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ABSTRACT

A mathematics curriculum guide is presented for the purpose of offering statewide guidelines to colleges for determining the content of those courses which might be considered standard courses in the first two years of the college curriculum. Courses covered include: intermediate algebra, college algebra, trigonometry, analytic geometry, differential equations, linear algebra, statistics, and liberal arts mathematics. Recommendations are given. (CK)

CURRICULUM GUIDE

for

BACCALAUREATE ORIENTED COURSES

in

MATHEMATICS

Prepared by

JUNIOR COLLEGE TASK FORCE

of

ILLINOIS SECTION

of

MATHEMATICAL ASSOCIATION OF AMERICA

1973

Editor

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PREFACE

Appreciation is extended to the members of the Junior College Task Force of the Illinois Section of the Mathematical Association of America for the time and energies needed in developing the suggested course content guidelines for mathematics in the first two years of the baccalaureate degree. Articulation problems have existed for many years between institutions, both two and four year, and the relationship of courses in various departments with other curriculum offerings. These problems, although now solved to a large degree, will always be subject to continued study.

The Illinois Section of the Mathematical Association of American has agreed to continue to serve as a curriculum advisory group to the office of the Illinois Junior College Board in the years to come. Furthermore, the group will continually study, evaluate and offer needed revisions annually for these guidelines for selected courses in mathematics.

College instructors of mathematics and curriculum administrators in both two and four year institutions should understand that these course guidelines are intended only as reference materials with the primary purpose being that instructors will know the minimum body of knowledge that they can expect the student to have covered in a particular course regardless of the location of where the instruction was given.

This curriculum bulletin is being distributed to instructors of mathematics in both two and four year institutions as well as other interested individuals. These guidelines in no way should be interpreted as restricting initiative or enrichment of any of the courses; however, they are intended to identify the minimum amount of material that should be covered in each course. These suggestions are intended to serve as minimum guidelines for designing courses in mathematics for the first two years of the baccalaureate degree. As of this date, members of the Junior College Task Force do not know the future of formal organization and administration of higher education as it relates to the process of approval and funding of courses in higher education. These guidelines have been prepared and are distributed on the assumption that the basic guidelines for course approval and funding as known today will continue in the future and that these guidelines would continue to be used as indicated.

The State of Illinois, as well as mathematics departments in all institutions are indebted to the Illinois Section of the Mathematical Association of America for the several years of work and study needed to support this bulletin. The office of the Illinois Junior College Board is pleased to distribute this bulletin as a curriculum guide and shares in the favorable reception that this publication is receiving both at the state and national level.

G. Robert Darnes
Associate Secretary
Illinois Junior College Board

FOREWORD

This Curriculum Guide has been written by the Junior College Task Force of the Illinois Section of the Mathematical Association of America. It received this duty when it accepted its recent status as the Mathematics Advisory Committee to the Illinois Junior College Board.

The Task Force Members are:

William L. Drezdzon, Chairman
Oakton Community College

John Bradburn
Elgin Community College

Lawrence Eggan
Illinois State University

John Hooker
Southern Illinois University

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Community College of Decatur

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Belleville Area College

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Illinois Central College

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CHAPTER I

INTRODUCTION

The Junior College Task Force is an extension of the Junior College Committee of the Illinois Section of the Mathematical Association of America. The Junior College Committee is a standing committee of the ISMAA. It was instrumental, along with the Men's Mathematics Club of Chicago, in setting up articulation conferences that were held with the encouragement of the Illinois Junior College Board, such as those held at Elmhurst College on November 26, 1968, and at Bradley University on March 28 and 29, 1969. Both of these conferences had wide representation from both the two- and four-year colleges throughout the state. At the Annual Meeting of the Illinois Section at Western Illinois University in May, 1969, an ad hoc committee was formed to "write a suitable handbook for coordinating the mathematics programs in the various collegiate institutions in the state." This committee prepared a fourteen-page report titled "Articulation in Mathematics" and presented it at the Annual Meeting of the Illinois Section in May, 1970. This work states the background of articulation in the state and makes a series of recommendations, some of which are incorporated in this Curriculum Guide.

In the past few years the Illinois Junior College Board has been working to have people from various academic disciplines draw up curriculum guides for their particular fields. The purpose has been to offer statewide guidelines to colleges for determining the content of those courses which might be considered standard courses in the first two years of the college curriculum, in the hope that the use of such guidelines will help to solve "articulation" problems, i.e., those problems that students encounter in transferring from two-year to four-year colleges.

In the Fall of 1971, Dr. G. Robert Darnes, Associate Secretary of the Illinois Junior College Board, responded very positively to being offered the services of the ISMAA Junior College Committee. At a meeting with Dr. Darnes on December 8, 1971, the Committee defined specific areas to be examined. Dr. Darnes acted as secretary and had a letter directed to Dr. John Schumaker, who was the Chairman of the Section, asking Dr. Schumaker to have the Junior College Committee work on a set of guidelines for transfer courses in mathematics in community colleges. These guidelines were given the name "Curriculum Guide" by Dr. Darnes.

Dr. Schumaker responded that he was "pleased to learn of the opportunity of our Section to accept the responsibility of working with Dr. Darnes." In this letter, dated February 14, 1972, Dr. Schumaker established the Task Force that now is completing the Curriculum Guide. Following Dr. Darnes' suggestion, four-year and two-year colleges were equally represented on the Task Force; this composition still remains.

On April 21, 1972, the Task Force first met and examined drafts of the Curriculum Guide. Much progress was made and it was decided to meet again on Wednesday, September 20, 1972, to bring together the first copy of the Guide.

At the September 20, 1972 meeting, it was pointed out by Dr. Darnes that mathematics and business were given top articulation priority by the Illinois Junior College Board for that school year. The IJCB staff members wanted to know what the lowest level transfer course should be in mathematics. Also, it was

pointed out that no advisory committee would be appointed by the IJCB for mathematics; the ISMAA Junior College Committee would serve in this capacity. This choice was supported by the fact that the Junior College Committee has representatives from many parts of the state and from both four- and two-year colleges. After completing the first draft, the Task Force agreed to meet at the annual meeting of the Illinois Council of Teachers of Mathematics in DeKalb in November, 1972.

At Northern Illinois University in DeKalb, on November 3, 1972, the course outlines were examined to prepare them for presenting to the Illinois Community College Mathematics Workshop at Allerton House, Monticello, Illinois, on December 8 and 9, 1972. This was the first revised draft of the Guide.

At Allerton House, the Task Force did not meet separately, but discussed the work of the Task Force with the attending community college mathematics instructors. Approximately three-fifths of the community colleges of the state were represented. Much explaining was necessary since many were not aware of the Task Force's existence or activity. Copies of the revised draft were distributed. Many recommendations were made during the conference and a request was made that other recommendations be sent to William Drezdzon, Chairman of the Task Force, by February 2, 1973. Shortly before Christmas, 1972, the first recommendations arrived in the mail.

On January 5, 1973, an articulation conference was held at Circle Campus of the University of Illinois, attended by people from both four-year and two-year colleges. Copies of the revised draft were given to those present. As a result, a representative at each four-year and each two-year college in Illinois had received a copy of the Curriculum Guide (first revised draft). From this conference other recommendations were sent to the Task Force.

As you read the Curriculum Guide, you will find transfer courses in the following subjects discussed:

Intermediate Algebra
College Algebra
Trigonometry
Analytic Geometry
Calculus
Linear Algebra
Differential Equations
Mathematical Statistics

Service Courses:
- Mathematics for Social Sciences and Business Majors
- Computer Programming
- Descriptive Statistics
- Liberal Arts Mathematics
- Elementary Teacher Preparation Mathematics

The order of presentation of topics in each course is not meant to be an order of importance nor the order in which the topics must be presented in class. The guidelines are not meant to produce a rigid uniformity in courses throughout Illinois. The Task Force and the IJCB recognize that you are a professional person who understands his field. We are listing the content

CHAPTER II

COURSES IN MATHEMATICS

Revised: March 1973

A. INTERMEDIATE ALGEBRA — 2 to 3 Semester Hours

3 to 5 Quarter Hours

This is a course that would have a prerequisite of one year of high school Algebra and usually one year of high school Geometry. It normally fulfills the prerequisite for the three semester hour College Algebra course. The material of the course is normally included in that covered in the "third year high school mathematics course" that is part of a college prep program. Emphasis should be placed on techniques and manipulations.

The following topics are considered a standard for the course and the recommended percentage of class time to devote to each is given as a guide.

Topics	Percentage of Class Time
Properties and operations of the number system	6 - 8
Elementary operations with polynomials and factoring	10 - 16
Elementary operations with algebraic fractions	8 - 14
Exponents, roots and radicals	12 - 20
First and second degree equations and inequalities	16 - 22
Functions and Graphing	8 - 14
Systems of Equations and Inequalities	8 - 14
Exponential and Logarithmic Functions	8 - 16

Revised: March 1973

B. COLLEGE ALGEBRA

3 - 4 Semester Hours

4 - 5 Quarter Hours

This course assumes a prerequisite of Intermediate Algebra or an equivalent high school course and, along with a course in Trigonometry, fulfills the prerequisites for the Analytic Geometry-Calculus sequence.

The specified topics are considered a standard for the course and the recommended percentage of class time to devote to each is given as a guide. It is recommended that at least two or three of the further topics be included.

	Percentage of Class Time
I. Specified Topics	
A. Review of Algebraic Skills	10 - 20
1. Properties and operations of the number system	
2. Elementary operations with polynomials and factoring	
3. Elementary operations with algebraic fractions	
4. Exponents and radicals	
B. First and second degree equations and inequalities: absolute values	10 - 20
C. Complex numbers; basic operations	4 - 6
D. Systems	12 - 18
1. Equations and inequalities	
2. Matrices, Row Reduction and Determinants	
E. Functions and Graphing	12 - 18
1. Rational	
2. Exponential	
3. Logarithmic	
4. Inverse	
F. Theory of Equations	8 - 12
1. Synthetic division	
2. Factor and root theorems	
G. Mathematical Induction	5 - 8
H. Sequences, Series and Binomial Expansion	5 - 7
II. Further topics	10 - 15
A. Partial fractions	
B. Ratio, proportion and variation	
C. Permutations and combinations	
D. Probability	

Revised: March 1973

C. TRIGONOMETRY

2 to 3 Semester Hours

3 to 5 Quarter Hours

This course is similar in content to the usual full semester trigonometry course in high school. The normal prerequisites are a one-year course in high school Geometry and a course in Intermediate Algebra, or equivalents. This course, along with College Algebra, fulfills the prerequisites for the Analytic Geometry-Calculus sequence.

The following topics are considered as a standard for the course and the recommended percentage of class time to devote to each is given as a guide.

	Percentage of Class Time
Background topics	6 - 10
Definition of trigonometric functions	10 - 14
Graphing and radian measure	10 - 14
Trigonometric identities and equations	25 - 35
Solution of triangles	10 - 20
Inverse trigonometric functions	6 - 16
Powers and roots of complex numbers	10 - 14

Revised: March 1973

D. COLLEGE ALGEBRA AND TRIGONOMETRY — 3 - 6 Semester Hours

5 - 9 Quarter Hours

Occasionally a college chooses to offer an integrated course in College Algebra and Trigonometry. Two different and appropriate courses could be offered having the same title but serving distinctly different groups of students.

One such course could be one designed for the student having three or four years of high school mathematics but who needs more in-depth study before enrolling in the Analytic Geometry-Calculus sequence. This would usually be a three or four semester hour course covering the same topics as listed in the trigonometry and three semester hour college algebra courses, with the majority of the time devoted to the more advanced topics.

Another course could be a one semester course of five semester hours or a two semester sequence of three semester hours each. This course or sequence would serve exactly the same group of students as the separate trigonometry and three semester hour college algebra courses. The prerequisites, topics covered, distribution of time devoted to each topic, and the end result of preparing the student for the Analytic Geometry-Calculus sequence should all remain the same as for the separate courses.

A college may choose to offer a course or courses titled Elementary Functions, which would emphasize the notion of a function as a unifying concept for the topics of either of these courses.

E. COLLEGE ALGEBRA 5 Semester Hours

A few colleges may choose to offer a five semester hour College Algebra course in addition to the three semester hour course as described above. The five semester hour course would normally have the same prerequisities as the Intermediate Algebra course and would have as content the topics covered in Intermediate Algebra and the three semester hour College Algebra course. The class periods devoted to those topics listed exclusively in the three hour College Algebra course or the Intermediate Algebra course should remain approximately the same for this course with the additional class hour distributed among the common topics.

A college on a quarter system would ordinarily offer a quarter of intermediate algebra and a quarter of college algebra instead of this course.

F. ANALYTIC GEOMETRY - CALCULUS

The analytic geometry - calculus sequence chosen by the university or the community college must be governed by the students' mathematical backgrounds, the size of the student population, and the mathematical needs of associated programs. It is important that the student be advised to complete that sequence in the college in which it is begun. Transfer in the middle of the sequence is not recommended.

The mathematical background of a community college is largely determined by the curriculum of the feeder schools. Students in one community may enter with sufficient background for differential calculus, while others may require analytic geometry or below. Some schools need an integrated course in analytic geometry and calculus in order to allow proper progression in engineering physics.

Each school must evaluate its own needs and pick the combinations of sequence structure that best meet these needs. The committee agrees that this sequence should cover the following topics, to be divided into combined or separate courses as the department deems advisable, and that the combined credit should be in the range of 12 to 14 semester hours (18 to 21 quarter hours).

If it is felt that integration of linear algebra into the calculus courses is advantageous, then the sequence could be extended to the equivalent of 16 semester hours (24 quarter hours).

If mathematical computer language and programming (with lab) be integrated with calculus then the sequence could be increased by one or two hours.

Non-integrated courses in computer languages and programming and in linear algebra will be discussed separately.

TOPICS IN ANALYTIC GEOMETRY

1. Coordinate systems
2. Lines and line segments; distance between points
3. Curve sketching
4. Equations and graphs of conic sections
5. Transformation of coordinates; translations and rotations
6. Parametric equations
7. Polar coordinates and equations
8. Vectors in 2 and 3 dimensions; Vector operations
9. Planes and lines in space
10. Surfaces; quadric surfaces
11. Cylindrical and spherical coordinates
12. Space curves (optional)

TOPICS IN CALCULUS

1. Limits and continuity
2. Definition of derivative; rate of change, slope
3. Derivatives of polynomial and rational functions
4. The chain rule
5. Implicit differentiation
6. Approximation by differentials
7. Higher order derivatives
8. Rolle's theorem; mean-value theorem
9. Applications of the derivative
10. Anti-derivatives
11. The definite integral
12. The fundamental theorem of calculus
13. Area, volume, other applications of the integral
14. The calculus of the trigonometric functions
15. Logarithmic and exponential functions
16. Techniques of integration, including numerical approximation methods
17. Indeterminate forms; L'Hospital's rule
18. Improper integrals
19. Sequences and series; convergence tests; Taylor series
20. Functions of more than one variable; partial derivatives
21. The differential; directional derivatives, gradients; applications
22. Double and triple integrals; evaluation, applications

This is a standard list of topics; it does <u>not</u> imply that any particular order of topics is preferable.

G. DIFFERENTIAL EQUATIONS

4 Quarter Hours

3 Semester Hours

A typical course would cover the topics listed below in Group I plus an introduction to two or three of the topics in Group II.

I

Linear equations of first order

Linear equations with constant coefficients

The general linear equation

Variation of parameters

Undetermined coefficients

Linear independence; the Wronskian

Exact equations

Separation of variables

Applications

II

Systems of Linear Equations

Solution by Laplace transforms

Existence and uniqueness of solutions

Solution of power series

Oscillation and comparison theorems

Partial differential equations

Boundary value problems

Numerical methods

Stability of solutions

H. INTRODUCTION TO LINEAR ALGEBRA — 3 Semester Hours

4 Quarter Hours

This is a first course in vectors and matrices, vector spaces, and linear transformations. The ideas discussed in this course not only serve as a good introduction to the more abstract courses a mathematics student meets at the junior-senior level, but they also have many useful applications outside of mathematics. Since the topics listed below can be treated at many levels, great care must be taken to choose a text and methods of presentation that are appropriate for second-year college students. The course is not intended to replace a more complete linear algebra course at the junior-senior level.

This course could follow or be taken concurrently with the last course in the calculus sequence, but it should not replace the last calculus course for a transfer student.

The order of the topics below will vary, depending on the approach used.

Vectors
Operation on matrices
Matrices
Inverse of a matrix
Solution of systems of linear equations
Rank of a matrix
Vector spaces and subspaces
Linear dependence and independence
Basis and dimension
Linear transformations
Sums, composites, inverses of linear transformations
Range and kernel of a linear transformation

Other topics might include

Determinants
Characteristic values and characteristic vectors (eigenvalues and eigenvectors)
Orthagonality; inner product spaces
Quadratic forms

I. MATHEMATICAL STATISTICS

3 Semester Hours

4 to 5 Quarter Hours

Post-calculus statistics is one of the three courses generally approved for the two-year college curriculum needing post-calculus courses in order to provide the student with four semesters of mathematics.

Since there is wide variation in the statistics and probability courses in the four-year universities within the state, the committee suggests that this course contains topics chosen from the CUPM Mathematics 7 (probability and statistics--6 semester hours), so that their course can coordinate with the four-year university to which most of their students transfer. A first course in statistics will necessarily contain a strong section of probability.

J. SERVICE COURSES

Nearly everyone is familiar with the importance of mathematics for the majors in the physical sciences and engineering, and the mathematical requirements for these specialties are generally known. Traditionally, the mathematics needed by majors in these areas has been offered in the mathematics departments, and in the two-year colleges it has been considered part of the transfer program.

Now many other academic disciplines find their subject is becoming more quantified and at the research level an increasing effort is being made to find suitable mathematical models for situations encountered in the social sciences, biological sciences, and business. Thus, more and more schools are introducing mathematical requirements for majors in these areas. Pre-calculus statistics seems the most frequently required course for students in biology, psychology, political science, sociology, and business curricula. In many of the four-year schools the various departments offer their own course in statistics for their own majors.

We believe that in the long run the students' best interest is served if the mathematics courses students need are offered by the mathematics department. At the same time, the mathematics departments must recognize that the students in the areas mentioned above are not best served by a proof oriented year's work in calculus simply because they find it advantageous to know some calculus.

Many mathematics departments in four-year schools are introducing appropriate courses for these new consumers of mathematics. Obviously there should be consultation between the mathematics department and the departments being served.

The specific content of the special courses for majors in the biological and social sciences and business is not nearly as well established as is the content of the courses in the traditional transfer program. An increasing number of texts written for use in these new courses has appeared on the market. Furthermore, the content of these courses is certainly appropriate for courses at the freshman and sophomore levels, and so these courses will in time become part of the baccalaureate transfer program. In fact, most of the departments in question prefer that their majors complete their mathematics requirements as early as possible, so that they can better cope with the quantitative aspects of their discipline.

These service courses can be grouped roughly as follows:

I. Pre-calculus statistics
II. Finite mathematics including linear algebra
III. Calculus for students of business and social science
IV. Computer programming

I. PRE-CALCULUS STATISTICS

These courses are designed especially for students in those fields which require a knowledge of descriptive statistics. These courses do not as a rule count toward a mathematics major or minor.

Course Title: GENERAL ELEMENTARY STATISTICS

Credit: Usually 3 semester hours or 4 quarter hours, but one senior institution has two 4-quarter hour courses.

Topics which usually appear in these courses are listed below, although all the topics listed will probably not appear in any one given course. Applications are drawn from many fields since the students being served generally represent several areas.

1. Descriptive Methods

   A. Frequency Distributions and Graphing
   B. Measures of Location--Mean, Median, Quartiles, Percentiles
   C. Measures of Variation--Variance, Standard Deviation, Computation Methods

2. Basic Probability Theory

   A. Sample Spaces, Counting, Factorials, Combinations, Permutations
   B. Probability Laws

3. Probability Distributions

   A. Normal Distribution and Normal Curve
   B. Binomial Distribution and Its Approximation to the Normal Distribution
   C. Random Samples and Sampling Techniques
      1. Distribution of sample means and variance
      2. Applications in fields such as quality control

4. Statistical Inference

   A. Estimation
   B. Hypothesis Testing
   C. Errors

   (The t-test and Chi-Square test are generally included in the broad topic of "statistical inference.")

5. Correlation and Regression

   A. Coefficient of Correlation
   B. Regression Line, Line of Best Fit

6. F test and Analysis of Variance

II. FINITE MATHEMATICS
(For Business and Management)

These courses are designed especially for students in areas such as business, economics, and social science. They do not count toward a major or minor in mathematics. They usually are part of a two course sequence, the other course being a course in polynomial calculus. If at all possible, the junior college student should complete both of these courses at the school at which he begins the sequence.

Also, the student who wishes to transfer these courses to a senior college should perhaps take the time to check the specific requirements at the senior college the student plans to attend since the specific requirements in this area at the public senior institutions in Illinois are not uniform.

These courses emphasize concept and applications of mathematics rather than mathematical structures.

Course Title: FINITE MATHEMATICS FOR BUSINESS AND MANAGEMENT or INTRODUCTORY ANALYSIS FOR BUSINESS AND THE SOCIAL SCIENCES

Credit: 3 to 4 semester hours; 4 to 5 quarter hours

Prerequisite: At least 3 semesters of high school algebra or the equivalent.

Topics which usually appear in these courses are listed below, although all of the topics listed will probably not appear in any one course. Applications are drawn primarily from economics and business.

Also, many of the major topics of these courses are relatively independent of each other, so that the order in which they are presented below is not necessarily indicative of the order in which they are presented in the courses.

Matrices and their applications seem to be about the only topics found in all courses of this type. With the passage of time there will probably be more standardization of the course content.

1. Vectors, Matrices and Matrix Algebra
2. Solving systems of simultaneous linear equations by Matrix Methods
3. Determinants
4. Other applications of matrices
5. Set Theory, Logic and Boolean Algebra
6. Counting and Probability Theory
7. Stochastic Processes
8. Systems of Inequalities and Linear Programming
9. Mathematical Modeling

III. CALCULUS FOR STUDENTS OF BUSINESS AND SOCIAL SCIENCE

This course is designed specifically for students in business and the social sciences. It emphasizes applications of the basic concepts of the calculus rather than proofs, and it generally does not count toward a mathematics major or minor in mathematics. It is generally the second course of a two course sequence, the preceding two courses often are taught from the same text, so that the topics listed for the two courses are not necessarily always divided as we have them divided here. The order in which the topics in the two courses is presented depends also on the text or texts used for the two courses.

However, because there is as yet not the uniformity in these courses as there is in the traditional algebra, trigonometry, analytic geometry-calculus sequence, the student who expects to transfer from one school to another should make every attempt to complete this two course sequence at the school where he begins study.

Course Title: INTRODUCTION TO ANALYSIS or INTRODUCTION TO CALCULUS FOR STUDENTS OF SOCIAL SCIENCE AND BUSINESS

Credit: 4 semester hours or 4-6 quarter hours

Prerequisites: Preferably a knowledge of algebra equivalent to that one usually assumes of a student who has had the college algebra course described previously.

Course Outline:

1. Introductory Topics

   A. Sets, functions
   B. Linear functions
   C. More general functions and curve sketching
   D. Exponential and logarithmic functions
   E. Applications of functions and graphs. Mathematical models.

2. Differential Calculus

   A. Limits, definition of the derivative
   B. Formulas for finding derivatives
   C. Higher derivatives
   D. Maxima and minima of functions of one variable
   E. Functions of more than one variable
   F. Partial derivatives and maxima and minima of functions of more than one variable
   B. Applications in business and economics

3. Integral Calculus

   A. The definite integral and the indefinite integral
   B. The fundamental theorem of the integral calculus
   C. The use of definite integrals to find areas
   D. Methods of integration: substitution, parts, tables
   E. Approximate integration

IV. COMPUTER PROGRAMMING

When this beginning course in digital computer programming is found in a mathematics department, the computer related topics seem fairly well standardized, although the applications of programming techniques to mathematical problems appear to vary widely in sophistication.

The distinguishing feature of this course when compared to data processing courses based on Fortran offered in other departments should be the mathematical procedures the student is expected to cover. Of course, the complexity of these procedures will depend on the mathematical prerequisites for the course, and as mentioned above, these vary widely from school to school. The students should be required to write their own programs and to develop their own algorithms rather than use the "canned" variety generally available.

Another feature of beginning courses in Fortran programming courses taught in the mathematics department is the consideration of numerical errors which are associated with computer arithmetic.

A programming course which does not involve mathematical techniques and numerical considerations will probably not be acceptable in such transfer programs as pre-engineering.

Course Title: BEGINNING PROGRAMMING IN FORTRAN IV
or
INTRODUCTION TO AUTOMATIC DIGITAL COMPUTING

Credit: 3 semester hours or 4 quarter hours

Prerequisite: Ranges from college algebra and trigonometry to calculus.

Course Outline:

1. Fortran IV
   - A. Arithmetic Statements
   - B. Input/Output Statements
   - C. Arrays and Subscripted Variables
   - D. Branching and Looping
2. Subroutines: Data storage and retrieval
3. Algorithms, iterative processes
4. Numerical analysis

K. MATHEMATICS FOR ELEMENTARY TEACHING — 8 - 10 Quarter Hours

6 - 8 Semester Hours

The purpose for these courses is to provide the potential elementary teacher with the necessary mathematical foundations needed to teach the mathematics in the current elementary school programs. They are not designed to teach methods of instruction. The topics listed below are of a general nature. It is expected that each of these topics will be considered in some depth. If at all possible, the student should complete this sequence of courses in the school in which he starts the sequence.

Since the primary purpose for these courses is to prepare future elementary teachers, both the instructor and the students should become aware of the kind of mathematics currently being taught in the elementary schools.

I. a. Logic and an Introduction to Mathematical Reasoning

b. Sets, Relations and Functions

c. The Whole Number System

d. Numeration Systems

e. The System of Integers

f. Elementary Number Theory

g. The Rational Number System

h. The Real Number System

i. Measurement

j. Non-Metric Geometry

II. Further Topics

a. Finite Mathematical Structures

b. Probability and Statistics

L. LIBERAL ARTS MATHEMATICS

4 - 5 QUARTER HOURS
3 - 4 SEMESTER HOURS

This course is intended to introduce the students to mathematical concepts they may not have previously met. A major concern for this course should be to develop a broader understanding and appreciation of mathematics. It is terminal in nature and is not intended to be a General Studies (Remedial) or a course in Mathematics for Elementary Teaching.

CHAPTER III

CONCLUSION

Dr. Darnes has asked the Task Force to furnish his office with recommendations concerning the two perennial questions:

1. What should be the lowest level mathematics course in the baccalaureate transfer program?

2. In the field of mathematics, which courses are the lower division courses? This question is important, because by law the community colleges are to confine their offerings in the transfer program to freshman and sophomore level courses.

Unfortunately, the answers to both of these questions have changed over the years, and there is every indication that the answers will continue to change with the passage of time. At present, both two-year and four-year colleges are admitting students with very limited backgrounds in mathematics, and at the same time are admitting students with superior backgrounds in mathematics. If one assumes that the community colleges should offer two years of mathematics for each of these types of students, it is apparent that there can be no one package consisting of either four semester or six quarters of courses in mathematics suitable for all community college students. These considerations lead the Task Force to make the following recommendations:

1. We recommend that at present the lowest level course in the baccalaureate transfer program be a course which is the equivalent of the INTERMEDIATE ALGEBRA course described on page 4 of this report.

2. Rather than try to impose an unrealistic demarcation between upper and lower division courses in the mathematics curriculum, we recommend that all courses through the level of the traditional calculus be considered lower division courses. We further recommend that the following courses, which usually have at least some calculus as a prerequisite, be considered as legitimate lower or upper division courses: linear algebra, differential equations, calculus based statistics.

3. In preparation for the annual revision of this Guide, we suggest that recommendations be sent to the members of the Junior College Committee of the ISMAA.