

SOFTWARE PACKAGE  
for  
NUMERICAL METHODS

Developed By  
HADJIPANAYI ANDROS

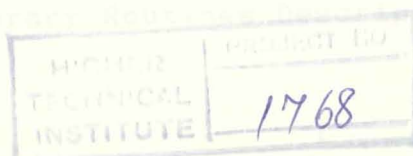
Project Report  
Submitted To The  
Department Of General Studies  
Of The  
Higher Technical Institute  
Nicosia Cyprus  
In Partial Fulfillment Of The Requirements  
For The Diploma In  
COMPUTER STUDIES

Project Supervisors : Mr. Christos Makarounas  
Mrs. Paraskevoulla Kroni

External Assessors : Mr. Nicos Philippou  
Mr. Andreas Kattos

Higher Technical Institute

June 1991



## SUMMARY

The book you are about to read is more like a report on the work performed during the development of this project. It contains information about the nature and the scope of the project.

The report tries to describe step by step and to the closest detail as possible, the stages that the project has gone through and the way it has been developed. It tries to make the reader understand how information concerning the project requirements has been analyzed and organized, and finally put together to prepare this project.

The report follows a specific structure. It is divided in the following four chapters :

- Investigation Phase
- Analysis And General Design Phase
- Detailed Design And Implementation Phase
- Installation Phase

These five chapters represent four of the five phases of the System's Development Life Cycle which is the structure of a system's development project.

Each phase is subdivided into smaller pieces of work the activities. It is with the description of these activities that the report will attempt to explain to the reader the process which was involved in the development of this project.

## Table Of Contents

	Page
ACKNOWLEDGEMENTS	4
SUMMARY	5
INTRODUCTION	6
CHAPTER 1 - INVESTIGATION PHASE	
1. Initial Investigation	8
1.1. What Are Numerical Methods	8
1.2. Existing Software Package For Numerical Methods	8
1.3. Define The Problem	8
1.4. Conclusion	9
1.5. Recommendation	9
1.6. Policy Consideration	9
2. Feasibility Study	10
2.1. Feasibility Report	10
2.2. Financial Feasibility	10
2.3. Operational Feasibility	11
2.4. Technical Feasibility	11
2.5. Schedule Feasibility	11
2.6. Human Factor Feasibility	12
2.7. Advantages And Disadvantages Of The System	13
CHAPTER 2 - ANALYSIS AND GENERAL DESIGN PHASE	
3. Existing System Review	15
4. New System Requirements	16
4.1. Main Objective Of The System	16
4.2. System Function	16
4.3. Program Processing	17
4.4. Library Routines Description	17

4.4.1.	Matrix Operations	17
4.4.1.1.	Matrix Addition	17
4.4.1.2.	Matrix Subtraction	18
4.4.1.3.	Multiplication By A Scalar	18
4.4.1.4.	Matrix Multiplication	18
4.4.1.5.	Determinant Of A Matrix	18
4.4.1.6.	Inversion Of A Matrix	18
4.4.2.	Systems Of Linear Algebraic Equations	19
4.4.2.1.	Direct Method	19
4.4.2.2.	Gauss Elimination	19
4.4.2.3.	Gauss Jordan Elimination	19
4.4.2.4.	Gauss Seidel Iteration	19
4.4.3.	Non Linear And Transcendental Equations	20
4.4.3.1.	Bisection Method	20
4.4.3.2.	Secant Method	20
4.4.3.3.	Simple Step Iteration	20
4.4.3.4.	False Position Method	20
4.4.3.5.	Basic Iteration	20
4.4.3.6.	Newton Raphson Method	21
4.4.3.7.	Modified Newton Raphson Method	21
4.4.4.	Finite Differences And Interpolation	21
4.4.4.1.	Formation Of Finite Difference Table	21
4.4.4.2.	Interpolation	21
4.4.5.	Numerical Integration	22
4.4.5.1.	Trapezoidal Rule	22
4.4.5.2.	Simpson's Rule	22
4.4.6.	Curve Fitting	22
4.4.6.1.	O.L.S. Method	22
4.5.	Input To The Library	23
4.6.	Output To The Library	23
4.7.	User Interface With The Library	23
5.	New System Design	24
5.1.	Objectives Of The New System Design	24
5.2.	Security And Control Measures	24
5.3.	Performance Criteria	25

6.	Implementation And Installation Planning	26
6.1.	Objectives Of Implementation And Installation Planning	26
6.2.	Preliminary design And Implementation Planning	26

### CHAPTER 3 - DETAILED DESIGN AND IMPLEMENTATION PHASE

7.	Technical Design	28
7.1.	Program Inventory	28
7.2.	Program Specifications	33
8.	Test Specification And Planning	58
9.	Programming And Testing	60
10.	User Training	61
11.	System Test	62

### CHAPTER 4 - INSTALLATION PHASE

12.	Installation	64
-----	--------------	----

REFERENCES	65
------------	----

### APPENDIX A

### APPENDIX B