer programming provides requirements for certain of the variables to take on only integer values if they appear in the solution.

In an effort to identify the goals typically considered important to faculty members in the assignment of their teaching schedules, a sample of faculty members of a large university were surveyed. Based upon a consensus of the replies, seven goals were considered to be the most important:

1. consistent observance of expected teaching load;

2. granting individualized requests, i.e., teaching a particular course, no classes at particular times, etc.;

3. least number of preparations;

4. shortest possible teaching day;

5. maximum assignment of two sections of the same course;

6. least possible number of teaching days; and

7. minimal assignment of night classes.

These seven goals were then ranked in order of preference by the faculty
and a model was developed to ensure the observance of those goals in order
of preference, as opposed to absolutely.

Absolute goal attainment is frequently difficult to achieve because of
goal conflict. The decision maker must find a way to ensure deviation
from those goals is minimized [16]. Harwood and Lawless use goal pro-
gramming techniques to achieve a near-optimal solution. Goal programming
relies upon the decision maker's ordinal preference for the respective
goals as well as the faculty's aggregate preference ordering of those
goals.

McClure and Wells [18] generate teaching schedules that achieve prior-
itized scheduling goals as determined by surveyed faculty members. The
McClure-Wells model maximizes the sum of all faculty members' utilities
for their schedule assignments, subject to requiring that each faculty
member be assigned only one schedule and that those schedules reflect the
required number of course sections. The decision variables of the
McClure-Wells model represent the assignment of a complete schedule to a
faculty member as opposed to single course assignments. This overcomes
the negligence of course utility interaction effects in the previously
proposed faculty assignment models [2], [4], [9], [12], [20-21]. The
structure of the resulting model is conducive to existing solution tech-

niques, e.g., McClure and Wells utilize the commercially available software package LINDO for their solution.

Implementation of the McClure-Wells model requires two steps. First, each faculty member updates a report containing the following information: 1) the courses offered in the upcoming term, 2) the courses the faculty member is interested in teaching (with restrictions placed on the number that may be listed), 3) the minimum and maximum number of hours in a teaching schedule, and 4) the maximum number of preparations in a teaching schedule. If any changes are made by the faculty member, new schedules must be generated. From the list of courses the faculty member requests or is assigned, all feasible schedules, i.e., those schedules which satisfy the constraints on hours and preparations, are generated by the computer. The generation of a large number of schedules for each faculty member is minimized due to the restrictions placed on the number of courses that can be listed.

The second step of the implementation process requires each faculty member to assign utility values to each of the feasible schedules. The utility scale used by McClure and Wells ranges from zero to one hundred, where one hundred represents the most desirable schedule.

These schedules and their respective utilities are used to update a permanent history file to obtain information necessary to generate a permanent editor file of the mathematical formulation. The editor file

provides the necessary input for the integer programming software package used to determine the optimal schedule.

2.2   GROUP PREFERENCE DETERMINATION METHODS

Churchman and Ackoff [7] present a method of estimating the values an individual associates with outcomes (goals) which is applicable to actual choices or preference expressions of discrete goals.   There are three underlying assumptions of this model:

1.   values assigned to each goal can be interpreted as measures of true importance,

2.   transitivity, and

3.   additivity.

The intention of this method is to improve the estimates of the goal values as perceived by the decision maker(s).

The method requires the utilization of two tests for the decision maker, each contributing information concerning the importance of the goals to the individual.   The first test requires tentative assignments of value by the individual utilizing an experimenter-assigned scale.   Questions about combinations of the goals are presented to the individual in the second test, assuming lack of influence of the initial judgments, revisions to values assigned in the first test may be required.   The ability to make those revisions is possible with this method.

Churchman and Ackoff [7] report that replication under controlled conditions is possible, which implies that measures of reliability can be made. Although this method does not provide any estimate of the accuracy or bias of the judgments, Churchman and Ackoff found this inadequacy to be common to all other existing preference evaluation techniques.

The method is directed toward individual evaluations, but is applicable to groups as well. Two methods, voting and averaging, are discussed by Churchman and Ackoff for the group decision making situation.

Because decisions often affect groups of people as opposed to only isolated individuals, decision makers must consider the preferences of the individuals concerned. Farris and Sage [10] present approaches previously taken to aggregate individual preferences into group preferences. Additionally, they show the relationship between worth assessment and group decision making. In defining the group decision making problem, Farris and Sage develop methodologies for its solution. Their work is based on a set of conditions which acceptable methodologies should satisfy and an extension of the concept of single-peaked preferences.

2.3 SUMMARY

As the literature review shows, several attempts have been made at solving the faculty/course assignment problem. However, there exists a need to proceed from this point. Following is a summary list of the extensions to the current literature upon which this research focuses:

1. To incorporate the work of Churchman and Ackoff [7] into the faculty/course assignment problem, especially as it relates to determining the goals of the faculty in achieving their optimal schedules.

2. To develop a ranking technique for effective and efficient determination of faculty course preferences.

3. To develop a heuristic procedure encompassing an interactive, microcomputer solution technique.

3.0 CHAPTER 3. METHODOLOGY

3.1 DETERMINATION OF SOLUTION TECHNIQUE TO BE USED

Two techniques to solve this problem were considered: goal programming and heuristics. A brief discussion of the advantages and disadvantages of each technique follows; a summary statement regarding the technique chosen is included.

Because of the nature of the group decision making problem, where absolute goal attainment may be impossible, the decision maker must be able to minimize deviation from these goals [16]. Goal programming is a technique which can be used for some decision processes to ensure least possible deviation from these goals [9]. Goal programming can accommodate a variety of decision problems, those with a single goal and multiple subgoals as well as those having both multiple goals and subgoals [16].

Originally introduced by Charnes and Cooper [6], the techniques of goal programming were further developed by Ijiri [15], Lee [16], Ignizio [14], and Dyer [8]. The basis of this technique for resolving goal conflict is the decision maker's ordinal preference for the respective goals. As a natural extension of the work of Lee [17] and Harwood and Lawless [12], an interactive, integer goal programming model incorporating a micro-computer would be an appropriate solution technique.

However, due to potential limitations of the micro-computer, as well as available software support, a solution alternative utilizing heuristics, was investigated. Heuristics, or algorithms without proven convergence, are iterative procedures which may not necessarily converge toward an optimal solution. Algorithms can be defined to be "procedures for solving a problem stated in mathematical terms" [19].

Most of the problems for which no efficient converging algorithms exist or can be developed are of the combinatorial type, i.e. they involve arrangement, grouping, ordering, or selection of discrete objects, usually finite in number [19]. Many of these problems are optimization problems; an optimal solution is sought from the resulting feasible solutions. However, there exist some problems for which only a feasible solution is sought. According to Muller-Merbach [19], the difference between optimality and feasibility can be reduced with clever tactics. For example, the introduction of an objective which minimizes the infeasibility transfers the goal of feasibility into the goal of optimality. Alternatively, an objective can be replaced by a parallel constraint which is (or becomes) so close to the optimum that the optimal solution is also the only feasible solution.

The use of heuristics requires the development of a mathematical model which could be iteratively applied during the solution process. Because of their practicality and resemblance to intuitive thought processes, more effective and/or logical solutions to the problem may be achieved using heuristic techniques.

It was necessary however, to first determine the feasibility of pursuing the goal programming option before continuing with the heuristic model development. For the goal programming alternative to be feasible, a number of measurable attributes relating to the software had to be considered, including:

1. ability to be used on an IBM-PC;
2. amount of computing memory required;
3. ease of use; and
4. purchase price.

The feasibility study revealed that currently, there are no commercially available goal programming packages for the micro-computer. However, according to Dr. Linus Schrage, the developer of the LINDO package for the micro-computer, it is possible to write high-level programming language inserts, through the use of a linkable object code, that would allow the simulation of a goal programming environment. Similar inserts utilizing FORTRAN have been written for the mainframe version of LINDO by Dr. James Frendeway of the Department of Management Science at Virginia Tech. The linkable object code option is available with one of the LINDO packages his research group has developed at the University of Chicago. However, this version of the micro-computer LINDO package is the most expensive of the available LINDO packages with one-time University charge of approximately one thousand dollars and requires a minimum of 512K of memory. Virginia Tech does not own this package.

Another micro-computer linear programming package, Microsolve/Operations Research also has the capability to interface with the high-level programming language, BASIC. However, the program is of limited usefulness for the solution of the faculty/course assignment problem because of programming limitations placed on the number of variables and constraints that can be utilized in the solution process. Additionally, it is not a particularly easy program to use.

For the reasons stated above, the alternative to design an heuristic algorithm has been determined to be the most feasible solution technique. The design of the heuristic follows.

3.2 DESIGN AND DEVELOPMENT OF THE SOLUTION PROCEDURE

Part of the difficulty in determining a group preference function comes from the diversity of preferences held by the individual members of the group. In fact, two possibilities exist: all individuals could possess the same preference structure, thereby reducing the task to triviality, or all group members possess a different preference structure, requiring consideration be given to a broader class of preference orderings. The next three subsections of this chapter present the methodology followed by the thesis in determining these preference orderings, followed by two subsections explaining program development steps, and a final subsection presents summary conclusions.

3.2.1 THE GOAL QUESTIONNAIRE

The purpose of the goal questionnaire, shown in Figure 1 on page 23, is
to determine the goals faculty members consider important in the assign-
ment of teaching responsibilities.   Based on the work of Harwood and
Lawless [12], the questionnaire is designed to stimulate the thought
processes of the faculty members by leading with a several of the goals
presented by Harwood and Lawless. Each faculty member must indicate which
goals are important to him by marking the appropriate space. Additional
space is provided for the faculty members to include other goals that are
important to him, if necessary.   Requesting information from faculty
members in this manner should lead to less repetition of the least im-
portant goals, instead focusing on those goals most important to the en-
tire staff.

3.2.2 THE PREFERENCE PROGRAM

The purpose of the preference program is to determine the ordinal pref-
erences of each faculty member for the goals indicated on the aggregate
of the goal questionnaires.   A model developed by Churchman and Ackoff
[7] to determine the ordinal preferences is incorporated into an inter-
active micro-computer program.

Data compilation of the responses received on the goal questionnaire
should reveal that several of the goals predominate all the others.   From

this compiled list of goals, adjustments may need to be made to ensure the following assumptions of the Churchman and Ackoff model [7] are met:

1. For every goal G_j, there corresponds a real non-negative V_j, to be interpreted as a measure of the true importance of G_j.

2. If G_j is more important then G_k, then $V_j > V_k$, and if G_j and G_k are equally important, then $V_j = V_k$.

3. If V_j and V_k correspond to G_j and G_k respectively, then $V_j + V_k$ corresponds to the combined outcome $G_j + G_k$. This implies that the goals must be discrete.

4. If G_j is preferred to G_k, and G_k is preferred to G_1, then G_j is preferred to G_1.

5. The importance of the combined goal G_j and G_k is equal to the importance of the combined goal G_k and G_j.

6. If G_j and G_k are equally preferred to G_k, then $V_j = 0$.

Once the list of goals is adjusted, or reduced, to meet the assumptions, it can be assumed that, given a range of real number values, an individual could make an initial estimate of the value (v_i) of each goal. According to Churchman and Ackoff [7], their method provides a technique for improving these initial estimates of value by subjecting the individual to two tests, each contributing information concerning the importance of the goals to him. In the first test, the faculty member rank orders the goals from most important to least important without assigning value. Questions about the relative importance of combinations of goals, modified slightly with a method presented by Canada and White [5], are presented to the

Indicate (with an X) which of the following goals are important to you in selecting the courses you want to teach. Please add any others you feel are important but are not included on this list.

_____ SHORTEST POSSIBLE TEACHING DAY (Back-to-back classes)

_____ LEAST NUMBER OF PREPARATIONS (Preparatory work which must be done prior to teaching a course; typically, more preparation is needed if you are teaching a course for the first time.)

_____ CONSISTENT OBSERVANCE OF EXPECTED TEACHING LOAD

_____ TEACHING A PARTICULAR COURSE

_____ MINIMAL NUMBER OF NIGHT CLASSES

_____ LEAST POSSIBLE NUMBER OF TEACHING DAYS (Teaching T,Th classes as opposed to M,W,F classes)

_____ GOOD FIT BETWEEN RESEARCH INTERESTS AND COURSES

_____ _____

       _____

_____ _____

       _____

_____ _____

       _____

_____ _____

       _____

Please attach additional pages if necessary.

_____
(Name)

Figure 1. The Goal Questionnaire

faculty member in the second test. This permits proper assessment of the results of the first test and allows adjustments of the initial rank ordering to be made, if necessary.

The procedure to be followed is the second of two presented by Churchman and Ackoff [7], selected because of its ability to handle at least seven goals. The procedure followed by the program is as follows.

1. Rank the entire set of goals in terms of preference without assigning quantitative values.

2. The highest ranking goal becomes the standard goal, G_s. Then, by random assignment, the remaining set of goals are subdivided into groups of no more than five, with the groups being approximately equal in size.

3. Add G_s to each group and assign it the value of 1000 (v_s = 1000).

4. Use Steps (5) through (9), as follows, to obtain unstandardized values for the goals in the groups formed in Steps (2) and (3), but in adjusting the v_j, do not change the value of v_s.

5. Tentatively assign values to the goals that seem initially to reflect their relative values to G_s and to each other. For example, the evaluator might assign 1000, 800, 500, and 300 to G_1, G_2, G_3, and G_4, respectively. Call these tentative values v_1, v_2, v_3, and v_4. These are to be considered as first estimates of the 'true' values of v_1, v_2, v_3, and v_4.

6. Now make the following comparison:

    G_1 versus G_2 and G_3.

That is, if the evaluator had the choice of obtaining G_1 or the combination of G_2 and G_3, which would he select? Suppose that the evaluator says that G_1 is preferable. Then the values of v_2, v_3, v_4 should be adjusted so that:

$$v_1 > v_2 + v_3.$$

For example: v_1 = 1000

v_2 = 400

v_3 = 250

v_4 = 150

Note that the relative values of v_1, v_2, v_3, and v_4 have been retained.

7. Now compare G_1 versus G_2 and G_3 and G_4, since the sum of $v_2 + v_3 <$ 1000. Suppose that the combination of G_2, G_3, and G_4 is preferred to G_1. Then further adjustment of the values is necessary since:

$$v_1 > v_2 + v_3 + v_4.$$

For example: v_1 = 1000

v_2 = 400

v_3 = 350

v_4 = 300

8. Next, compare G_2 versus G_3 and G_4. Suppose G_2 is preferred to G_3 and G_4. Further adjustment of the values is necessary since:

$$v_3 + v_4 > v_2$$

For example: v_1 = 1000

v_2 = 550

v_3 = 300

v_4 = 250

Now each value is consistent with all the evaluations. Repeat Steps (5) through (8) for each group.

9. Compare the rankings obtained from Steps (5) through (8) with those obtained in Step (1). If the rank orders differ, reconsider the ranking and, if necessary, proceed again from step (5).

10. Once consistent results are obtained, standardize the values obtained in Step (8) by dividing the value assigned to each goal by the sum of the values assigned to all the goals.

An assumption made by Churchman and Ackoff [7] is that a single individual does the evaluating. However, for the faculty assignment problem, the method must be adjusted to suit the group decision making scenario. A group vote could be taken for each comparison with the decision going to the majority, or averages of each individual evaluation could be assigned. The method of averages may retain the individuality of the faculty members' preferences better than voting. Additionally, because of problems associated with the "paradox of voting" in which a set of transitive individual preference orderings leads to an intransitive group preference ordering [10], the method of averages appears to be more appropriate for this situation. Although it is difficult to determine which procedure maintains the concept of equality in a democracy, averages will be used for simplicity's sake.

A complete program listing, including variable assignments, is given in Appendix A.

3.2.3 THE PREFERENCE QUESTIONNAIRE

The purpose of the the preference questionnaire, shown in Figure 2 on page 28, is to determine each faculty member's preference for each course. It is assumed that several of the goals will be course-specific, i.e., teaching courses which relate to research interests, while some will be schedule-specific, i.e., only teaching in the evening. So, it is imperative that the course preferences listed by the individual faculty members be related to the course-specific goals, while the schedule-specific goals be reserved for use as scheduling constraints.

The questionnaire includes a listing of each course offered by the department followed by numbered columns, corresponding to each of the course-specific goals. Each faculty member is instructed to indicate which of those goals would be met if he were to teach a given course. Additionally, each faculty member must list, in order of preference, which five courses he would most like to teach. This helps to further delineate the faculty members' preferred courses. The information collected from this questionnaire, along with that obtained from the preference program, will be used as input to the value assessment program.

3.2.4 THE VALUE ASSESSMENT PROGRAM

The purpose of the value assessment program is to determine each faculty member's quantitative preference value for each course.

On the attached course listing, please indicate which of the eight course-specific goals would be met for you by teaching these courses. For example, if you really wanted to teach IEOR 4110 because it was related to your research interests, your expertise, and you plan to write a related textbook, in the row corresponding to IEOR 4110, you would put a check under the columns corresponding to 1 (Teaching a particular course), 2 (Good fit between research interests and courses), 4 (Teaching in area of expertise), and 8 (Teaching to support textbook development).

Which five courses (in order of preference) would you most prefer to teach?

1. _____
2. _____
3. _____
4. _____
5. _____

Please indicate your satisfaction with the current assignment method:

_____ 1 Dissatisfied
_____ 2 Somewhat dissatisfied
_____ 3 Indifferent
_____ 4 Somewhat satisfied
_____ 5 Satisfied

How satisfied are you with your current assignments for Fall and Winter quarters?

_____ 1 Dissatisfied   _____ 1 Dissatisfied
_____ 2 Somewhat dissatisfied _____ 2 Somewhat dissatisfied
_____ 3 Indifferent   _____ 3 Indifferent
_____ 4 Somewhat satisfied   _____ 4 Somewhat satisfied
_____ 5 Satisfied   _____ 5 Satisfied

Can you pinpoint the reason for your satisfaction or dissatisfaction?
_____Yes _____No

If so, what is it?

_____

_____

_____

Figure 2. The Preference Questionnaire

IEOR UNDERGRADUATE COURSE OFFERINGS

	1	2	3	4	5	6	7	8
H2150 Eng Economy								
2150 Eng Economy								
2180 Intro to IEOR								
3120 Ind Cost Control								
3130 Methods Eng								
3200 Hum Perf in Ind Sys								
3300 Manuf Processes								
3460 Comp Methods in IE								
4050 Nuclear Fuel Cycle Mgt								
4070 Mat & the Economy								
4090 Prin of IE								
4100 Occ Saf & Haz Cntrl								
4110 Process Eng								
4150 Sys Anal Thru Sim								
4160 Ind Haz Cntrl Lab								
4200 Eng Psychology								
4210 Math Meth of OR								
4211 Prod Plan & Cntrl								
4212 Plant Des & Layout								
4220 Ind Automation								
4240 Ind Economy								
4250 Stat Quality Cntrl								
4280 Ind Sys Eng								
4290 Theory of Organ								
4310 Det OR Models								
4320 Prob OR Models								
4330 Mat Hand Anal								
4350 Ind Quality Cntrl								
4360 Comp Plan & Des								
4361 Intro Com-B Info Sys								
4362 Intro Com-B Info Sys								
4363 Intro Com-B Info Sys								
4370 Micro Appl in IMF								
4380 Ind Sys Design								
4400 Ind Work Phys								
4410 Sys Safety Anal								
4420 Ind Fire Control								
4980 Special Study								

1 Teaching a particular course
2 Good fit between research interests and courses
3 Teaching honors courses
4 Teaching in area of expertise
5 Faculty enrichment
6 Teaching classes of reasonable size
7 Least number of preparations
8 Teaching for textbook development

Figure 2 (continued). The Preference Questionnaire

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IEOR GRADUATE COURSE OFFERINGS

	1	2	3	4	5	6	7	8
5010 Appl Opt Meth								
5040 Math Prog I								
5060 Adv Motion Time Study								
5100 Theory Graphs Net Anal								
5101 Adv Eng Economy								
5102 Adv Eng Economy								
5111 HF Res Methods I								
5112 HF Res Methods II								
5113 HF Res Methods III								
5131 Prin & Prob of Mgt								
5132 Prin & Prob of Mgt								
5133 Prin & Prob of Mgt								
5141 OR Methods I								
5142 OR Methods II								
5160 App Sim Lang								
5170 Fac Plan & Mat Hand								
5180 Intro Org Theory & Des								
5190 Ind Sys Sim								
5220 Adv Ind Automation								
5230 Forecasting Models								
5240 Queueing Theory I								
5250 Adv Quality Control								
5260 Quality Cntrl & Rel								
5270 Models in Rel Eng								
5280 Proc & Inv Theory								
5311 Des & Eval M/M Sys								
5312 Des & Eval M/M Sys								
5330 Res Des Proj HF Eng								
5340 Integer Math Prog								
5361 Anal Stoch Sys I								
5362 Anal Stoch Sys II								
5370 Des Anal Ind Trng Sys								
5380 Anth Workplace Des								
5390 Anal Com Int Sys T Sim								
5400 Work & Motivation								
5410 Info Sys Anal & Des								
5450 Lab Meth HF Res								
5460 Manuf Sys Anal								
5470 Manf Costs & Prod Econ								
5480 Prc Eng & Anal								
5490 Prod Planning & Sched								
5940 Seminar								
5950 Seminar Appl Prob								
5980 Special Study								

1 Teaching a particular course
2 Good fit between research interests and courses
3 Teaching honors courses
4 Teaching in area of expertise
5 Faculty enrichment
6 Teaching classes of reasonable size
7 Least number of preparations
8 Teaching for textbook development

Figure 2 (continued). The Preference Questionnaire

	1	2	3	4	5	6	7	8
6030 Ind Sys Opt								
6040 Adv Ind Prog								
6061 Dynamic Prog I								
6062 Dynamic Prog II								
6110 Adv Prod Sched								
6241 Queueing Theory II								
6242 Queueing Theory III								
6280 Inventory Theory								
6310 Man Cntrl Theory								
6320 HF in Display Sys								
6350 Math Meth OR II								
6360 App Stoch Proc in OR								
6370 Ind Trng Tech								
6380 Adv Topics in HF Eng								
6460 Mfg Sys & Cntrl								
64XX Math Mod M/M Sys								

1 Teaching a particular course
2 Good fit between research interests and courses
3 Teaching honors courses
4 Teaching in area of expertise
5 Faculty enrichment
6 Teaching classes of reasonable size
7 Least number of preparations
8 Teaching for textbook development

Figure 2 (continued). The Preference Questionnaire

This computer program (1) averages the standardized values of the goals from the preference program, (2) allows input of faculty preferences for courses from the preference questionnaire, and (3) assigns a value to each course a faculty member indicated a preference for by taking the sum of the average values of the goals indicated; an integer value is added to that sum if the course was listed as one of the five most preferred courses to teach on the preference questionnaire. The integer value is a whole number from one to five, five being assigned to the most preferred course.

A complete listing of the program, including variable assignments is provided in Appendix B.

3.2.5 THE ASSIGNMENT PROGRAM

The purpose of the assignment program is to make faculty member/course assignments based on (1) committee information, (2) faculty preferences, and (3) historical data where (1) and (2) are not available. This computer program questions the user about the term being scheduled, the courses to be offered during that term, faculty availability for teaching, and committee and/or historical data needed for making direct course assignments. Three reports are provided to the user: (1) a listing of the courses offered for the term being scheduled, (2) a listing of the direct assignments made, if any, and (3) a final listing of the courses and their corresponding assignment, if a match was possible. These reports will be discussed in further detail in Chapters 5 and 6. Faculty availability

and a maximum number of credit hours that can be taught by each faculty member are constraining factors to the system.

A complete listing of the program and its associated variable assignments is given in Appendix C. The user's guide appears in Appendix H.

3.3 CERTIFICATION OF EXEMPTION INVOLVING HUMAN SUBJECTS

Because this research involved the use of human subjects and was carried out under the auspices of Virginia Tech, a review of the study had to be conducted by the Institutional Review Board (IRB) on Research Involving Human Subjects to comply with the requirements of the Code of Federal Regulations 45 CFR 46 on the Protection of Human Subjects. An exemption was applied for, and granted, under Part 46.101(b) Human Subjects not at risk.

3.4 SUMMARY

The author feels that these procedures are well-suited to the development of a method for determining faculty member teaching assignments. The questionnaires are designed to fit the needs of both the faculty member and the scheduler. The scheduler is able to obtain the information he needs in a straight-forward, unobtrusive, and objective manner. The ease of use makes the faculty members' tasks simple and requires little effort on their part.

The three computer programs are designed with the user in mind, ease of use being the mainstay in each one. The preference program is especially useful in determining faculty preferences for the goals; using direct assessment techniques, in combination with pair-wise comparison ranking methods, has been reported by Johnson and Huber [11] as being useful in structuring value assessments. Ranking methods, because they are so common to everyday living, are intuitively appealing to many decision makers [11].

4.0 CHAPTER 4. THE CASE STUDY

4.1 INTRODUCTION

The Department of Industrial Engineering and Operations Research (IEOR) at Virginia Tech was selected for use as the case study for several reasons; exhibited need and generalizability being the major contributing factors of its selection.

The department is divided into four major option areas: Operations Research, Management Systems, Manufacturing Systems, and Human Factors; faculty members typically teach only in their field of expertise. Occasionally, however, faculty members with the interest and expertise to do so, teach in more than one option area. This situation is found most often between the Management Systems and Manufacturing Systems options. Although this is more often the exception than the rule, it provides constraining factors to the scheduling problem not unique to this department, and therefore it serves as a useful representation of a typical University department. Additionally, the need exists, in the department, for a scheduling system capable of efficiently producing alternative feasible schedules. The system must be flexible enough to accommodate the dynamic needs of both the faculty and the department.

4.2   THE IEOR DEPARTMENT

In 1920, Paul Norton became the first head of the Department of Commercial Engineering at Virginia Tech, then called Virginia Polytechnic Institute. In 1929, the department's name was changed to Industrial Engineering, closely followed by the awarding of the first undergraduate degree the next year.   Grant Ireson succeeded Dr. Norton in 1947, with Herbert Manning assuming the post shortly thereafter and remaining the department head until 1966. The graduate program was initiated during Dr. Manning's tenure, resulting in the first graduate degree being awarded in 1950. Paul Torgersen was the department head from 1966 until 1970, at which time he became the Dean of the College of Engineering. Dean Torgersen's promotion opened the position for Marvin Agee, who held the post for three years, during which time the department's name became Industrial Engineering and Operations Research.   For the next two years, until 1975, James Moore served as the department head, releasing the administrative post to Harry Snyder, who served in this capacity until 1979.   Robert Dryden has held the position since 1979, when Dr. Snyder returned to full-time teaching and research in Human Factors.

Since its inception, the Department of Industrial Engineering and Operations Research at Virginia Tech has achieved international prominence for the excellence of its academic programs, research contributions, and professional society activities.   In its sixty-five years of service to the engineering profession, the department has conferred 2,555 bachelor's degrees, 295 master's degrees, and 76 doctoral degrees.

During the past five years, the department has experienced dramatic growth, not only in enrollments (Figure 3 on page 39 and Figure 4 on page 40), but in the amount of sponsored and unsponsored research and development conducted by faculty members and students (Figure 5 on page 41). In a study published in the March, 1984 ASEE Journal of Engineering Education, Virginia Tech ranked first in the amount of research dollars awarded and third in the amount awarded per faculty member. A steady increase can also be seen in the number of faculty members involved in academic programs and research projects. These rankings not only indicate the department's ability to support high quality research efforts, typically involving many graduate and undergraduate students, but also its strength in providing an excellent educational environment for its students.

The department currently has twenty-eight faculty members, including eleven full professors, eight associate professors, eight assistant professors, and one instructor. The results of their research projects have been published in hundreds of journals and conference proceedings, as well as numerous textbooks and monographs.

Currently, concentration at the doctorate level is limited to Operations Research, Human Factors, and Manufacturing Systems Engineering. At the master's level, concentrations may be taken in Operations Research, Human Factors, Manufacturing Systems Engineering, Management Systems Engineering, and General Option. Additionally, an off-campus program offers the Master of Engineering Administration option.

Undergraduate students receive strong preparation in all areas of study. Technical electives increase their expertise in the areas of facilities planning, industrial automation, process engineering, safety engineering, wage and salary administration, engineering psychology, systems engineering, work physiology, industrial fire control, advanced economics, material handling, and advanced quality control. Department facilities are modern and well-equipped, occupying more than twenty rooms and over ten thousand square feet of space.

The department currently offers more than one hundred different courses, with most taught at least once per academic year. At the undergraduate level, a number of these courses have several sections offered during the same term, especially those at the 2000 and 3000 level.

Because of the amount of research conducted annually by the department, as well as the number of courses offered, a scheduling situation exists in which multiple conflicting objectives cause absolute teaching assignments to be elusive. A presentation of the case study follows, addressing the above mentioned scheduling needs of the Department of Industrial Engineering and Operations Research at Virginia Tech.

4.3   THE CURRENT SCHEDULING PROCESS

The current scheduling process in the Department of Industrial Engineering and Operations Research at Virginia Tech is based on quarterly assignments for an academic year (three quarters during a nine-month period

YEAR	NUMBER OF STUDENTS	PERCENT GROWTH
1977-78	144	--
1978-79	202	40 %
1979-80	255	26 %
1980-81	296	16 %
1981-82	336	14 %
1982-83	370	10. %
1983-84	343	(7)%

Figure 3.   Departmental Undergraduate Enrollment Growth (1977-1984)

	TOTAL 1982-83	TOTAL 1983-84
OPTION ------	-------	-------
Operations Research	58	60
Human Factors	47	45
Manufacturing	34	40
	----	----
TOTAL	133	145

Figure 4.   Departmental Graduate Degrees Conferred (1982-84)

YEAR	AMOUNT
1975-76	$ 177,000
1976-77	199,000
1977-78	356,000
1978-79	732,000
1979-80	956,000
1980-81	1,060,000
1981-82	1,400,000
1982-83	1,535,000
1983-84	2,058,000

Figure 5.   Departmental Research Expenditures (1975-84)

from September to June). Summer teaching is "volunteer" and therefore
not part of the scheduling process under consideration; summer teaching
assignments are made on a case-by-case basis.

The current scheduling process is two-fold and is as follows:

1. Committees, made up of all the faculty members in a given option, meet
    on an "as-needed" basis, but at least once per academic year. From
    a list of the courses to be offered in the upcoming academic year,
    they utilize round table discussion techniques to determine who will
    teach what courses. Once a consensus has been reached, the matched
    list of faculty members to courses is given to the scheduler.

2. Individual faculty members also fill out a chart, shown in Figure 6
    on page 43, indicating their desire to teach each course offered by
    the department. This step is also done once per academic year.

3. Based on the information received from the committees, the scheduler
    assigns the faculty members to the courses they have agreed to teach.
    It should be noted however, that situational constraints may cause
    the scheduler to carry the process further. However, these situations
    are not easy to predict.

Course				Course			
H2150 Eng Economy				5180 Int Org Theory & Des			
2150 Eng Economy				5190 Ind Sys Sim			
2180 Intro to IEOR				5220 Adv Ind Automation			
3120 Ind Cost Control				5230 Forecasting Models			
3130 Methods Eng				5240 Queueing Theory I			
3200 Hum Perf in Ind Sys				5250 Adv Quality Contr			
3300 Manuf Processes				5260 Qual Contr & Rel			
3460 Comp Methods in IE				5270 Models in Rel Eng			
4050 Nuc Fuel Cycle Mgmt				5280 Proc & Inv Theory			
4070 Mat & the Economy				5311 Des Eval M-M Sys I			
4090 Principles of Ind Eng				5312 Des Eval M-M SYs II			
4100 Occ Saf & Haz Contr				5330 Res Des Proj HF Eng			
4110 Process Eng				5340 Integer Math Prog			
4150 Sys Anal Thro Sim				5361 Anal Stoch Sys I			
4160 Ind Haz Contr Lab				5362 Anal Stoch Sys II			
4200 Eng Psychology				5370 Des Anal Ind Trng Sys			
4210 Math Meth of OR				5380 Anth Workplace Des			
4211 Prod Plan & Contr				5390 Anal Com Int Sys T Sim			
4212 Plant Des & Layout				5400 Work & Motivation			
4220 Ind Automation				5410 Inf Sys Anal & Des			
4240 Ind Economy				5450 Lab Meth HF Res			
4250 Stat Quality Contr				5460 Manuf Sys Anal			
4280 Ind Sys Eng				5470 Manuf Costs & Prod Ec			
4290 Theory of Organiz				5480 Proc Eng & Anal			
4310 Det OR Models				5490 Prod Plan & Sched			
4320 Prob OR Models				5940 Seminar			
4330 Mat Hand Anal				5950 Seminar Appl Prob			
4350 Ind Quality Contr				5980 Special Study			
4360 Comp Plan & Des				6030 Ind Sys Opt			
4361 Intro Com-B Inf Sys				6040 Adv Ind Prog			
4362 Intro Com-B Inf Sys				6061 Dynamic Prog I			
4363 Intro Com-B Inf Sys				6062 Dynamic Prog II			
4370 Micro Appl in IMF				6110 Adv Prod Sched			
4380 Ind Sys Des				6241 Queueing Theory II			
4400 Ind Work Phys				6242 Queueing Theory III			
4410 Sys Safety Anal				6280 Inventory Theory			
4420 Ind Fire Control				6310 Man Cont Theo M-M Sys			
4980 Special Study				6320 HF in Display Sys			
5010 Appl Opt Meth				6350 Math Meth OR II			
5040 Math Prog I				6360 App Stoch Proc in OR			
5060 Adv Motion Time Study				6370 Ind Train Tech			
5100 Theory Graphs Net Anal				6380 Ind Topics in HF Eng			
5101 Adv Eng Economy				6460 Mfg Sys & Contr			
5102 Adv Eng Economy				64XX Math Model Hum Mach Sys			
5111 HF Res Meth I							
5112 HF Res Meth II							
5113 HF Res Meth III							
5131 Prin Prob of Mgmt							
5132 Prin Prob of Mgmt							
5133 Prin Prob of Mgmt							
5141 OR Meth I							
5142 OR Meth II							
5160 App Sim Lang							
5170 Fac Plan Mat Hand							

Scale:

1 - Competent to teach this course and I wish to teach it.
2 - Competent to teach this course but I would prefer not to teach it.
3 - Could possibly teach this course with considerable preparation and I would like to teach it.
4 - I could teach this course with considerable preparation, but would prefer not to teach it.
5 - Incompetent to teach this course.

Figure 6. Current System: Course Preference Chart

CHAPTER 4. The Case Study

For example, the scheduler may find he has:

a. a course no one wants to teach;

b. a course the committee could not come to a consensus on;

c. service courses, such as IEOR 2150 and IEOR 2180, involving certain University constraints;

d. problems with faculty members having teaching interests in more than one option, requiring extra effort to schedule those faculty members' courses;

e. an assigned course does not make, so another class must be assigned to the faculty member so he has something to teach; and/or

f. because research contracts are often not known prior to schedule finalization, new assignments must be made to account for both planned and/or unplanned research events.

If the process must be continued because of conflicts or problems such as those mentioned here, the scheduler would continue with Step 4.

4. Utilizing the information obtained from Step 2, the scheduler first determines if there is only one faculty member who has assigned a (1) to the course in question. Typically, if this condition exists, that faculty member would be assigned that course. However, if this faculty member already has a full teaching load based on the committee meetings, then one of his classes must be reassigned. This is done for all courses under consideration.

5. The scheduler must then check to see if only two faculty members have assigned a (1) to the course. If so, a tie-breaker must be conducted based on a variety of decision factors such as: if one of these faculty members been teaching this course for a significant number of

quarters, thereby implying that perhaps the other faculty member should have a chance to teach the course; or if one of the faculty members has not been receiving good evaluations when teaching this course, he may no longer be effective and needs a break from teaching it.

6. Next, if more than two faculty members have assigned a (1) to the course, the tie-breaking process must be repeated.

7. This assignment procedure (Steps 1 through 6) is continued until all courses have been assigned.

8. The scheduler reviews the assignments made and makes modifications, if necessary.

This process is very time consuming and arduous, often requiring up to eighty man-hours each term (including the time needed for all iterations necessary to produce the final teaching schedule). Additionally, faculty members may be disappointed when they receive their teaching assignments, and the courses they are to teach are those to which they had assigned (2)'s. However, because of their competence to teach the course, they may be the best person for the job. Some inadequacies may exist with this method which cannot be overlooked.

With increased enrollments every year, more sections of courses will need to be offered, especially service courses (those courses which must be taken by students in engineering majors other than industrial engineering). This will effectively increase the number of courses offered, re-quiring still more juggling for equity and effectiveness, translating

into increased work for the scheduler. Also, because the faculty members are aware of the mechanics of the system, the potential that exists for gaming to occur adds other dimensions to the scheduler's problems.

4.4 THE PROPOSED SCHEDULING SYSTEM

With the introduction of the micro-computer to the scheduler's desk comes the ability to dramatically change the future of the faculty/course assignment process. Micro-computers enable the storage, manipulation, and retrieval of data to occur with very little manual effort, as well as the reduction of errors based on the user-friendliness of the system design. Time spent on developing feasible schedules can be drastically reduced and changes to those schedules can be made rather effortlessly.

The proposed scheduling system will have the capability to both incorporate the advantages of the current scheduling system as well as to overcome some of the existing drawbacks. The use of committees will be maintained. Because of the nature of the department having four distinct concentration areas, committees enable the faculty members to attach membership to a group much smaller than that represented by the entire department. The resultant feeling of "belonging" enables the group to function more cohesively and fairly, thereby leading to a more efficient production of mutual agreement in the group decision making process.

The replacement of the questionnaire in Step 2 of the current scheduling process with the preference program and questionnaire broadens the base

upon which feasible schedules are developed and should lead to more, and better, alternative schedules being produced.

Four of the six situational problems listed in section 3.3 of this chapter, can be resolved with the proposed system. Because the system utilizes faculty preferences for courses, based on value assignments, when Item (b) (a course the committee could not come to a consensus on) is considered, the system would search for the faculty member with the highest value assignment for the course in question. If the faculty member does not have a full teaching load, the computer makes the assignment. Otherwise, the computer continues searching until a match is made or no other feasible alternatives exist. Items (d), (e), and (f) are addressed by the flexibility of the proposed system; very little time is required to produce alternative schedules to circumvent these problems. The other two situational problems require management decisions that a computer is incapable of making.

Since the system itself is relatively complex, gaming the system may be slightly more difficult than is currently the case. The intricacies of the computer programs, in conjunction with the questionnaire interaction, may make the proposed system less decipherable by the faculty members.

The prospect of spending less time on the assignment process, in addition to the possibility for a reduced gaming environment and more effective teaching assignments are distinct advantages of the proposed scheduling system.

5.0 CHAPTER 5. MODEL IMPLEMENTATION

The purpose of Chapter 5 is to present the procedures of model implementation for the case example. The majority of the chapter focuses on data collection: the reasons, the methods, and the results.

5.1 DATA COLLECTION

The methods of data collection used in this thesis were interview and questionnaire. Three questionnaires were distributed and one interview with each participating faculty member was conducted.

5.1.1 THE GOAL QUESTIONNAIRE

As described previously in Chapter 3, the purpose of the goal questionnaire shown in Figure 1 on page 23 was to determine the goals faculty members consider important in the assignment of teaching responsibilities. The data collected were the responses each faculty member gave by (1) a mark to indicate that a stated goal was important and/or (2) additional goals added to the given list. The results were used as input for the preference program. Figure 7 summarizes the results of the goal questionnaire.

```
GOAL DESCRIPTION                                        NO. OF RESPONSES


1.  Consistent observance of expected teaching load          7
2.  Teaching a particular course                            21
3.  Good fit between research interests and courses         19
4.  Least possible number of teaching days                  10
5.  Teaching the same course two terms in a row              1
6.  Teaching a variety of courses on a regular rotation      1
7.  Good mix of graduate and undergraduate courses           3
8.  Teaching honors courses (highly motivated students)      1
9.  No classes at particular times                           4
10. Graduate classes taught in three hour blocks             2
11. Minimal number of night classes                          3
12. Teaching in area of expertise                            3
13. Faculty enrichment                                       2
14. Shortest possible teaching day                           2
15. Offering a consistent sequence of courses to support
    graduate research                                        1
16. Teaching classes of reasonable size                      2
17. Teaching graduate classes to recruit graduate
    students to do research with you                         2
18. Least number of preparations                             6
19. Minimum of one hour between classes                      1
20. Maximum number of night classes                          1
21. Teaching for textbook development                        2
22. Balanced teaching/research/graduate student loads        1

TOTAL RESPONSES                                             95




Total questionnaires distributed:   26
Total questionnaires returned:       23
Percent returned:                    88%
```

Figure 7. Results of the Goal Questionnaire

5.1.2 THE PREFERENCE PROGRAM

As stated in Chapter 3, the purpose of the preference program is to determine the ordinal preference of each faculty member for the goals indicated on the goal questionnaire. Before the program could be written, it was necessary to reduce the list of goals presented in Figure 7 on page 49 to meet the assumptions of the Churchman and Ackoff model. Figure 8 shows the reduced list of goals.

The reasons for removing seven of the original twenty-two goals were as follows:

Goal 10 -- Scheduling problem outside the scope of this research.

Goal 11 -- Violates additivity assumption when Goal 20 is also considered.

Goal 14 -- Violates additivity assumption when Goal 19 is also considered.

Goal 15 -- Scheduling problem outside the scope of this research.

Goal 17 -- Scheduling problem outside the scope of this research.

Goal 19 -- Violates additivity assumption when Goal 14 is also considered.

Goal 20 -- Violates additivity assumption when Goal 11 is also considered.

Personal interviews with faculty members were used to collect data for the preference program.

1. Consistent observance of expected teaching load

2. Teaching a particular course

3. Good fit between research interests and courses

4. Least possible number of teaching days

5. Teaching the same course two terms in a row

6. Teaching a variety of courses on a regular rotation

7. Good mix of graduate and undergraduate courses

8. Teaching honors courses (highly motivated students)

9. No classes at particular times

10. Teaching in area of expertise

11. Faculty enrichment

12. Teaching classes of reasonable size

13. Least number of preparations

14. Teaching for textbook development

15. Balanced teaching/research/graduate student loads

Figure 8. Reduced List of Goals for Preference Program

Interviews were scheduled in advance and lasted approximately thirty minutes. A description of the interview process using the preference program follows.

5.1.2.1 AN EXAMPLE INTERVIEW SESSION

1. A brief overview of the preference program is given by the interviewer, including: the purpose, the types of responses expected, the program procedure, the results to be obtained and their meaning, and what will be done with the results.

2. Screen 1 is explained when it appears. The faculty member is told that he must rank order the goals based on degree of importance to him (no value is to be assigned). When the faculty member has finished ordering the goals, Screen 2 appears, showing a numbered listing of the complete rank ordering.

3. Screen 3 is explained as showing the random assignment of goals to each of three groups and the addition of the standard goal (G_s) to each group.

4. Screen 4 prompts the faculty member to assign values between 1 and 999 to each of the goals in the first group that initially reflect the preference of the goal under consideration in relation to G_s and the other goals in the group.

5. After initial value assignments are made to all goals in the first group, the faculty member is led through a question-and-answer routine using modified pair-wise comparisons of the goals and their assigned values. Values are adjusted, if necessary, although the value

of 1000 is always maintained for the G_s, as are the relative values of the other goals.

6. Step 5 is repeated for all groups.

7. After values have been assigned to all groups, the final screen appears, showing the initial rank ordering, the value assignments, and the standardized value associated with the value assignment. This summary screen enables the faculty member to see if his internal consistency was maintained when he assigned values to the ranked goals.

8. At this point, the faculty member has the opportunity to return to the first group of goals and begin again from this point in assigning values. He would make the decision based on how accurately he feels the final rank ordering of the goals (based on the values he assigned) reflects his preference ordering for the goals.

9. If the faculty member is satisfied with the final ordering, and indicates this, the data is stored in a sequential data file on the disk.

10. This process is repeated for all faculty members willing to participate, and their data is stored in the same data file.

For more detailed explanations of the screens and method of operation of the program, refer to the "Preference Program User's Guide" in Appendix D.

For the case study, twenty-one faculty members participated in the preference program. A listing of the data recorded in the data file can be found in Appendix E.

5.1.3 THE PREFERENCE QUESTIONNAIRE

The data collected by this questionnaire, shown in Figure 2 on page 28, are faculty member preferences for courses based on the course-specific goals and the five most desired courses each faculty member would like to teach. The course-specific goals were:

1. Teaching a particular course (Goal 2)

2. Good fit between research interests and courses (Goal 3)

3. Teaching honors courses (Goal 8)

4. Teaching in area of expertise (Goal 12)

5. Faculty enrichment (Goal 13)

6. Teaching classes of reasonable size (Goal 16)

7. Least number of preparations (Goal 18)

8. Teaching for textbook development (Goal 21)

Twenty-six questionnaires were distributed and twenty-one were returned, for a response rate of eighty-one percent. The responses were used for input into the value assessment program and as information for the direct assignments to be made in the assignment program.

5.1.4 THE VALUE ASSESSMENT PROGRAM

The value assessment program converted the data received from the pref-
erence program and preference questionnaire into information to be used
by the assignment program. The data input for this program required ap-
proximately 45 minutes. The information that resulted were value as-
signments representing each participating faculty member's preference for
teaching the courses offered by the department.

A listing of the value assessment program is provided in Appendix B, the
User's Guide in Appendix F, and the data listing in Appendix G.

5.1.5 THE ASSIGNMENT PROGRAM

The assignment program used information provided by the value assessment
program, committee reports, and historical information to prepare feasi-
ble teaching assignments. Four alternative schedules for Fall and Winter
were prepared by the assignment program. Each alternative schedule took
approximately 30 minutes to prepare, including: determination of the di-
rect assignments, entering necessary data (courses offered, faculty mem-
ber availability, and direct assignments), and printing. The method of
direct assignment used accounts for the majority of the differences in
the schedules. These and other differences will be discussed in Chapter
6.

The following subsections provide summary information pertaining to each of the alternative schedules, including: the courses offered, the method of direct assignments used for each schedule, the direct assignments made, and the alternative schedules.

5.1.5.1   SCHEDULE 1 (FALL AND WINTER)

The method of direct assignment used was:

1.   All assignments as stated on faculty committee lists were made.
2.   One assignment was made from the preference questionnaire for each faculty member without faculty committee information.
3.   For each faculty member unable to provide committee information or preference questionnaire, one assignment was made based on historical information.

This method of direct assignment is the same as that used by the current system (without Step 2). The Fall and Winter schedules developed using this method will be presented for system comparison purposes in Chapter 6. The Fall and Winter tentative schedules, as assigned by the current system are shown in Figure 9 on page 61 and Figure 14 on page 66.

5.1.5.2   SCHEDULE 2 (FALL AND WINTER)

The method of direct assignment used was:

1. One assignment for each faculty member with faculty committee information was made.

2. One assignment was made from the preference questionnaire for each faculty member without committee information.

3. For each faculty member unable to provide committee information or preference questionnaire, one/two assignments were made based on historical information.

5.1.5.3 SCHEDULE 3 (FALL AND WINTER)

The method of direct assignment used was:

1. One assignment was made for each faculty member from preference questionnaire, if available.

2. One/two assignments were made from faculty committee list, if preference questionnaires were unavailable.

3. For each faculty member unable to provide committee information or preference questionnaire, one/two assignments were made based on historical information.

5.1.5.4 SCHEDULE 4 (FALL AND WINTER)

The method of direct assignment used was:

1. Assignments were made for faculty members without preference questionnaires and for special study courses only.

The following tables show summary statistics regarding the alternative schedules. Figures 9 and 14 show the tentative schedules, as assigned by the current system, for Fall and Winter quarters, respectively. Proposed system alternative schedules are shown in Figures 10 through 13 (Fall) and Figures 15 through 18 (Winter). Listings of the courses to be offered Fall and Winter quarters appear in Appendix I and the direct assignments made for each alternative schedule are shown in Appendix J.

Table 1.   Data Decomposition of Alternative Fall Schedules

SCHEDULE	DIRECTLY ASSIGNED *	COMPUTER ASSIGNED *	NOT ASSIGNED *	TOTAL OFFERED*	FIG
Fall 1	26/77 (65%)	6/19 (15%)	8/24 (20%)	40/120	10
Fall 2	20/58 (50%)	12/38 (30%)	8/24 (20%)	40/120	11
Fall 3	21/60 (52%)	11/35 (28%)	8/25 (20%)	40/120	12
Fall 4	7/20 (18%)	24/76 (60%)	9/24 (22%)	40/120	13

* Courses/Hours

Table 2.   Data Decomposition of Alternate Winter Schedules

SCHEDULE	DIRECTLY ASSIGNED *	COMPUTER ASSIGNED *	NOT ASSIGNED *	TOTAL OFFERED*	FIG
Winter 1	25/68 (56%)	9/35 (20%)	11/36 (24%)	45/139	15
Winter 2	21/65 (46%)	12/37 (27%)	12/37 (27%)	45/139	16
Winter 3	22/67 (49%)	11/34 (24%)	12/38 (27%)	45/139	17
Winter 4	6/19 (13%)	24/76 (53%)	15/44 (34%)	45/139	18

* Course/Hours

```
                    FALL   QUARTER


     THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:


              IEOR  2011 (2 CR) -- DR. GREENE
              IEOR A2150 (3 CR) -- DR. FABRYCKY
              IEOR B2150 (3 CR) -- DR. FABRYCKY
              IEOR C2150 (3 CR) -- DR. FABRYCKY
              IEOR A2180 (3 CR) -- ** NO ASSIGNMENT **
              IEOR B2180 (3 CR) -- ** NO ASSIGNMENT **
              IEOR A3120 (4 CR) -- DR. JONES
              IEOR A3300 (3 CR) -- DR. GREENE
              IEOR B3300 (3 CR) -- DR. GREENE
              IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
              IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
              IEOR  4100 (3 CR) -- DR. PRICE
              IEOR  4200 (3 CR) -- DR. CASALI
              IEOR A4210 (3 CR) -- DR. SCHMIDT
              IEOR B4210 (3 CR) -- DR. SCHMIDT
              IEOR A4211 (3 CR) -- DR. SARIN
              IEOR B4211 (3 CR) -- DR. SARIN
              IEOR C4211 (3 CR) -- DR. SARIN
              IEOR  4240 (3 CR) -- DR. JONES
              IEOR A4250 (4 CR) -- DR. NACHLAS
              IEOR B4250 (4 CR) -- DR. NACHLAS
              IEOR A4320 (3 CR) -- ** NO ASSIGNMENT **
              IEOR  4400 (3 CR) -- DR. KROEMER
              IEOR  4980 (3 CR) -- DR. DEISENROTH
              IEOR  5040 (3 CR) -- DR. SHERALI
              IEOR  5101 (3 CR) -- DR. GHARE
              IEOR  5111 (3 CR) -- DR. SNYDER
              IEOR  5131 (3 CR) -- DR. SINK
              IEOR  5141 (3 CR) -- DR. SHERALI
              IEOR  5250 (3 CR) -- DR. GHARE
              IEOR  5311 (3 CR) -- DR. CASALI
              IEOR  5361 (3 CR) -- DR. DISNEY
              IEOR  5380 (3 CR) -- DR. KROEMER
              IEOR  5410 (3 CR) -- DR. KURSTEDT
              IEOR  5450 (3 CR) -- DR. WIERWILLE
              IEOR  5490 (3 CR) -- DR. SARIN
              IEOR  5940 (1 CR) -- DR. SCHMIDT
              IEOR  5950 (1 CR) -- DR. DISNEY
              IEOR  6360 (3 CR) -- DR. DISNEY
              IEOR  6370 (3 CR) -- DR. WILLIGES
```

Figure 9. Current System: Tentative Fall Schedule

```
                    FALL   QUARTER


THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


        IEOR  2011 (2 CR) -- DR. GREENE
        IEOR A2150 (3 CR) -- DR. FABRYCKY
        IEOR B2150 (3 CR) -- DR. FABRYCKY
        IEOR C2150 (3 CR) -- DR. FABRYCKY
        IEOR A2180 (3 CR) -- DR. GREENE
        IEOR B2180 (3 CR) -- DR. GREENE
        IEOR A3120 (4 CR) -- DR. GHARE
        IEOR A3300 (3 CR) -- DR. DEISENROTH
        IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
        IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
        IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
        IEOR  4100 (3 CR) -- DR. PRICE
        IEOR  4200 (3 CR) -- DR. KROEMER
        IEOR A4210 (3 CR) -- DR. SCHMIDT
        IEOR B4210 (3 CR) -- DR. SHERALI
        IEOR A4211 (3 CR) -- DR. JONES
        IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
        IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  4240 (3 CR) -- DR. JONES
        IEOR A4250 (4 CR) -- DR. NACHLAS
        IEOR B4250 (4 CR) -- DR. NACHLAS
        IEOR A4320 (3 CR) -- DR. DISNEY
        IEOR  4400 (3 CR) -- DR. CASALI
        IEOR  4980 (3 CR) -- DR. DEISENROTH
        IEOR  5040 (3 CR) -- DR. SHERALI
        IEOR  5101 (3 CR) -- DR. GHARE
        IEOR  5111 (3 CR) -- DR. SNYDER
        IEOR  5131 (3 CR) -- DR. SINK
        IEOR  5141 (3 CR) -- DR. SARIN
        IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5311 (3 CR) -- DR. CASALI
        IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5380 (3 CR) -- DR. KROEMER
        IEOR  5410 (3 CR) -- DR. KURSTEDT
        IEOR  5450 (3 CR) -- DR. WIERWILLE
        IEOR  5490 (3 CR) -- DR. SARIN
        IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
        IEOR  5950 (1 CR) -- DR. DISNEY
        IEOR  6360 (3 CR) -- DR. DISNEY
        IEOR  6370 (3 CR) -- DR. WILLIGES
```

Figure 10. Proposed System: Fall Schedule 1

```
                    FALL   QUARTER


THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


            IEOR  2011 (2 CR) -- DR. GREENE
            IEOR A2150 (3 CR) -- DR. FABRYCKY
            IEOR B2150 (3 CR) -- DR. FABRYCKY
            IEOR C2150 (3 CR) -- DR. JONES
            IEOR A2180 (3 CR) -- DR. CASALI
            IEOR B2180 (3 CR) -- DR. GREENE
            IEOR A3120 (4 CR) -- DR. GHARE
            IEOR A3300 (3 CR) -- DR. DEISENROTH
            IEOR B3300 (3 CR) -- DR. GREENE
            IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
            IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
            IEOR  4100 (3 CR) -- DR. PRICE
            IEOR  4200 (3 CR) -- DR. WILLIGES
            IEOR A4210 (3 CR) -- DR. SCHMIDT
            IEOR B4210 (3 CR) -- DR. SHERALI
            IEOR A4211 (3 CR) -- DR. SARIN
            IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
            IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4240 (3 CR) -- DR. JONES
            IEOR A4250 (4 CR) -- DR. NACHLAS
            IEOR B4250 (4 CR) -- DR. NACHLAS
            IEOR A4320 (3 CR) -- DR. DISNEY         .
            IEOR  4400 (3 CR) -- DR. KROEMER
            IEOR  4980 (3 CR) -- DR. DEISENROTH
            IEOR  5040 (3 CR) -- DR. SHERALI
            IEOR  5101 (3 CR) -- DR. GHARE
            IEOR  5111 (3 CR) -- DR. SNYDER
            IEOR  5131 (3 CR) -- DR. SINK
            IEOR  5141 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5311 (3 CR) -- DR. CASALI
            IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5380 (3 CR) -- DR. KROEMER
            IEOR  5410 (3 CR) -- DR. KURSTEDT
            IEOR  5450 (3 CR) -- DR. WIERWILLE
            IEOR  5490 (3 CR) -- DR. SARIN
            IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
            IEOR  5950 (1 CR) -- DR. DISNEY
            IEOR  6360 (3 CR) -- DR. DISNEY
            IEOR  6370 (3 CR) -- DR. WILLIGES
```

Figure 11.   Proposed System: Fall Schedule 2

```
                    FALL   QUARTER


THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


          IEOR  2011 (2 CR) -- DR. GREENE
          IEOR A2150 (3 CR) -- DR. FABRYCKY
          IEOR B2150 (3 CR) -- DR. FABRYCKY
          IEOR C2150 (3 CR) -- DR. JONES
          IEOR A2180 (3 CR) -- DR. CASALI
          IEOR B2180 (3 CR) -- DR. GREENE
          IEOR A3120 (4 CR) -- DR. GHARE
          IEOR A3300 (3 CR) -- DR. DEISENROTH
          IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
          IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
          IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
          IEOR  4100 (3 CR) -- DR. PRICE
          IEOR  4200 (3 CR) -- DR. WILLIGES
          IEOR A4210 (3 CR) -- DR. SCHMIDT
          IEOR B4210 (3 CR) -- DR. SARIN
          IEOR A4211 (3 CR) -- DR. GREENE
          IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
          IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
          IEOR  4240 (3 CR) -- DR. JONES
          IEOR A4250 (4 CR) -- DR. NACHLAS
          IEOR B4250 (4 CR) -- ** NO ASSIGNMENT **
          IEOR A4320 (3 CR) -- DR. DISNEY
          IEOR  4400 (3 CR) -- DR. KROEMER
          IEOR  4980 (3 CR) -- DR. DEISENROTH
          IEOR  5040 (3 CR) -- DR. SHERALI
          IEOR  5101 (3 CR) -- DR. GHARE
          IEOR  5111 (3 CR) -- DR. SNYDER
          IEOR  5131 (3 CR) -- DR. SINK
          IEOR  5141 (3 CR) -- DR. SHERALI
          IEOR  5250 (3 CR) -- DR. NACHLAS
          IEOR  5311 (3 CR) -- DR. CASALI
          IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
          IEOR  5380 (3 CR) -- DR. KROEMER
          IEOR  5410 (3 CR) -- DR. KURSTEDT
          IEOR  5450 (3 CR) -- DR. WIERWILLE
          IEOR  5490 (3 CR) -- DR. SARIN
          IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
          IEOR  5950 (1 CR) -- DR. DISNEY
          IEOR  6360 (3 CR) -- DR. DISNEY
          IEOR  6370 (3 CR) -- DR. WILLIGES
```

Figure 12. Proposed System: Fall Schedule 3

```
                    FALL   QUARTER


THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


        IEOR  2011 (2 CR) -- DR. GREENE
        IEOR A2150 (3 CR) -- DR. FABRYCKY
        IEOR B2150 (3 CR) -- DR. FABRYCKY
        IEOR C2150 (3 CR) -- DR. JONES
        IEOR A2180 (3 CR) -- DR. CASALI
        IEOR B2180 (3 CR) -- DR. GREENE
        IEOR A3120 (4 CR) -- DR. GHARE
        IEOR A3300 (3 CR) -- DR. DEISENROTH
        IEOR B3300 (3 CR) -- DR. GREENE
        IEOR A3460 (4 CR) -- DR. GHARE
        IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
        IEOR  4100 (3 CR) -- DR. PRICE
        IEOR  4200 (3 CR) -- DR. KROEMER
        IEOR A4210 (3 CR) -- DR. SCHMIDT
        IEOR B4210 (3 CR) -- DR. SCHMIDT
        IEOR A4211 (3 CR) -- DR. SARIN
        IEOR B4211 (3 CR) -- DR. SARIN
        IEOR C4211 (3 CR) -- DR. JONES
        IEOR  4240 (3 CR) -- ** NO ASSIGNMENT **
        IEOR A4250 (4 CR) -- DR. NACHLAS
        IEOR B4250 (4 CR) -- DR. NACHLAS
        IEOR A4320 (3 CR) -- DR. DISNEY
        IEOR  4400 (3 CR) -- DR. KROEMER
        IEOR  4980 (3 CR) -- DR. DEISENROTH
        IEOR  5040 (3 CR) -- DR. SHERALI
        IEOR  5101 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5111 (3 CR) -- DR. SNYDER
        IEOR  5131 (3 CR) -- DR. SINK
        IEOR  5141 (3 CR) -- DR. SHERALI
        IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5311 (3 CR) -- DR. CASALI
        IEOR  5361 (3 CR) -- DR. DISNEY
        IEOR  5380 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5410 (3 CR) -- DR. KURSTEDT
        IEOR  5450 (3 CR) -- DR. WIERWILLE
        IEOR  5490 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
        IEOR  5950 (1 CR) -- ** NO ASSIGNMENT **
        IEOR  6360 (3 CR) -- ** NO ASSIGNMENT **
        IEOR  6370 (3 CR) -- DR. WILLIGES
```

Figure 13. Proposed System: Fall Schedule 4

```
                    WINTER QUARTER

      THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

            IEOR H2150 (3 CR) -- DR. GREENE
            IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
            IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
            IEOR A2180 (3 CR) -- DR. CASALI
            IEOR A3130 (4 CR) -- DR. KEMMERLING
            IEOR B3130 (4 CR) -- DR. CASALI
            IEOR A3200 (4 CR) -- DR. WILLIGES
            IEOR A3300 (3 CR) -- DR. DEISENROTH
            IEOR B3300 (3 CR) -- DR. JONES
            IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
            IEOR  4100 (3 CR) -- DR. PRICE
            IEOR A4150 (4 CR) -- ** NO ASSIGNMENT **
            IEOR B4150 (4 CR) -- DR. DEISENROTH
            IEOR  4200 (3 CR) -- DR. KROEMER
            IEOR A4210 (3 CR) -- DR. SCHMIDT
            IEOR A4212 (3 CR) -- DR. SARIN
            IEOR B4212 (3 CR) -- DR. SARIN
            IEOR C4212 (3 CR) -- DR. SARIN
            IEOR  4220 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4290 (3 CR) -- DR. TORGERSEN
            IEOR A4310 (3 CR) -- DR. GHARE
            IEOR B4310 (3 CR) -- DR. GHARE
            IEOR  4350 (3 CR) -- DR. NACHLAS
            IEOR  4362 (3 CR) -- DR. KURSTEDT
            IEOR  4420 (3 CR) -- DR. PRICE
            IEOR  5010 (3 CR) -- DR. SHERALI
            IEOR  5102 (3 CR) -- DR. GHARE
            IEOR  5112 (3 CR) -- DR. SNYDER
            IEOR  5132 (3 CR) -- DR. SINK
            IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5190 (3 CR) -- DR. SCHMIDT
            IEOR  5230 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
            IEOR A5280 (3 CR) -- DR. NACHLAS
            IEOR B5280 (3 CR) -- DR. FABRYCKY
            IEOR  5312 (3 CR) -- DR. WIERWILLE
            IEOR  5340 (3 CR) -- DR. SHERALI
            IEOR  5362 (3 CR) -- DR. DISNEY
            IEOR  5370 (3 CR) -- DR. WILLIGES
            IEOR  5470 (3 CR) -- DR. JONES
            IEOR  5950 (1 CR) -- DR. DISNEY
            IEOR  5980 (3 CR) -- DR. GREENE
            IEOR  6241 (3 CR) -- DR. DISNEY
            IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Figure 14. Current System: Tentative Winter Schedule

```
                    WINTER QUARTER

THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:

            IEOR H2150 (3 CR) -- DR. GREENE
            IEOR A2150 (3 CR) -- DR. GHARE
            IEOR B2150 (3 CR) -- DR. KURSTEDT
            IEOR A2180 (3 CR) -- DR. CASALI
            IEOR A3130 (4 CR) -- DR. KEMMERLING
            IEOR B3130 (4 CR) -- DR. KROEMER
            IEOR A3200 (4 CR) -- DR. KEMMERLING
            IEOR A3300 (3 CR) -- DR. DEISENROTH
            IEOR B3300 (3 CR) -- DR. JONES
            IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
            IEOR  4100 (3 CR) -- DR. PRICE
            IEOR A4150 (4 CR) -- DR. SCHMIDT
            IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
            IEOR  4200 (3 CR) -- DR. KROEMER
            IEOR A4210 (3 CR) -- DR. SARIN
            IEOR A4212 (3 CR) -- DR. SARIN
            IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
            IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4220 (3 CR) -- DR. DEISENROTH
            IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4290 (3 CR) -- DR. TORGERSEN
            IEOR A4310 (3 CR) -- DR. SHERALI
            IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4350 (3 CR) -- DR. NACHLAS
            IEOR  4362 (3 CR) -- DR. KURSTEDT
            IEOR  4420 (3 CR) -- DR. PRICE
            IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5112 (3 CR) -- DR. SNYDER
            IEOR  5132 (3 CR) -- DR. SINK
            IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5190 (3 CR) -- DR. SCHMIDT
            IEOR  5230 (3 CR) -- DR. GHARE
            IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
            IEOR A5280 (3 CR) -- DR. NACHLAS
            IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5312 (3 CR) -- DR. CASALI
            IEOR  5340 (3 CR) -- DR. SHERALI
            IEOR  5362 (3 CR) -- DR. DISNEY
            IEOR  5370 (3 CR) -- DR. WILLIGES
            IEOR  5470 (3 CR) -- DR. JONES
            IEOR  5950 (1 CR) -- DR. DISNEY
            IEOR  5980 (3 CR) -- DR. GREENE
            IEOR  6241 (3 CR) -- DR. DISNEY
            IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Figure 15. Proposed System: Winter Schedule 1

```
                        WINTER QUARTER
     THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


               IEOR H2150 (3 CR) -- DR. GREENE
               IEOR A2150 (3 CR) -- DR. GHARE
               IEOR B2150 (3 CR) -- DR. SHERALI
               IEOR A2180 (3 CR) -- DR. DEISENROTH
               IEOR A3130 (4 CR) -- DR. KROEMER
               IEOR B3130 (4 CR) -- DR. KEMMERLING
               IEOR A3200 (4 CR) -- DR. KEMMERLING
               IEOR A3300 (3 CR) -- DR. JONES
               IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
               IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
               IEOR  4100 (3 CR) -- DR. PRICE
               IEOR A4150 (4 CR) -- DR. SCHMIDT
               IEOR B4150 (4 CR) -- DR. SCHMIDT
               IEOR  4200 (3 CR) -- DR. CASALI
               IEOR A4210 (3 CR) -- DR. SARIN
               IEOR A4212 (3 CR) -- DR. SARIN
               IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
               IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  4220 (3 CR) -- DR. DEISENROTH
               IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  4290 (3 CR) -- DR. KURSTEDT
               IEOR A4310 (3 CR) -- ** NO ASSIGNMENT **
               IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  4350 (3 CR) -- DR. NACHLAS
               IEOR  4362 (3 CR) -- DR. KURSTEDT
               IEOR  4420 (3 CR) -- DR. PRICE
               IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  5112 (3 CR) -- DR. SNYDER
               IEOR  5132 (3 CR) -- DR. SINK
               IEOR  5142 (3 CR) -- DR. DISNEY
               IEOR  5190 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  5230 (3 CR) -- DR. GHARE
               IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
               IEOR A5280 (3 CR) -- DR. NACHLAS
               IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  5312 (3 CR) -- DR. CASALI
               IEOR  5340 (3 CR) -- DR. SHERALI
               IEOR  5362 (3 CR) -- DR. DISNEY
               IEOR  5370 (3 CR) -- DR. WILLIGES
               IEOR  5470 (3 CR) -- DR. JONES
               IEOR  5950 (1 CR) -- DR. DISNEY
               IEOR  5980 (3 CR) -- DR. GREENE
               IEOR  6241 (3 CR) -- ** NO ASSIGNMENT **
               IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Figure 16.   Proposed System: Winter Schedule 2

WINTER QUARTER

THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:

```
IEOR H2150 (3 CR) -- DR. KURSTEDT
IEOR A2150 (3 CR) -- DR. JONES
IEOR B2150 (3 CR) -- DR. GHARE
IEOR A2180 (3 CR) -- DR. GREENE
IEOR A3130 (4 CR) -- DR. KEMMERLING
IEOR B3130 (4 CR) -- DR. KROEMER
IEOR A3200 (4 CR) -- DR. KEMMERLING
IEOR A3300 (3 CR) -- DR. DEISENROTH
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR A4150 (4 CR) -- DR. SCHMIDT
IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4200 (3 CR) -- DR. CASALI
IEOR A4210 (3 CR) -- DR. SARIN
IEOR A4212 (3 CR) -- DR. SARIN
IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4220 (3 CR) -- DR. DEISENROTH
IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4290 (3 CR) -- DR. TORGERSEN
IEOR A4310 (3 CR) -- DR. SHERALI
IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4350 (3 CR) -- DR. NACHLAS
IEOR  4362 (3 CR) -- DR. KURSTEDT
IEOR  4420 (3 CR) -- DR. PRICE
IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5112 (3 CR) -- DR. SNYDER
IEOR  5132 (3 CR) -- DR. SINK
IEOR  5142 (3 CR) -- DR. DISNEY
IEOR  5190 (3 CR) -- DR. SCHMIDT
IEOR  5230 (3 CR) -- DR. GHARE
IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
IEOR A5280 (3 CR) -- DR. NACHLAS
IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5312 (3 CR) -- DR. WIERWILLE
IEOR  5340 (3 CR) -- DR. SHERALI
IEOR  5362 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5370 (3 CR) -- DR. WILLIGES
IEOR  5470 (3 CR) -- DR. JONES
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  5980 (3 CR) -- DR. GREENE
IEOR  6241 (3 CR) -- DR. DISNEY
IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Figure 17.   Proposed System: Winter Schedule 3

```
                      WINTER QUARTER
  THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:


            IEOR H2150 (3 CR) -- DR. GREENE
            IEOR A2150 (3 CR) -- DR. JONES
            IEOR B2150 (3 CR) -- DR. JONES
            IEOR A2180 (3 CR) -- DR. DEISENROTH
            IEOR A3130 (4 CR) -- DR. KEMMERLING
            IEOR B3130 (4 CR) -- DR. KEMMERLING
            IEOR A3200 (4 CR) -- DR. PRICE
            IEOR A3300 (3 CR) -- DR. DEISENROTH
            IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
            IEOR A3460 (4 CR) -- DR. GHARE
            IEOR  4100 (3 CR) -- DR. PRICE
            IEOR A4150 (4 CR) -- DR. SCHMIDT
            IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
            IEOR  4200 (3 CR) -- DR. CASALI
            IEOR A4210 (3 CR) -- DR. SARIN
            IEOR A4212 (3 CR) -- DR. SARIN
            IEOR B4212 (3 CR) -- DR. GHARE
            IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4220 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  4290 (3 CR) -- DR. TORGERSEN
            IEOR A4310 (3 CR) -- DR. SHERALI
            IEOR B4310 (3 CR) -- DR. SHERALI
            IEOR  4350 (3 CR) -- DR. NACHLAS
            IEOR  4362 (3 CR) -- DR. KURSTEDT
            IEOR  4420 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5112 (3 CR) -- DR. WILLIGES
            IEOR  5132 (3 CR) -- DR. SINK
            IEOR  5142 (3 CR) -- DR. DISNEY
            IEOR  5190 (3 CR) -- DR. SCHMIDT
            IEOR  5230 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
            IEOR A5280 (3 CR) -- DR. NACHLAS
            IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5312 (3 CR) -- DR. WIERWILLE
            IEOR  5340 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5362 (3 CR) -- DR. DISNEY
            IEOR  5370 (3 CR) -- DR. WILLIGES
            IEOR  5470 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  5950 (1 CR) -- ** NO ASSIGNMENT **
            IEOR  5980 (3 CR) -- DR. GREENE
            IEOR  6241 (3 CR) -- ** NO ASSIGNMENT **
            IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Figure 18. Proposed System: Winter Schedule 4

6.0 CHAPTER 6. CASE ANALYSIS

The purpose of Chapter 6 is to present an analysis of the results obtained from the model implementation for the case example. Consideration will be given to preparation time of the alternative schedules, levels of faculty satisfaction, and alternative schedule analysis.

6.1 ALTERNATIVE SCHEDULES

The basis for the decision to prepare alternative schedules for Fall and Winter quarters of the upcoming academic year was that tentative schedules had already developed for these quarters with the current system. By doing this, comparisons could be drawn between preparation time and level of faculty member satisfaction with the new schedule and the old schedule.[1]

6.1.1 PREPARATION TIME

As mentioned previously in Chapter 5:

1. approximately 30 minutes was required for each faculty interview;

---

[1] NEW in this instance refers to the proposed system assignments and OLD to the current system tentative assignments.

2. 45 minutes was required for data input into the value assessment
    program; and

3. 30 minutes was required to prepare each alternative schedule.

For the case example, this amounted to:

    1.   21 faculty members @ 30 min. each = 10.50 hours

    2.   Value assessment data input   = 0.75 hours

    3.   8 schedules @ 30 min. each   = 4.00 hours

                                             =====

         Total time spent   = 15.25 hours

If all faculty members had participated, the total time spent would have
increased by approximately four hours:

    1.   28 faculty members @ 30 min. each = 14.00 hours

    2.   Value assessment data input   = 1.00 hours

    3.   8 schedules @ 30 min. each   = 4.00 hours

                                             =====

         Total time spent   = 19.00 hours

Since (1) and (2) need only be done once per year, the amount of time
actually spent by the scheduler would be determined by the number of it-
erations required to produce the final teaching schedule for the quarter.
As stated in Chapter 4, under the current scheduling system, approximately
80 man-hours are required to produce the final teaching schedules each
quarter. Since each iteration using the proposed scheduling system re-
quires approximately 30 minutes, in the 80 hours it requires to develop

the final teaching schedule using the current scheduling system, 160 alternative schedules could be developed (if that number of permutations actually existed) using the proposed scheduling system. It is assumed that far fewer than 160 alternative schedules would need to be produced to arrive at a final teaching schedule for the quarter.

6.1.2 LEVEL OF FACULTY MEMBER SATISFACTION

Based on an acceptance criterion of an improved level of faculty member satisfaction (or alternatively, no reduction in the current level) the acceptability of the proposed system can be tested. An effort was made to measure to the level of faculty member satisfaction, with respect to their assigned schedules under both systems, using pre- and post-test assessment techniques. The pre-test was conducted prior to the development of the assignment program to determine the current level of faculty member satisfaction associated with the tentatively assigned schedules. Several questions were presented on the preference questionnaire (Figure 2 on page 28) for this purpose. The post-test was conducted upon completion of the assignment program. A questionnaire, shown in Figure 19 on page 74 was developed and distributed to the faculty members with assigned teaching responsibilities under the new system.

The data collected are shown in Table 3 and Table 4 for Fall and Winter quarters, respectively.

How satisfied/dissatisfied would you be with Fall 1?

_____ 5 Satisfied
_____ 4 Somewhat satisfied
_____ 3 Indifferent
_____ 2 Somewhat dissatisfied
_____ 1 Dissatisfied

How satisfied/dissatisfied would you be with Winter 1?

_____ 5 Satisfied
_____ 4 Somewhat satisfied
_____ 3 Indifferent
_____ 2 Somewhat dissatisfied
_____ 1 Dissatisfied

Figure 19. Post-test Satisfaction Questionnaire

Table 3.   Satisfaction Data Decomposition for Fall

FACULTY MEMBER	PRE-TEST	POST-TEST
A	--	---
B	2	5
C	3	2
D	5	5
E	5	---
F	2	5
G	4	5
H	5	5
I	5	---
J	5	5
K	5	5
L	5	5
M	5	5
N	--	4
O	5	4
P	--	5
Q	5	---
R	5	5
S	3	---

Table 4.   Satisfaction Data Decomposition for Winter

FACULTY MEMBER	PRE-TEST	POST-TEST
A	--	---
B	2	5
C	3	2
D	4	5
E	2	---
F	5	5
G	4	4
H	5	5
I	5	---
J	5	5
K	5	5
L	5	5
M	4	2
N	--	5
O	5	5
P	--	5
Q	1	---
R	3	5
S	1	---

The perceived level of satisfaction was based on the following scale:

    5 -- Satisfied

    4 -- Somewhat satisfied

    3 -- Indifferent

    2 -- Somewhat dissatisfied

    1 -- Dissatisfied

Although the systems cannot be directly compared because of post-test satisfaction differences that may be a result of the differences between the current schedules and the proposed schedules (for example, the current system Fall Schedule shows five courses not assigned and Fall Schedule 1 shows eight courses not assigned), since observations of the population (the faculty members) were made in pairs (pre-test and post-test for each faculty member), use of the paired observation t-test is appropriate for analyzing system acceptability based on the differences in pre-test satisfaction and post-test satisfaction. Of course, only those faculty members with both pre-test and post-test measures could be included in the sample. Additionally, one pair of measurements had to be removed from the sample because of inconsistencies in the pre- and post-test measures. This faculty member was assigned the same courses by both the current system and the proposed system, but gave different measures of satisfaction for the identical assignments. It is first necessary to make the following assumptions:

• the observations are normally distributed, and

- the differences between the observations are normally and independently distributed.

Test statistic (t_0) = sample mean/sample variance

Degrees of freedom = 10

H_0: $\mu_1 \geq \mu_2$ would be rejected if $t_0 \geq t_{\alpha,n-1}$.

For Fall quarter:

    Sample mean   = 0.55

    Sample variance = 2.00

    Test statistic = 1.29

Since $1.29 > 1.22$ ($\alpha = .10$), to a 90% confidence level, we would reject H_0; beyond this limit, we would fail to reject H_0.

For Winter quarter:

    Sample mean   = 0.36

    Sample variance = 1.80

    Test statistic = 0.89

Since $0.89 > 0.88$ ($\alpha = .20$), to a confidence level of 80%, we would reject H_0; beyond this level however, we would fail to reject H_0.

These statistics can be interpreted to mean that to a certain degree of confidence (based on the differences between the pre- and post-test levels of satisfaction), the proposed system may be a more acceptable means of scheduling faculty members to their courses than the current system. In fact, for both Fall and Winter quarters, an increase in the aggregate level of satisfaction can be found. If the same measure reflecting the reduction in labor could be included in the comparison, the value of the proposed system would be increased further.

Additionally, if the sample size had been larger, the effects of the change in sample variance and degrees of freedom would be apparent in the test statistic and its associated critical limit of rejection of H_0. In fact, many of the faculty members with low pre-test satisfaction levels neglected to respond to the post-test questionnaire.

6.1.3 ALTERNATIVE SCHEDULE ANALYSIS

Probably the most conspicuous pieces of information in Figure 10 on page 62 and Figure 15 on page 67 are the "not assigned" values. "Not assigned" means that when control was passed to the computer program to make assignments, if a faculty member/course assignment match was not possible because of the system constraints, the computer made no assignment to the course.

The number of faculty openings that currently exist in the department could be the cause of the high values. Although the department has 28

faculty members, during Fall quarter, only 18 will be teaching (6 are full-time research and/or administration, and 4 will be leaving the department), and of the 18, one faculty member is teaching only one course because of research responsibilities. In Winter quarter, 19 faculty members will be teaching (3 are full-time research and/or administration, and 1 has a full-time teaching load outside the department), however, 3 of the 19 will be teaching only one course each.

An additional confounding factor is that, for example, even though a faculty member teaches in the Manufacturing Systems option, he may not be competent, or willing, to teach all of the manufacturing courses offered by the department. So, while there may be five faculty members with interests in the Manufacturing Systems option, if there are ten courses offered during a particular quarter, and two of those faculty members have the ability or desire to teach only one of those courses each, the remaining eight courses must be divided among the other three faculty members. Two possible solutions exist: (1) overloading one or two of the faculty members with the promise that they will have a lighter teaching load in a subsequent quarter, and/or (2) hiring additional faculty. This dilemma is not easy to resolve, but a compromise would need to be reached that most benefits those involved: the faculty, the department, and the students.

It is also interesting to note the course levels of the "not assigned" courses. For example, the Fall 1 schedule, shown in Figure 10 on page 62, has five courses (17 hours) at the undergraduate level not assigned

and only three courses (7 hours) unassigned at the graduate level. However, looking at the direct assignments made for the schedule (and its associated method of direct assignment), there were ten courses (33 hours) not directly assigned at the undergraduate level, while the three courses that received no assignment were the same three that received no direct assignment either. The apparent reason for this is that if direct assignments are made for the majority of the graduate courses, the probability that a professor will not have been assigned a full teaching load by the time control is passed to the computer program is extremely low. Results from the preference questionnaire indicate that 56% of the courses listed by the faculty members as being the most preferred, were graduate courses which account for only 52% of the courses offered. Many faculty members prefer to teach graduate courses over undergraduate courses, and if direct assignments are not limited in some manner, the candidate pool of faculty members to teach undergraduate courses will be reduced.

The Fall 4 schedule, shown in Figure 13 on page 65, represents another facet of the proposed system constructs. For this schedule, very few direct assignments were made, resulting in a higher number of "not assigned" courses at the graduate level. This was caused by the iterative nature of the assignment program itself. The program starts with the first course on the list (lower course numbers first) that is "not assigned", attempts to assign it and then moves to the next "not assigned" course. It searches the value assessment data to find the faculty member with the highest preference value without a full teaching load. This

causes the candidate pool of faculty members to be reduced dramatically by the time it begins assigning graduate courses.

7.0 CHAPTER 7. FURTHER REMARKS

This thesis provides a scheduling tool to solve the faculty/course as-
signment problem. Techniques for assigning faculty members to their
courses had previously lacked specific methods for determining faculty
member preferences for courses. Additionally, of the methods that were
computer-based, not only did they lack interactive capabilities, they
were also designed for mainframe applications. The system presented here,
designed for the micro-computer, incorporates interactive capabilities
with a heuristic algorithm, basing the solution on faculty member pref-
erence for the courses.

7.1 RECOMMENDATIONS FOR FURTHER RESEARCH

Six recommendations for further research have been identified.

1. THE   DEVELOPMENT   OF   A   METHODOLOGY   FOR   INCORPORATING   THE
    SCHEDULE-SPECIFIC DATA

According to the results of the goal questionnaire, when (time of day,
days of the week, etc.) a course is offered is a concern of the faculty
members (27% of the responses were related to schedule-specific goals);
accounting for their preferences is important. This university gives
rather flexible guidelines to the departments on scheduling of course
times; if a suitable technique could be found for making those determi-

nations, its incorporation into this system would greatly enhance the power of the scheduling tool.

2. THE COMBINATION OF THIS SYSTEM WITH A DATA BASE MANAGEMENT SYSTEM

A data base management system would allow the storage and maintenance of historical information, such as: which courses each faculty member has taught, if a faculty member has been overloaded and should be receiving a lighter teaching load in a subsequent quarter, and any other information that might need to be accessed on a regular basis for making assignments. A data base system could potentially incorporate a variety of departmental tasks as these systems are capable of assimilating large amounts of data into information useful for management decision making tasks.

3. ASSESS THE APPLICABILITY OF THIS SYSTEM TO THE ASSIGNMENT OF GRADUATE ASSISTANTS TO TEACHING AND RESEARCH APPOINTMENTS

The process of making graduate teaching and research assignments is similar to that of making faculty assignments. It is important to know the graduate student's preference for certain assignments, since this would imply interest in the subject area, ability of the student, and level of knowledge. However, the development of a scheduling tool for graduate assistantships would require the maintenance of a data base information system because of the dynamic nature of the graduate student population. The scheduler would need large amounts of information at his disposal to make efficient and effective assignments. This information would in-

clude, but is not limited to: availability of the student, grade point average, number of graduate hours completed, previous research and/or teaching assignments, and the courses taken by the student at both the undergraduate and graduate level (to help determine prior exposure to the subject matter).

4. TESTING OF THE SYSTEM ACROSS OTHER DEPARTMENTS

This would increase the sample size of the population to permit additional statistical analysis and thereby allow further system evaluation. Several departments at this university use scheduling systems similar to the one currently used by the case study department, so the application of this system for testing purposes would be appropriate.

5. WHEN SUITABLE GOAL PROGRAMMING PACKAGES ARE AVAILABLE FOR THE MICRO-COMPUTER, DEVELOP A MODEL TO TEST AGAINST THE HEURISTIC APPROACH OF THIS MODEL

Since the review of the faculty/course assignment literature made such a strong statement for the applicability of goal programming, using it for comparative purposes would allow further analysis of the acceptability of the heuristic approach.

6. PROGRAMMING ENHANCEMENTS

Although the programs written for this system currently have many user-friendly characteristics, three programming modifications are suggested:

- HELP SCREENS: on-line help screens will allow the user to become more independent of the program user's guides and will enable the scheduler to delegate more of the system update tasks to others.
- MENU SCREENS: will increase the user-friendliness of the system.
- ADDITIONAL ERROR RETURNS: will prevent misuse of the system when entering data.

The intention of these suggestions is to further enhance the capabilities and acceptability of this scheduling tool for the faculty/course assignment problem. The incorporation of these suggestions will provide a more reliable, useful, and user-friendly system.

APPENDIX A. PREFERENCE PROGRAM LISTING

```
1 'PROGRAM "PREF.BAS"  -  by Dona Chapman  - 14 July 1985
1000 CLS: KEY OFF: FOR I=1 TO 10: KEY I,"": NEXT
1010 DEFINT A-Z
1020 DIM GOAL$(15), GOAL(15), GROUP(15), RATE(15), RANK(15),
        TEMP.GOAL$(6), TEMP.RANK(6), TEMP.RATE(6)
1030 CLR = 7
1040 TUNE1$ = "MB L20 N24 N20 MF": TUNE2$ = "MB L50 N50 N45 N55 N55 N60 MF":
     TUNE3$ = "MB L15 N55 N51 MF"
1050 GOTO 1800
1060 '
1070 ' ┌─────────────────────────────────────────────────────────────────┐
     '   VARIABLES:
1080 '      GOAL$(I) = goal I (ordered by preference [initially ordered by
     '                  index number])
1090 '      GOAL(I)  = index number of the goal whose preference is I
1100 '      RANK(K)  = preference of the goal whose index number is K
1110 '      GROUP(I) = group assignment of the goal whose preference is I
1120 '      TEMP.GOAL$(J) = goal whose group index is J
1130 '      TEMP.RANK(J) = preference of the goal whose group index is J
1140 '      TEMP.RATE(J) = second ranking of the goal whose group index is J
1150 '      RATE(I)  = second ranking of the goal whose index number is K
1160 ' └─────────────────────────────────────────────────────────────────┘
1170 '
1180 '─────────────────────── KEYBOARD INPUT SUBROUTINE ───────────────────
1190 ' VARIABLES:
1200 '    OLDR - row of current field
1210 '    R - row of next field
1220 '    RETCODE - code which indicates the key that was pressed
1230 '    H - number of digits entered
1240 '─────────────────────────────────────────────────────────────────────
1250 OLDR=R: H=0: Q$(1)="": Q$(2)="": Q$(3)="": Q$(4)="": DREW!=FRE(" ")
1260 Q$=INKEY$: IF Q$="" THEN 1260
1270 IF LEN(Q$)=1 THEN Q=ASC(Q$): GOTO 1490 ELSE Q=ASC(MID$(Q$,2,1))
1280 IF Q=15   THEN RETCODE=6:  RETURN   'SHIFT TAB
1290 IF Q<59   THEN 1380                 'ALT-CHAR OR NULL
1300 IF Q=72   THEN RETCODE=1:  RETURN   'CURSOR UP
1310 IF Q=80   THEN RETCODE=2:  RETURN   'CURSOR DOWN
1320 IF Q=75   THEN RETCODE=3:  RETURN   'CURSOR LEFT
1330 IF Q=77   THEN RETCODE=4:  RETURN   'CURSOR RIGHT
1340 IF Q=73   THEN RETCODE=9:  RETURN   'PgUp
1350 IF Q=81   THEN RETCODE=10: RETURN   'PgDn
1360 ON Q-58 GOTO 1400,1410,1380,1380,1380,1380,1380,1380,1380,1380
1370 '      F1   F2   BEEP BEEP BEEP BEEP BEEP BEEP BEEP BEEP
1380 PLAY "X"+VARPTR$(TUNE1$): GOTO 1260
1390 '
1400 RETCODE=13: RETURN    'F1
1410 RETCODE=14: RETURN    'F2
1420 RETCODE=15: RETURN    'F3
1430 RETCODE=16: RETURN    'F4
1440 RETCODE=17: RETURN    'F5
1450 '
1460 RETCODE=11: RETURN    'HELP
1470 RETCODE=12: RETURN    'MENU
1480 '
1490 IF Q=9  THEN RETCODE=5: RETURN    'TAB
1500 IF Q=13 THEN RETCODE=7: RETURN    'CARRIAGE RETURN
1510 IF Q=27 THEN RETCODE=8: RETURN    'ESC
1520 IF Q=8 AND H=0 THEN PLAY "X"+VARPTR$(TUNE1$):GOTO 1260 'BKSPC & NOPREV INP
1530 IF Q=8 AND H=1 THEN Q$(H)="": H=H-1: PRINT "1" CHR$(29);: GOTO 1260
1540 IF Q=8 AND H=2 THEN Q$(H)="": H=H-1: PRINT CHR$(29) "1" Q$(H) CHR$(29);:
                       GOTO 1260
1550 IF Q=8 AND H=3 THEN Q$(H)="": H=H-1: PRINT STRING$(2,29) "1" Q$(1) Q$(H)
                       CHR$(29);: GOTO 1260
1560 IF Q=8 AND H=4 THEN Q$(H)="": H=H-1: PRINT STRING$(3,29) "1" Q$(1) Q$(2)
                       Q$(H) SPC(4) STRING$(5,29);: GOTO 1260
1570 IF (Q<48 OR Q>57) THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 1260
1580 IF H=0 THEN PRINT Q$ CHR$(29);: H=H+1: Q$(H)=Q$: GOTO 1260
1590 IF H=1 THEN PRINT CHR$(29) Q$(H) Q$ CHR$(29);: H=H+1: Q$(H)=Q$: GOTO 1260
1600 IF H=2 THEN PRINT STRING$(2,29) Q$(1) Q$(H) Q$ CHR$(29);: H=H+1: Q$(H)=Q$:
                  GOTO 1260
1610 IF H=3 THEN PRINT STRING$(3,29) Q$(1) Q$(2) Q$(H) Q$ " ";: H=H+1:
                  Q$(H)=Q$: COLOR CLR+16: PRINT CHR$(17) CHR$(196) CHR$(217)
                  STRING$(5,29);: COLOR CLR: GOTO 1260
1620 IF H=4 THEN PLAY "X"+VARPTR$(TUNE1$):GOTO 1260   'FIELD FULL
1630 '
1640 '─────────────────── CALL WINDOW SCROLLING SUBROUTINE ────────────────
1650 '
1660 DEF SEG
1670 DREW!=PEEK(VARPTR(CODE$)+1)+PEEK(VARPTR(CODE$)+2)*256
1680 IF DREW!>32768! THEN SCROLL=CSNG(DREW!-65536!) ELSE SCROLL=CSNG(DREW!)
1690 N=0
1700 CALL SCROLL(UL,LR,N)
1710 RETURN
1720 '
1730 ' NOTE:To scroll a window with an upper left corner at R1,C1 and a lower
     '       right corner at R2,C2 (inclusive), specify window coordinates
     '       to the scroll subroutine as UL=&H(R1-1)(C1-1) and LR=&H(R2-1)(C2-1).
1740 ' FOR EXAMPLE:To scroll a window with the following boundaries:
```

```
                 TOP ROW = 10, BOTTOM ROW = 14, LEFT COL = 35, RIGHT COL = 45    then
                 subtract 1 from each of the values and convert them to hexadecimal:
1750 '           TOP ROW  = 10-1 =   9 = &H09    BOTTOM ROW = 14-1 = 13 = &H0D
                 LEFT COL = 35-1 = 34 = &H22     RIGHT COL  = 45-1 = 44 = &H2E
1760 '           and assign the following values to the parameter variables:
                 (upper left)  UL = &H0922     (lower right)  LR = &H0D22
1770 '
1780 '———————————————— GOAL VARIABLE ASSIGNMENTS ————————————————
1790 '
1800 GOAL$(1)  = "Consistent observance of expected teaching load"
1810 GOAL$(2)  = "Teaching a particular course"
1820 GOAL$(3)  = "Good fit between research interests and courses"
1830 GOAL$(4)  = "Least possible number of teaching days"
1840 GOAL$(5)  = "Teaching the same course two terms in a row"
1850 GOAL$(6)  = "Teaching a variety of courses on a regular rotation"
1860 GOAL$(7)  = "Good mix of graduate and undergraduate courses"
1870 GOAL$(8)  = "Teaching honors courses (highly motivated students)"
1880 GOAL$(9)  = "No classes at particular times"
1890 GOAL$(10) = "Balanced teaching/research/graduate student loads"
1900 GOAL$(11) = "Teaching in area of expertise"
1910 GOAL$(12) = "Faculty enrichment"
1920 GOAL$(13) = "Teaching classes of reasonable size"
1930 GOAL$(14) = "Least number of preparations"
1940 GOAL$(15) = "Teaching to support textbook development"
1950 UPRBND = 15
1960 FOR I=1 TO UPRBND: GOAL(I)=I: RANK(I)=I: NEXT I
1970 '
1980 '——————— SET UP MACHINE LANGUAGE SCROLLING ROUTINE ———————
1990 '
2000 DATA 85,139,236,139,118,6,139,4,139,118,8,139,20,139
2010 DATA 118,10,139,12,183,7,180,6,205,16,93,202,6,0
2020 '
2030 CODE$=""
2040 RESTORE 2000
2050 FOR I=1 TO 28
2060   READ Q
2070   CODE$=CODE$+CHR$(Q)
2080 NEXT
2090 '————————————————————————————————————————————————————————————
2100 '
2110 'GOTO 3520   'remove this line when testing is complete
2120 '
2130 '————————————————————————————————————————————————————————————
2140 INPUT "PLEASE ENTER YOUR LAST NAME:   ",PROF.NAME$
2150 CLS
2160 '————————————————————————————————————————————————————————————
2170 TOP=4: V=4: BOT=18: LEFT1=15: LEFT2=17
2180 LOCATE 1,7,0
2190 PRINT"REORDER THE FOLLOWING GOALS WITH YOUR HIGHEST PREFERENCE AT THE TOP"
2200 LOCATE 2,24: PRINT "(PRESS ";:COLOR CLR+8:PRINT CHR$(17)CHR$(196)CHR$(217);:
           COLOR CLR: PRINT " WHEN YOU ARE FINISHED)" CHR$(13)
2210 FOR I = 1 TO UPRBND
2220   LOCATE ,LEFT2: PRINT GOAL$(I)
2230 NEXT I
2240 LOCATE 24,18: PRINT "PRESS "; COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
        PRINT " TO MOVE ARROW UP, "; COLOR CLR+8: PRINT CHR$(25);:
        COLOR CLR: PRINT " "; LOCATE 25,14
2250 PRINT "AND PRESS THE SPACE BAR TO SELECT AND DESELECT A GOAL";
2260 PLAY "X"+VARPTR$(TUNE2$)
2270 '
2280 LOCATE V,LEFT1: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
2290 Q$=INKEY$:IF Q$="" THEN 2290
2300 IF LEN(Q$)=1  THEN Q=ASC(Q$):GOTO 2380  ELSE Q=ASC(MID$(Q$,2,1))
2310 IF Q<>72 AND Q<>80 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 2290
2320 IF Q=72 THEN V=V-1   'cursor up
2330 IF Q=80 THEN V=V+1   'cursor down
2340 IF V<TOP THEN V=BOT
2350 IF V>BOT THEN V=TOP
2360 PRINT " ": GOTO 2280
2370 '
2380 IF Q<>13 AND Q<>32 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 2290
2390 IF Q=13 THEN 2580
2400 LOCATE ,LEFT2
2410 IF SCREEN(V,LEFT2,1)=CLR+8 THEN PRINT GOAL$(V-3);: FLAG=0: GOTO 2500
2420 IF FLAG=0 THEN COLOR CLR+8: PRINT GOAL$(V-3);: COLOR CLR: FLAG=1:
        MARK = V-3: GOTO 2500
2430 SWAP GOAL$(V-3),GOAL$(MARK): FLAG=0
2440 SWAP RANK(GOAL(V-3)),RANK(GOAL(MARK))
2450 SWAP GOAL(V-3),GOAL(MARK)
2460 LENGTH1=LEN(GOAL$(V-3)): LENGTH2=LEN(GOAL$(MARK))
2470 IF LENGTH1>LENGTH2 THEN 2520
2480 PRINT GOAL$(V-3) SPC(LENGTH2-LENGTH1)
2490 LOCATE MARK+3,LEFT2: PRINT GOAL$(MARK)
2500 LOCATE V,LEFT1: GOTO 2290
2510 '
2520 PRINT GOAL$(V-3)
2530 LOCATE MARK+3,LEFT2: PRINT GOAL$(MARK) SPC(LENGTH1-LENGTH2)
```

```
2540 LOCATE V,LEFT1: GOTO 2290
2550 '
2560 '——————————————— DISPLAY INITIAL PREFERENCE RANKING ———————————————
2570 '
2580 CLS
2590 LOCATE 2,26: PRINT "PREFERENCE RANKING OF GOALS:" CHR$(13)
2600 PRINT
2610 FOR I = 1 TO UPRBND
2620    LOCATE ,12: PRINT USING "##   ";I;: PRINT GOAL$(I)
2630 NEXT I
2640 LOCATE 25,26: PRINT "< PRESS ANY KEY TO CONTINUE >";
2650 IF INKEY$="" THEN 2650
2660 CLS
2670 '
2680 '——————————————————— GROUPING SUBROUTINE ———————————————————
2690 '
2700 RANDOMIZE TIMER
2710 GOAL.STND = 1
2720 COUNTER.ONE = 0
2730 COUNTER.TWO = 0
2740 COUNTER.THREE = 0
2750 FOR I=2 TO UPRBND
2760    X = INT(RND(I) * 4)
2770    IF X = 0 THEN 2760
2780 ' IF I = UPRBND THEN 2550   'use this line if group distribution is such
                          that the odd group has one more member than the others
2790    ON X GOTO 2800,2820,2840
2800      IF COUNTER.ONE > 4 THEN 2760
2810        COUNTER.ONE = COUNTER.ONE + 1: GOTO 2860
2820      IF COUNTER.TWO > 4 THEN 2760
2830        COUNTER.TWO = COUNTER.TWO + 1: GOTO 2860
2840      IF COUNTER.THREE > 4 THEN 2760
2850        COUNTER.THREE = COUNTER.THREE + 1
2860        GROUP(I) = X
2870 NEXT I
2880 '————————————————————————————————————————————————————————
2890 '
2900 'GOTO 3940   'remove this line when testing is complete
2910 '
2920 '————————————————————————————————————————————————————————
2930 PRINT "GROUP 1 ASSIGNMENT:"
2940 PRINT GOAL.STND "  -   " GOAL$(GOAL.STND)
2950 FOR I=1 TO UPRBND
2960    IF GROUP(I)=1 THEN PRINT USING "##  (#)  ";I,GROUP(I);: PRINT GOAL$(I)
2970 NEXT I
2980 PRINT
2990 PRINT "GROUP 2 ASSIGNMENT:"
3000 PRINT GOAL.STND "  -   " GOAL$(GOAL.STND)
3010 FOR I=1 TO UPRBND
3020    IF GROUP(I)=2 THEN PRINT USING "##  (#)  ";I,GROUP(I);: PRINT GOAL$(I)
3030 NEXT I
3040 PRINT
3050 PRINT "GROUP 3 ASSIGNMENT:"
3060 PRINT GOAL.STND "  -   " GOAL$(GOAL.STND)
3070 FOR I=1 TO UPRBND
3080    IF GROUP(I)=3 THEN PRINT USING "##  (#)  ";I,GROUP(I);: PRINT GOAL$(I)
3090 NEXT I
3100 PRINT
3110 LOCATE 24,26: PRINT "< PRESS ANY KEY TO CONTINUE >";
3120 IF INKEY$="" THEN 3120
3130 '
3140 '——————————————— WITHIN GROUP RANKING SUBROUTINE ———————————————
3150 '
3160 TEMP.RATE(1)=1000: RATE(GOAL(1))=TEMP.RATE(1): TEMP.RANK(1)=1
3170 FOR GROUP=1 TO 3
3180 CLS
3190 LOCATE 1,6: PRINT "INDICATE THE IMPORTANCE OF EACH GOAL WITH RESPECT TO
                 THE STANDARD"
3200 LOCATE 2,19: PRINT "WITH AN INTEGER VALUE BETWEEN 1 AND 999"
3210 LOCATE 4,28: PRINT "GROUP" GROUP "ASSIGNMENT:"
3220 LOCATE 6,8: PRINT " 1  " GOAL$(1);: LOCATE ,67: PRINT "*1000*" CHR$(13)
3230 J=1
3240 FOR I=2 TO UPRBND
3250    LOCATE ,8
3260    IF GROUP(I)=GROUP THEN J=J+1 ELSE 3300
3270    PRINT USING "##  ";I;: PRINT GOAL$(I) CHR$(13)
3280    TEMP.GOAL$(J)=GOAL$(I)
3290    TEMP.RANK(J)=I
3300 NEXT I
3310 LOCATE 23,14: PRINT "ENTER THE IMPORTANCE OF THE HIGHLIGHTED GOAL ";:
        COLOR CLR+16: PRINT ">>>";: COLOR CLR: LOCATE 23,63: PRINT "llll";
3320 LOCATE 24,19: PRINT "PRESS ";: COLOR CLR+8: PRINT "F1";: COLOR CLR:
        PRINT " WHEN YOU HAVE ENTERED ALL VALUES";
3330 PLAY "X"+VARPTR$(TUNE2$)
3340 '
3350 '——————————————— ENTER VALUES OF GOALS WITHIN GROUPS ———————————————
3360 '
```

```
3370 TOP=6: BOT=TOP+2*(J-1): S=1: COMPARE=1: FLAG=0
3380 IF TEMP.RATE(TOP/2-2)=1000 THEN R=TOP+2 ELSE R=TOP
3390 COLOR CLR+8
3400 LOCATE R,12: PRINT TEMP.GOAL$(R/2-2);: LOCATE ,68
3410 IF TEMP.RATE(R/2-2)=0 THEN PRINT "0000" ELSE PRINT USING "####"; TEMP.RATE(R/2-2)
3420 COLOR CLR
3430 LOCATE 23,63: PRINT "1111    ";: LOCATE ,66
3440 GOSUB 1250
3450 '              UP   DOWN LEFT RIGHT TAB S-TAB CR   ESC PGUP PGDN HELP
3460 ON RETCODE GOTO 3520,3600,3480,3480,3600,3520,3620,3500,3480,3480,3480,
           3480,3740
3470 '              MENU  F1
3480 PLAY "X"+VARPTR$(TUNE1$): GOTO 3440
3490 '
3500 IF H=0 THEN 3480 ELSE 3430  'esc
3510 '
3520 IF H=0 THEN 3560              'cursor up or shift tab
3530 TEMP = VAL(Q$(1)+Q$(2)+Q$(3)+Q$(4))
3540 IF TEMP=0 OR TEMP>999 THEN PLAY "X"+VARPTR$(TUNE3$):GOTO 3430
3550 TEMP.RATE(R/2-2) = TEMP
3560 IF R=TOP THEN R=BOT ELSE R=R-2
3570 IF TEMP.RATE(R/2-2)=1000 THEN IF R=TOP THEN R=BOT ELSE R=R-2
3580 GOTO 3680
3590 '
3600 IF H=0 THEN 3650                  'cursor down or tab
3610 '
3620 TEMP = VAL(Q$(1)+Q$(2)+Q$(3)+Q$(4))   'carriage return
3630 IF TEMP=0 OR TEMP>999 THEN PLAY "X"+VARPTR$(TUNE3$):GOTO 3430
3640 TEMP.RATE(R/2-2) = TEMP
3650 IF R=BOT THEN R=TOP ELSE R=R+2
3660 IF TEMP.RATE(R/2-2)=1000 THEN IF R=BOT THEN R=TOP ELSE R=R+2
3670 '
3680 LOCATE OLDR,12: PRINT TEMP.GOAL$(OLDR/2-2);: LOCATE ,68
3690 IF TEMP.RATE(OLDR/2-2)=0 THEN PRINT "    " ELSE PRINT USING "####";
         TEMP.RATE(OLDR/2-2)
3700 GOTO 3390
3710 '
3720 '—————————————— REARRANGE GOALS WITHIN GROUPS ————————————————
3730 '
3740 'IF FLAG=1 THEN 3570
3750 FOR I=1 TO J-1     'bubble sort to rearrange goals
3760   FOR L=I+1 TO J
3770     IF TEMP.RATE(I) => TEMP.RATE(L) THEN 3810
3780     SWAP TEMP.RATE(I),TEMP.RATE(L)
3790     SWAP TEMP.GOAL$(I),TEMP.GOAL$(L)
3800     SWAP TEMP.RANK(I),TEMP.RANK(L)
3810   NEXT L
3820 NEXT I
3830 LOCATE 6,8: PRINT " 1  " GOAL$(1);: LOCATE ,67: PRINT "*1000*" CHR$(13)
3840 FOR I=2 TO J
3850   LOCATE 2*(I+2),8
3860   PRINT USING "##  ";TEMP.RANK(I);
3870   PRINT TEMP.GOAL$(I) SPC(56-LEN(TEMP.GOAL$(I)));
3880   LOCATE ,68: PRINT USING "#### ";TEMP.RATE(I): PRINT CHR$(13)
3890 NEXT I
3900 '
3910 '—————————————— WEIGHTING FACTOR DETERMINATION ————————————————
3920 '
3930 FLAG = 1
3940 UL=&H1600: LR=&H184F: GOSUB 1640    'blank rows 23,24,25
3950 GT=0: COMPARE=COMPARE+1
3960 IF COMPARE=J-S+1 THEN S=S+1: COMPARE=2: TOP=TOP+2
3970 IF S=>J-1 THEN 4280
3980 LOCATE 20,20: PRINT SPC(39): LOCATE 19,13
3990 PRINT USING "IS GOAL ## MORE IMPORTANT THAN THE COMBINATION OF GOALS ";
       TEMP.RANK(S)
4000 IF COMPARE>2 THEN 4040
4010   LOCATE ,31: PRINT TEMP.RANK(S+1) "AND" TEMP.RANK(S+2) CHR$(29) "?  (Y/N)"
4020   IF TEMP.RATE(S) > TEMP.RATE(S+1)+TEMP.RATE(S+2) THEN GT=1
4030   GOTO 4140
4040 IF COMPARE>3 THEN 4080
4050   LOCATE ,28: PRINT TEMP.RANK(S+1) "AND" TEMP.RANK(S+2) "AND" TEMP.RANK(S+3)
       CHR$(29) "?  (Y/N)"
4060   IF TEMP.RATE(S) > TEMP.RATE(S+1)+TEMP.RATE(S+2)+TEMP.RATE(S+3) THEN GT=1
4070   GOTO 4140
4080 IF COMPARE>4 THEN 4120
4090   LOCATE ,24: PRINT TEMP.RANK(S+1) "AND" TEMP.RANK(S+2) "AND" TEMP.RANK(S+3)
       "AND" TEMP.RANK(S+4) CHR$(29) "?  (Y/N)"
4100   IF TEMP.RATE(S) > TEMP.RATE(S+1)+TEMP.RATE(S+2)+TEMP.RATE(S+3)+TEMP.RATE(S+4)
       THEN GT=1
4110   GOTO 4140
4120 LOCATE ,20: PRINT TEMP.RANK(S+1) "AND" TEMP.RANK(S+2) "AND" TEMP.RANK(S+3)
       "AND" TEMP.RANK(S+4) "AND" TEMP.RANK(S+5) CHR$(29) "?  (Y/N)"
4130   IF TEMP.RATE(S) > TEMP.RATE(S+1)+TEMP.RATE(S+2)+TEMP.RATE(S+3)+TEMP.RATE(S+4)
       +TEMP.RATE(S+5) THEN GT=1
4140 Q$=INKEY$: IF Q$="" THEN 4140
4150 IF (Q$="Y" OR Q$="y") AND GT=0  THEN 4210
```

```
4160 IF (Q$="Y" OR Q$="y") AND GT=1  THEN 3950
4170 IF (Q$="N" OR Q$="n") AND GT=0  THEN S=S+1: COMPARE=2: TOP=TOP+2:GOTO 3960
4180 IF (Q$="N" OR Q$="n") AND GT=1  THEN S=S+1: COMPARE=1: GOTO 4210
4190 PLAY "X"+VARPTR$(TUNE1$): GOTO 4140
4200 '
4210 UL=&H1200: LR=&H134F: GOSUB 1640    'blank rows 19 & 20
4220 LOCATE 23,14: PRINT "ENTER THE IMPORTANCE OF THE HIGHLIGHTED GOAL ";:
     COLOR CLR+16: PRINT ">>>";: COLOR CLR: LOCATE 23,63: PRINT "1111";
4230 LOCATE 24,19: PRINT "PRESS ";: COLOR CLR+8: PRINT "F1";: COLOR CLR:
     PRINT " WHEN YOU HAVE ENTERED ALL VALUES";
4240 GOTO 3380
4250 '
4260 '———————————— ASSIGNMENT OF RATES TO GOALS ————————————
4270 '
4280 FOR I=2 TO J
4290   RATE(GOAL(TEMP.RANK(I))) = TEMP.RATE(I)
4300   TEMP.RATE(I) = 0
4310 NEXT I
4320 NEXT GROUP
4330 '
4340 '———————————— DISPLAY FINAL RESULTS ————————————
4350 '
4360 CLS
4370 TOTAL=1000
4380 FOR I=2 TO UPRBND
4390   TOTAL=TOTAL+RATE(I)
4400 NEXT I
4410 LOCATE 2,25: PRINT "THE FINAL PREFERENCE RESULTS ARE:" CHR$(13)
4420 LOCATE ,9: PRINT "GOAL";: LOCATE ,64: PRINT "RATE     VALUE"
4430 LOCATE 6
4440 FOR I=1 TO UPRBND
4450   LOCATE ,5: PRINT USING "##  "; I;: PRINT GOAL$(I);: LOCATE ,64: PRINT
       USING "####"; RATE(GOAL(I));: LOCATE ,73: PRINT USING "#.###";
       RATE(GOAL(I))/TOTAL
4460 NEXT I
4470 '
4480 LOCATE 23,22: PRINT "IS THE FINAL ORDERING CORRECT?  (Y/N)"
4490 Q$=INKEY$: IF Q$="" THEN 4490
4500 IF Q$="Y" OR Q$="y" THEN 4550
4510 IF Q$="N" OR Q$="n" THEN 3160
4520 PLAY "X"+VARPTR$(TUNE1$): GOTO 4490
4530 '———————————— WRITE RESULTS TO DISK ————————————
4540 '
4550 LOCATE 23,22: PRINT "< SAVING RESULTS IN FILE  IEOR.DAT' >";
4560 'OPEN "IEOR.DAT" FOR APPEND AS #1
4570 'PRINT #1, CHR$(34) PROF.NAME$ CHR$(34)
4580 'FOR I=1 TO UPRBND
4590 '  PRINT #1,USING "##_, ####_, #.###";RANK(I);RATE(I);RATE(I)/TOTAL
4600 'NEXT I
4610 'CLOSE #1
4620 '————————————————————————————————————————————————
4630 LOCATE 23,22: PRINT "   < PRESS ANY KEY TO END PROGRAM >  ";
4640 IF INKEY$="" THEN 4640
4650 CLS: END
```

APPENDIX B. VALUE ASSESSMENT PROGRAM LISTING

```
1 'PROGRAM "VALUE.BAS"   -   by Dona Chapman   -   14 July 1985
1000 CLS: KEY OFF: FOR I=1 TO 10: KEY I,"": NEXT
1010 DEFINT A-Z
1020 DIM RANK(50,15), VALUE.STD!(50,15), RATE(50,15), AVG!(15), COURSE$(120),
     PROF$(28), GOAL$(8), AVG.GOAL!(8)
1030 DIM TEMP.COURSE$(300), TEMP.PROF$(300), TEMP.COURSE.VALUE!(300),
     DR$(300), CLASS$(300), AMT!(300)
1040 CLR = 7
1050 TUNE1$ = "MB L20 N24 N20 MF": TUNE2$ = "MB L50 N50 N45 N55 N55 N60 MF":
1060 '
1070 LOCATE 8,15: PRINT "DO YOU WANT A COPY OF THE PREVIOUS RESULTS?  (Y/N)"
1080 Q$=INKEY$: IF Q$="" THEN 1080
1090 IF Q$="Y" OR Q$="y" THEN 5900    'print results to printer
1100 IF Q$="N" OR Q$="n" THEN CLS: GOTO 1490   'course variable assignment
1110 PLAY "X"+VARPTR$(TUNE1$): GOTO 1080
1120 '
1130 '
1140 '    VARIABLES:
1150 '        AVG(J) = average value of goal whose rank is I
1160 '        PROF$(I) = identification number of professor I
1170 '        VALUE.STD!(I,J) = standardized value of rates entered, where I is
1175 '                          the number of professors and J is the number of
1180 '                          goals
1180 '        RATE(I,J) = value assigned by individual faculty members
1190 '        RANK(I,J) = preference of goal whose index number is I
1200 '        COURSE$(J) = course number identification
1210 '        GOAL$(J) = goal identification of course-specific goals
1220 '        TEMP.COURSE$(I) = temporary course list for data file
1230 '        TEMP.CLASS$ = temporary course list for data manipulation
1240 '        TEMP.COURSE.VALUE!(I) = temporary value list for data file
1250 '        DR$(B) = temporary file for data manipulation
1260 '        TEMP.PROF$(I) = temporary professor list for data file
1270 '        CLASS$(B) = temporary file for data manipulation
1280 '        AVG.GOAL!(I) = average value of course-specific goal I
1290 '        PROF.NAME$ = name of professor for FACULTY.DAT data file
1300 '        DR.NAME$ = name of professor for FACULTY.DAT data file
1310 '        COURSE.NUM$ = course number for FACULTY.DAT data file
1320 '        CLASS.NUM$ = course number for COURSE.DAT data file
1330 '        VALUE$ = course value assignment for FACULTY.DAT data file
1340 '        CLASS.AMT$ = course value assignment for COURSE.DAT data file
1350 '        AVG.GOAL!(I) = average value of course-specific goal I
1360 '
1370 '
1380 '──────────────── CALL WINDOW SCROLLING SUBROUTINE ────────────────
1390 '
1400 DEF SEG
1410 DONA!=PEEK(VARPTR(CODE$)+1)+PEEK(VARPTR(CODE$)+2)*256
1420 IF DONA!>32768! THEN SCROLL=CSNG(DONA!-65536!) ELSE SCROLL=CSNG(DONA!)
1430 N=0
1440 CALL SCROLL(UL,LR,N)
1450 RETURN
1460 '
1470 '──────────────── COURSE VARIABLE ASSIGNMENTS ────────────────
1480 '
1490 COURSE$(1)   = " 2011"    'Technology of Metals I
1500 COURSE$(2)   = " 2012"    'Technology of Metals II
1510 COURSE$(3)   = "H2150"    'Engineering Economy - Honors
1520 COURSE$(4)   = "A2150"    'Engineering Economy - Section A
1530 COURSE$(5)   = "B2150"    'Engineering Economy - Section B
1540 COURSE$(6)   = "C2150"    'Engineering Economy - Section C
1550 COURSE$(7)   = "A2180"    'Intro to IEOR - Section A
1560 COURSE$(8)   = "B2180"    'Intro to IEOR - Section B
1570 COURSE$(9)   = "A3120"    'Industrial Cost Control - Section A
1580 COURSE$(10)  = "B3120"    'Industrial Cost Control - Section B
1590 COURSE$(11)  = "C3120"    'Industrial Cost Control - Section C
1600 COURSE$(12)  = "A3130"    'Methods Engineering - Section A
1610 COURSE$(13)  = "B3130"    'Methods Engineering - Section B
1620 COURSE$(14)  = "A3200"    'Human Performance in Ind. Systems - Section A
1630 COURSE$(15)  = "B3200"    'Human Performance in Ind. Systems - Section B
1640 COURSE$(16)  = "A3300"    'Manufacturing Processes - Section A
1650 COURSE$(17)  = "B3300"    'Manufacturing Processes - Section B
1660 COURSE$(18)  = "A3460"    'Computation Methods in IE - Section A
1670 COURSE$(19)  = "B3460"    'Computation Methods in IE - Section B
1680 COURSE$(20)  = " 4050"    'Nuclear Fuel Cycle Management
1690 COURSE$(21)  = " 4070"    'Materials and the Economy
1700 COURSE$(22)  = " 4090"    'Principles of IE
1710 COURSE$(23)  = " 4100"    'Occupational Safety and Hazard Control
1720 COURSE$(24)  = " 4110"    'Process Engineering
1730 COURSE$(25)  = "A4150"    'Systems Analysis through Simulation - Section A
1740 COURSE$(26)  = "B4150"    'Systems Analysis through Simulation - Section B
1750 COURSE$(27)  = " 4160"    'Industrial Hazard Control Lab
1760 COURSE$(28)  = " 4200"    'Engineering Psychology
1770 COURSE$(29)  = "A4210"    'Math Methods of OR - Section A
1780 COURSE$(30)  = "B4210"    'Math Methods of OR - Section B
1790 COURSE$(31)  = "A4211"    'Production Planning and Control - Section A
1800 COURSE$(32)  = "B4211"    'Production Planning and Control - Section B
1810 COURSE$(33)  = "C4211"    'Production Planning and Control - Section C
```

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1820 COURSE$(34)  = "A4212"      'Plant Design and Layout - Section A
1830 COURSE$(35)  = "B4212"      'Plant Design and Layout - Section B
1840 COURSE$(36)  = "C4212"      'Plant Design and Layout - Section C
1850 COURSE$(37)  = " 4220"      'Industrial Automation
1860 COURSE$(38)  = " 4240"      'Industrial Economy
1870 COURSE$(39)  = "A4250"      'Statisical Quality Control - Section A
1880 COURSE$(40)  = "B4250"      'Statisical Quality Control - Section B
1890 COURSE$(41)  = " 4280"      'Industrial Systems Engineering
1900 COURSE$(42)  = " 4290"      'Theory of Organization
1910 COURSE$(43)  = "A4310"      'Deterministic OR Models - Section A
1920 COURSE$(44)  = "B4310"      'Deterministic OR Models - Section B
1930 COURSE$(45)  = "A4320"      'Probablistic OR Models - Section A
1940 COURSE$(46)  = "B4320"      'Probablistic OR Models - Section B
1950 COURSE$(47)  = " 4330"      'Material Handling Analysis
1960 COURSE$(48)  = " 4350"      'Industrial Quality Control
1970 COURSE$(49)  = " 4360"      'Compensation Planning and Design
1980 COURSE$(50)  = " 4361"      'Intro to Computer-based Info Systems
1990 COURSE$(51)  = " 4362"      'Intro to Computer-based Info Systems
2000 COURSE$(52)  = " 4363"      'Intro to Computer-based Info Systems
2010 COURSE$(53)  = " 4370"      'Micro-computer Applications in IMF
2020 COURSE$(54)  = " 4380"      'Industrial Systems Design
2030 COURSE$(55)  = " 4400"      'Industrial Work Physiology
2040 COURSE$(56)  = " 4410"      'Systems Safety Analysis
2050 COURSE$(57)  = " 4420"      'Industrial Fire Control
2060 COURSE$(58)  = " 4980"      'Special Study
2070 '
2080 '—————————————— 5000-LEVEL GRADUATE COURSES ——————————————
2090 '
2100 COURSE$(59)  = " 5010"      'Applied Optimization Methods
2110 COURSE$(60)  = " 5040"      'Math Programming I
2120 COURSE$(61)  = " 5060"      'Advanced Motion and Time Study
2130 COURSE$(62)  = " 5100"      'Theory of Graphs and Network Analysis
2140 COURSE$(63)  = " 5101"      'Advanced Engineering Economy
2150 COURSE$(64)  = " 5102"      'Advanced Engineering Economy
2160 COURSE$(65)  = " 5111"      'Human Factors Research Methodology
2170 COURSE$(66)  = " 5112"      'Human Factors Research Methodology
2180 COURSE$(67)  = " 5113"      'Human Factors Research Methodology
2190 COURSE$(68)  = " 5131"      'Principles and Problems of Management
2200 COURSE$(69)  = " 5132"      'Principles and Problems of Management
2210 COURSE$(70)  = " 5133"      'Principles and Problems of Management
2220 COURSE$(71)  = " 5141"      'OR Methodology I
2230 COURSE$(72)  = " 5142"      'OR Methodology II
2240 COURSE$(73)  = " 5160"      'Applications of Simulation Languages
2250 COURSE$(74)  = " 5170"      'Facilities Planning and Material Handling
2260 COURSE$(75)  = " 5180"      'Organization Theory and Design
2270 COURSE$(76)  = " 5190"      'Industrial System Simulation
2280 COURSE$(77)  = " 5220"      'Advanced Industrial Automation
2290 COURSE$(78)  = " 5230"      'Forecasting Models
2300 COURSE$(79)  = " 5240"      'Queueing Theory I
2310 COURSE$(80)  = " 5250"      'Advanced Quality Control
2320 COURSE$(81)  = " 5260"      'Quality Control and Reliability
2330 COURSE$(82)  = " 5270"      'Models in Reliability Engineering
2340 COURSE$(83)  = "A5280"      'Procurement and Inventory Theory - Section A
2350 COURSE$(84)  = "B5280"      'Procurement and Inventory Theory - Section B
2360 COURSE$(85)  = " 5311"      'Design and Evaluation of M/M Systems I
2370 COURSE$(86)  = " 5312"      'Design and Evaluation of M/M Systems II
2380 COURSE$(87)  = " 5330"      'Research and Design Projects in HF
2390 COURSE$(88)  = " 5340"      'Integer Mathematical Programming
2400 COURSE$(89)  = " 5361"      'Analysis of Stochastic Systems I
2410 COURSE$(90)  = " 5362"      'Analysis of Stochastic Systems II
2420 COURSE$(91)  = " 5370"      'Design and Analysis of Ind Training Systems
2430 COURSE$(92)  = " 5380"      'Anthropometry in Workplace Design
2440 COURSE$(93)  = " 5390"      'Analysis of Complex Interactive Systems
2450 COURSE$(94)  = " 5400"      'Work and Motivation
2460 COURSE$(95)  = " 5410"      'Information Systems Analysis and Design
2470 COURSE$(96)  = " 5450"      'Lab Methods in Human Factors Research
2480 COURSE$(97)  = " 5460"      'Manufacturing Systems Analysis
2490 COURSE$(98)  = " 5470"      'Manufacturing Costs and Production Economics
2500 COURSE$(99)  = " 5480"      'Process Engineering and Analysis
2510 COURSE$(100) = " 5490"      'Production Planning and Scheduling
2520 COURSE$(101) = " 5940"      'Seminar
2530 COURSE$(102) = " 5950"      'Seminar in Applied Probability
2540 COURSE$(103) = " 5980"      'Special Study
2550 '
2560 '—————————————— 6000-LEVEL GRADUATE COURSES ——————————————
2570 '
2580 COURSE$(104) = " 6030"      'Industrial Systems Optimization
2590 COURSE$(105) = " 6040"      'Advanced Industrial Programming
2600 COURSE$(106) = " 6061"      'Dynamic Programming I
2610 COURSE$(107) = " 6062"      'Dynamic Programming II
2620 COURSE$(108) = " 6110"      'Advanced Production Scheduling
2630 COURSE$(109) = " 6241"      'Queueing Theory II
2640 COURSE$(110) = " 6242"      'Queueing Theory III
2650 COURSE$(111) = " 6280"      'Inventory Theory
2660 COURSE$(112) = " 6310"      'Manual Control Theory in M/M Systems
2670 COURSE$(113) = " 6320"      'Human Factors in Display Systems
2680 COURSE$(114) = " 6350"      'Math Methods of OR
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2690 COURSE$(115) = " 6360"      'Applied Stochastic Processes in OR
2700 COURSE$(116) = " 6370"      'Industrial Training Technology
2710 COURSE$(117) = " 6380"      'Advanced Topics in Human Factors Engineering
2720 COURSE$(118) = " 6460"      'Manufacturing Systems and Controls
2730 COURSE$(119) = " 64XX"      'Math Models in M/M Systems
2740 COURSE$(120) = " XXXX"      'Extra course space
2750 '
2760 '——————————— PROFESSOR VARIABLE ASSIGNMENT ——————————
2770 '
2780 PROF$(1)    =  "AGEE          "
2790 PROF$(2)    =  "BALACHANDRAN  "
2800 PROF$(3)    =  "CASALI        "
2810 PROF$(4)    =  "CHACHRA       "
2820 PROF$(5)    =  "DEISENROTH    "
2830 PROF$(6)    =  "DISNEY        "
2840 PROF$(7)    =  "DRYDEN        "
2850 PROF$(8)    =  "FABRYCKY      "
2860 PROF$(9)    =  "GHARE         "
2870 PROF$(10)   =  "GREENE        "
2880 PROF$(11)   =  "GREENSTEIN    "
2890 PROF$(12)   =  "JONES         "
2900 PROF$(13)   =  "KEMMERLING    "
2910 PROF$(14)   =  "KROEMER       "
2920 PROF$(15)   =  "KURSTEDT      "
2930 PROF$(16)   =  "MALMBORG      "
2940 PROF$(17)   =  "MULLER        "
2950 PROF$(18)   =  "NACHLAS       "
2960 PROF$(19)   =  "PRICE         "
2970 PROF$(20)   =  "REASOR        "
2980 PROF$(21)   =  "SARIN         "
2990 PROF$(22)   =  "SCHMIDT       "
3000 PROF$(23)   =  "SHERALI       "
3010 PROF$(24)   =  "SINK          "
3020 PROF$(25)   =  "SNYDER        "
3030 PROF$(26)   =  "TORGERSEN     "
3040 PROF$(27)   =  "WIERWILLE     "
3050 PROF$(28)   =  "WILLIGES      "
3060 '
3070 '——————————— GOAL VARIABLE ASSIGNMENTS ——————————
3080 '
3090 GOAL$(1)  = "Teaching a particular course"
3100 GOAL$(2)  = "Good fit between research interests and courses"
3110 GOAL$(3)  = "Teaching honors courses (highly motivated students)"
3120 GOAL$(4)  = "Teaching in area of expertise"
3130 GOAL$(5)  = "Faculty enrichment"
3140 GOAL$(6)  = "Teaching classes of reasonable size"
3150 GOAL$(7)  = "Least number of preparations"
3160 GOAL$(8)  = "Teaching to support textbook development"
3170 '
3180 '——————— SET UP MACHINE LANGUAGE SCROLLING ROUTINE ——————
3190 '
3200 DATA 85,139,236,139,118,6,139,4,139,118,8,139,20,139
3210 DATA 118,10,139,12,183,7,180,6,205,16,93,202,6,0
3220 '
3230 CODE$=""
3240 RESTORE 3200
3250 FOR I=1 TO 28
3260    READ Q
3270    CODE$=CODE$+CHR$(Q)
3280 NEXT I
3290 '——————————— READ DATA FROM DATA FILE ——————————
3300 '
3310 OPEN "IEOR.DAT" FOR INPUT AS #1
3320 FOR I=1 TO 21
3330    INPUT #1, PROF.NAME$
3340    IF EOF(1) THEN 3390
3350    FOR J=1 TO 15
3360      INPUT #1, RANK(I,J), RATE(I,J), VALUE.STD!(I,J)
3370    NEXT J
3380 NEXT I
3390 CLOSE #1
3400 '
3410 '——————————— AVERAGING SUBROUTINE ——————————
3420 '
3430 FOR J=1 TO 15
3440    SUM.VALUE.STD!=0
3450    FOR I=1 TO 21
3460      SUM.VALUE.STD! = SUM.VALUE.STD! + VALUE.STD!(I,J)
3470    NEXT I
3480    AVG!(J)=SUM.VALUE.STD!/21
3490 NEXT J
3500 '——————————— AVERAGING ASSIGNMENTS ——————————
3510 '
3520 AVG.GOAL!(1)=AVG!(2)
3530 AVG.GOAL!(2)=AVG!(3)
3540 AVG.GOAL!(3)=AVG!(8)
3550 AVG.GOAL!(4)=AVG!(11)
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3560 AVG.GOAL!(5)=AVG!(12)
3570 AVG.GOAL!(6)=AVG!(13)
3580 AVG.GOAL!(7)=AVG!(14)
3590 AVG.GOAL!(8)=AVG!(15)
3600 '
3610 '————————————— OPEN FACULTY.DAT FILE ————————————
3620 '
3630 OPEN "FACULTY.DAT" AS #2 LEN=24
3640 FIELD 2, 15 AS PROF.NAME$, 5 AS COURSE.NUM$, 4 AS VALUE$
3650 '
3660 '————————— DATA INPUT FROM FACULTY QUESTIONNAIRES ——————————
3670 '
3680 CLS
3690 TOP=6: V=6: BOT=19: LEFT1=21: C=21: LEFT2=46
3700 LOCATE 1,10,0
3710 PRINT "PREFERENCE INPUT SECTION - SELECT A PROFESSOR FOR DATA INPUT";
3720 LOCATE 3,16: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
     PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
     PRINT " TO MOVE ARROW DOWN,"
3730 LOCATE 4,18: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
     PRINT " TO MOVE ARROW RIGHT, ";:COLOR CLR+8:PRINT CHR$(27);:COLOR CLR:
     PRINT " TO MOVE ARROW LEFT" CHR$(13)
3740 '
3750 FOR I=1 TO 14
3760    LOCATE ,23: PRINT PROF$(I);: LOCATE ,48: PRINT PROF$(I+14)
3770 NEXT I
3780 '
3790 LOCATE 23,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
     COLOR CLR: PRINT " TO SELECT A PROFESSOR"
3800 PLAY "X"+VARPTR$(TUNE2$)
3810 '
3820 LOCATE V,C: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
3830 Q$=INKEY$: IF Q$="" THEN 3830
3840 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 3940  ELSE Q=ASC(MID$(Q$,2,1))
3850 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):GOTO 3830
3860 IF Q=72 THEN V=V-1    'cursor up
3870 IF Q=80 THEN V=V+1    'cursor down
3880 IF Q=75 THEN C=LEFT1   'cursor left
3890 IF Q=77 THEN C=LEFT2   'cursor right
3900 IF V<TOP THEN V=BOT
3910 IF V>BOT THEN V=TOP
3920 PRINT " ": GOTO 3820
3930 '
3940 IF Q<>13 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 3830
3950 I=(V-5)-(14*(C=LEFT2))
3960 '
3970 '————————————— SELECT COURSE FOR DATA INPUT ————————————
3980 '
3990 CLS
4000 TOP1=7: ROW=7: BOT1=21: COL=3: COL1=5: COL2=15: COL3=25: COL4=35: COL5=45:
     COL6=55: COL7=65: COL8=75: LEFT=3: RIGHT=73
4010 LOCATE 1,1,0
4020 COLOR CLR+8: PRINT "DR. " PROF$(I);: COLOR CLR
4030 LOCATE 2,14,0
4040 PRINT "PREFERENCE INPUT SECTION - SELECT A COURSE FOR DATA INPUT";
4050 LOCATE 4,19: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
     PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
     PRINT " TO MOVE ARROW DOWN, "
4060 LOCATE 5,21: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
     PRINT " TO MOVE ARROW RIGHT, ";: COLOR CLR+8: PRINT CHR$(27);: COLOR CLR:
     PRINT " TO MOVE ARROW LEFT" CHR$(13)
4070 '
4080 FOR J=1 TO 15
4090    LOCATE ,COL1: PRINT COURSE$(J);: LOCATE ,COL2: PRINT COURSE$(J+15);:
     LOCATE ,COL3: PRINT COURSE$(J+30);: LOCATE ,COL4: PRINT COURSE$(J+45);
4100    LOCATE ,COL5: PRINT COURSE$(J+60);: LOCATE ,COL6: PRINT COURSE$(J+75);:
     LOCATE ,COL7: PRINT COURSE$(J+90);: LOCATE ,COL8: PRINT COURSE$(J+105)
4110 NEXT J
4120 '
4130 LOCATE 23,28: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
     COLOR CLR: PRINT " TO SELECT A COURSE"
4140 PLAY "X"+VARPTR$(TUNE2$)
4150 '
4160 LOCATE ROW,COL: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
4170 Q$=INKEY$: IF Q$="" THEN 4170
4180 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 4300  ELSE Q=ASC(MID$(Q$,2,1))
4190 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):
     GOTO 4170
4200 IF Q=72 THEN ROW=ROW-1    'cursor up
4210 IF Q=80 THEN ROW=ROW+1    'cursor down
4220 IF Q=75 THEN COL=COL-10   'cursor left
4230 IF Q=77 THEN COL=COL+10   'cursor right
4240 IF ROW<TOP1 THEN ROW=BOT1
4250 IF ROW>BOT1 THEN ROW=TOP1
4260 IF COL<LEFT THEN COL=RIGHT
4270 IF COL>RIGHT THEN COL=LEFT
4280 PRINT " ": GOTO 4160
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4290 '
4300 IF Q<>13 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 4170
4310 J=(ROW-TOP1+1)+15*((COL-LEFT)/10)
4320 '
4330 '───────────────────── COURSE-SPECIFIC DATA INPUT ─────────────
4340 '
4350 CLS
4360 LOCATE 8,20,0
4370 PRINT "IS ";: COLOR CLR+8: PRINT "IEOR " COURSE$(J);: COLOR CLR:
      PRINT " A PREFERRED COURSE?  (Y/N)";
4380 Q$=INKEY$: IF Q$="" THEN 4380
4390 IF Q$="N" OR Q$="n" THEN PREF.VALUE=0: GOTO 4590
4400 IF Q$="Y" OR Q$="y" THEN 4420
4410 PLAY "X"+VARPTR$(TUNE1$): GOTO 4380
4420 UL=&H700: LR=&H84F: GOSUB 1400
4430 LOCATE 8,11: PRINT
      "ENTER A PREFERENCE VALUE FROM 5 (HIGHEST) TO 1 (LOWEST): ": GOTO 4460
4440 PLAY "X"+VARPTR$(TUNE1$): GOTO 4380
4450 '
4460 LOCATE 8,69
4470 Q$=INKEY$: IF Q$="" THEN 4470
4480 IF Q$="1" THEN PRINT "1": PREF.VALUE=1: GOTO 4540
4490 IF Q$="2" THEN PRINT "2": PREF.VALUE=2: GOTO 4540
4500 IF Q$="3" THEN PRINT "3": PREF.VALUE=3: GOTO 4540
4510 IF Q$="4" THEN PRINT "4": PREF.VALUE=4: GOTO 4540
4520 IF Q$="5" THEN PRINT "5": PREF.VALUE=5: GOTO 4540
4530 PLAY "X"+VARPTR$(TUNE1$): GOTO 4470
4540 LOCATE 23,30: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
      COLOR CLR: PRINT " TO CONTINUE";
4550 Q$=INKEY$: IF Q$="" THEN 4550
4560 IF Q=13 THEN 4590
4570 IF Q<>13 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 4550
4580 '
4590 CLS
4600 TOP2=8: V2=8: BOT2=15: POS1=15: POS2=17
4610 LOCATE 2,10,0
4620 PRINT "PREFERENCE INPUT SECTION - INDICATE GOALS MET BY ";: COLOR CLR+8:
      PRINT "IEOR " COURSE$(J);: COLOR CLR
4630 LOCATE 4,16: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
      PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
      PRINT " TO MOVE ARROW DOWN"
4640 LOCATE 5,15: PRINT "PRESS THE SPACE BAR TO SELECT AND DESELECT A GOAL"
      CHR$(13) CHR$(13)
4650 '
4660 FOR K=1 TO 8
4670   LOCATE ,POS2: PRINT USING "#    ";K;: PRINT GOAL$(K)
4680 NEXT K
4690 '
4700 LOCATE 23,23: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
      COLOR CLR: PRINT " WHEN FINISHED WITH INPUT";
4710 PLAY "X"+VARPTR$(TUNE2$)
4720 '
4730 LOCATE V2,POS1: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
4740 Q$=INKEY$: IF Q$="" THEN 4740
4750 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 4830  ELSE Q=ASC(MID$(Q$,2,1))
4760 IF Q<>72 AND Q<>80 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 4740
4770 IF Q=72 THEN V2=V2-1    'cursor up
4780 IF Q=80 THEN V2=V2+1    'cursor down
4790 IF V2<TOP2 THEN V2=BOT2
4800 IF V2>BOT2 THEN V2=TOP2
4810 PRINT " ": GOTO 4730
4820 '
4830 IF Q<>13 AND Q<>32 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 4740
4840 IF Q=13 THEN 4930    'calculate course value
4850 IF Q=32 THEN LOCATE ,POS2+2
4860 IF SCREEN(V2,POS2+2,1)=CLR+8 THEN LOCATE ,POS2+2: PRINT CHR$(255);: FLAG=0:
      GOTO 4890
4870 IF FLAG=0 THEN COLOR CLR+8: PRINT CHR$(42);: COLOR CLR: FLAG=1: GOTO 4890
4880 IF FLAG=1 THEN COLOR CLR+8: PRINT CHR$(42);: COLOR CLR: FLAG=0: GOTO 4890
4890 LOCATE V2,POS1: GOTO 4740
4900 '
4910 '───────────────────── COURSE VALUE CALCULATIONS ─────────────
4920 '
4930 COURSE.GOAL!=0: L=7
4940 FOR K=1 TO 8
4950   IF SCREEN(L+K,POS2+2,1)=CLR+8 THEN COURSE.GOAL!=COURSE.GOAL! + AVG.GOAL!(K)
4960 NEXT K
4970 COURSE.VALUE!=COURSE.GOAL! + PREF.VALUE
4980 CLS
4990 '
5000 '───────────────────── WRITE DATA TO FACULTY.DAT ─────────────
5010 '
5020 IF LOF(2) > 0 THEN 5040 ELSE 5090
5030 '
5040 FOR Z=1 TO LOF(2)/24
5050   GET #2,Z
5060   IF PROF$(I)=PROF.NAME$ AND COURSE$(J)=COURSE.NUM$ THEN
```

```
            LSET PROF.NAME$=PROF$(I): RSET COURSE.NUM$=COURSE$(J):
            LSET VALUE$=MKS$(COURSE.VALUE!): PUT #2,Z: GOTO 5160
5070 NEXT Z
5080 '
5090 LSET PROF.NAME$=PROF$(I)
5100 RSET COURSE.NUM$=COURSE$(J)
5110 LSET VALUE$=MKS$(COURSE.VALUE!)
5120 PUT #2
5130 '
5140 '———————————————— NEW SELECTION SUBROUTINE ——————————
5150 '
5160 LOCATE 8,24: PRINT "  SELECT ANOTHER COURSE?  (Y/N) "
5170 Q$=INKEY$: IF Q$="" THEN 5170
5180 IF Q$="Y" OR Q$="y" THEN 3990     'select another course
5190 IF Q$="N" OR Q$="n" THEN 5220
5200 PLAY "X"+VARPTR$(TUNE1$): GOTO 5170
5210 '
5220 LOCATE 8,24: PRINT "SELECT ANOTHER PROFESSOR?  (Y/N)"
5230 Q$=INKEY$: IF Q$="" THEN 5230
5240 IF Q$="Y" OR Q$="y" THEN 3680     'select another professor
5250 IF Q$="N" OR Q$="n" THEN 5300     'end program
5260 PLAY "X"+VARPTR$(TUNE1$): GOTO 5230
5270 '
5280 '———————————————— REARRANGE FACULTY.DAT INPUT ——————————
5290 '
5300 CLS
5310 CLOSE #2
5320 '
5330 LOCATE 8,20: PRINT "< PLEASE BE PATIENT WHILE I CALCULATE >"
5340 '
5350 OPEN "FACULTY.DAT" AS #2 LEN=24
5360 FIELD #2, 15 AS PROF.NAME$, 5 AS COURSE.NUM$, 4 AS VALUE$
5370 '
5380 K=0
5390 FOR X=1 TO LOF(2)/24
5400    GET #2,X
5410    K=K+1
5420    TEMP.PROF$(K)=PROF.NAME$
5430    TEMP.COURSE$(K)=COURSE.NUM$
5440    TEMP.COURSE.VALUE!(K)=CVS(VALUE$)
5450 NEXT X
5460 CLOSE #2
5470 '
5480 B=0
5490 FOR J=1 TO 120
5500    FOR L=1 TO K
5510      IF TEMP.COURSE$(L)<>COURSE$(J) THEN 5560
5520      B=B+1
5530      DR$(B)=TEMP.PROF$(L)
5540      CLASS$(B)=TEMP.COURSE$(L)
5550      AMT!(B)=TEMP.COURSE.VALUE!(L)
5560    NEXT L
5570 NEXT J
5580 '
5590 FIRST=1: LAST=1: TEMP.CLASS$=""
5600 FOR L=1 TO K
5610   IF CLASS$(L)=TEMP.CLASS$ THEN 5710
5620   FOR Y=FIRST TO LAST-1
5630     FOR N=Y+1 TO LAST
5640       IF AMT!(Y) => AMT!(N) THEN 5670
5650       SWAP AMT!(Y), AMT!(N)
5660       SWAP DR$(Y), DR$(N)
5670     NEXT N
5680   NEXT Y
5690   FIRST=L
5700   TEMP.CLASS$=CLASS$(L)
5710   LAST=L
5720 NEXT L
5730 '
5740 '———————————————— WRITE RESULTS TO COURSE.DAT ——————————
5750 '
5760 OPEN "COURSE.DAT" AS #3 LEN=24
5770 FIELD #3, 15 AS DR.NAME$, 5 AS CLASS.NUM$, 4 AS CLASS.AMT$
5780 '
5790 FOR L=1 TO K
5800    LSET DR.NAME$=DR$(L)
5810    RSET CLASS.NUM$=CLASS$(L)
5820    LSET CLASS.AMT$=MKS$((AMT!(L)))
5830    PUT #3,L
5840 NEXT L
5850 '
5860 CLOSE #3
5870 '
5880 '———————————————— PRINT RESULTS TO PRINTER ——————————
5890 '
5900 CLS
5910 LOCATE 8,16: PRINT "PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER"
```

```
5920 LOCATE 9,18: PRINT "TO PRINT A COPY OF THE FACULTY/COURSE VALUES"
5930 LOCATE 12,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
     COLOR CLR: PRINT " WHEN PRINTER IS READY"
5940 PLAY "X"+VARPTR$(TUNE2$)
5950 Q$=INKEY$: IF Q$="" THEN 5950
5960 IF Q$<>CHR$(13) THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 5950
5970 CLS
5980 LOCATE 8,30: PRINT "<<< PRINTING >>>"
5990 LPRINT STRING$(8,13) TAB(29) "FACULTY/COURSE VALUES" STRING$(2,13)
6000 LINES.PRINTED=10
6010 '
6020 OPEN "COURSE.DAT" AS #3 LEN=24
6030 FIELD #3, 15 AS DR.NAME$, 5 AS CLASS.NUM$, 4 AS CLASS.AMT$
6040 FOR X=1 TO LOF(3)/24
6050   GET #3,X
6060   IF LINES.PRINTED > 56 THEN LPRINT CHR$(12) STRING$(8,13):LINES.PRINTED=8
6070   LPRINT TAB(24) DR.NAME$;
6080   LPRINT CLASS.NUM$;: LPRINT USING "      #.####"; CVS(CLASS.AMT$)
6090   LINES.PRINTED=LINES.PRINTED+1
6100 NEXT X
6110 '
6120 CLOSE #3
6130 '
6140 '———————————————— END PROGRAM ————————————————
6150 '
6160 CLS
6170 LOCATE 8,24: PRINT "< PRESS ANY KEY TO END PROGRAM >";
6180 IF INKEY$="" THEN 6170
6190 CLS: END
```

APPENDIX C. ASSIGNMENT PROGRAM LISTING

```
1 'PROGRAM "ASSIGN.BAS" - by Dona Chapman - 14 July 1985
1000 CLS: KEY OFF: FOR I=1 TO 10: KEY I,"": NEXT
1010 DEFINT A-Z
1020 DIM COURSE(120), COURSE$(120), COURSE.NAME$(120), PROF$(28), ASSIGN(120),
       TEMP.PROF$(120), CREDIT.COUNTER(28), PROF(28)
1030 DIM TEMP.DR.NAME$(300), TEMP.CLASS.NUM$(300), TEMP.CLASS.AMT!(300),
       CREDIT.HOURS(120), PROF1(28)
1040 CLR = 7
1050 TUNE1$ = "MB L20 N24 N20 MF": TUNE2$ = "MB L50 N50 N45 N55 N55 N60 MF":
1060 GOTO 1340   'course variable assignment subroutine
1070 '
1080 '
1090 '    VARIABLES:
1100 '      ASSIGN(I) = course assignment designation (-1: yes, 0: no)
1110 '      CLASS.AMT$ = assignment of value for COURSE.DAT data file
1120 '      CLASS.NUM$ = assignment of course for COURSE.DAT data file
1130 '      COURSE(J) = course offering designation (-1: yes, 0: no)
1140 '      COURSE$(J) = course number identification
1150 '      COURSE.NAME$(K) = course title identification of course K
1160 '      COURSE.NUM$ = assignment of COURSE$(J) for random file
1170 '      COURSE.VALUE!(I) = value of course whose indentification is I
1180 '      CREDIT.COUNTER (I) = number of credit hours assigned professor I
1190 '      CREDIT.HOURS(J) = number of credit hours for course J
1200 '      DR.NAME$ = assignment of professor for COURSE.DAT data file
1210 '      PROF(I) = faculty availability designation (-1: yes, 0: no)
1220 '      PROF1(I) = faculty availability (one course only) (-1:yes, 0: no)
1230 '      PROF$(I) = identification number of professor I
1240 '      PROF.NAME$ = assignment of PROF$(I) for random file
1250 '      VALUE$ = assignment of COURSE.VALUE! for random file
1260 '      TEMP.CLASS.AMT!(B) = temporary assignment for data manipulation
1270 '      TEMP.CLASS.NUM$(B) = temporary assignment for data manipulation
1280 '      TEMP.DR.NAME$(B) = temporary assignment for data manipulation
1290 '      TEMP.PROF$(I) = temporary assignment for data manipulation
1300 '
1310 '
1320 '————————————————— COURSE VARIABLE ASSIGNMENTS ——————————————
1330 '
1340 COURSE$(1)    = "  2011"    'Technology of Metals I
1350 COURSE$(2)    = "  2012"    'Technology of Metals II
1360 COURSE$(3)    = "H2150"     'Engineering Economy - Honors
1370 COURSE$(4)    = "A2150"     'Engineering Economy - Section A
1380 COURSE$(5)    = "B2150"     'Engineering Economy - Section B
1390 COURSE$(6)    = "C2150"     'Engineering Economy - Section C
1400 COURSE$(7)    = "A2180"     'Intro to IEOR - Section A
1410 COURSE$(8)    = "B2180"     'Intro to IEOR - Section B
1420 COURSE$(9)    = "A3120"     'Industrial Cost Control - Section A
1430 COURSE$(10)   = "B3120"     'Industrial Cost Control - Section B
1440 COURSE$(11)   = "C3120"     'Industrial Cost Control - Section C
1450 COURSE$(12)   = "A3130"     'Methods Engineering - Section A
1460 COURSE$(13)   = "B3130"     'Methods Engineering - Section B
1470 COURSE$(14)   = "A3200"     'Human Performance in Ind. Systems - Section A
1480 COURSE$(15)   = "B3200"     'Human Performance in Ind. Systems - Section B
1490 COURSE$(16)   = "A3300"     'Manufacturing Processes - Section A
1500 COURSE$(17)   = "B3300"     'Manufacturing Processes - Section B
1510 COURSE$(18)   = "A3460"     'Computation Methods in IE - Section A
1520 COURSE$(19)   = "B3460"     'Computation Methods in IE - Section B
1530 COURSE$(20)   = "  4050"    'Nuclear Fuel Cycle Management
1540 COURSE$(21)   = "  4070"    'Materials and the Economy
1550 COURSE$(22)   = "  4090"    'Principles of IE
1560 COURSE$(23)   = "  4100"    'Occupational Safety and Hazard Control
1570 COURSE$(24)   = "  4110"    'Process Engineering
1580 COURSE$(25)   = "A4150"     'Systems Analysis through Simulation - Section A
1590 COURSE$(26)   = "B4150"     'Systems Analysis through Simulation - Section B
1600 COURSE$(27)   = "  4160"    'Industrial Hazard Control Lab
1610 COURSE$(28)   = "  4200"    'Engineering Psychology
1620 COURSE$(29)   = "A4210"     'Math Methods of OR - Section A
1630 COURSE$(30)   = "B4210"     'Math Methods of OR - Section B
1640 COURSE$(31)   = "A4211"     'Production Planning and Control - Section A
1650 COURSE$(32)   = "B4211"     'Production Planning and Control - Section B
1660 COURSE$(33)   = "C4211"     'Production Planning and Control - Section C
1670 COURSE$(34)   = "A4212"     'Plant Design and Layout - Section A
1680 COURSE$(35)   = "B4212"     'Plant Design and Layout - Section B
1690 COURSE$(36)   = "C4212"     'Plant Design and Layout - Section C
1700 COURSE$(37)   = "  4220"    'Industrial Automation
1710 COURSE$(38)   = "  4240"    'Industrial Economy
1720 COURSE$(39)   = "A4250"     'Statistical Quality Control - Section A
1730 COURSE$(40)   = "B4250"     'Statistical Quality Control - Section B
1740 COURSE$(41)   = "  4280"    'Industrial Systems Engineering
1750 COURSE$(42)   = "  4290"    'Theory of Organization
1760 COURSE$(43)   = "A4310"     'Deterministic OR Models - Section A
1770 COURSE$(44)   = "B4310"     'Deterministic OR Models - Section B
1780 COURSE$(45)   = "A4320"     'Probablistic OR Models - Section A
1790 COURSE$(46)   = "B4320"     'Probablistic OR Models - Section B
1800 COURSE$(47)   = "  4330"    'Material Handling Analysis
1810 COURSE$(48)   = "  4350"    'Industrial Quality Control
1820 COURSE$(49)   = "  4360"    'Compensation Planning and Design
1830 COURSE$(50)   = "  4361"    'Intro to Computer-based Info Systems
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1840 COURSE$(51)  = " 4362"       'Intro to Computer-based Info Systems
1850 COURSE$(52)  = " 4363"       'Intro to Computer-based Info Systems
1860 COURSE$(53)  = " 4370"       'Micro-computer Applications in IMF
1870 COURSE$(54)  = " 4380"       'Industrial Systems Design
1880 COURSE$(55)  = " 4400"       'Industrial Work Physiology
1890 COURSE$(56)  = " 4410"       'Systems Safety Analysis
1900 COURSE$(57)  = " 4420"       'Industrial Fire Control
1910 COURSE$(58)  = " 4980"       'Special Study
1920 '
1930 '————————————————— 5000-LEVEL GRADUATE COURSES ————————————————
1940 '
1950 COURSE$(59)  = " 5010"       'Applied Optimization Mathods
1960 COURSE$(60)  = " 5040"       'Math Programming I
1970 COURSE$(61)  = " 5060"       'Advanced Motion and Time Study
1980 COURSE$(62)  = " 5100"       'Theory of Graphs and Network Analysis
1990 COURSE$(63)  = " 5101"       'Advanced Engineering Economy
2000 COURSE$(64)  = " 5102"       'Advanced Engineering Economy
2010 COURSE$(65)  = " 5111"       'Human Factors Research Methodology
2020 COURSE$(66)  = " 5112"       'Human Factors Research Methodology
2030 COURSE$(67)  = " 5113"       'Human Factors Research Methodology
2040 COURSE$(68)  = " 5131"       'Principles and Problems of Management
2050 COURSE$(69)  = " 5132"       'Principles and Problems of Management
2060 COURSE$(70)  = " 5133"       'Principles and Problems of Management
2070 COURSE$(71)  = " 5141"       'OR Methodology I
2080 COURSE$(72)  = " 5142"       'OR Methodology II
2090 COURSE$(73)  = " 5160"       'Applications of Simulation Languages
2100 COURSE$(74)  = " 5170"       'Facilities Planning and Material Handling
2110 COURSE$(75)  = " 5180"       'Organization Theory and Design
2120 COURSE$(76)  = " 5190"       'Industrial System Simulation
2130 COURSE$(77)  = " 5220"       'Advanced Industrial Automation
2140 COURSE$(78)  = " 5230"       'Forecasting Models
2150 COURSE$(79)  = " 5240"       'Queueing Theory I
2160 COURSE$(80)  = " 5250"       'Advanced Quality Control
2170 COURSE$(81)  = " 5260"       'Quality Control and Reliability
2180 COURSE$(82)  = " 5270"       'Models in Reliability Engineering
2190 COURSE$(83)  = "A5280"       'Procurement and Inventory Theory - Section A
2200 COURSE$(84)  = "B5280"       'Procurement and Inventory Theory - Section B
2210 COURSE$(85)  = " 5311"       'Design and Evaluation of M/M Systems I
2220 COURSE$(86)  = " 5312"       'Design and Evaluation of M/M Systems II
2230 COURSE$(87)  = " 5330"       'Research and Design Projects in HF
2240 COURSE$(88)  = " 5340"       'Integer Mathematical Programming
2250 COURSE$(89)  = " 5361"       'Analysis of Stochastic Systems I
2260 COURSE$(90)  = " 5362"       'Analysis of Stochastic Systems II
2270 COURSE$(91)  = " 5370"       'Design and Analysis of Ind Training Systems
2280 COURSE$(92)  = " 5380"       'Anthropometry in Workplace Design
2290 COURSE$(93)  = " 5390"       'Analysis of Complex Interactive Systems
2300 COURSE$(94)  = " 5400"       'Work and Motivation
2310 COURSE$(95)  = " 5410"       'Information Systems Analysis and Design
2320 COURSE$(96)  = " 5450"       'Lab Methods in Human Factors Research
2330 COURSE$(97)  = " 5460"       'Manufacturing Systems Analysis
2340 COURSE$(98)  = " 5470"       'Manufacturing Costs and Production Economics
2350 COURSE$(99)  = " 5480"       'Process Engineering and Analysis
2360 COURSE$(100) = " 5490"       'Production Planning and Scheduling
2370 COURSE$(101) = " 5940"       'Seminar
2380 COURSE$(102) = " 5950"       'Seminar in Applied Probability
2390 COURSE$(103) = " 5980"       'Special Study
2400 '
2410 '————————————————— 6000-LEVEL GRADUATE COURSES ————————————————
2420 '
2430 COURSE$(104) = " 6030"       'Industrial Systems Optimization
2440 COURSE$(105) = " 6040"       'Advanced Industrial Programming
2450 COURSE$(106) = " 6061"       'Dynamic Programming I
2460 COURSE$(107) = " 6062"       'Dynamic Programming II
2470 COURSE$(108) = " 6110"       'Advanced Production Scheduling
2480 COURSE$(109) = " 6241"       'Queueing Theory II
2490 COURSE$(110) = " 6242"       'Queueing Theory III
2500 COURSE$(111) = " 6280"       'Inventory Theory
2510 COURSE$(112) = " 6310"       'Manual Control Theory in M/M Systems
2520 COURSE$(113) = " 6320"       'Human Factors in Display Systems
2530 COURSE$(114) = " 6350"       'Math Methods of OR
2540 COURSE$(115) = " 6360"       'Applied Stochastic Processes in OR
2550 COURSE$(116) = " 6370"       'Industrial Training Technology
2560 COURSE$(117) = " 6380"       'Advanced Topics in Human Factors Engineering
2570 COURSE$(118) = " 6460"       'Manufacturing Systems and Controls
2580 COURSE$(119) = " 64XX"       'Math Models in M/M Systems
2590 COURSE$(120) = " XXXX"       'Extra course space
2600 '
2610 '
2620 '————————————————— COURSE NAME VARIABLE ASSIGNMENTS ————————————————
2630 '
2640 COURSE.NAME$(1)  = "Technology of Metals I              "   'IEOR 2011
2650 COURSE.NAME$(2)  = "Technology of Metals II             "   'IEOR 2012
2660 COURSE.NAME$(3)  = "Engineering Economy - Honors        "   'IEOR H2150
2670 COURSE.NAME$(4)  = "Engineering Economy - Section A     "   'IEOR A2150
2680 COURSE.NAME$(5)  = "Engineering Economy - Section B     "   'IEOR B2150
2690 COURSE.NAME$(6)  = "Engineering Economy - Section C     "   'IEOR C2150
2700 COURSE.NAME$(7)  = "Introduction to IEOR - Section A    "   'IEOR A2180
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2710 COURSE.NAME$(8)   = "Introduction to IEOR - Section B          "  'IEOR B2180
2720 COURSE.NAME$(9)   = "Industrial Cost Control - Section A      "  'IEOR A3120
2730 COURSE.NAME$(10)  = "Industrial Cost Control - Section B      "  'IEOR B3120
2740 COURSE.NAME$(11)  = "Industrial Cost Control - Section C      "  'IEOR C3120
2750 COURSE.NAME$(12)  = "Methods Engineering - Section A          "  'IEOR A3130
2760 COURSE.NAME$(13)  = "Methods Engineering - Section B          "  'IEOR B3130
2770 COURSE.NAME$(14)  = "Human Perf. in Ind. Systems - Section A"  'IEOR A3200
2780 COURSE.NAME$(15)  = "Human Perf. in Ind. Systems - Section B"  'IEOR B3200
2790 COURSE.NAME$(16)  = "Manufacturing Processes - Section A      "  'IEOR A3300
2800 COURSE.NAME$(17)  = "Manufacturing Processes - Section B      "  'IEOR B3300
2810 COURSE.NAME$(18)  = "Computation Methods in IE - Section A    "  'IEOR A3460
2820 COURSE.NAME$(19)  = "Computation Methods in IE - Section B    "  'IEOR B3460
2830 COURSE.NAME$(20)  = "Nuclear Fuel Cycle Management            "  'IEOR 4050
2840 COURSE.NAME$(21)  = "Materials and the Economy                "  'IEOR 4070
2850 COURSE.NAME$(22)  = "Principles of IE                         "  'IEOR 4090
2860 COURSE.NAME$(23)  = "Occupational Safety and Hazard Control "  'IEOR 4100
2870 COURSE.NAME$(24)  = "Process Engineering                      "  'IEOR 4110
2880 COURSE.NAME$(25)  = "Sys. Analysis through Sim. - Section A "  'IEOR A4150
2890 COURSE.NAME$(26)  = "Sys. Analysis through Sim. - Section B "  'IEOR B4150
2900 COURSE.NAME$(27)  = "Industrial Hazard Control Lab            "  'IEOR 4160
2910 COURSE.NAME$(28)  = "Engineering Psychology                   "  'IEOR 4200
2920 COURSE.NAME$(29)  = "Math Methods of OR - Section A           "  'IEOR A4210
2930 COURSE.NAME$(30)  = "Math Methods of OR - Section B           "  'IEOR B4210
2940 COURSE.NAME$(31)  = "Prod. Planning & Control - Section A     "  'IEOR A4211
2950 COURSE.NAME$(32)  = "Prod. Planning & Control - Section B     "  'IEOR B4211
2960 COURSE.NAME$(33)  = "Prod. Planning & Control - Section C     "  'IEOR C4211
2970 COURSE.NAME$(34)  = "Plant Design and Layout - Section A      "  'IEOR A4212
2980 COURSE.NAME$(35)  = "Plant Design and Layout - Section B      "  'IEOR B4212
2990 COURSE.NAME$(36)  = "Plant Design and Layout - Section C      "  'IEOR C4212
3000 COURSE.NAME$(37)  = "Industrial Automation                    "  'IEOR 4220
3010 COURSE.NAME$(38)  = "Industrial Economy                       "  'IEOR 4240
3020 COURSE.NAME$(39)  = "Statistical Quality Control - Section A"  'IEOR A4250
3030 COURSE.NAME$(40)  = "Statistical Quality Control - Section B"  'IEOR B425
3040 COURSE.NAME$(41)  = "Industrial Systems Engineering           "  'IEOR 4280
3050 COURSE.NAME$(42)  = "Theory of Organization                   "  'IEOR 4290
3060 COURSE.NAME$(43)  = "Deterministic OR Models - Section A      "  'IEOR A4310
3070 COURSE.NAME$(44)  = "Deterministic OR Models - Section B      "  'IEOR B4310
3080 COURSE.NAME$(45)  = "Probablistic OR Models - Section A       "  'IEOR A4320
3090 COURSE.NAME$(46)  = "Probablistic OR Models - Section B       "  'IEOR B4320
3100 COURSE.NAME$(47)  = "Material Handling Analysis               "  'IEOR 4330
3110 COURSE.NAME$(48)  = "Industrial Quality Control               "  'IEOR 4350
3120 COURSE.NAME$(49)  = "Compensation Planning and Design         "  'IEOR 4360
3130 COURSE.NAME$(50)  = "Intro to Computer-based Info Systems     "  'IEOR 4361
3140 COURSE.NAME$(51)  = "Intro to Computer-based Info Systems     "  'IEOR 4362
3150 COURSE.NAME$(52)  = "Intro to Computer-based Info Systems     "  'IEOR 4363
3160 COURSE.NAME$(53)  = "Micro-computer Applications in IMF       "  'IEOR 4370
3170 COURSE.NAME$(54)  = "Industrial Systems Design                "  'IEOR 4380
3180 COURSE.NAME$(55)  = "Industrial Work Physiology               "  'IEOR 4400
3190 COURSE.NAME$(56)  = "Systems Safety Analysis                  "  'IEOR 4410
3200 COURSE.NAME$(57)  = "Industrial Fire Control                  "  'IEOR 4420
3210 COURSE.NAME$(58)  = "Special Study                            "  'IEOR 4980
3220 '
3230 '————————————— 5000-LEVEL GRADUATE COURSES —————————————
3240 '
3250 COURSE.NAME$(59)  = "Applied Optimization Methods             "  'IEOR 5010
3260 COURSE.NAME$(60)  = "Math Programming I                       "  'IEOR 5040
3270 COURSE.NAME$(61)  = "Advanced Motion and Time Study           "  'IEOR 5060
3280 COURSE.NAME$(62)  = "Theory of Graphs and Network Analysis    "  'IEOR 5100
3290 COURSE.NAME$(63)  = "Advanced Engineering Economy             "  'IEOR 5101
3300 COURSE.NAME$(64)  = "Advanced Engineering Economy             "  'IEOR 5102
3310 COURSE.NAME$(65)  = "Human Factors Research Methodology       "  'IEOR 5111
3320 COURSE.NAME$(66)  = "Human Factors Research Methodology       "  'IEOR 5112
3330 COURSE.NAME$(67)  = "Human Factors Research Methodology       "  'IEOR 5113
3340 COURSE.NAME$(68)  = "Principles and Problems of Management    "  'IEOR 5131
3350 COURSE.NAME$(69)  = "Principles and Problems of Management    "  'IEOR 5132
3360 COURSE.NAME$(70)  = "Principles and Problems of Management    "  'IEOR 5133
3370 COURSE.NAME$(71)  = "Operations Research Methodology I        "  'IEOR 5141
3380 COURSE.NAME$(72)  = "Operations Research Methodology II       "  'IEOR 5142
3390 COURSE.NAME$(73)  = "Applications of Simulation Languages     "  'IEOR 5160
3400 COURSE.NAME$(74)  = "Facilities Planning & Material Handling"  'IEOR 5170
3410 COURSE.NAME$(75)  = "Organization Theory and Design           "  'IEOR 5180
3420 COURSE.NAME$(76)  = "Industrial System Simulation             "  'IEOR 5190
3430 COURSE.NAME$(77)  = "Advanced Industrial Automation           "  'IEOR 5220
3440 COURSE.NAME$(78)  = "Forecasting Models                       "  'IEOR 5230
3450 COURSE.NAME$(79)  = "Queueing Theory I                        "  'IEOR 5240
3460 COURSE.NAME$(80)  = "Advanced Quality Control                 "  'IEOR 5250
3470 COURSE.NAME$(81)  = "Quality Control and Reliability          "  'IEOR 5260
3480 COURSE.NAME$(82)  = "Models in Reliability Engineering        "  'IEOR 5270
3490 COURSE.NAME$(83)  = "Procurement & Inv. Theory - Section A    "  'IEOR A5280
3500 COURSE.NAME$(84)  = "Procurement & Inv. Theory - Section B    "  'IEOR B5280
3510 COURSE.NAME$(85)  = "Design and Evaluation of M/M Systems I "  'IEOR 5311
3520 COURSE.NAME$(86)  = "Design and Evaluation of M/M Systems II"  'IEOR 5312
3530 COURSE.NAME$(87)  = "Research and Design Projects in HF       "  'IEOR 5330
3540 COURSE.NAME$(88)  = "Integer Mathematical Programming         "  'IEOR 5340
3550 COURSE.NAME$(89)  = "Analysis of Stochastic Systems I         "  'IEOR 5361
3560 COURSE.NAME$(90)  = "Analysis of Stochastic Systems II        "  'IEOR 5362
3570 COURSE.NAME$(91)  = "Design & Analysis of Ind. Trng. Systems"  'IEOR 5370
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3580 COURSE.NAME$(92)  = "Anthropometry in Workplace Design       "  'IEOR 5380
3590 COURSE.NAME$(93)  = "Analysis of Complex Interactive Systems"  'IEOR 5390
3600 COURSE.NAME$(94)  = "Work and Motivation                    "  'IEOR 5400
3610 COURSE.NAME$(95)  = "Information Systems Analysis and Design"  'IEOR 5410
3620 COURSE.NAME$(96)  = "Lab Methods in Human Factors Research  "  'IEOR 5450
3630 COURSE.NAME$(97)  = "Manufacturing Systems Analysis         "  'IEOR 5460
3640 COURSE.NAME$(98)  = "Manufacturing Costs and Prod. Economics"  'IEOR 5470
3650 COURSE.NAME$(99)  = "Process Engineering and Analysis       "  'IEOR 5480
3660 COURSE.NAME$(100) = "Production Planning and Scheduling     "  'IEOR 5490
3670 COURSE.NAME$(101) = "Seminar                                "  'IEOR 5940
3680 COURSE.NAME$(102) = "Seminar in Applied Probability         "  'IEOR 5950
3690 COURSE.NAME$(103) = "Special Study                          "  'IEOR 5980
3700 '
3710 '————————————— 6000-LEVEL GRADUATE COURSES —————————————
3720 '
3730 COURSE.NAME$(104) = "Industrial Systems Optimization        "  'IEOR 6030
3740 COURSE.NAME$(105) = "Advanced Industrial Programming        "  'IEOR 6040
3750 COURSE.NAME$(106) = "Dynamic Programming I                  "  'IEOR 6061
3760 COURSE.NAME$(107) = "Dynamic Programming II                 "  'IEOR 6062
3770 COURSE.NAME$(108) = "Advanced Production Scheduling         "  'IEOR 6010
3780 COURSE.NAME$(109) = "Queueing Theory II                     "  'IEOR 6241
3790 COURSE.NAME$(110) = "Queueing Theory III                    "  'IEOR 6242
3800 COURSE.NAME$(111) = "Inventory Theory                       "  'IEOR 6280
3810 COURSE.NAME$(112) = "Manual Control Theory in M/M Systems   "  'IEOR 6310
3820 COURSE.NAME$(113) = "Human Factors in Display Systems       "  'IEOR 6320
3830 COURSE.NAME$(114) = "Math Methods of Operations Research     "  'IEOR 6350
3840 COURSE.NAME$(115) = "Applied Stochastic Processes in OR      "  'IEOR 6360
3850 COURSE.NAME$(116) = "Industrial Training Technology          "  'IEOR 6370
3860 COURSE.NAME$(117) = "Adv Topics in Human Factors Engineering"  'IEOR 6380
3870 COURSE.NAME$(118) = "Manufacturing Systems and Controls     "  'IEOR 6460
3880 COURSE.NAME$(119) = "Math Models in Man/Machine Systems     "  'IEOR 64XX
3890 COURSE.NAME$(120) = "Extra course space                     "  'IEOR XXXX
3900 '
3910 '————————————— CREDIT HOUR VARIABLE ASSIGNMENTS —————————————
3920 '
3930 CREDIT.HOURS(1)  = 2   'IEOR 2011
3940 CREDIT.HOURS(2)  = 5   'IEOR 2012
3950 CREDIT.HOURS(3)  = 3   'IEOR H2150
3960 CREDIT.HOURS(4)  = 3   'IEOR A2150
3970 CREDIT.HOURS(5)  = 3   'IEOR B2150
3980 CREDIT.HOURS(6)  = 3   'IEOR C2150
3990 CREDIT.HOURS(7)  = 3   'IEOR A2180
4000 CREDIT.HOURS(8)  = 3   'IEOR B2180
4010 CREDIT.HOURS(9)  = 4   'IEOR A3120
4020 CREDIT.HOURS(10) = 4   'IEOR B3120
4030 CREDIT.HOURS(11) = 4   'IEOR C3120
4040 CREDIT.HOURS(12) = 4   'IEOR A3130
4050 CREDIT.HOURS(13) = 4   'IEOR B3130
4060 CREDIT.HOURS(14) = 4   'IEOR A3200
4070 CREDIT.HOURS(15) = 4   'IEOR B3200
4080 CREDIT.HOURS(16) = 3   'IEOR A3300
4090 CREDIT.HOURS(17) = 3   'IEOR B3300
4100 CREDIT.HOURS(18) = 4   'IEOR A3460
4110 CREDIT.HOURS(19) = 4   'IEOR B3460
4120 CREDIT.HOURS(20) = 3   'IEOR 4050
4130 CREDIT.HOURS(21) = 3   'IEOR 4070
4140 CREDIT.HOURS(22) = 3   'IEOR 4090
4150 CREDIT.HOURS(23) = 3   'IEOR 4100
4160 CREDIT.HOURS(24) = 3   'IEOR 4110
4170 CREDIT.HOURS(25) = 4   'IEOR A4150
4180 CREDIT.HOURS(26) = 4   'IEOR B4150
4190 CREDIT.HOURS(27) = 2   'IEOR 4160
4200 CREDIT.HOURS(28) = 3   'IEOR 4200
4210 CREDIT.HOURS(29) = 3   'IEOR A4210
4220 CREDIT.HOURS(30) = 3   'IEOR B4210
4230 CREDIT.HOURS(31) = 3   'IEOR A4211
4240 CREDIT.HOURS(32) = 3   'IEOR B4211
4250 CREDIT.HOURS(33) = 3   'IEOR C4211
4260 CREDIT.HOURS(34) = 3   'IEOR A4212
4270 CREDIT.HOURS(35) = 3   'IEOR B4212
4280 CREDIT.HOURS(36) = 3   'IEOR C4212
4290 CREDIT.HOURS(37) = 3   'IEOR 4220
4300 CREDIT.HOURS(38) = 3   'IEOR 4240
4310 CREDIT.HOURS(39) = 4   'IEOR A4250
4320 CREDIT.HOURS(40) = 4   'IEOR B4250
4330 CREDIT.HOURS(41) = 3   'IEOR 4280
4340 CREDIT.HOURS(42) = 3   'IEOR 4290
4350 CREDIT.HOURS(43) = 3   'IEOR A4310
4360 CREDIT.HOURS(44) = 3   'IEOR B4310
4370 CREDIT.HOURS(45) = 3   'IEOR A4320
4380 CREDIT.HOURS(46) = 3   'IEOR B4320
4390 CREDIT.HOURS(47) = 3   'IEOR 4330
4400 CREDIT.HOURS(48) = 3   'IEOR 4350
4410 CREDIT.HOURS(49) = 3   'IEOR 4360
4420 CREDIT.HOURS(50) = 3   'IEOR 4361
4430 CREDIT.HOURS(51) = 3   'IEOR 4362
4440 CREDIT.HOURS(52) = 3   'IEOR 4363
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4450 CREDIT.HOURS(53)    = 3      'IEOR 4370
4460 CREDIT.HOURS(54)    = 4      'IEOR 4380
4470 CREDIT.HOURS(55)    = 3      'IEOR 4400
4480 CREDIT.HOURS(56)    = 3      'IEOR 4410
4490 CREDIT.HOURS(57)    = 3      'IEOR 4420
4500 CREDIT.HOURS(58)    = 3      'IEOR 4980
4510 '
4520 '————————————————— 5000-LEVEL GRADUATE COURSES ——————————————
4530 '
4540 CREDIT.HOURS(59)    = 3      'IEOR 5010
4550 CREDIT.HOURS(60)    = 3      'IEOR 5040
4560 CREDIT.HOURS(61)    = 3      'IEOR 5060
4570 CREDIT.HOURS(62)    = 3      'IEOR 5100
4580 CREDIT.HOURS(63)    = 3      'IEOR 5101
4590 CREDIT.HOURS(64)    = 3      'IEOR 5102
4600 CREDIT.HOURS(65)    = 3      'IEOR 5111
4610 CREDIT.HOURS(66)    = 3      'IEOR 5112
4620 CREDIT.HOURS(67)    = 3      'IEOR 5113
4630 CREDIT.HOURS(68)    = 3      'IEOR 5131
4640 CREDIT.HOURS(69)    = 3      'IEOR 5132
4650 CREDIT.HOURS(70)    = 3      'IEOR 5133
4660 CREDIT.HOURS(71)    = 3      'IEOR 5141
4670 CREDIT.HOURS(72)    = 3      'IEOR 5142
4680 CREDIT.HOURS(73)    = 3      'IEOR 5160
4690 CREDIT.HOURS(74)    = 3      'IEOR 5170
4700 CREDIT.HOURS(75)    = 3      'IEOR 5180
4710 CREDIT.HOURS(76)    = 3      'IEOR 5190
4720 CREDIT.HOURS(77)    = 3      'IEOR 5220
4730 CREDIT.HOURS(78)    = 3      'IEOR 5230
4740 CREDIT.HOURS(79)    = 3      'IEOR 5240
4750 CREDIT.HOURS(80)    = 3      'IEOR 5250
4760 CREDIT.HOURS(81)    = 3      'IEOR 5260
4770 CREDIT.HOURS(82)    = 3      'IEOR 5270
4780 CREDIT.HOURS(83)    = 3      'IEOR A5280
4790 CREDIT.HOURS(84)    = 3      'IEOR B5280
4800 CREDIT.HOURS(85)    = 3      'IEOR 5311
4810 CREDIT.HOURS(86)    = 3      'IEOR 5312
4820 CREDIT.HOURS(87)    = 3      'IEOR 5330
4830 CREDIT.HOURS(88)    = 3      'IEOR 5340
4840 CREDIT.HOURS(89)    = 3      'IEOR 5361
4850 CREDIT.HOURS(90)    = 3      'IEOR 5362
4860 CREDIT.HOURS(91)    = 3      'IEOR 5370
4870 CREDIT.HOURS(92)    = 3      'IEOR 5380
4880 CREDIT.HOURS(93)    = 3      'IEOR 5390
4890 CREDIT.HOURS(94)    = 3      'IEOR 5400
4900 CREDIT.HOURS(95)    = 3      'IEOR 5410
4910 CREDIT.HOURS(96)    = 3      'IEOR 5450
4920 CREDIT.HOURS(97)    = 3      'IEOR 5460
4930 CREDIT.HOURS(98)    = 3      'IEOR 5470
4940 CREDIT.HOURS(99)    = 3      'IEOR 5480
4950 CREDIT.HOURS(100)   = 3      'IEOR 5490
4960 CREDIT.HOURS(101)   = 1      'IEOR 5940
4970 CREDIT.HOURS(102)   = 1      'IEOR 5950
4980 CREDIT.HOURS(103)   = 3      'IEOR 5980
4990 '
5000 '————————————————— 6000-LEVEL GRADUATE COURSES ——————————————
5010 '
5020 CREDIT.HOURS(104)   = 3      'IEOR 6030
5030 CREDIT.HOURS(105)   = 3      'IEOR 6040
5040 CREDIT.HOURS(106)   = 3      'IEOR 6061
5050 CREDIT.HOURS(107)   = 3      'IEOR 6062
5060 CREDIT.HOURS(108)   = 3      'IEOR 6010
5070 CREDIT.HOURS(109)   = 3      'IEOR 6241
5080 CREDIT.HOURS(110)   = 3      'IEOR 6242
5090 CREDIT.HOURS(111)   = 3      'IEOR 6280
5100 CREDIT.HOURS(112)   = 3      'IEOR 6310
5110 CREDIT.HOURS(113)   = 3      'IEOR 6320
5120 CREDIT.HOURS(114)   = 3      'IEOR 6350
5130 CREDIT.HOURS(115)   = 3      'IEOR 6360
5140 CREDIT.HOURS(116)   = 3      'IEOR 6370
5150 CREDIT.HOURS(117)   = 3      'IEOR 6380
5160 CREDIT.HOURS(118)   = 3      'IEOR 6460
5170 CREDIT.HOURS(119)   = 3      'IEOR 64XX
5180 CREDIT.HOURS(120)   = 3      'IEOR XXXX
5190 '
5200 '————————————————— PROFESSOR VARIABLE ASSIGNMENT ——————————————
5210 '
5220 PROF$(1)    =    "AGEE            "
5230 PROF$(2)    =    "BALACHANDRAN    "
5240 PROF$(3)    =    "CASALI          "
5250 PROF$(4)    =    "CHACHRA         "
5260 PROF$(5)    =    "DEISENROTH      "
5270 PROF$(6)    =    "DISNEY          "
5280 PROF$(7)    =    "DRYDEN          "
5290 PROF$(8)    =    "FABRYCKY        "
5300 PROF$(9)    =    "GHARE           "
5310 PROF$(10)   =    "GREENE          "
```

```
5320 PROF$(11)  =  "GREENSTEIN       "
5330 PROF$(12)  =  "JONES            "
5340 PROF$(13)  =  "KEMMERLING       "
5350 PROF$(14)  =  "KROEMER          "
5360 PROF$(15)  =  "KURSTEDT         "
5370 PROF$(16)  =  "MALMBORG         "
5380 PROF$(17)  =  "MULLER           "
5390 PROF$(18)  =  "NACHLAS          "
5400 PROF$(19)  =  "PRICE            "
5410 PROF$(20)  =  "REASOR           "
5420 PROF$(21)  =  "SARIN            "
5430 PROF$(22)  =  "SCHMIDT          "
5440 PROF$(23)  =  "SHERALI          "
5450 PROF$(24)  =  "SINK             "
5460 PROF$(25)  =  "SNYDER           "
5470 PROF$(26)  =  "TORGERSEN        "
5480 PROF$(27)  =  "WIERWILLE        "
5490 PROF$(28)  =  "WILLIGES         "
5500 '
5510 '———————————— SELECT TERM FOR DATA INPUT ————————————
5520 '
5530 CLS
5540 LOCATE 8,16: PRINT "WHICH TERM WOULD YOU LIKE TO SCHEDULE?  (F/W/S)"
5550 Q$=INKEY$: IF Q$="" THEN 5550
5560 IF Q$="F" OR Q$="f" THEN TERM$=" FALL  QUARTER": GOTO 5630
5570 IF Q$="W" OR Q$="w" THEN TERM$="WINTER QUARTER": GOTO 5630
5580 IF Q$="S" OR Q$="s" THEN TERM$="SPRING QUARTER": GOTO 5630
5590 PLAY "X"+VARPTR$(TUNE1$): GOTO 5550
5600 '
5610 '———————————— SELECT COURSE FOR DATA INPUT ————————————
5620 '
5630 FOR J=1 TO 120
5640    COURSE(J)=0
5650 NEXT J
5660 '
5670 CLS
5680 TOP1=7: ROW=7: BOT1=21: COL=3: COL1=5: COL2=15: COL3=25: COL4=35: COL5=45:
     COL6=55: COL7=65: COL8=75: LEFT=3: RIGHT=73
5690 LOCATE 1,14,0
5700 PRINT "INDICATE THE COURSES TO BE OFFERED DURING ";TERM$
5710 LOCATE 3,20: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
        PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
        PRINT " TO MOVE ARROW DOWN, "
5720 LOCATE 4,22: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
        PRINT " TO MOVE ARROW RIGHT, ";: COLOR CLR+8: PRINT CHR$(27);: COLOR CLR:
        PRINT " TO MOVE ARROW LEFT" CHR$(13) CHR$(13)
5730 LOCATE 5,17: PRINT "PRESS THE SPACE BAR TO SELECT AND DESELECT A COURSE"
        CHR$(13)
5740 '
5750 FOR J=1 TO 15
5760    LOCATE ,COL1: PRINT COURSE$(J);: LOCATE ,COL2: PRINT COURSE$(J+15);:
        LOCATE ,COL3: PRINT COURSE$(J+30);: LOCATE ,COL4: PRINT COURSE$(J+45);
5770    LOCATE ,COL5: PRINT COURSE$(J+60);: LOCATE ,COL6: PRINT COURSE$(J+75);:
        LOCATE ,COL7: PRINT COURSE$(J+90);: LOCATE ,COL8: PRINT COURSE$(J+105)
5780 NEXT J
5790 '
5800 LOCATE 23,33: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
        COLOR CLR: PRINT " TO CONTINUE"
5810 PLAY "X"+VARPTR$(TUNE2$)
5820 '
5830 LOCATE ROW,COL: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
5840 Q$=INKEY$: IF Q$="" THEN 5840
5850 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 5970  ELSE Q=ASC(MID$(Q$,2,1))
5860 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):
        GOTO 5840
5870 IF Q=72 THEN ROW=ROW-1     'cursor up
5880 IF Q=80 THEN ROW=ROW+1     'cursor down
5890 IF Q=75 THEN COL=COL-10    'cursor left
5900 IF Q=77 THEN COL=COL+10    'cursor right
5910 IF ROW<TOP1 THEN ROW=BOT1
5920 IF ROW>BOT1 THEN ROW=TOP1
5930 IF COL<LEFT THEN COL=RIGHT
5940 IF COL>RIGHT THEN COL=LEFT
5950 PRINT " ": GOTO 5830
5960 '
5970 IF Q<>13 AND Q<>32 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 5840
5980 IF Q=13 THEN 6070
5990 J=(ROW-TOP1+1)+15*((COL-LEFT)/10)
6000 LOCATE ROW,COL+2
6010 IF COURSE(J)  THEN PRINT COURSE$(J): COURSE(J)=0 ELSE COLOR CLR+8:
        PRINT COURSE$(J): COLOR CLR: COURSE(J)=-1
6020 LOCATE ROW,COL: GOTO 5840
6030 '
6040 '———————————— PRINT COURSES OFFERED TO PRINTER ————————————
6050 '
6060 '
6070 CLS
```

```
6080 LOCATE 8,16: PRINT "PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER"
6090 LOCATE 9,21: PRINT "TO PRINT A COPY OF THE COURSES OFFERED"
6100 LOCATE 12,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
     COLOR CLR: PRINT " WHEN PRINTER IS READY"
6110 PLAY "X"+VARPTR$(TUNE2$)
6120 Q$=INKEY$: IF Q$="" THEN 6120
6130 IF Q$<>CHR$(13) THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 6120
6140 CLS
6150 LOCATE 8,30: PRINT "<<< PRINTING >>>"
6160 LPRINT STRING$(8,13)
6170 LPRINT TAB(33) TERM$ STRING$(2,13)
6180 LPRINT TAB(21) "THE FOLLOWING COURSES WILL BE OFFERED:" STRING$(2,13)
6190 LINES.PRINTED=14
6200 FOR J=1 TO 120
6210   IF COURSE(J)=0 THEN 6250
6220   IF LINES.PRINTED > 56 THEN LPRINT CHR$(12) STRING$(7,13):LINES.PRINTED=8
6230   LPRINT TAB(13) "IEOR " COURSE$(J);: LPRINT USING " (# CR)"; CREDIT.HOURS(J);:
LPRINT " -- " COURSE.NAME$(J)
6240   LINES.PRINTED=LINES.PRINTED+1
6250 NEXT J
6260 '
6270 '─────────────── FACULTY AVAILABILITY (NO COURSES) ───────────────
6280 '
6290 FOR I=1 TO 28
6300   PROF(I)=0
6310 NEXT I
6320 '
6330 CLS
6340 TOP=8: V=8: BOT=21: LEFT1=21: C=21: LEFT2=46
6350 LOCATE 1,13,0
6360 PRINT "INDICATE THOSE PROFESSORS NOT TEACHING "; TERM$
6370 LOCATE 3,16: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
     PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
     PRINT " TO MOVE ARROW DOWN,"
6380 LOCATE 4,18: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
     PRINT " TO MOVE ARROW RIGHT, ";: COLOR CLR+8: PRINT CHR$(27);: COLOR CLR:
     PRINT " TO MOVE ARROW LEFT" CHR$(13)
6390 LOCATE 5,12: PRINT "PRESS THE SPACE BAR TO SELECT AND DESELECT A PROFESSOR"
     CHR$(13) CHR$(13)
6400 '
6410 FOR I=1 TO 14
6420   LOCATE ,23: PRINT PROF$(I);: LOCATE ,48: PRINT PROF$(I+14)
6430 NEXT I
6440 '
6450 LOCATE 23,29: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
     COLOR CLR: PRINT " TO CONTINUE"
6460 PLAY "X"+VARPTR$(TUNE2$)
6470 '
6480 LOCATE V,C: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
6490 Q$=INKEY$: IF Q$="" THEN 6490
6500 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 6600  ELSE Q=ASC(MID$(Q$,2,1))
6510 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):
     GOTO 6490
6520 IF Q=72 THEN V=V-1     'cursor up
6530 IF Q=80 THEN V=V+1     'cursor down
6540 IF Q=75 THEN C=LEFT1   'cursor left
6550 IF Q=77 THEN C=LEFT2   'cursor right
6560 IF V<TOP THEN V=BOT
6570 IF V>BOT THEN V=TOP
6580 PRINT " ": GOTO 6480
6590 '
6600 IF Q<>13 AND Q<>32 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 6490
6610 IF Q=13 THEN 6700
6620 '
6630 I=(V-7)-(14*(C=LEFT2))
6640 LOCATE V,C+2
6650 IF PROF(I) THEN PRINT PROF$(I): PROF(I)=0 ELSE COLOR CLR+8: PRINT PROF$(I):
     COLOR CLR: PROF(I)=-1
6660 LOCATE V,C: GOTO 6490
6670 '
6680 '─────────────── FACULTY AVAILABILITY (ONE COURSE ONLY) ───────────────
6690 '
6700 FOR I=1 TO 28
6710   PROF1(I)=0
6720 NEXT I
6730 '
6740 CLS
6750 TOP=8: V=8: BOT=21: LEFT1=21: C=21: LEFT2=46
6760 LOCATE 1,7,0
6770 PRINT "INDICATE THOSE PROFESSORS TEACHING ONLY ONE COURSE "; TERM$
6780 LOCATE 3,16: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
     PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
     PRINT " TO MOVE ARROW DOWN,"
6790 LOCATE 4,18: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
     PRINT " TO MOVE ARROW RIGHT, ";: COLOR CLR+8: PRINT CHR$(27);: COLOR CLR:
     PRINT " TO MOVE ARROW LEFT" CHR$(13)
6800 LOCATE 5,12: PRINT "PRESS THE SPACE BAR TO SELECT AND DESELECT A PROFESSOR"
```

```
              CHR$(13) CHR$(13)
6810 '
6820 FOR I=1 TO 14
6830   LOCATE ,23: PRINT PROF$(I);: LOCATE ,48: PRINT PROF$(I+14)
6840 NEXT I
6850 '
6860 LOCATE 23,29: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
        COLOR CLR: PRINT " TO CONTINUE"
6870 PLAY "X"+VARPTR$(TUNE2$)
6880 '
6890 LOCATE V,C: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
6900 Q$=INKEY$: IF Q$="" THEN 6900
6910 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 7010  ELSE Q=ASC(MID$(Q$,2,1))
6920 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):
        GOTO 6900
6930 IF Q=72 THEN V=V-1     'cursor up
6940 IF Q=80 THEN V=V+1     'cursor down
6950 IF Q=75 THEN C=LEFT1    'cursor left
6960 IF Q=77 THEN C=LEFT2    'cursor right
6970 IF V<TOP THEN V=BOT
6980 IF V>BOT THEN V=TOP
6990 PRINT " ": GOTO 6890
7000 '
7010 IF Q<>13 AND Q<>32 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 6900
7020 IF Q=13 THEN 7110
7030 '
7040 I=(V-7)-(14*(C=LEFT2))
7050 LOCATE V,C+2
7060 IF PROF1(I) THEN PRINT PROF$(I): PROF1(I)=0 ELSE COLOR CLR+8: PRINT PROF$(I):
        COLOR CLR: PROF1(I)=-1
7070 LOCATE V,C: GOTO 6900
7080 '
7090 '—————————— DIRECT ASSIGNMENT OF FACULTY TO COURSES ——————————
7100 '
7110 FOR I=1 TO 28
7120   CREDIT.COUNTER(I)=0
7130 NEXT I
7140 '
7150 FOR J=1 TO 120
7160 '
7170 CLS
7180 IF COURSE(J)=0 THEN 7620
7190 LOCATE 8,6: PRINT "WOULD YOU LIKE TO DIRECTLY ASSIGN A PROFESSOR TO ";:
        COLOR CLR+8: PRINT "IEOR " COURSE$(J);: COLOR CLR: PRINT "?  (Y/N)"
7200 Q$=INKEY$: IF Q$="" THEN 7200
7210 IF Q$="N" OR Q$="n" THEN ASSIGN(J)=0: GOTO 7620
7220 IF Q$="Y" OR Q$="y" THEN ASSIGN(J)=-1: GOTO 7250
7230 PLAY "X"+VARPTR$(TUNE1$): GOTO 7200
7240 '
7250 CLS
7260 TOP=6: V=6: BOT=19: LEFT1=21: C=21: LEFT2=46
7270 LOCATE 1,14,0
7280 PRINT "INDICATE THE PROFESSOR TO BE ASSIGNED TO ";: COLOR CLR+8:
        PRINT "IEOR "; COURSE$(J);: COLOR CLR
7290 LOCATE 3,16: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(24);: COLOR CLR:
        PRINT " TO MOVE ARROW UP, ";: COLOR CLR+8: PRINT CHR$(25);: COLOR CLR:
        PRINT " TO MOVE ARROW DOWN,"
7300 LOCATE 4,18: COLOR CLR+8: PRINT CHR$(26);: COLOR CLR:
        PRINT " TO MOVE ARROW RIGHT, ";: COLOR CLR+8: PRINT CHR$(27);: COLOR CLR:
        PRINT " TO MOVE ARROW LEFT" CHR$(13)
7310 '
7320 FOR I=1 TO 14
7330   LOCATE ,23: PRINT PROF$(I);: LOCATE ,48: PRINT PROF$(I+14)
7340 NEXT I
7350 '
7360 LOCATE 23,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
        COLOR CLR: PRINT " TO SELECT A PROFESSOR"
7370 PLAY "X"+VARPTR$(TUNE2$)
7380 '
7390 LOCATE V,C: COLOR CLR+24: PRINT CHR$(16) CHR$(29);: COLOR CLR
7400 Q$=INKEY$: IF Q$="" THEN 7400
7410 IF LEN(Q$)=1  THEN Q=ASC(Q$): GOTO 7510  ELSE Q=ASC(MID$(Q$,2,1))
7420 IF Q<>72 AND Q<>80 AND Q<>75 AND Q<>77 THEN PLAY "X"+VARPTR$(TUNE1$):
        GOTO 7400
7430 IF Q=72 THEN V=V-1     'cursor up
7440 IF Q=80 THEN V=V+1     'cursor down
7450 IF Q=75 THEN C=LEFT1    'cursor left
7460 IF Q=77 THEN C=LEFT2    'cursor right
7470 IF V<TOP THEN V=BOT
7480 IF V>BOT THEN V=TOP
7490 PRINT " ": GOTO 7390
7500 '
7510 IF Q<>13 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 7400
7520 I=(V-5)-(14*(C=LEFT2))
7530 IF PROF(I)=-1 THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 7400
7540 CREDIT.COUNTER(I)=CREDIT.COUNTER(I)+CREDIT.HOURS(J)
7550 '
```

```
7560 CLS
7570 LOCATE 8,(80-(28+(LEN(PROF$(I)))))/2
7580 PRINT "IEOR "; COURSE$(J);: PRINT " IS ASSIGNED TO:  DR. "; PROF$(I)
7590 TEMP.PROF$(J)=PROF$(I)
7600 LOCATE 23,23: PRINT "< PRESS ANY KEY TO CONTINUE >"
7610 Q$=INKEY$: IF Q$="" THEN 7610
7620 NEXT J
7630 '
7640 '————————————— PRINT DIRECT ASSIGNMENTS TO PRINTER ————————————
7650 '
7660 CLS
7670 LOCATE 8,16: PRINT "PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER"
7680 LOCATE 9,19: PRINT "TO PRINT A COPY OF THE DIRECT ASSIGNMENTS"
7690 LOCATE 12,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
        COLOR CLR: PRINT " WHEN PRINTER IS READY"
7700 PLAY "X"+VARPTR$(TUNE2$)
7710 Q$=INKEY$: IF Q$="" THEN 7710
7720 IF Q$<>CHR$(13) THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 7710
7730 CLS
7740 LOCATE 8,30: PRINT "<<< PRINTING >>>"
7750 LPRINT STRING$(8,13)
7760 LPRINT TAB(33) TERM$ STRING$(2,13)
7770 LPRINT TAB(16) "THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:"
        STRING$(2,13)
7780 LINES.PRINTED=14
7790 '
7800 FOR J=1 TO 120
7810    IF COURSE(J)=0 THEN 7850
7820    IF LINES.PRINTED > 56 THEN LPRINT CHR$(12) STRING$(8,13):LINES.PRINTED=8
7830    IF ASSIGN(J)=0 THEN LPRINT TAB(23) "IEOR " COURSE$(J);: LPRINT USING
        " (# CR)"; CREDIT.HOURS(J);: LPRINT " -- ** NO ASSIGNMENT **":
        LINES.PRINTED=LINES.PRINTED+1
7840    IF ASSIGN(J)=-1 THEN LPRINT TAB(23) "IEOR " COURSE$(J);: LPRINT USING
        " (# CR)"; CREDIT.HOURS(J);: LPRINT " -- DR. " TEMP.PROF$(J):
        LINES.PRINTED=LINES.PRINTED+1
7850 NEXT J
7860 '
7870 '————————————————— SCHEDULING ROUTINE ———————————————
7880 '
7890 CLS
7900 LOCATE 8,20: PRINT "< PLEASE BE PATIENT WHILE I CALCULATE >"
7910 '
7920 OPEN "COURSE.DAT" AS #3 LEN=24
7930 FIELD #3, 15 AS DR.NAME$, 5 AS CLASS.NUM$, 4 AS CLASS.AMT$
7940 '
7950 B=0
7960 FOR Y=1 TO LOF(3)/24
7970    GET #3,Y
7980    B=B+1
7990    TEMP.DR.NAME$(B)=DR.NAME$
8000    TEMP.CLASS.NUM$(B)=CLASS.NUM$
8010    TEMP.CLASS.AMT!(B)=CVS(CLASS.AMT$)
8020 NEXT Y
8030 '
8040 CLOSE #3
8050 '
8060 '
8070 FOR J=1 TO 120
8080    IF COURSE(J)=0 THEN 8220
8090    IF ASSIGN(J)=-1 THEN 8220
8100    FOR Y=1 TO B
8110      IF TEMP.CLASS.NUM$(Y)<>COURSE$(J) THEN 8210
8120        FOR I=1 TO 28
8130          IF TEMP.DR.NAME$(Y)<>PROF$(I) THEN 8200
8140          IF PROF(I)<>0 THEN 8200
8150          IF PROF1(I)<>0 AND CREDIT.COUNTER(I) => 3 THEN 8200
8160          IF CREDIT.COUNTER(I) => 6 THEN 8200
8170          IF TEMP.CLASS.AMT!(Y)=0 THEN 8200
8180          TEMP.PROF$(J)=PROF$(I)
8190          ASSIGN(J)=-1:CREDIT.COUNTER(I)=CREDIT.COUNTER(I)+CREDIT.HOURS(J)
8200        NEXT I
8210    NEXT Y
8220 NEXT J
8230 '
8240 '————————————————— PRINT SCHEDULE TO PRINTER ———————————————
8250 '
8260 CLS
8270 LOCATE 8,16: PRINT "PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER"
8280 LOCATE 9,15: PRINT "TO PRINT A COPY OF THE FACULTY/COURSE ASSIGNMENTS"
8290 LOCATE 12,25: PRINT "PRESS ";: COLOR CLR+8: PRINT CHR$(17) CHR$(217);:
        COLOR CLR: PRINT " WHEN PRINTER IS READY"
8300 PLAY "X"+VARPTR$(TUNE2$)
8310 Q$=INKEY$: IF Q$="" THEN 8310
8320 IF Q$<>CHR$(13) THEN PLAY "X"+VARPTR$(TUNE1$): GOTO 8310
8330 CLS
8340 LOCATE 8,30: PRINT "<<< PRINTING >>>"
8350 LPRINT STRING$(8,13)
```

```
8360 LPRINT TAB(33) TERM$ STRING$(2,13)
8370 LPRINT TAB(12) "THE FOLLOWING FACULTY/COURSE ASSIGNMENTS HAVE BEEN MADE:"
     STRING$(2,13)
8380 LINES.PRINTED=14
8390 '
8400 FOR J=1 TO 120
8410    IF COURSE(J)=0 THEN 8450
8420    IF LINES.PRINTED > 56 THEN LPRINT CHR$(12) STRING$(8,13):LINES.PRINTED=8
8430    IF ASSIGN(J)=0 THEN LPRINT TAB(23) "IEOR " COURSE$(J);: LPRINT USING
        " (# CR)"; CREDIT.HOURS(J);: LPRINT " -- ** NO ASSIGNMENT **":
        LINES.PRINTED=LINES.PRINTED+1: GOTO 8450
8440    IF ASSIGN(J)=-1 THEN LPRINT TAB(23) "IEOR " COURSE$(J);: LPRINT USING
        " (# CR)"; CREDIT.HOURS(J);: LPRINT " -- DR. " TEMP.PROF$(J):
        LINES.PRINTED=LINES.PRINTED+1: GOTO 8450
8450 NEXT J
8460 '
8470 '———————————————— NEW SELECTION SUBROUTINE ————————————————
8480 '
8490 CLS
8500 LOCATE 8,22: PRINT "  CHANGE DIRECT ASSIGNMENTS?  (Y/N) "
8510 Q$=INKEY$: IF Q$="" THEN 8510
8520 IF Q$="Y" OR Q$="y" THEN 7110     'direct assignments
8530 IF Q$="N" OR Q$="n" THEN 8560     'schedule another term
8540 PLAY "X"+VARPTR$(TUNE1$): GOTO 8510
8550 '
8560 CLS
8570 LOCATE 8,24: PRINT "  SCHEDULE ANOTHER TERM?  (Y/N) "
8580 Q$=INKEY$: IF Q$="" THEN 8580
8590 IF Q$="Y" OR Q$="y" THEN 5530     'select another term
8600 IF Q$="N" OR Q$="n" THEN 8650     'end program
8610 PLAY "X"+VARPTR$(TUNE1$): GOTO 8580
8620 '
8630 '———————————————————— END PROGRAM ————————————————————
8640 '
8650 CLS
8660 LOCATE 8,24: PRINT "< PRESS ANY KEY TO END PROGRAM >";
8670 IF INKEY$="" THEN 8670
8680 CLS: END
```

Preference Program User's Guide

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WHAT YOU NEED

To use this program, you need:

*   An IBM PC

*   A double-sided disk drive

*   A monochrome or color display
    capable of displaying 80 columns

*   An IBM PC compatible printer

*   The IBM PC Disk Operating System
    (PC DOS) Version 1.1, 2.0, 2.1, or 3.0

D.1 CHAPTER 1. GETTING STARTED

In preparing this user's guide, it is assumed that you are familiar with your personal computer, its major components (ie. keyboard, disk drives), and its operating system (PC DOS). If you are not, then before you at-tempt to use the preference program, it is recommended that you review the Guide to Operations and Disk Operating System manuals that were pro-vided with your computer.

In this chapter, you will:

>   * Learn how to begin a preference program session.

To get started, you will need:

>   * Your DOS diskette.

>   * Your preference program diskette.

It is assumed that your computer is turned OFF before you start. You are now ready to begin.

>   NOTE: In all of the following procedures,
>   you may type the commands in either upper
>   or lower case.

D.1.1 HOW TO START THE PREFERENCE PROGRAM

To start a preference program session:

1. Open the disk drive door of the left hand drive (Drive A).
2. Holding your DOS diskette by the end with the label, insert it into
    Drive A with the label facing up.
3. When the diskette is in as far as it will go, close the disk drive
    door.
4. Move the System Unit Switch up to the ON position. (If your monitor
    is other than an IBM Monochrome Display, turn it on also.)
5. After a short period of time you will see a message on the screen
    telling you to enter today's date. If today were July 4, 1984, you
    would type 7-4-84 and press the ENTER key.
6. Next, you will see a message telling you to enter the time. If the
    time were 9:30 AM, you would type 9:30 or if the time were 9:30 PM,
    you would type 21:30) and then press the ENTER key.
7. Now you should see the following prompt on your screen:

            A>

8. Type BASICA and press the ENTER key.
9. You will see the words "Version A" and the release number displayed
    along with the number of free bytes.
10. Remove your DOS diskette from Drive A.
11. Insert your preference program diskette into Drive A and close the
    drive door.
12. Press the F3 key (on the left hand side of your keyboard).
13. You will see the following prompt:

            LOAD"

14. Type PREF and press the ENTER key.
15. When the program has finished loading into memory, the word "OK" will
    appear below the LOAD" command.
16. Press F2 or type RUN and press the ENTER key.
17. After a few moments, the Name Screen will appear.

You are now ready to use the preference program. Proceed to Chapter 2.

D.2 CHAPTER 2. USING THE PREFERENCE PROGRAM

The user is initially prompted to enter the last name of the faculty member being interviewed. The name can be entered in either upper or lower case letters. The purpose of entering the name is to partition the data into meaningful groups when a listing of the data file is printed.

Enter the name and press the ENTER key. Screen 1 will appear.

D.2.1   SCREEN 1

Screen 1, on the following page, shows a list of the 15 goals as deter-
mined by the goal questionnaire. Using this screen, the faculty member
reorders these goals in descending order of preference, with the most
preferred at the top. This is accomplished by reversing the positions
of two goals at a time until the desired order is obtained.

To reverse the positions of any two goals, the user must select those
goals using the up and down cursor keys and the space bar. The sequence
of events is as follows:

1. Position the blinking arrow next to the first goal to be reversed
    using the up cursor key or down cursor key located on the numeric
    keypad (on the right hand side of the keyboard). For example, with
    the arrow positioned next to the first goal, if you press the down
    cursor key, the arrow will move down to the next goal. If you press
    the up cursor key, the arrow will jump to the goal at the bottom of
    the list. This wrap around feature can save you several keystrokes
    and works at both the top and the bottom of the list.
2. Press the space bar to select the goal. The program confirms that
    you have selected the goal by highlighting it.
3. Move the blinking arrow to the second goal to be reversed and press
    the space bar again. The program will then swap the first goal with
    the second goal.

As an example, if you wish to move the first goal on the list to the fourth
position, position the blinking arrow next to the first goal and press
the space bar. Next, position the blinking arrow next to the fourth goal
and press the space bar. The first goal will move to the fourth position
and the fourth goal will move to the first position.

The space bar also serves a second function -- to deselect a highlighted
goal. In the example above, if you change your mind after selecting the
first goal, and decide to reverse the second and fourth goals instead,
move the arrow back to the first goal and press the space bar again. The
first goal will no longer be highlighted. Then, move the arrow down to
the second goal and press the space bar. Now the second goal will be
highlighted and you may continue as before to reverse the second and
fourth goals.

The most efficient strategy to use in this reordering task, is to se-
quentially select the goals in order of their importance and move each
to its appropriate position in the list. In other words, select the most
important goal first and move it to the first position. Then select the
second most important goal and move it to the second position. Continue
until all goals are in order of importance.

When you are satisfied with the ordering, press the ENTER key to proceed
to Screen 2.

```
REORDER THE FOLLOWING GOALS WITH YOUR HIGHEST PREFERENCE AT THE TOP
              (PRESS ⏎ WHEN YOU ARE FINISHED)

        Consistent observance of expected teaching load
        Teaching a particular course
        Good fit between research interests and courses
        Least possible number of teaching days
        Teaching the same course two terms in a row
        Teaching a variety of courses on a regular rotation
        Good mix of graduate and undergraduate courses
        Teaching honors courses (highly motivated students)
        No classes at particular times
        Balanced teaching/research/graduate student loads
        Teaching in area of expertise
        Faculty enrichment
        Teaching classes of reasonable size
        Least number of preparations
        Teaching to support textbook development



          ↑ TO MOVE ARROW UP, ↓ TO MOVE ARROW DOWN
    AND PRESS THE SPACE BAR TO SELECT AND DESELECT A GOAL
```

SCREEN 1

D.2.2 SCREEN 2

Screen 2 shows the rank ordering of the goals from Screen 1, numbered from 1 to 15 to identify the goals in later screens. These numbers do not reflect any preference value for the goals; they merely provide iden- tification for the goals based on the initial rank ordering just com- pleted.   It is not necessary to memorize or write down these numbers.

Press any key to go to Screen 3.

```
                        PREFERENCE RANKING OF GOALS:


        1   Consistent observance of expected teaching load
        2   Teaching a particular course
        3   Good fit between research interests and courses
        4   Least possible number of teaching days
        5   Teaching the same course two terms in a row
        6   Teaching a variety of courses on a regular rotation
        7   Good mix of graduate and undergraduate courses
        8   Teaching honors courses (highly motivated students)
        9   No classes at particular times
       10   Balanced teaching/research/graduate student loads
       11   Teaching in area of expertise
       12   Faculty enrichment
       13   Teaching classes of reasonable size
       14   Least number of preparations
       15   Teaching to support textbook development




                    < PRESS ANY KEY TO CONTINUE >
```

SCREEN 2

D.2.3 SCREEN 3

Screen 3 shows the random group assignment of each goal. In all groups,
the first goal is the standard, or the goal given the highest preference
in the initial ordering.

The ranks of the other goals in the groups can be identified by the number
in the first column. The number in the second column (in parenthesis)
is the group assignment number; notice that all of the goals in Group 1
(except for the standard) have the number one in parenthesis.

Press any key to continue to Screen 4.

```
GROUP 1 ASSIGNMENT:
 1    -    Consistent observance of expected teaching load
 8   (1)   Teaching honors courses (highly motivated students)
 9   (1)   No classes at particular times
10   (1)   Balanced teaching/research/graduate student loads
11   (1)   Teaching in area of expertise

GROUP 2 ASSIGNMENT:
 1    -    Consistent observance of expected teaching load
 4   (2)   Least possible number of teaching days
 5   (2)   Teaching the same course two terms in a row
 7   (2)   Good mix of graduate and undergraduate courses
12   (2)   Faculty enrichment
13   (2)   Teaching classes of reasonable size

GROUP 3 ASSIGNMENT:
 1    -    Consistent observance of expected teaching load
 2   (3)   Teaching a particular course
 3   (3)   Good fit between research interests and courses
 6   (3)   Teaching a variety of courses on a regular rotation
14   (3)   Least number of preparations
15   (3)   Teaching to support textbook development


             < PRESS ANY KEY TO CONTINUE >
```

SCREEN 3

D.2.4   SCREEN 4

With Screen 4 begins the value assignment section. Each group will have
a screen similar to this one. All the goals that have been assigned to
the group will appear, with the standard at the top and the others in rank
order (from highest to lowest).

Notice that the standard has been automatically assigned a value of 1000.
This is the value against which comparisons will be made for the assign-
ment of values to the other goals. To put the value assignments into
perspective, the user might ask the following question: if 1000 is the
value of the most important goal, what value does the second goal in the
list have, when comparing the two?

Although the assigned values must be between 1 and 999, they do not have
to sum to any particular number.

To assign a value:

1.   Using the numbers on the top of the keyboard, enter the numbers cor-
     responding to the value you want to assign. For example: If you
     wanted to enter the value 150, you would press 1 then 5 then 0. Notice
     that the numbers appear at the bottom of the screen in the highlighted
     position, or preview area, in the order they are entered. If you make
     a mistake, simply backspace over the number using the BACKSPACE key
     (located just to the right of the number keys at the top of the key-
     board) and enter the correct value.
2.   To move the value from the preview area to the highlighted position
     next to the goal, press the ENTER key.
3.   If you enter a value and then decide to change it, use the up or down
     cursor keys to highlight that goal and then make the change as if you
     were entering the value for the first time.
4.   When you have entered values for all the goals, press the F1 key (on
     the upper left hand side of the keyboard) to go to Screen 5.

```
INDICATE THE IMPORTANCE OF EACH GOAL WITH RESPECT TO THE STANDARD
            WITH AN INTEGER VALUE BETWEEN 1 AND 999

                     GROUP 1 ASSIGNMENT:

   1  Consistent observance of expected teaching load        *1000*

   8  Teaching honors courses (highly motivated students)    ▒▒▒▒▒▒

   9  No classes at particular times

  10  Balanced teaching/research/graduate student loads

  11  Teaching in area of expertise




        ENTER THE IMPORTANCE OF THE HIGHLIGHTED GOAL >>> ▒▒▒▒▒
            PRESS F1 WHEN YOU HAVE ENTERED ALL VALUES
```

SCREEN 4

D.2.5 SCREEN 5

Screen 5 begins the modified pair-wise comparison section. You will be asked to compare combinations of goals to further assess their importance. In so doing, it may be necessary for you to change some of the values you have entered.

The comparison questions will appear at the bottom of the screen. The flow diagram (on the following page) will help you understand the comparison process. To answer the comparison questions press Y or N.

The comparison process is repeated until you compare GOAL (n-2) with the combination of GOALS (n-1) and GOAL (n) of each group. When this final question is answered, and adjustments made, if necessary, the next group screen will appear. All groups follow the same comparison process. When all groups have been completed, Screen 6 appears.

```
       INDICATE THE IMPORTANCE OF EACH GOAL WITH RESPECT TO THE STANDARD
                 WITH AN INTEGER VALUE BETWEEN 1 AND 999

                          GROUP 1 ASSIGNMENT:

       1   Consistent observance of expected teaching load        *1000*

       8   Teaching honors courses (highly motivated students)      400

       9   No classes at particular times                           300

      10   Balanced teaching/research/graduate student loads        200

      11   Teaching in area of expertise                            100



            IS GOAL  8 MORE IMPORTANT THAN THE COMBINATION OF GOALS
                          9 AND 10?   (Y/N)
```

SCREEN 5
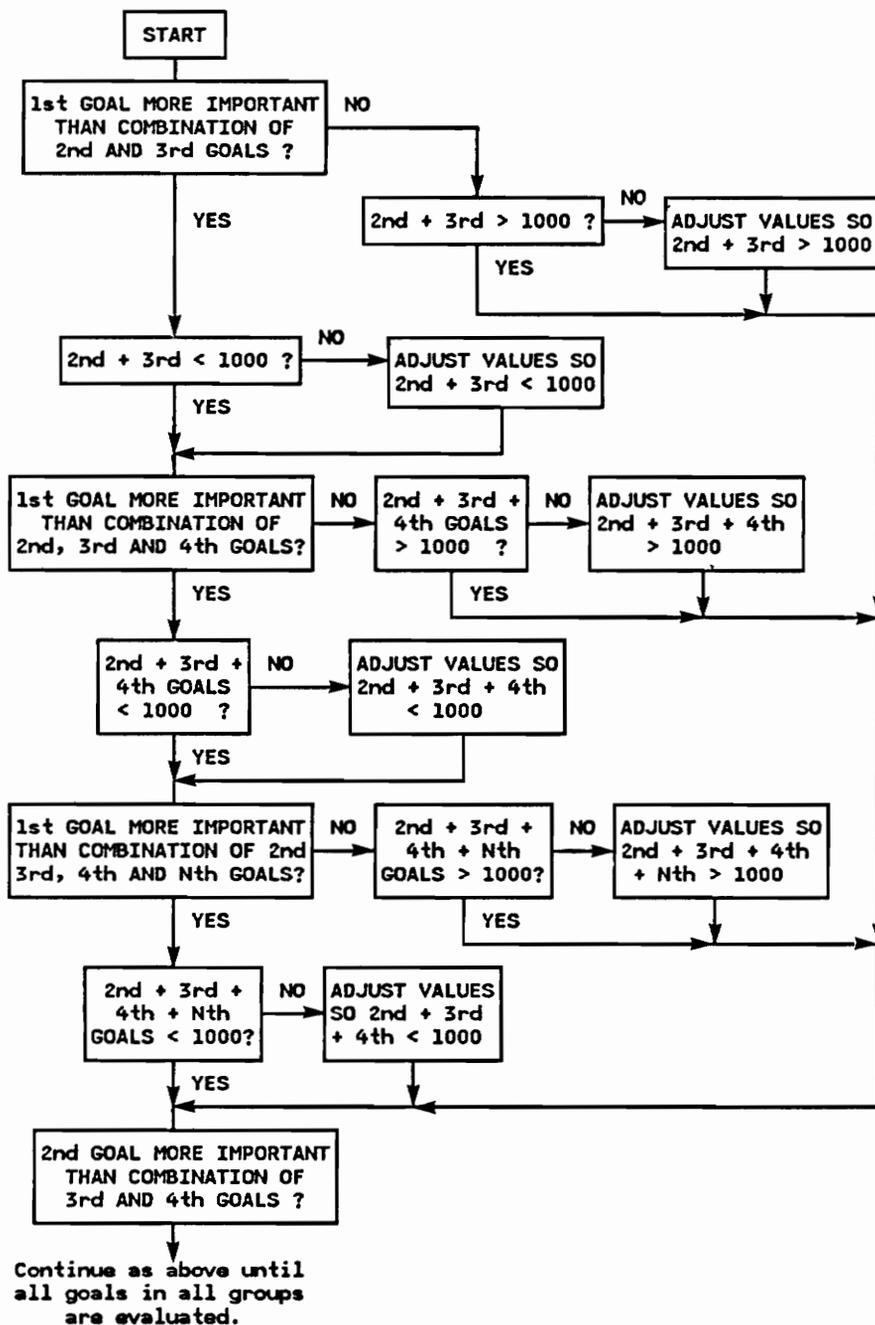
FLOW DIAGRAM FOR MODIFIED PAIR-WISE COMPARISONS

D.2.6 SCREEN 6

Screen 6 is the final screen and shows the final preference results. The first column is the initial rank ordering identifier, the second column is the goal description, the third column (rate) contains the integer value assigned by the faculty member, and the fourth column contains the standardized value (the integer value assigned to the goal divided by the sum of the integer values for all goals).

At the bottom of the screen, the user is prompted for a Y or N when questioned about the final ordering. The final ordering is the rank ordering based on the values assigned to each of the goals. It must be compared to the initial rank ordering (given in the first column) to answer the question.

If you have a printer attached to the PC and you want a copy of Screen 6 (this must be done prior to pressing Y or N to answer the question at the bottom of the screen):

    1. Align the paper to the perforation.
    2. Turn the printer on.
    3. Press the ONLINE button on the printer.
    4. Press the shift key and the PrtSc key (located below the ENTER key) simultaneously.

If satisfied with the final ordering, press Y; if not, press N.

If not satisfied with the final rank ordering, the program returns to Screen 4 of Group 1, with no values assigned. New assignments can now be made.

If the faculty member is satisfied with the final rank ordering, the data is stored in the data file "IEOR.DAT".

Press any key to end the program.

```
                    THE FINAL PREFERENCE RESULTS ARE:

        GOAL                                                RATE    VALUE

    1   Consistent observance of expected teaching load     1000    0.267
    2   Teaching a particular course                         500    0.133
    3   Good fit between research interests and courses       350    0.093
    4   Least possible number of teaching days                 0    0.000
    5   Teaching the same course two terms in a row            0    0.000
    6   Teaching a variety of courses on a regular rotation   200    0.053
    7   Good mix of graduate and undergraduate courses         0    0.000
    8   Teaching honors courses (highly motivated students)   400    0.107
    9   No classes at particular times                        300    0.080
   10   Balanced teaching/research/graduate student loads     200    0.053
   11   Teaching in area of expertise                         100    0.027
   12   Faculty enrichment                                      0    0.000
   13   Teaching classes of reasonable size                     0    0.000
   14   Least number of preparations                          700    0.187
   15   Teaching to support textbook development                1    0.000


                IS THE FINAL ORDERING CORRECT?   (Y/N)
```

SCREEN 6

D.2.7 PRINTING THE DATA FILE

If you would like to print a copy of the data file:

    1.   Align the paper to the perforation.
    2.   Turn the printer on.
    3.   Press the ONLINE button on the printer.
    4.   From DOS, type: COPY IEOR.DAT PRN
    5.   Press ENTER.

The data file is printed out in the following format:

    NAME

    Column 1: rank assigned to initial list of goals

    Column 2: value assigned to goal

    Column 3: standardized value of the value assigned in 2

APPENDIX E. PREFERENCE PROGRAM DATA FILE LISTING

```
 4,  600, 0.096          14,   50, 0.007
 3,  800, 0.128           5,  400, 0.054
 2,  900, 0.144           3,  900, 0.122
10,  110, 0.018           1, 1000, 0.135
 6,  500, 0.080           7,  600, 0.081
15,   40, 0.006          13,  100, 0.014
 8,  400, 0.064           8,  400, 0.054
 9,  200, 0.032          12,  150, 0.020
14,   50, 0.008          10,  200, 0.027
 7,  500, 0.080           2,  950, 0.128
 1, 1000, 0.160           4,  800, 0.108
12,  100, 0.016           9,  300, 0.041
13,   50, 0.008           6,  400, 0.054
 5,  550, 0.088          11,  150, 0.020
11,   50, 0.008          15,   50, 0.007

 4,  900, 0.125           3,  600, 0.106
 2,  700, 0.097           4,  550, 0.098
11,  300, 0.042           5,  400, 0.071
13,  300, 0.042           9,  300, 0.053
 9,  400, 0.056          15,   25, 0.004
10,  500, 0.069           8,  300, 0.053
 7,  500, 0.069           6,  350, 0.062
15,    1, 0.000          13,   75, 0.013
 6,  400, 0.056          11,  125, 0.022
 3,  900, 0.125           1, 1000, 0.177
 1, 1000, 0.139           2,  800, 0.142
12,  200, 0.028          12,  100, 0.018
 5,  500, 0.069          10,  150, 0.027
 8,  400, 0.056           7,  400, 0.071
14,  100, 0.014          14,   60, 0.011

 5,  400, 0.092          10,  200, 0.027
 1, 1000, 0.231           2,  950, 0.129
 3,  500, 0.115           4,  850, 0.116
 4,  200, 0.046           8,  500, 0.068
14,    1, 0.000           5,  650, 0.088
 8,  150, 0.035           7,  350, 0.048
15,    1, 0.000           6,  400, 0.054
12,    1, 0.000          11,  200, 0.027
 9,   75, 0.017          12,  200, 0.027
 7,  300, 0.069           1, 1000, 0.136
 6,  500, 0.115           3,  900, 0.122
11,    1, 0.000          14,    2, 0.000
10,  100, 0.023          13,  100, 0.014
 2,  500, 0.115           9,  250, 0.034
13,    1, 0.000          15,    1, 0.000
```

```
11,    50, 0.009          5,   600, 0.076
10,    80, 0.014          1,  1000, 0.127
 2,   700, 0.125          3,   850, 0.108
14,   100, 0.018          8,   450, 0.057
12,    50, 0.009         12,   250, 0.032
13,    50, 0.009          7,   700, 0.089
 7,   150, 0.027          2,   950, 0.121
 8,   100, 0.018         15,     1, 0.000
 9,    90, 0.016         11,   299, 0.038
 3,   900, 0.160          6,   550, 0.070
 1,  1000, 0.178          4,   850, 0.108
 5,   200, 0.036          9,   500, 0.063
 4,   600, 0.107         13,    75, 0.010
13,     1, 0.000         10,   400, 0.051
 6,   600, 0.107         14,     1, 0.000

 7,   600, 0.114          1,  1000, 0.195
 5,   400, 0.076          2,   800, 0.156
 3,   850, 0.161          3,   500, 0.097
10,    10, 0.002         15,    50, 0.010
15,     1, 0.000          7,   150, 0.029
11,     1, 0.000         11,   200, 0.039
 4,   750, 0.142          5,   500, 0.097
 9,     5, 0.001         13,    80, 0.016
 6,   200, 0.038          9,   100, 0.019
 2,   900, 0.171         10,   100, 0.019
 1,  1000, 0.190          4,   800, 0.156
12,     1, 0.000         12,   100, 0.019
13,     1, 0.000          8,   200, 0.039
14,     1, 0.000          6,   500, 0.097
 8,   150, 0.028         14,    50, 0.010

10,   700, 0.071          5,   500, 0.094
 5,   850, 0.087          2,   450, 0.085
 1,  1000, 0.102          3,   500, 0.094
 7,   900, 0.092         13,   100, 0.019
11,   125, 0.013         11,    50, 0.009
 4,   900, 0.092          7,   450, 0.085
 6,   825, 0.084          6,   400, 0.075
 3,   925, 0.094         10,   350, 0.066
 8,   400, 0.041         15,    25, 0.005
 9,   850, 0.087          8,   400, 0.075
 2,   950, 0.097          1,  1000, 0.188
12,   400, 0.041         12,   100, 0.019
13,   300, 0.031          4,   300, 0.056
14,   300, 0.031          9,   150, 0.028
15,   100, 0.010         14,    50, 0.009
```

```
11,    100,  0.015          8,    250,  0.038
10,    125,  0.013          1,   1000,  0.151
 1,   1000,  0.148          3,    700,  0.105
 8,    250,  0.037         14,     50,  0.008
15.      1,  0.000         13,    200,  0.030
 5,    650,  0.096          9,    280,  0.042
 7,    550,  0.081          6,    450,  0.068
13,    175,  0.026          7,    250,  0.038
 4,    325,  0.048         15,    100,  0.015
 6,    400,  0.059          5,    550,  0.083
 2,    950,  0.140          2,    900,  0.136
 9,    200,  0.030         11,     80,  0.012
 3,    900,  0.133         10,    180,  0.027
12,    225,  0.033         12,    200,  0.030
14,     25,  0.004          4,    700,  0.105

11,    100,  0.014          1,   1000,  0.215
 2,    950,  0.131          2,    800,  0.172
 4,    950,  0.131          3,    500,  0.108
 5,    800,  0.110         14,     10,  0.002
14,     50,  0.007         11,    200,  0.043
 8,    500,  0.069          6,    150,  0.032
 9,    100,  0.014          7,    140,  0.030
10,     50,  0.007         10,    200,  0.043
 6,    400,  0.055         15,     50,  0.011
 3,    900,  0.124          4,    300,  0.065
 1,   1000,  0.137          8,    500,  0.108
 7,    400,  0.055          9,    400,  0.086
15,     25,  0.003          5,    250,  0.054
12,    100,  0.014         12,    100,  0.022
13,     50,  0.007         13,     50,  0.011

15,      2,  0.001          8,    300,  0.048
 2,    550,  0.142          6,    400,  0.064
 4,    200,  0.052          9,    450,  0.072
10,     50,  0.013         10,     35,  0.006
11,     20,  0.005          5,    100,  0.016
 8,    150,  0.039          2,    900,  0.144
 3,    300,  0.078          3,    800,  0.128
13,      3,  0.001         12,    100,  0.016
 7,    100,  0.026         14,     50,  0.008
 6,    250,  0.065          7,    600,  0.096
 1,   1000,  0.259          1,   1000,  0.160
 5,    100,  0.026         11,    200,  0.032
 9,    100,  0.026         13,     60,  0.010
14,      2,  0.001         15,     50,  0.008
12,     40,  0.010          4,    500,  0.080
```

```
 2,    850,  0.147
 1,   1000,  0.173
 9,    200,  0.035
13,    125,  0.022
 4,    525,  0.091.
 3,    800,  0.138
 5,    600,  0.104
15,     50,  0.009
 6,    300,  0.052
10,    150,  0.026
 7,    400,  0.069
12,    150,  0.026
11,    200,  0.035
14,     80,  0.014
 8,    200,  0.035


14,     10,  0.001
 2,    950,  0.133
 3,    900,  0.126
 9,    400,  0.056
15,      1,  0.000
 4,    800,  0.112
 7,    200,  0.028
 8,     50,  0.007
 5,    600,  0.084
 6,    800,  0.112
 1,   1000,  0.140
13,    100,  0.014
12,    100,  0.014
10,    200,  0.028
11.     50.  0.007


 8,    550,  0.086
 5,    100,  0.016
 2,    999,  0.156
12,    100,  0.016
10,    250,  0.039
 9,    200,  0.031
 7,    300,  0.047
14,     50,  0.008
 6,    400,. 0.062
 3,    900,  0.141
 1,   1000,  0.156
 4,    900,  0.141
13,    100,  0.016
11,    100,  0.016
15,      2,  0.000
```

APPENDIX F. VALUE ASSESSMENT PROGRAM USER'S GUIDE

Value Assessment Program User's Guide

by

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WHAT YOU NEED

To use this program, you need:

* An IBM PC

* A double-sided disk drive

* A monochrome or color display
  capable of displaying 80 columns

* An IBM PC compatible printer

* The IBM PC Disk Operating System
  (PC DOS) Version 1.1, 2.0, 2.1, or 3.0

F.1 CHAPTER 1. GETTING STARTED

In preparing this user's guide, it is assumed that you are familiar with your personal computer, its major components (ie. keyboard, disk drives), and its operating system (PC DOS). If you are not, then before you at-tempt to use the preference program, it is recommended that you review the Guide to Operations and Disk Operating System manuals that were pro-vided with your computer.

In this chapter, you will:

> * Learn how to begin a value assessment program session.

To get started, you will need:

> * Your DOS diskette.

> * Your value assessment program diskette.

It is assumed that your computer is turned OFF before you start. You are now ready to begin.

> NOTE: In all of the following procedures,
> you may type the commands in either upper
> or lower case.

F.1.1 HOW TO START THE VALUE ASSESSMENT PROGRAM

To start a value assessment program session:

1. Open the disk drive door of the left hand drive (Drive A).
2. Holding your DOS diskette by the end with the label, insert it into Drive A with the label facing up.
3. When the diskette is in as far as it will go, close the disk drive door.
4. Move the System Unit Switch up to the ON position. (If your monitor is other than an IBM Monochrome Display, turn it on also.)
5. After a short period of time you will see a message on the screen telling you to enter today's date. If today were July 4, 1984, you would type 7-4-84 and press the ENTER key.
6. Next, you will see a message telling you to enter the time. If the time were 9:30 AM, you would type 9:30 or if the time were 9:30 PM, you would type 21:30) and then press the ENTER key.
7. Now you should see the following prompt on your screen:

        A>

8. Type BASICA and press the ENTER key.
9. You will see the words "Version A" and the release number displayed along with the number of free bytes.
10. Remove your DOS diskette from Drive A.
11. Insert your assignment program diskette into Drive A and close the drive door.
12. Press the F3 key (on the left hand side of your keyboard).
13. You will see the following prompt:

        LOAD"

14. Type VALUE and press the ENTER key.
15. When the program has finished loading into memory, the word "OK" will appear below the LOAD" command.
16. Press F2 or type RUN and press the ENTER key.
17. After a few moments, the following message will appear:

        DO YOU WANT A COPY OF THE PREVIOUS RESULTS? (Y/N)

If you want a copy of the results, press Y; if not, press N.

You are now ready to use the value assessment program. Proceed to Chapter 2.

F.2 CHAPTER 2. USING THE VALUE ASSESSMENT PROGRAM

F.2.1 THE PREFERENCE INPUT - PROFESSOR SELECTION SCREEN

The Preference Input - Professor Selection Screen lists the names of all
faculty members in the IEOR department. The purpose of this screen is
to allow the user to select a faculty member for data input. The data
to be entered are the results of the Preference Questionnaire.

This is accomplished as follows:

1. Place the blinking arrow next to the name of the faculty member
    selected for data input (using the up, down, left, and right
    cursor keys).
2. Press the ENTER key.
3. The Preference Input - Course Selection Screen will appear.

```
  ↑TO MOVE ARROW UP, ↓TO MOVE ARROW DOWN.
 ━TO MOVE ARROW RIGHT,━TO MOVE ARROW LEFT



        AGEE                KURSTEDT
        BALACHANDRAN        MALMBORG
        CASALI              MULLER
        CHACHRA             NACHLAS
        DEISENROTH          PRICE
        DISNEY              REASOR
        DRYDEN              SARIN
        FABRYCKY            SCHMIDT
        GHARE               SHERALI
        GREENE              SINK
        GREENSTEIN          SNYDER
        JONES               TORGERSEN
        KEMMERLING          WIERWILLE
        KROEMER             WILLIGES


        PRESS━ TO SELECT A PROFESSOR
```

PREFERENCE INPUT - PROFESSOR SELECTION SCREEN

F.2.2 THE PREFERENCE INPUT - COURSE SELECTION SCREEN

The Preference Input - Course Selection Screen, shown on the following page, is a list of all the courses taught by the IEOR department. The letters in front of some of the courses have the following meanings:

    A -- Section A (or 1)
    B -- Section B (or 2)
    C -- Section C (or 3)
    H -- Honors

Using this screen, the user can select the courses the faculty member under consideration has indicated a preference for teaching. This is accomplished by using the ENTER to select a course for data input. The sequence of events is as follows:

1. Position the blinking arrow next to the course to be selected using the up cursor key, down cursor key, left cursor key, or right cursor key located on the numeric keypad (on the right hand side of the keyboard). For example, with the arrow positioned next to the first course, if you press the down cursor key, the arrow will move down to the next course. If you press the up cursor key, the arrow will jump to the course at the bottom of the list; if you press the left cursor key, the arrow will jump to the first course in the last column. This wrap around feature can save you several keystrokes and works at the top and the bottom of all columns and to the right and left in all rows.
2. Press the ENTER key to select the course.

```
      ↑TO MOVE ARROW UP, ↓TO MOVE ARROW DOWN,
      ←TO MOVE ARROW RIGHT,←TO MOVE ARROW LEFT

  2011   A3300   A4211   B4320   5060   5190   5370   6061
  2012   B3300   B4211   4330    5100   5220   5380   6062
  H2150  A3460   C4211   4350    5101   5230   5390   6110
  A2150  B3460   A4212   4360    5102   5240   5400   6241
  B2150  4050    B4212   4361    5111   5250   5410   6242
  C2150  4070    C4212   4362    5112   5260   5450   6280
  A2180  4090    4220    4363    5113   5270   5460   6310
  B2180  4100    4240    4370    5131   A5280  5470   6320
  A3120  4110    A4250   4380    5132   B5280  5480   6350
  B3120  A4150   B4250   4400    5133   5311   5490   6360
  C3120  B4150   4280    4410    5141   5312   5940   6370
  A3130  4160    4290    4420    5142   5330   5950   6380
  B3130  4200    A4310   4980    5160   5340   5980   6460
  A3200  A4210   B4310   5010    5170   5361   6030   64XX
  B3200  B4210   A4320   5040    5180   5362   6040   XXXX

            PRESS← TO SELECT A COURSE
```

PREFERENCE INPUT - COURSE SELECTION SCREEN

When a course has been selected, the following question will appear:

IS IEOR (course #) A PREFERRED COURSE? (Y/N)

where, course # is the course that was selected in the previous screen.

If the course under consideration was listed by the faculty member as being one of his five most preferred courses to teach on the Preference Questionnaire, this question must be answered yes (press Y), otherwise, press N.

If the course is preferred, the following message will appear:

ENTER A PREFERENCE VALUE FROM 5 (HIGHEST) TO 1 (LOWEST):

As listed in the Preference Questionnaire, enter a value using the numeric keys at the top of the keyboard. Press ENTER to go to the Preference Input Goal Selection Screen.

F.2.3 PREFERENCE INPUT GOAL SELECTION SCREEN

The Preference Input Goal Selection Screen lists the eight course-specific goals that the faculty member used to fill out the Preference Questionnaire. The requirement here is to show which goals the faculty member under consideration felt would be met if he were to teach the course under consideration.

This is accomplished as follows:

1. Position the blinking arrow next to the first goal indicated by the faculty member on the Preference Questionnaire. This can be done using the up or down cursor keys (located on the keypad on the right hand side of the keyboard).
2. Press the space bar.
3. The program confirms the selection by placing a highlighted asterisk (*) between the goal number and the goal description.
4. If you make a mistake, position the blinking arrow next to the goal that should not have been selected, and press the space bar. The asterisk will disappear.
5. Continue to select goals as above until all goals indicated on the Preference Questionnaire have been entered.
6. Press the Enter key when finished.

```
          ↑ TO MOVE ARROW UP, ↓ TO MOVE ARROW DOWN
     PRESS THE SPACE BAR TO SELECT AND DESELECT A GOAL


        1    Teaching a particular course
        2    Good fit between research interests and courses
        3    Teaching honors courses (highly motivated students)
        4    Teaching in area of expertise
        5    Faculty enrichment
        6    Teaching classes of reasonable size
        7    Least number of preparations
        8    Teaching to support textbook development




          PRESS ← WHEN FINISHED WITH INPUT
```

PREFERENCE INPUT GOAL SELECTION SCREEN

You have now stored the data for the faculty member and the course.

The following question will appear:

SELECT ANOTHER COURSE?   (Y/N)

If all the data has not been entered, press Y to continue entering data for the faculty member (the program will return to the Preference Input Course Selection Screen).

If all the data has been entered for all the courses indicated by the faculty member under consideration, press N and the following question will appear:

SELECT ANOTHER PROFESSOR?   (Y/N)

If all the data for all the faculty members has not been entered, press Y (the program will return to the Preference Input Professor Selection Screen).

If all the data has been entered, press N and the following message will appear:

< PLEASE BE PATIENT WHILE I CALCULATE >

When the program has finished doing the calculations (about two minutes), the Print Screen will appear.

F.2.4 THE PRINT SCREEN

The Print Screen requests the user to ensure that the printer is ready
to print a listing of the faculty/course values.

To do this:

1. With the printer power off, manually adjust the paper to align
    the print head with the perforation.
2. Turn the printer power on (the power light will now be on).
3. Press the ONLINE button (if the online indicator light is not
    on).
4. Make sure the cover is down to reduce the noise level.
5. Press the ENTER key on the keyboard to begin listing the course.
    While the listing is being printed, the following message will
    appear:

          <<< PRINTING >>>

When the listing is complete, the printer will stop and the Value As-
signment Program will end.

```
      PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER
      TO PRINT A COPY OF THE FACULTY/COURSE VALUES


          PRESS← WHEN PRINTER IS READY
```

THE PRINT SCREEN

FACULTY/COURSE VALUES

Name	Course	Value	Name	Course	Value
FABRYCKY	H2150	0.4012	DEISENROTH	B3460	0.2854
GREENE	H2150	0.1657	GHARE	B3460	0.1432
KURSTEDT	H2150	0.0791	KURSTEDT	4050	1.4301
SHERALI	H2150	0.0695	FABRYCKY	4090	0.1432
FABRYCKY	A2150	5.3801	PRICE	4100	5.3941
JONES	A2150	0.2380	GREENE	4110	0.2843
GREENE	A2150	0.1447	DEIGENROTH	4110	0.0335
GHARE	A2150	0.1432	DEISENROTH	A4150	0.3916
SHERALI	A2150	0.0695	DEISENROTH	B4150	0.3916
KURSTEDT	A2150	0.0581	PRICE	4160	2.4301
FABRYCKY	B2150	5.3801	KEMMERLING	4200	4.3581
JONES	B2150	0.2380	KROEMER	4200	3.4636
GREENE	B2150	0.1447	WILLIGES	4200	2.3941
GHARE	B2150	0.1432	PRICE	4200	1.4301
SHERALI	B2150	0.0695	SNYDER	4200	0.2494
KURSTEDT	B2150	0.0581	SARIN	A4210	0.2829
FABRYCKY	C2150	5.3801	SHERALI	A4210	0.2494
JONES	C2150	0.2380	DISNEY	A4210	0.1432
GREENE	C2150	0.1447	FABRYCKY	A4210	0.0335
GHARE	C2150	0.1432	SARIN	B4210	0.2829
SHERALI	C2150	0.0695	SHERALI	B4210	0.2494
KURSTEDT	C2150	0.0581	DISNEY	B4210	0.1432
GREENE	A2180	3.1087	FABRYCKY	B4210	0.0335
JONES	A2180	1.2380	GREENE	A4211	5.3916
DEISENROTH	A2180	0.1087	SARIN	A4211	2.3941
GREENE	B2180	3.1087	JONES	A4211	0.1087
JONES	B2180	1.2380	GREENE	B4211	5.3916
DEISENROTH	B2180	0.1087	SARIN	B4211	2.3941
GHARE	A3120	3.2880	JONES	B4211	0.1087
KURSTEDT	A3120	0.1792	GREENE	C4211	5.3916
JONES	A3120	0.0360	SARIN	C4211	2.3941
GHARE	B3120	3.2880	JONES	C4211	0.1087
KURSTEDT	B3120	0.1792	SARIN	A4212	2.2844
JONES	B3120	0.0360	JONES	A4212	0.3581
GHARE	C3120	3.2880	GHARE	A4212	0.1432
KURSTEDT	C3120	0.1792	DEISENROTH	A4212	0.1087
JONES	C3120	0.0360	SARIN	B4212	2.2844
KEMMERLING	A3130	5.2519	JONES	B4212	0.3581
KROEMER	A3130	1.3916	GHARE	B4212	0.1432
KEMMERLING	B3130	5.2519	DEISENROTH	B4212	0.1087
KROEMER	B3130	1.3916	SARIN	C4212	2.2844
KEMMERLING	A3200	3.2519	JONES	C4212	0.3581
PRICE	A3200	0.2855	GHARE	C4212	0.1432
WILLIGES	A3200	0.1793	DEISENROTH	C4212	0.1087
SNYDER	A3200	0.1432	DEISENROTH	4220	5.3801
KROEMER	A3200	0.0335	JONES	4240	3.2720
KEMMERLING	B3200	3.2519	FABRYCKY	4240	0.2715
PRICE	B3200	0.2855	GHARE	4240	0.1432
WILLIGES	B3200	0.1793	NACHLAS	A4250	3.3801
SNYDER	B3200	0.1432	GHARE	A4250	0.1668
KROEMER	B3200	0.0335	FABRYCKY	A4250	0.0335
DEISENROTH	A3300	1.3100	NACHLAS	B4250	3.3801
GREENE	A3300	1.2509	GHARE	B4250	0.1668
KEMMERLING	A3300	0.1421	FABRYCKY	B4250	0.0335
DEISENROTH	B3300	1.3100	FABRYCKY	4280	0.2715
GREENE	B3300	1.2509	KURSTEDT	4290	0.2843
KEMMERLING	B3300	0.1421	SARIN	A4310	1.3941
DEISENROTH	A3460	0.2854	SHERALI	A4310	0.3581
GHARE	A3460	0.1432	SARIN	B4310	1.3941

SHERALI	B4310	0.3581	KURSTEDT	5180	0.3189
SARIN	A4320	1.3941	DEISENROTH	5190	0.3916
DISNEY	A4320	0.2855	DEISENROTH	5220	2.3801
SHERALI	A4320	0.2519	GHARE	5230	4.4522
SARIN	B4320	1.3941	DISNEY	5240	1.3941
DISNEY	B4320	0.2855	NACHLAS	5250	4.3581
SHERALI	B4320	0.2519	GHARE	5250	2.4522
JONES	4330	4.3941	GHARE	5260	0.1793
GHARE	4330	0.2519	NACHLAS	5270	5.3916
DEISENROTH	4330	0.1087	GHARE	5270	1.4522
NACHLAS	4350	2.3801	FABRYCKY	A5280	4.3801
FABRYCKY	4350	0.0335	NACHLAS	A5280	1.2854
KURSTEDT	4361	4.4496	JONES	A5280	0.2519
KURSTEDT	4362	3.4496	FABRYCKY	B5280	4.3801
KURSTEDT	4363	2.4496	NACHLAS	B5280	1.2854
GREENE	4380	2.3941	JONES	B5280	0.2519
SARIN	4380	0.1782	KROEMER	5311	2.4847
KROEMER	4400	4.5067	KEMMERLING	5311	2.2519
PRICE	4400	0.2854	WIERWILLE	5311	1.3941
KEMMERLING	4400	0.0335	SNYDER	5311	0.1792
PRICE	4410	4.4301	WIERWILLE	5312	4.4301
PRICE	4420	3.4301	SNYDER	5312	0.1792
DEISENROTH	4980	4.3801	WIERWILLE	5330	3.4301
PRICE	4980	0.0335	SHERALI	5340	4.3581
SHERALI	5010	2.3581	GHARE	5340	0.3941
GHARE	5010	0.4152	DISNEY	5361	3.3941
SARIN	5010	0.2494	DISNEY	5362	2.3941
SHERALI	5040	5.3801	WILLIGES	5370	3.4857
GHARE	5040	0.3941	KEMMERLING	5370	1.2854
SARIN	5040	0.2494	KROEMER	5380	5.4847
SHERALI	5100	3.3801	KEMMERLING	5400	0.1767
GHARE	5100	0.4522	KURSTEDT	5410	5.4522
GHARE	5101	5.4857	WIERWILLE	5450	5.4301
FABRYCKY	5101	2.3801	KROEMER	5450	0.2494
JONES	5101	0.3581	PRICE	5450	0.0335
GHARE	5102	0.4636	GREENE	5460	0.4636
JONES	5102	0.3581	DEISENROTH	5460	0.1432
FABRYCKY	5102	0.1617	SARIN	5460	0.1397
SNYDER	5111	4.2879	FABRYCKY	5470	3.3801
KROEMER	5111	0.4847	JONES	5470	2.3581
PRICE	5111	0.2494	DEISENROTH	5470	0.0335
WILLIGES	5112	5.4857	GREENE	5480	0.4636
SNYDER	5112	3.2879	DEISENROTH	5480	0.1421
PRICE	5112	0.2494	SARIN	5490	5.3941
WILLIGES	5113	4.4857	GREENE	5490	4.4636
SNYDER	5113	2.2879	DEISENROTH	5490	0.1432
PRICE	5113	0.2494	GREENE	5940	0.1447
KURSTEDT	5131	0.2127	DISNEY	5950	0.3550
KURSTEDT	5132	0.2127	DEISENROTH	5980	3.3801
KURSTEDT	5133	0.2127	SNYDER	5980	1.2879
SHERALI	5141	0.3941	GREENE	5980	0.4857
SARIN	5141	0.2855	SHERALI	6030	1.3801
GHARE	5141	0.2488	GHARE	6030	0.3581
FABRYCKY	5141	0.0555	GHARE	6040	0.3581
SARIN	5142	0.2855	SHERALI	6040	0.3581
SHERALI	5142	0.1767	SARIN	6040	0.1397
DISNEY	5142	0.1432	SARIN	6061	3.3941
FABRYCKY	5142	0.0555	SHERALI	6061	0.2494
GREENE	5160	0.4276	SARIN	6062	0.1397
DEISENROTH	5160	0.2854	SARIN	6110	4.3941
JONES	5170	5.3581	GREENE	6110	0.4276
GHARE	5170	0.3215	FABRYCKY	6110	0.0335
SHERALI	5170	0.2494	DISNEY	6241	4.3941
DEISENROTH	5170	0.1087	DISNEY	6242	4.3941

```
FABRYCKY      6290     4.3064
NACHLAS       6280     0.3912
WIERWILLE     6310     2.4301
SNYDER        6320     5.3100
SHERALI       6350     0.3581
DISNEY        6360     5.3941
WILLIGES      6370     1.4636
WILLIGES      6380     0.4276
PRICE         6380     0.3550
SNYDER        6380     0.2879
KEMMERLING    6380     0.1767
DEISENROTH    6460     0.3581
```

Assignment Program User's Guide

by

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WHAT YOU NEED

To use this program, you need:

* An IBM PC

* A double-sided disk drive

* A monochrome or color display
  capable of displaying 80 columns

* An IBM PC compatible printer

* The IBM PC Disk Operating System
  (PC DOS) Version 1.1, 2.0, 2.1, or 3.0

H.1 CHAPTER 1. GETTING STARTED

In preparing this user's guide, it is assumed that you are familiar with your personal computer, its major components (ie. keyboard, disk drives), and its operating system (PC DOS). If you are not, then before you attempt to use the preference program, it is recommended that you review the Guide to Operations and Disk Operating System manuals that were provided with your computer.

In this chapter, you will:

          * Learn how to begin an assignment program session.

To get started, you will need:

          * Your DOS diskette.

          * Your assignment program diskette.

It is assumed that your computer is turned OFF before you start. You are now ready to begin.

          NOTE: In all of the following procedures,
          you may type the commands in either upper
          or lower case.

H.1.1 HOW TO START THE ASSIGNMENT PROGRAM

To start an assignment program session:

1. Open the disk drive door of the left hand drive (Drive A).
2. Holding your DOS diskette by the end with the label, insert it into Drive A with the label facing up.
3. When the diskette is in as far as it will go, close the disk drive door.
4. Move the System Unit Switch up to the ON position. (If your monitor is other than an IBM Monochrome Display, turn it on also.)
5. After a short period of time you will see a message on the screen telling you to enter today's date. If today were July 4, 1984, you would type 7-4-84 and press the ENTER key.
6. Next, you will see a message telling you to enter the time. If the time were 9:30 AM, you would type 9:30 or if the time were 9:30 PM, you would type 21:30) and then press the ENTER key.
7. Now you should see the following prompt on your screen:

            A>

8. Type BASICA and press the ENTER key.
9. You will see the words "Version A" and the release number displayed along with the number of free bytes.
10. Remove your DOS diskette from Drive A.
11. Insert your assignment program diskette into Drive A and close the drive door.
12. Press the F3 key (on the left hand side of your keyboard).
13. You will see the following prompt:

            LOAD"

14. Type ASSIGN and press the ENTER key.
15. When the program has finished loading into memory, the word "OK" will appear below the LOAD" command.
16. Press F2 or type RUN and press the ENTER key.
17. After a few moments, the Name Screen will appear.
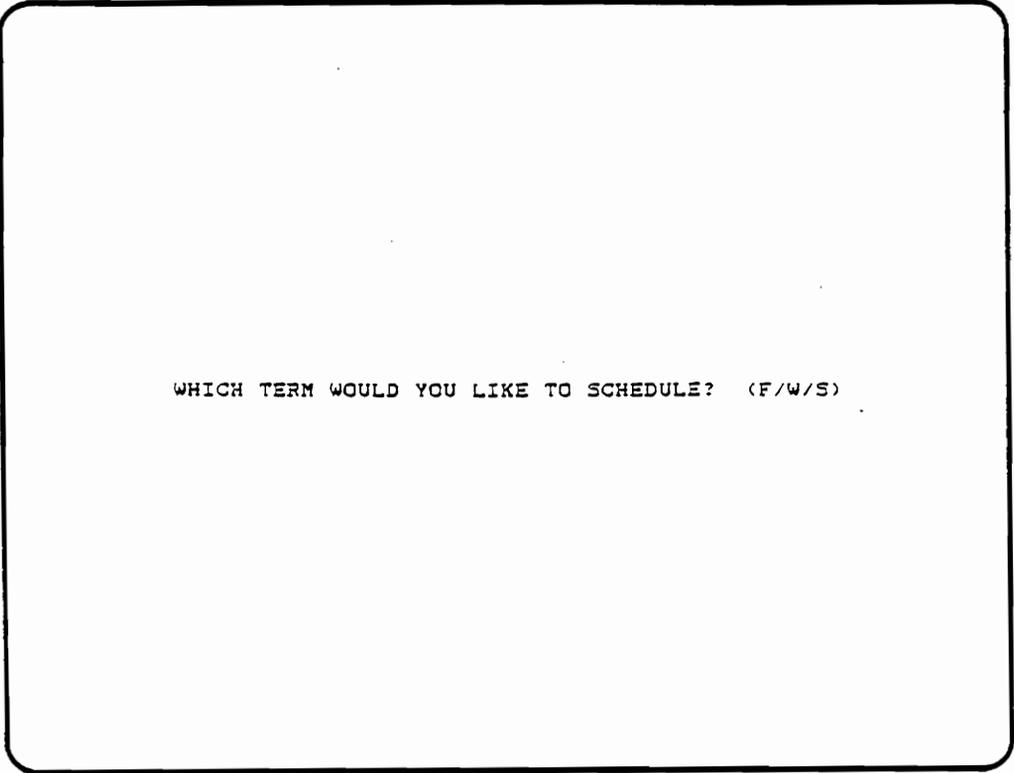
You are now ready to use the assignment program. Proceed to Chapter 2.

H.2 CHAPTER 2. USING THE ASSIGNMENT PROGRAM

H.2.1 THE TERM SELECTION SCREEN

The Term Selection Screen prompts you to enter the term you want to schedule. Press F for Fall, W for Winter, or S for Spring.

Enter the correct letter and press the ENTER key. The Course Selection Screen will appear.

```
                  WHICH TERM WOULD YOU LIKE TO SCHEDULE?   (F/W/S)
```

THE TERM SELECTION SCREEN

H.2.2 THE COURSE SELECTION SCREEN

The Course Selection Screen, shown on the following page, is a list of all the courses taught by the IEOR department. The letters in front of some of the courses have the following meanings:

        A -- Section A (or 1)
        B -- Section B (or 2)
        C -- Section C (or 3)
        H -- Honors

Using this screen, the user indicates which courses are to be offered during the quarter being scheduled. This is accomplished by using the space bar to indicate a course is to be offered. The sequence of events is as follows:

1. Position the blinking arrow next to the course to be offered using the up cursor key, down cursor key, left cursor key, or right cursor key located on the numeric keypad (on the right hand side of the keyboard). For example, with the arrow positioned next to the first course, if you press the down cursor key, the arrow will move down to the next course. If you press the up cursor key, the arrow will jump to the course at the bottom of the list; if you press the left cursor key, the arrow will jump to the first course in the last column. This wrap around feature can save you several keystrokes and works at the top and the bottom of all columns and to the right and left in all rows.
2. Press the space bar to select the course. The program confirms that you have selected the course by highlighting it.
3. Move the blinking arrow to the second course to be offered and press the space bar again. The program will then highlight the second course as well.
4. Continue in this manner until all courses that will be offered are highlighted.

The space bar also serves a second function -- to deselect a highlighted course. If you change your mind after selecting a course, move the arrow back to that course and press the space bar again. That course will no longer be highlighted.

When all courses being offered are highlighted, press the ENTER key to proceed to Print Screen 1.

```
    ↑ TO MOVE ARROW UP, ↓ TO MOVE ARROW DOWN.
        ← TO MOVE ARROW RIGHT,← TO MOVE ARROW LEFT
    PRESS THE SPACE BAR TO SELECT AND DESELECT A COURSE


  2011    A3300    A4211    B4320    5060    5190    5370    6061
  2012    B3300    B4211    4330     5100    5220    5380    6062
 H2150    A3460    C4211    4350     5101    5230    5390    6110
 A2150    B3460    A4212    4360     5102    5240    5400    6241
 B2150    4050     B4212    4361     5111    5250    5410    6242
 C2150    4070     C4212    4362     5112    5260    5450    6280
 A2180    4090     4220     4363     5113    5270    5460    6310
 B2180    4100     4240     4370     5131    A5280   5470    6320
 A3120    4110     A4250    4380     5132    B5280   5480    6350
 B3120    A4150    B4250    4400     5133    5311    5490    6360
 C3120    B4150    4280     4410     5141    5312    5940    6370
 A3130    4160     4290     4420     5142    5330    5950    6380
 B3130    4200     A4310    4980     5160    5340    5980    6460
 A3200    A4210    B4310    5010     5170    5361    6030    64XX
 B3200    B4210    A4320    5040     5180    5362    6040    XXXX

                   PRESS← TO CONTINUE
```


COURSE SELECTION SCREEN

H.2.3   PRINT SCREEN 1

Print Screen 1 requests the user to ensure that the printer is ready to print a listing of the courses to be offered as indicated in the previous screen.

To do this:

1. With the printer power off, manually adjust the paper to align the print head with the perforation.
2. Turn the printer power on (the power light will now be on).
3. Press the ONLINE button (if the online indicator light is not on).
4. Make sure the cover is down to reduce the noise level.
5. Press the ENTER key on the keyboard to begin listing the course.

When the listing is complete, the printer will stop and the Faculty Availability Screen 1 will appear. Forward the paper to the next alignment as follows:

1. Press the ONLINE button to take the printer offline (the online indicator light will now be off).
2. Press the FORM FEED button, and the paper will automatically align with the next perforation in the paper.
3. Press the ONLINE button (the online indicator will now be on) and the printer will be ready for its next printing job.

```
            PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER
               TO PRINT A COPY OF THE COURSES OFFERED

                   PRESS ← WHEN PRINTER IS READY
```

PRINT SCREEN 1

H.2.4 FACULTY AVAILABILITY SCREEN 1

The Faculty Availability Screen 1 lists the names of all faculty members
in the IEOR department. The purpose of this screen is to allow the user
to indicate which faculty members will not be available to teach any
courses during the term being scheduled.

This is accomplished as follows:

1. Place the blinking arrow next to the name of the faculty member
   not teaching (using the up, down, left, and right cursor keys).
2. Press the space bar. The program confirms the selection by
   highlighting the name.
3. Continue as above until the names of all faculty members not
   teaching during the term being scheduled are highlighted.
4. Press the ENTER key to go to the Faculty Availability Screen 2.

↑TO MOVE ARROW UP, ↓TO MOVE ARROW DOWN,

←TO MOVE ARROW RIGHT,←TO MOVE ARROW LEFT
PRESS THE SPACE BAR TO SELECT AND DESELECT A PROFESSOR

AGEE	KURSTEDT
BALACHANDRAN	MALMBORG
CASALI	MULLER
CHACHRA	NACHLAS
DEISENROTH	PRICE
DISNEY	REASOR
DRYDEN	SARIN
FABRYCKY	SCHMIDT
GHARE	SHERALI
GREENE	SINK
GREENSTEIN	SNYDER
JONES	TORGERSEN
KEMMERLING	WIERWILLE
KROEMER	WILLIGES

PRESS← TO CONTINUE

FACULTY AVAILABILITY SCREEN 1

H.2.5 FACULTY AVAILABILITY SCREEN 2

The Faculty Availability Screen 2 lists the names of all faculty members in the IEOR department. The purpose of this screen is to allow the user to indicate which faculty members will only be teaching one course during the term being scheduled.

This is accomplished as follows:

1. Place the blinking arrow next to the name of the faculty member teaching only one course (using the up, down, left, and right cursor keys).
2. Press the space bar. The program confirms the selection by highlighting the name.
3. Continue as above until the names of all faculty members teaching only one course during the term being scheduled are highlighted.
4. Press the ENTER key to go to the Direct Assignment Screen.

```
       ↑ TO MOVE ARROW UP, ↓ TO MOVE ARROW DOWN,
       → TO MOVE ARROW RIGHT,← TO MOVE ARROW LEFT
      PRESS THE SPACE BAR TO SELECT AND DESELECT A PROFESSOR


            AGEE                KURSTEDT
            BALACHANDRAN        MALMBORG
            CASALI              MULLER
            CHACHRA             NACHLAS
            DEISENROTH          PRICE
            DISNEY              REASOR
            DRYDEN              SARIN
            FABRYCKY            SCHMIDT
            GHARE               SHERALI
            GREENE              SINK
            GREENSTEIN          SNYDER
            JONES               TORGERSEN
            KEMMERLING          WIERWILLE
            KROEMER             WILLIGES

                PRESS← TO CONTINUE
```

FACULTY AVAILABILITY SCREEN 2

H.2.6 DIRECT ASSIGNMENT SCREEN

The Direct Assignment Screen begins the direct assignment of faculty members to courses. Each course to be offered during the term will have a similar screen and they will be presented in ascending order of course number. If you would like to directly assign the course in question, press Y; if not, press N.

If you answered N, you will be questioned about the next course in the sequence of the those being offered.

If you answered Y, the Faculty Direct Assignment Screen will appear.

H.2.7 FACULTY DIRECT ASSIGNMENT SCREEN

The Faculty Direct Assignment Screen is very similar to the Faculty Availability Screens 1 and 2. To directly assign the course in question (it appears in the upper right hand corner of the screen):

   1. Place the blinking arrow next to the name of the faculty member to be directly assigned (using the up, down, left, and right cursor keys).
   2. Press the ENTER key. The program confirms the selection in the Direct Assignment Confirmation Screen.

H.2.8 DIRECT ASSIGNMENT CONFIRMATION SCREEN

The Direct Assignment Confirmation Screen confirms that the faculty member selected in the Faculty Direct Assignment Screen has been assigned to the course in question.

Press any key to continue to the next course in the sequence for direct assignment. When all courses to be offered have been presented, Print Screen 2 will appear.

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│   WOULD YOU LIKE TO DIRECTLY ASSIGN A PROFESSOR TO IEOR  2011?   (Y/N) │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
└─────────────────────────────────────────────────────────┘
```

DIRECT ASSIGNMENT SCREEN

```
INDICATE THE PROFESSOR TO BE ASSIGNED TO IEOR  2011

    ↑TO MOVE ARROW UP, ↓TO MOVE ARROW DOWN.
    →TO MOVE ARROW RIGHT,←TO MOVE ARROW LEFT

        AGEE                KURSTEDT
        BALACHANDRAN        MALMBORG
        CASALI              MULLER
        CHACHRA             NACHLAS
        DEISENROTH          PRICE
        DISNEY              REASOR
        DRYDEN              SARIN
        FABRYCKY            SCHMIDT
        GHARE               SHERALI
        GREENE              SINK
        GREENSTEIN          SNYDER
        JONES               TORGERSEN
        KEMMERLING          WIERWILLE
        KROEMER             WILLIGES


        PRESS→ TO SELECT A PROFESSOR
```

FACULTY DIRECT ASSIGNMENT SCREEN

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│                                                         │
│                                                         │
│         IEOR  2011 IS ASSIGNED TO:  DR. GREENE          │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│                                                         │
│            < PRESS ANY KEY TO CONTINUE >               │
│                                                         │
│                                                         │
│                                                         │
└─────────────────────────────────────────────────────────┘
```

DIRECT ASSIGNMENT CONFIRMATION SCREEN

H.2.9 PRINT SCREEN 2

Print Screen 2 requests that the user ensure that the printer is ready
to print a listing of the direct assignment that have been made. If the
procedures presented with Print Screen 1 were followed properly, press
the Enter key to begin printing the listing of direct assignments. If
the procedures for Print Screen 1 were not followed properly, refer to
those instructions now to ready the printer.

When the listing is complete, the following statement will appear on the
screen:

<<< PLEASE BE PATIENT WHILE I CALCULATE >>>

The program is attempting to make assignments where no direct assignments
have been made. When it is finished, Print Screen 3 will appear.

PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER
TO PRINT A COPY OF THE DIRECT ASSIGNMENTS

PRESS← WHEN PRINTER IS READY

PRINT SCREEN 2

H.2.10 PRINT SCREEN 3

Print Screen 3 requests the user to ensure that the printer is ready to
print a listing of the faculty/course assignments for the term being
scheduled. If the procedures presented with Print Screen 1 were followed
properly, press the Enter key to begin printing the listing of the
faculty/course assignments. If the procedures for Print Screen 1 were
not followed properly, refer to those instructions now to ready the
printer.

```
              PLEASE TURN ON YOUR PRINTER AND ALIGN THE PAPER
              TO PRINT A COPY OF THE FACULTY/COURSE ASSIGNMENTS


                    PRESS← WHEN PRINTER IS READY
```

PRINT SCREEN 3

When the listing is complete, the following statement will appear on the screen:

CHANGE DIRECT ASSIGNMENTS?   Y/N

If you would like to change the direct assignments, press Y. This returns the program to the Direct Assignment Screen for the first course being offered during the term. None of the previously determined direct assignments have been retained in memory; you must re-enter any and all direct assignments.

If you do not want to change any of the direct assignments, press N. The following statement will appear on the screen:

SCHEDULE ANOTHER TERM?   Y/N

If you would like to schedule another term, press Y.
This returns the program to the Term Selection Screen, another term can be selected, and the procedures presented in this guide can be repeated for the new term.

If you do not want to schedule another term, press N.
The following statement will appear:

PRESS ANY KEY TO END PROGRAM

Press any key to end the program.

APPENDIX I. COURSE OFFERINGS

FALL   QUARTER

THE FOLLOWING COURSES WILL BE OFFERED:


```
IEOR  2011 (2 CR) -- Technology of Metals I
IEOR A2150 (3 CR) -- Engineering Economy - Section A
IEOR B2150 (3 CR) -- Engineering Economy - Section B
IEOR C2150 (3 CR) -- Engineering Economy - Section C
IEOR A2180 (3 CR) -- Introduction to IEOR - Section A
IEOR B2180 (3 CR) -- Introduction to IEOR - Section B
IEOR A3120 (4 CR) -- Industrial Cost Control - Section A
IEOR A3300 (3 CR) -- Manufacturing Processes - Section A
IEOR B3300 (3 CR) -- Manufacturing Processes - Section B
IEOR A3460 (4 CR) -- Computation Methods in IE - Section A
IEOR B3460 (4 CR) -- Computation Methods in IE - Section B
IEOR  4100 (3 CR) -- Occupational Safety and Hazard Control
IEOR  4200 (3 CR) -- Engineering Psychology
IEOR A4210 (3 CR) -- Math Methods of OR - Section A
IEOR B4210 (3 CR) -- Math Methods of OR - Section B
IEOR A4211 (3 CR) -- Prod. Planning & Control - Section A
IEOR B4211 (3 CR) -- Prod. Planning & Control - Section B
IEOR C4211 (3 CR) -- Prod. Planning & Control - Section C
IEOR  4240 (3 CR) -- Industrial Economy
IEOR A4250 (4 CR) -- Statistical Quality Control - Section A
IEOR B4250 (4 CR) -- Statistical Quality Control - Section B
IEOR A4320 (3 CR) -- Probablistic OR Models - Section A
IEOR  4400 (3 CR) -- Industrial Work Physiology
IEOR  4980 (3 CR) -- Special Study
IEOR  5040 (3 CR) -- Math Programming I
IEOR  5101 (3 CR) -- Advanced Engineering Economy
IEOR  5111 (3 CR) -- Human Factors Research Methodology
IEOR  5131 (3 CR) -- Principles and Problems of Management
IEOR  5141 (3 CR) -- Operations Research Methodology I
IEOR  5250 (3 CR) -- Advanced Quality Control
IEOR  5311 (3 CR) -- Design and Evaluation of M/M Systems I
IEOR  5361 (3 CR) -- Analysis of Stochastic Systems I
IEOR  5380 (3 CR) -- Anthropometry in Workplace Design
IEOR  5410 (3 CR) -- Information Systems Analysis and Design
IEOR  5450 (3 CR) -- Lab Methods in Human Factors Research
IEOR  5490 (3 CR) -- Production Planning and Scheduling
IEOR  5940 (1 CR) -- Seminar
IEOR  5950 (1 CR) -- Seminar in Applied Probability
IEOR  6360 (3 CR) -- Applied Stochastic Processes in OR
IEOR  6370 (3 CR) -- Industrial Training Technology
```

WINTER QUARTER

THE FOLLOWING COURSES WILL BE OFFERED:


```
IEOR H2150 (3 CR) -- Engineering Econony - Honors
IEOR A2150 (3 CR) -- Engineering Economy - Section A
IEOR B2150 (3 CR) -- Engineering Economy - Section B
IEOR A2180 (3 CR) -- Introduction to IEOR - Section A
IEOR A3130 (4 CR) -- Methods Engineering - Section A
IEOR B3130 (4 CR) -- Methods Engineering - Section B
IEOR A3200 (4 CR) -- Human Perf. in Ind. Systems - Section A
IEOR A3300 (3 CR) -- Manufacturing Processes - Section A
IEOR B3300 (3 CR) -- Manufacturing Processes - Section B
IEOR A3460 (4 CR) -- Computation Methods in IE - Section A
IEOR  4100 (3 CR) -- Occupational Safety and Hazard Control
IEOR A4150 (4 CR) -- Sys. Analysis through Sim. - Section A
IEOR B4150 (4 CR) -- Sys. Analysis through Sim. - Section B
IEOR  4200 (3 CR) -- Engineering Psychology
IEOR A4210 (3 CR) -- Math Methods of OR - Section A
IEOR A4212 (3 CR) -- Plant Design and Layout - Section A
IEOR B4212 (3 CR) -- Plant Design and Layout - Section B
IEOR C4212 (3 CR) -- Plant Design and Layout - Section C
IEOR  4220 (3 CR) -- Industrial Automation
IEOR  4280 (3 CR) -- Industrial Systems Engineering
IEOR  4290 (3 CR) -- Theory of Organization
IEOR A4310 (3 CR) -- Deterministic OR Models - Section A
IEOR B4310 (3 CR) -- Deterministic OR Models - Section B
IEOR  4350 (3 CR) -- Industrial Quality Control
IEOR  4362 (3 CR) -- Intro to Computer-based Info Systems
IEOR  4420 (3 CR) -- Industrial Fire Control
IEOR  5010 (3 CR) -- Applied Optimization Methods
IEOR  5102 (3 CR) -- Advanced Engineering Economy
IEOR  5112 (3 CR) -- Human Factors Research Methodology
IEOR  5132 (3 CR) -- Principles and Problems of Management
IEOR  5142 (3 CR) -- Operations Research Methodology II
IEOR  5190 (3 CR) -- Industrial System Simulation
IEOR  5230 (3 CR) -- Forecasting Models
IEOR  5260 (3 CR) -- Quality Control and Reliability
IEOR A5280 (3 CR) -- Procurement & Inv. Theory - Section A
IEOR B5280 (3 CR) -- Procurement & Inv. Theory - Section B
IEOR  5312 (3 CR) -- Design and Evaluation of M/M Systems II
IEOR  5340 (3 CR) -- Integer Mathematical Programming
IEOR  5362 (3 CR) -- Analysis of Stochastic Systems II
IEOR  5370 (3 CR) -- Design & Analysis of Ind. Trng. Systems
IEOR  5470 (3 CR) -- Manufacturing Costs and Prod. Economics
IEOR  5950 (1 CR) -- Seminar in Applied Probability
IEOR  5980 (3 CR) -- Special Study
IEOR  6241 (3 CR) -- Queueing Theory II
IEOR  6310 (3 CR) -- Manual Control Theory in M/M Systems
```

APPENDIX J. DIRECT ASSIGNMENTS FOR ALTERNATIVE SCHEDULES

Proposed System: Fall Schedule 1

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR  2011 (2 CR) -- DR. GREENE
IEOR A2150 (3 CR) -- DR. FABRYCKY
IEOR B2150 (3 CR) -- DR. FABRYCKY
IEOR C2150 (3 CR) -- DR. FABRYCKY
IEOR A2180 (3 CR) -- DR. GREENE
IEOR B2180 (3 CR) -- DR. GREENE
IEOR A3120 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR  4200 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4210 (3 CR) -- DR. SCHMIDT
IEOR B4210 (3 CR) -- DR. SHERALI
IEOR A4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4240 (3 CR) -- DR. JONES
IEOR A4250 (4 CR) -- DR. NACHLAS
IEOR B4250 (4 CR) -- DR. NACHLAS
IEOR A4320 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4400 (3 CR) -- DR. CASALI
IEOR  4980 (3 CR) -- DR. DEISENROTH
IEOR  5040 (3 CR) -- DR. SHERALI
IEOR  5101 (3 CR) -- DR. GHARE
IEOR  5111 (3 CR) -- DR. SNYDER
IEOR  5131 (3 CR) -- DR. SINK
IEOR  5141 (3 CR) -- DR. SARIN
IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5311 (3 CR) -- DR. CASALI
IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5380 (3 CR) -- DR. KROEMER
IEOR  5410 (3 CR) -- DR. KURSTEDT
IEOR  5450 (3 CR) -- DR. WIERWILLE
IEOR  5490 (3 CR) -- DR. SARIN
IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  6360 (3 CR) -- DR. DISNEY
IEOR  6370 (3 CR) -- DR. WILLIGES
```

Proposed System: Fall Schedule 2

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR  2011 (2 CR) -- DR. GREENE
IEOR A2150 (3 CR) -- DR. FABRYCKY
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR C2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- DR. CASALI
IEOR B2180 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3120 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR  4200 (3 CR) -- DR. WILLIGES
IEOR A4210 (3 CR) -- DR. SCHMIDT
IEOR B4210 (3 CR) -- DR. SHERALI
IEOR A4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4240 (3 CR) -- DR. JONES
IEOR A4250 (4 CR) -- DR. NACHLAS
IEOR B4250 (4 CR) -- ** NO ASSIGNMENT **
IEOR A4320 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4400 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4980 (3 CR) -- DR. DEISENROTH
IEOR  5040 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5101 (3 CR) -- DR. GHARE
IEOR  5111 (3 CR) -- DR. SNYDER
IEOR  5131 (3 CR) -- DR. SINK
IEOR  5141 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5311 (3 CR) -- DR. CASALI
IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5380 (3 CR) -- DR. KROEMER
IEOR  5410 (3 CR) -- DR. KURSTEDT
IEOR  5450 (3 CR) -- DR. WIERWILLE
IEOR  5490 (3 CR) -- DR. SARIN
IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  6360 (3 CR) -- DR. DISNEY
IEOR  6370 (3 CR) -- ** NO ASSIGNMENT **
```

Proposed System: Fall Schedule 3

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR  2011 (2 CR) -- DR. GREENE
IEOR A2150 (3 CR) -- DR. FABRYCKY
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR C2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- DR. CASALI
IEOR B2180 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3120 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR  4200 (3 CR) -- DR. WILLIGES
IEOR A4210 (3 CR) -- DR. SCHMIDT
IEOR B4210 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4211 (3 CR) -- DR. GREENE
IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4240 (3 CR) -- DR. JONES
IEOR A4250 (4 CR) -- ** NO ASSIGNMENT **
IEOR B4250 (4 CR) -- ** NO ASSIGNMENT **
IEOR A4320 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4400 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4980 (3 CR) -- DR. DEISENROTH
IEOR  5040 (3 CR) -- DR. SHERALI
IEOR  5101 (3 CR) -- DR. GHARE
IEOR  5111 (3 CR) -- DR. SNYDER
IEOR  5131 (3 CR) -- DR. SINK
IEOR  5141 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5250 (3 CR) -- DR. NACHLAS
IEOR  5311 (3 CR) -- DR. CASALI
IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5380 (3 CR) -- DR. KROEMER
IEOR  5410 (3 CR) -- DR. KURSTEDT
IEOR  5450 (3 CR) -- DR. WIERWILLE
IEOR  5490 (3 CR) -- DR. SARIN
IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  6360 (3 CR) -- DR. DISNEY
IEOR  6370 (3 CR) -- ** NO ASSIGNMENT **
```

Proposed System: Fall Schedule 4

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:


```
IEOR  2011 (2 CR) -- DR. GREENE
IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR C2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- DR. CASALI
IEOR B2180 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3120 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4200 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4210 (3 CR) -- DR. SCHMIDT
IEOR B4210 (3 CR) -- DR. SCHMIDT
IEOR A4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4211 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4240 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4250 (4 CR) -- ** NO ASSIGNMENT **
IEOR B4250 (4 CR) -- ** NO ASSIGNMENT **
IEOR A4320 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4400 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4980 (3 CR) -- DR. DEISENROTH
IEOR  5040 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5101 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5111 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5131 (3 CR) -- DR. SINK
IEOR  5141 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5250 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5311 (3 CR) -- DR. CASALI
IEOR  5361 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5380 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5410 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5450 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5490 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5940 (1 CR) -- ** NO ASSIGNMENT **
IEOR  5950 (1 CR) -- ** NO ASSIGNMENT **
IEOR  6360 (3 CR) -- ** NO ASSIGNMENT **
IEOR  6370 (3 CR) -- ** NO ASSIGNMENT **
```

Proposed System: Winter Schedule 1

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR H2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- DR. CASALI
IEOR A3130 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3130 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3200 (4 CR) -- DR. KEMMERLING
IEOR A3300 (3 CR) -- DR. DEISENROTH
IEOR B3300 (3 CR) -- DR. JONES
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR A4150 (4 CR) -- DR. SCHMIDT
IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4200 (3 CR) -- DR. KROEMER
IEOR A4210 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4212 (3 CR) -- DR. SARIN
IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4220 (3 CR) -- DR. DEISENROTH
IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4290 (3 CR) -- DR. TORGERSEN
IEOR A4310 (3 CR) -- DR. SHERALI
IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4350 (3 CR) -- DR. NACHLAS
IEOR  4362 (3 CR) -- DR. KURSTEDT
IEOR  4420 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5112 (3 CR) -- DR. SNYDER
IEOR  5132 (3 CR) -- DR. SINK
IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5190 (3 CR) -- DR. SCHMIDT
IEOR  5230 (3 CR) -- DR. GHARE
IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
IEOR A5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5312 (3 CR) -- DR. CASALI
IEOR  5340 (3 CR) -- DR. SHERALI
IEOR  5362 (3 CR) -- DR. DISNEY
IEOR  5370 (3 CR) -- DR. WILLIGES
IEOR  5470 (3 CR) -- DR. JONES
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  5930 (3 CR) -- DR. GREENE
IEOR  6241 (3 CR) -- DR. DISNEY
IEOR  6310 (3 CR) -- ** NO ASSIGNMENT **
```

Proposed System: Winter Schedule 2

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR H2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3130 (4 CR) -- DR. KROEMER
IEOR B3130 (4 CR) -- DR. KEMMERLING
IEOR A3200 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- DR. JONES
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR A4150 (4 CR) -- DR. SCHMIDT
IEOR B4150 (4 CR) -- DR. SCHMIDT
IEOR  4200 (3 CR) -- DR. CASALI
IEOR A4210 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4212 (3 CR) -- DR. SARIN
IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4220 (3 CR) -- DR. DEISENROTH
IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4290 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4350 (3 CR) -- DR. NACHLAS
IEOR  4362 (3 CR) -- DR. KURSTEDT
IEOR  4420 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5112 (3 CR) -- DR. SNYDER
IEOR  5132 (3 CR) -- DR. SINK
IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5190 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5230 (3 CR) -- DR. GHARE
IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
IEOR A5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5312 (3 CR) -- DR. CASALI
IEOR  5340 (3 CR) -- DR. SHERALI
IEOR  5362 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5370 (3 CR) -- DR. WILLIGES
IEOR  5470 (3 CR) -- DR. JONES
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  5980 (3 CR) -- DR. GREENE
IEOR  6241 (3 CR) -- ** NO ASSIGNMENT **
IEOR  6310 (3 CR) -- DR. WIERWILLE
```

Proposed System: Winter Schedule 3

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:

```
IEOR H2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- DR. GREENE
IEOR A3130 (4 CR) -- DR. KEMMERLING
IEOR B3130 (4 CR) -- DR. KROEMER
IEOR A3200 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- DR. PRICE
IEOR A4150 (4 CR) -- DR. SCHMIDT
IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4200 (3 CR) -- DR. CASALI
IEOR A4210 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4212 (3 CR) -- DR. SARIN
IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4220 (3 CR) -- DR. DEISENROTH
IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4290 (3 CR) -- DR. TORGERSEN
IEOR A4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4350 (3 CR) -- DR. NACHLAS
IEOR  4362 (3 CR) -- DR. KURSTEDT
IEOR  4420 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5112 (3 CR) -- DR. SNYDER
IEOR  5132 (3 CR) -- DR. SINK
IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5190 (3 CR) -- DR. SCHMIDT
IEOR  5230 (3 CR) -- DR. GHARE
IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
IEOR A5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5312 (3 CR) -- DR. WIERWILLE
IEOR  5340 (3 CR) -- DR. SHERALI
IEOR  5362 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5370 (3 CR) -- DR. WILLIGES
IEOR  5470 (3 CR) -- DR. JONES
IEOR  5950 (1 CR) -- DR. DISNEY
IEOR  5980 (3 CR) -- DR. GREENE
IEOR  6241 (3 CR) -- DR. DISNEY
IEOR  6310 (3 CR) -- ** NO ASSIGNMENT **
```

Proposed System: Winter Schedule 4

THE FOLLOWING DIRECT ASSIGNMENTS HAVE BEEN MADE:


```
IEOR H2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR B2150 (3 CR) -- ** NO ASSIGNMENT **
IEOR A2180 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3130 (4 CR) -- ** NO ASSIGNMENT **
IEOR B3130 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3200 (4 CR) -- ** NO ASSIGNMENT **
IEOR A3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR B3300 (3 CR) -- ** NO ASSIGNMENT **
IEOR A3460 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4100 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4150 (4 CR) -- DR. SCHMIDT
IEOR B4150 (4 CR) -- ** NO ASSIGNMENT **
IEOR  4200 (3 CR) -- DR. CASALI
IEOR A4210 (3 CR) -- ** NO ASSIGNMENT **
IEOR A4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR C4212 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4220 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4290 (3 CR) -- DR. TORGERSEN
IEOR A4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR B4310 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4350 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4362 (3 CR) -- ** NO ASSIGNMENT **
IEOR  4420 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5010 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5102 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5112 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5132 (3 CR) -- DR. SINK
IEOR  5142 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5190 (3 CR) -- DR. SCHMIDT
IEOR  5230 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5260 (3 CR) -- ** NO ASSIGNMENT **
IEOR A5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR B5280 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5312 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5340 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5362 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5370 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5470 (3 CR) -- ** NO ASSIGNMENT **
IEOR  5950 (1 CR) -- ** NO ASSIGNMENT **
IEOR  5980 (3 CR) -- DR. GREENE
IEOR  6241 (3 CR) -- ** NO ASSIGNMENT **
IEOR  6310 (3 CR) -- ** NO ASSIGNMENT **
```

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VITA

Dona Elizabeth Chapman was born September 20, 1958, in Frankfurt, West Germany. The daughter of an Army officer, she attended primary and secondary schools in the United States and Europe.

She entered Virginia Polytechnic Institute and State University in September, 1976 and received her Bachelor of Science degree in Biology in June, 1982. After graduation, she worked for Central Fidelity Bank, NA, in Charlottesville, Virginia, in the Commercial Loans and International Accounts departments.

Miss Chapman began her graduate work in Industrial Engineering and Operations Research at Virginia Polytechnic Institute and State University in January, 1984. She will join the international public accounting firm, Arthur Andersen & Co., as a Staff Consultant.

Dona Elizabeth Chapman