文献紹介（1）

センター・ニュースに対する要望の中の文献紹介の希望に応えるため，文献紹介シリーズをしばらく掲載することにしたい。計算機に関係する分野が多岐にわたるため，まず最初に，一応の標準として，ACM（Association for Computing Machinery）の計算機科学カリキュラム委員会が提示したカリキュラムに示された文献リストを掲げることにする。

（資料出所：Curriculum 68 Recommendations for Academic Programs in Computer Science, Comm. of ACM Vol. 11. No, 3, March 1968, pp 151—197.）

日本語の文献，又は翻訳書については，シリーズの適当な時点で提示することにしたい。

本稿で使用される用語，訳語については下記の文献を参照されたい。

(1)ＪＩＳ情報処理用語，ＪＩＳ　Ｃ　6230-[1970]，日本規格協会。

(2)情報処理学会規格委員会ＳＣ１専門委員会；情報処理用語標準対訳（英和—和英），昭和48年９月，オーム社。

(3)Joint Technical Committee on Terminology IFIP and ICC; IFIP-ICC Vocabulary of Information Processing, 1966, North-Holland.

(4)Dictionary Subcommittee of the IEEE Standards Committee; IEEE Standard Dictionary of Electrical and Electronics Terms, 1972, Wiley-Interscience.

(5)A.R.Meetham (edr.-in-chief); Encyclopaedia of Linguistics, Information and Control, 1969, Pergamon Press.

（注）文献中のＣＲ番号はＡＣＭのComputing Reviews誌上の分類番号（例：ＣＲ-6345-4551は同誌1963年，Vol. 4，No. 5のNo. 4551に紹介があることを意味する）である。

（教育広報専門委員会）

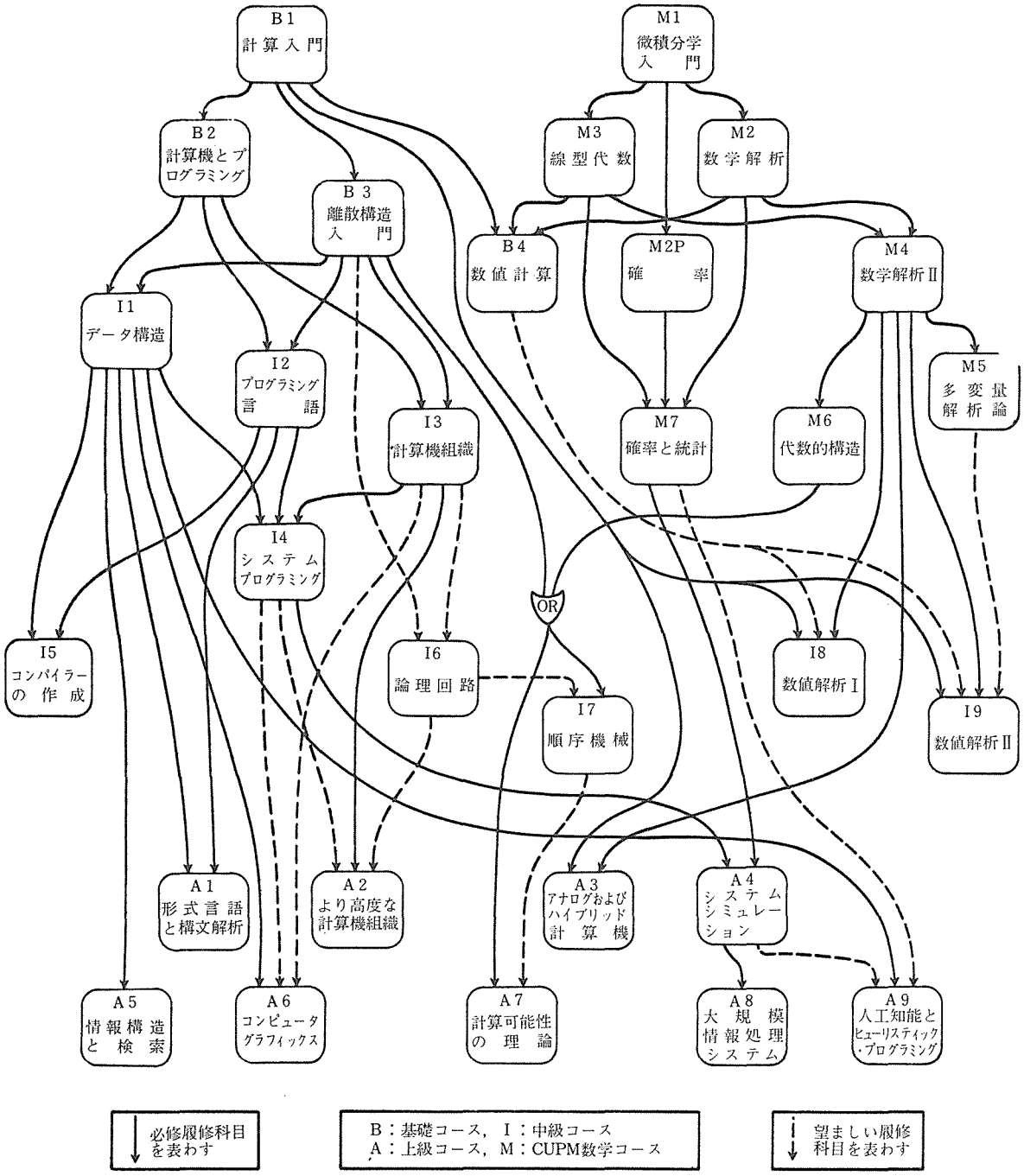

図1 カリキュラム履修順序

1．基礎コース

B 1．計算入門

In addition to the materials listed here, there are numerous books and manuals on specific computer languages which would be appropriate as part of the textual material for this course. Very few books, however, place sufficient emphasis on algorithms and provide the general introductory material proposed for this course.

1. ARDEN, B. W. *An Introduction to Digital Computing.* Addison-Wesley, Reading, Mass., 1963, 380 pp. CR-6345-4551.
   This text uses MAD and emphasizes the solution of numerical problems, although other types of problems are discussed. Numerous examples and exercises.
2. FORTE, A. *SBOBOL3 Primer.* M.I.T. Press, Cambridge, Mass., 1967, 107 pp.
   An elementary exposition of SNOBOL 3 which might well be used to introduce a "second" language. Many exercises and examples. (SNOBOL 4 is now becoming available.)
3. GALLER, B. A. *The Language of Computers.* McGraw-Hill, New York, 1962, 244 pp. CR-6341-3574.
   Emphasizes "discovering" the structure of algorithms needed for the solution of a varied set of problems. The computer language features necessary to express these algorithms are carefully motivated. The language introduced is primarily based on MAD, but FORTRAN and ALGOL are also discussed.
4. GRUENBERGER, F. The teaching of computing (Guest editorial). *Comm. ACM* 8.6 (June 1965), 348 and 410. CR-6565-8074.
   Conveys eloquently the philosophy which should be used in developing and teaching an introductory computing course.
5. GRUENBERGER, F. AND JAFFRAY, G. *Problems for Computer Solution.* Wiley, New York, 1965, 401 pp. CR-6671-8757.
   Contains a collection of problems appropriate for computer solution by students. Student is guided into the analysis of the problems and the development of good computational solutions, but actual computer programs for the solutions are not given.
6. HULL, T. E. *Introduction to Computing.* Prentice-Hall, Englewood Cliffs, N. J., 1966, 212 pp.
   Text on fundamentals of algorithms, basic features of stored-program computers, and techniques involved in implementing algorithms on computers. Presents a complete description of FORTRAN IV with examples of numerical methods, non-numerical applications, and simulations. Numerous exercises.
7. MARCOVITZ, A. B. AND SCHWEPPE, E. J. *An Introduction to Algorithmic Methods Using the MAD Language.* Macmillan, New York, 1966, 433 pp. CR-6781-11,199.
   Emphasizes algorithms and their expression as programs, characteristics of computers and computer systems, formal definition of computer lagnuages, and accuracy and efficiency of programs. Numerous examples and exercises.
8. PERLIS, A. J. Programming for digital computers. *Comm. ACM* 7, 4 (Apr. 1964), 210-211pp.
   Description of course developed by Perlis at Carnegie Institute of Technology which has strongly influenced the course proposed here.
9. RICE, J. K. AND RICE, J. R. *Introduction to Computer Science: Problems, Algorithms, Languages and Information,* Preliminary edition. Holt, Rinehart and Winston, New York, 1967, 452 pp.

Presentation revolves around the theme of "problem solving." emphasizing algorithms, languages, information representations, and machines necessary to solve problem solution methods classified, and many sample problems included. The nature of errors and uncertainty is considered. Detailed appendix on FORTRAN IV by E. Desautels.

10. School Mathematics Study Group. *Algorithms, Computation and Mathematics,* rev. ed. Stanford University, Stanford, Calif., 1966. *Student Text,* 453 pp. *Teacher's Commentary,* 301 pp.; *Algol Supplement: Student Text,* 133 pp., *Teacher's Commentary,* 109 pp.; *Fortran Supplement; Student Text,* 132 pp.; *Teacher's Commentary,* 102 pp. Available from A.C. Vroman, Inc., 367 South Pasadena, Pasadena, Calif. *A MAD Language Supplement* by E. I. Organick is available from Ulrich's Book Store, 549 E. University Avenue, Ann Arbor, Mich.

    Although developed for high school students and teachers, this work contains much material appropriate for this course. Develops an understanding of the relationship between mathematics, computing, and problem solving. Basic text uses English and flow charts to describe algorithms; supplements introduce the computer language and give these algorithms in ALGOL, FORTRAN, and MAD.

B 2. 計算機とプログラミング

Whereas many of the books on "computer programming" might seem to be appropriate texts or references for this course, only a few even begin to approach the subject as proposed for this course. Most books deal with specific machines, actual or hypothetical, but very few discuss computer organization from any general point of view or consider the techniques of symbolic programming by any method other than examples. A few of the many books which deal with specific machines have been included in this list, but no manufacturers' manuals have been listed even though they may be used effectively as supplemental material.

1. BROOKS, G. P., JR., AND IVERSON, K. E. *Automatic Data Processing.* Wiley, New York, 1963, 494 pp. CR-6673-9523.
    On computing fundamentals, machine language orgainzation and programming using IBM 650 as the principal example.
2. DAVIS, G. B. *An Introduction to Electronic Computers.* McGraw-Hill, New York, 1965, 541 pp.
    Informally written text containing a general introduction to computing, rather complete coverge of FORTRAN and COBOL, and considerable material on machines and machine language programming.
3. FISCHER, F. P., AND SWINDLE, G. F. *Computer Programming Systems.* Holt, Rinehart and Winston, New York, 1964, 643 pp. CR-6455-6299.
    Part I is concerned with machine oriented programming and programming systems using IBM 1401 as the illustrative computer.
4. FLORES, I. *Computer Programming.* Prentice-Hall, Englewood Cliffs, N. J., 1966, 386 pp. CR-6674-10,060.
    Covers machine language and software techniques using the Flores Assembly Program (FLAP) for illustrative purposes.
5. HASSITT, A. *Computer Programming and Computer Systems.* Academic Press, New York, 1967, 374 pp. CR-6784-12,355.
    Discusses various features of computer organization and programming languages

using examples from a number of machines including IBM 1401, 1620, 7090 and System/360, and CDC 1604 and 3600.

6. IVERSON, K. E. *A Programming Language.* Wiley, New York, 1962, 286 pp. CR-6671-9004.
   Introduces a language used extensively for description of computers as well as for description of computer programs. Contains material on machine organization, sorting and data structures.
7. STARK, P. A. *Digital Computer Programming.* Macmillan, New York, 1967, 525 pp.
   Presents machine language and symbolic programming for a 24-bit computer.
8. STEIN, M. L., AND MUNRO, W. D. *Computer Programming: A Mixed Language Approach.* Academic Press, New York, 1964, 459 pp. CR-6455-6140.
   A text on computer organization and assembly language programming using CDC 1604 as the basic computer.
9. WEGNER, P. *Programming Languages, Information Structures and Machine Organization.* McGraw-Hill, New York, 1968, about 410 pp.
   Covers machine languages, multiprogramming, assembler construction and procedure-oriented languages. Programming languages are treated as information structures.

B 3. 離散構造入門

1. BECKENBACH, E. F. (Ed.) *Applied Cambinatorial Mathematics.* Wiley, New York, 1964, 608 pp.
   A collection of articles on a broad spectrum of topics. Not directly suitable as a text, but an excellent source of ideas and an important reference.
2. BERGE, C. *Theory of Graphs and Its Applications.* Wiley, New York, 1962, 244 pp.
   A good presentation of directed and undirected graph theory, with some attention to algorithms. The work suffers from many misprints and errors which have been carried over into the English translation. A general reference text for this course.
3. BIRKHOFF, G., AND BARTEE, T. *Modern Applied Algebra,* Preliminary edition, *Parts I and II.* McGraw-Hill, New York, 1967.
   Preliminary edition available only in limited quantities, but the full text expected by the fall of 1968. Appears to be very close in spirit to the material proposed for this course, but the content is more algebraically oriented and includes little on graphs.
4. BUSACKER, R., AND SAATY, T. *Finite Graphs and Networks: An Introduction with Applications.* McGraw-Hill, New York, 1965, 294 pp.
   A good work on graph theory with a very nice collection of applications. Useful as source and reference for the graph theory part of this course.
5. GROSSMAN, I., AND MAGNUS, W. *Groups and Their Graphs.* Random House, New York, 1965, 195 pp. CR-6564-8003.
   An elementary but very well written discourse on basic connections between group and graph theory.
6. HARARY, F., NORMAN, R. Z., AND CARTWRIGHT, D. *Structural Models: An Introduction to the Theory of Directed Graphs.* Wiley, New York, 1965, 415 pp. CR-6566-8421.
   Excellent on directed graphs and probably the best source book of that field.

Should be an important reference for the corresponding portion of this course.

7. HOHN, F. *Applied Boolean Algebra,* 2nd ed. Macmillan, New York, 1966, 273 pp.
Very good introduction to basic facts of Boolean algebra and especially its applications in electrical engineering. Important reference for the corresponding portion of this course.
8. KEMENY, J., MIRKIL, H., SNELL, J., AND THOMPSON, G. *Finite Mathematical Structures.* Prentice-Hall, Englewood Cliffs, N. J., 1959, 487 pp.
A text for physical science and engineering students who have completed the calculus. First two chapters on compound statements, sets, and functions should be particularly useful.
9. KEMENY, J., SNELL, J., AND THOMPSON, G. *Introduction to Finite Mathematics,* 2nd ed. Prentice-Hill, Englewood Cliffs, N. J., 1966, 352 pp.
Freshman-sophomore level text designed primarily for students in biological and social sciences. Follows CUPM recommendations for the mathematical education of such students. First three chapters on compound statements, sets and subsets, partitions, and counting cover similar material as proposed for this course.
10. KORFHAGE, R. *Logic and Algorithms: With Applications to the Computer and Information Sciences.* Wiley, New York, 1966, 194 pp. CR-6782-11,339.
A fine new text introducing those basic topics from mathematical logic important in computer science–for instance Boolean algebra, Turing machines, and Markov algorithms. Written in the spirit which should pervade this course.
11. LEDERMAN, W. *Introduction to the Theory of Finite Groups.* Interscience, New York, 1953, 160 pp.
A very readable introduction to finite groups. Particularly interesting to this course is the chapter on permutation groups.
12. MACLANE, S., AND BIRKHOFF, G. *Algebra.* Macmillan, New York, 1967, 598 pp.
A substantially revised and updated version of *A Survey of Modern Algebra,* which has been a classic text on modern algebra. Should be one of the main references for the algebraic parts of this course.
13. ORE, O. *Graphs and Their Uses.* Random House, New York, 1963, 131 pp.
An introduction to the elementary concepts of graph theory. Very pleasant to read.
14. RIORDAN, J. *An Introduction to Combinatorial Analysis.* Wiley, New York, 1958, 244 pp.
One of the best source books on enumerative combinatorial analysis. However, it is too advanced for use as a text in a course of this type.
15. RYSER, H. *Combinatorial Mathematics.* Wiley, New York, 1963, 154 pp. CR-6562-7371.
An excellent introduction to such topics as (0,1) matrices, Latin-squares, and block-design, but containing almost no graph theory.
16. WHITESITT, J. E. *Boolean Algebra and Its Appicatians.* Addison-Wesley, Reading, Mass., 1961, 182 pp.
An introductory text designed for readers with a limited mathematical background.

B 4. 数値計算

Listed below are some of the books which might be used as texts and/or references for this course. Most of the books cover the following topics: solution of polynomian and other nonlinear equations; interpolation, numerical quadrature. and numerical differentiation; ordinary differential equations; and linear algebra. Significant deviations from these topics are indicated by the annotation.

1. Conte, S. D. *Elementary Numerical Analysis: An Algorithmic Approach.* McGraw-Hill, New York, 1965, 278 pp.
   Designed as a text for a one-semester, three-hour course for engineering and science undergraduate students. Machine-oriented treatment with many illustrative examples including flow charts and Fortran programs. Except for the chapter on differentions, a knowledge of basic calculus and of programming in a procedure-oriented language is sufficient background. Numerous exercises.
2. Jennings. W. *First Course in Numerical Methods.* Macmillan, New York, 1964. 233 pp. CR-6671-9036.
   Designed as a text for a one-semester course for advanced undergraduate students in science and engineering. Brief treatment of the standard topics. Presupposes caluclus, differential equations, some experience with the computer, and, for later chapters, matrices. Some exercises.
3. Macon, N. *Numerical Analysis.* Wiley, New York, 1963, 161 pp.
   Designed as a text for a one-semester first course in numerical analysis. Emphasis is more on the mathematical aspects rather than the computational aspects although there is an introductory chapter on the elements of computing, flow charting, and Fortran programming. For the early chapters calculus provides sufficient background. For later chapters an elementary knowledge of matrix theory, differential equations, and advanced calculus in recommended. Examples and exercises.
4. McCormick, J. M., and Salvadori, M. G. *Numerical Methods in FORTRAN.* Prentice-Hall, Englewood Cliffs, N. J., 1964, 324 pp. CR-6676-10,883.
   Designed as a text either for an elementary course in numerical analysis at the junior-senior level or for a course in programming. First part presents the methods without reference to programming techniques. There are 320 examples and problems. The last part contains 53 completely worked illustrative Fortran programs; Presupposes beginning analysis.
5. McCracken, D., and Dorn, W. S. *Numerical Methods and FORTRAN Programming.* Wiley, New York, 1964, 457 pp. CR-6562-7107.
   Designed as a text for a four semester-hour course in science or engineering at the sophomore-senior level. Emphasis on practical methods–for example, the treatment of simultaneous linear algebraic equations does not make use of matrices. Chapters on various aspects of Fortran are interspersed with chapters on numerical methods. Includes a brief chapter on partial differential equations. Presupposes beginning analysis. Examples and exercises.
6. Milne, W. E. *Numerical Calculus.* Princeton University Press, Princeton, N. J., 1949, 393 pp.
   Written in 1949 in the early days of computing, this is a very useful reference even though the treatment is oriented toward manual computation and though some of the methods have been superseded. Presupposes a knowledge of calculus and differential equations. Examples and exercises.

7. NIELSEN, K. L. *Methods in Numerical Analysis,* 2nd ed. Macmillan, New York, 1956 and 1964, 382 pp. CR-6455-6333.
   Designed as a textbook for a practical course for engineers. Primary emphasis on the use of desk calculators and tables. Presupposes calculus. Examples and exercises.
8. PENNINGTON, R. H. *Introductory Computer Methods and Numerical Analysis.* Macmillan, New York, 1965, 452 pp. CR-6565-8060.
   Designed as a text for a one-year elementary course for scientists and engineers to be taken immediately after integral calculus. The first part treats digital computers and programming. Numerical methods are then discussed from a computer viewpoint with the aid of flow diagrams. Little knowledge of computing is assumed. For some of the topics a knowledge of matrices and ordinary differential equations would be helpful. Many examples and exercises.
9. SINGER, J. *Elements of Numerical Analysis.* Academic Press, New York, 1964, 395 pp. CR-6561-6959.
   Designed as a text for junior undergraduate students in mathematics. Treatment geared more to manual computation than to the use of computers. Presupposes beginning analysis and, for some parts, differential equations and advanced calculus. Examples and exercises.
10. STIEFEL, E. L. *An Introduction to Numerical Mathematics,* transl. by W. C. and C. J. Rheinboldt. Academic Press, New York, 1963, 286 pp. CR-6455-6335.
    Appropriate for a junior-senior level course in mathematics, science, and engineering. Emphasis is on the algorithmic approach, although there are only a few flow charts and specific references to programs. A wide variety of topics and methods is treated. Basic calculus in required for the early chapters, but for later chapters familiarity with ordinary differential equations is desirable. Examples are given. There is a separate problem supplement with 36 exercises.