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INTRODUCTION TO FINITE ELEMENTS IN ENGINEERING  
(Fourth Edition)

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These downloads includes finite element programs.

Downloads

\C	- Source codes in ANSI C
\ExcelVB	- Programs in Microsoft Excel VBA (Input Data on Sheet1)
\FORTRAN	- Fortran source codes
\GraphicsEXE	- Executable Graphics Programs from VB5
\JavaScript	- Javascript HTML for IE, FireFox, Safari, or Chrome (Integrated Data Example)
\MATLAB	- Source codes in MATLAB
\QBasic	- Source codes in QuickBasic
\VB5	- Source codes in Visual Basic 5.0

\EXAMPLES - This directory has input data files. There is a data file for each program. Same input data file works for C, Fortran, Matlab, QuickBasic, and VB5. ExcelVB has its own input in the spreadsheet. JavaScript has its own integrated data screen.

\*\*\* Copy the Programs onto your hard disk (writable disk) and then run programs from the hard disk. Right click on the program name, click <properties> and then remove check on <Read Only>. The source codes can then be edited and saved.

The program source codes are in text format. The programs can be run on any PC or Workstation that has the compiler or interpreter for any of the above programming environments. Most of the programs are transportable among Windows, Unix systems, IBM compatible PCs, Apple/Mac computers and Workstations where the compilers are available.

COMMENTS

C Programs

- All C programs were compiled and tested using ANSI C
- Dynamic memory allocation is used in declaring the arrays

ExcelVB

- Excel programs use the VBA (VB Application) environment
- The Excel programs have been developed on Microsoft Excel 2003
- Click program name, then click <Enable Macros> on the Security warning window
- Sheet1 has the data for an example problem
- Click <Solve Problem> button. Results appear on Sheet2.
- If nothing happens the Security Level setting may be high. Change to MEDIUM (Click-Tools-Macro-Security to set the level)

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- Edit data to solve another problem (Do not delete comment lines, Do not leave any blank lines in the data sheet)  
Need less lines in a subset, right click and delete a line  
Need an extra line, right click at the next comment and add a line
  - Click <Alt + F11> to see the VB Screen where the source code resides.

#### FORTTRAN

- Array dimensions have been fixed at some values to enable solution of small problems
- Look carefully at the array dimensions and match them in the subroutines while attempting larger problems

#### GraphicsEXE

- Includes Plot2D, Bestfit, Bestfitq, ContourA, ContourB programs
- Source codes for these programs are in VB5. Other graphics source codes are available in QBASIC and MATLAB.

#### JavaScript

- Each JavaScript program is a HTML file written in Javascript language
- Click on the program name to load into the default WEB BROWSER. OR Right click and load into the browser of your choice.
- Click <allow blocked content> if asked (Needed in IE etc)
- Upper Window has input data for an example problem
- Click <SOLVE> to get output in the bottom screen
- You may cut and paste the output to a text processor or word processor
- Input data can be edited on the top screen or cut and paste from a text processor such as Notepad
- Click <View - Source> to see the source code for the program
- The HTML file may be opened using a text processor to edit source code for program modification needs.

#### MATLAB

- Make sure that Bansol.m file is in the working directory along with the finite element program

#### QBASIC

- Quick Basic programs can be run using the QBASIC interpreter (QBASIC.EXE) provided on DOS, Windows 3.1, and Windows 95 environments or QuickBasic interpreter/compiler
- QBASIC is not available on Windows 2000 and later systems
- All graphics programs can be run on QBASIC or QB45

#### VB5

- The Visual Basic programs may run on VB 4.0 or VB 5.0
- Each Visual Basic project consists of three files. The files have same name with extensions .vbp, .vbw, .frm
- The .frm file has the form information and the source code
- Make sure that all three files are in your directory while loading into Visual Basic VB 5.0

#### PROGRAMS ACCOMPANYING CHAPTERS

Chapter 2	Chapter 3	Chapter 4
GAUSS	FEM1D	TRUSS2D
SKYLINE		TRUSSKY
CGSOL		

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Chapter 5	Chapter 6	Chapter 7
BEAM	CST	AXISYM
FRAME2D		
FRAME3D		
Chapter 8	Chapter 9	Chapter 10
QUAD	TETRA3D	HEAT1D
QUADCG	HEXAFRON	HEAT2D
AXIQUAD	HEXA (JS)	TORSION
GaussLegendre (JS, ExcelVB)		
GLInteg (JS)		
Chapter 11	Chapter 12	
INVITR	MESHGEN	CONTOURA
JACOBI	PLOT2D	CONTOUTB
GENEIGEN	BESTFIT	
BEAMKM	BESTFITQ	
CSTKM		

Note: PLOT2D, BESTFIT, BESTFITQ, CONTOURA, and CONTOURB are available in EXE, VB, QBasic, and MATLAB only. QUADCG and AXIQUAD are not available in MATLAB.

#### MAIN VARIABLES

All programs use the variables defined below:

NN ----- Number of Nodes  
NE ----- Number of Elements  
NM ----- Number of Different Materials  
NDIM --- Number of Coordinates per Node  
(e.g. NDIM = 2 for Two dimensional problems)  
NEN ---- Number of Nodes per Element  
(e.g. NEN = 3 for CST Elem)  
NDN ---- Number of Degrees of Freedom per Node  
(e.g. NDN = 2 for BEAM)  
ND ----- Number of Specified Displacement Degrees of Freedom(DOF)  
NL ----- Number of Applied Component Loads (Along DOF directions)  
NPR ---- Number of Material Properties (e.g. E, nu, alpha)  
NMPC --- Number of MultiPoint Constraints (of the type  $B1*Q_i+B2*Q_j=B3$ )

The variables are also given inside the book cover.

We encourage you to provide your feedback on the use of this book and the programs.

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