

Index (Draft)

- Abel, J.F., 474
Abdulwahab, F., 371, 404
Abramowitz, M., 119
Abscissas, 31, 33, 124, 125, 205, 206, 208
Acceleration, 295
Adams, R.A., 58
Adams, V. 17
Adaptivity
 h-method, 233, 249, 263, 291, 317, 321, 328, 360, 394
 p-method, 109, 373, 410
 hp-method, 109, 373, 394
Adjoint, 22
Advective diffusion, 407, 422, 426
Ahmad, S., 96, 214, 474
Ainsworth, M., 58, 370, 372, 404
Akin, J.E., 17, 404, 474
Allaire, P.E. 240, 281
Allan, T., 474
Analytic solution, 36, 50, 85, 138, 140, 270, 343, 348
Angle of twist, 269, 272, 273
Anisotropic material, 1, 5, 313
Antisymmetry 219, 222, 223
Area coordinates, 102, 201, 202, 208
Askenazi, A., 17
Aspect ratio, 194
Assembly of equations, 10, 13, 15, 16, 39, 41, 42, 44, 49, 63, 65, 72, 75, 134, 151, 164, 227, 301
Axelsson, O., 58
Axial stress, 284
Axisymmetric integrals, 131, 143, 265, 463
Axisymmetric stress, 4, 284, 286, 287, 311, 314, 324, 326, 327, 329
Aziz, A.K., 58
Babuska, I., 17, 59, 119, 197, 198, 332, 370, 404
Back substitution, 29, 390
Baker, V.T., 58
Bang, H., 282
Bar, 62, 67, 72, 74, 77, 113
Baracentric coordinates, 202
Barlow points, 117, 213, 341, 380, 390
Barlow, J., 119, 213, 224
Barnhill, R.E., 370
Bathe, K.J., 17, 96, 167, 332
Becker, E.B., 17, 197, 332
Belegundu, A.D., 167
Belytischko, T., 332, 370, 404
Bilinear form, 54
Blacker, T., 370, 404
Blended functions, 178, 187
Body forces, 67, 72, 143, 289, 294
Boolean assembly, 8, 64-67
Boundary conditions, 8, 22, 23, 28, 42, 45, 49, 221, 350
Boundary flux, 57, 238, 255
Boundary layer, 406, 454
Boundary matrices, 218
Brauchli, H.J., 370
Brauchi, H.J., 370
Brooks, A.N., 410, 455
Bubble function, 408
Buchanan, G.R. 58, 96, 145
Bulk modulus, 298
Buscaglig, G., 456

- Byrom, T.G., 17, 474
- C^1 function, 105
- CALC_SCP_AVE_NODE_FLUX, 385-389
- Cantin, G., 404
- Capacity matrix, 53
- Carette, J.C., 455
- Carey, G.F., 17, 59, 130, 167, 197, 332, 460, 474
- Carpet plot, 230, 233, 245, 270, 322, 357, 468
- Carslaw, H.S., 282
- Centrifugal load, 70
- Centroid, 128, 192, 268, 294, 308
- Cervera, M., 455
- Chandrupatla, T.R., 167
- Choleski factorization,
- Christie, I., 407, 455
- Chung, T.J., 460, 474
- Ciarlet, P.G., 58, 370
- Circular hole, 315
- Coaxial cable, 145
- Codina, R., 411, 417, 455
- Cohen, M., 214
- Collocation, 24
- Complete polynomial, 337
- Computational fluid dynamics,
- Conduction, 52, 82, 216, 226, 257, 333
- Conduction matrix, 220, 223
- Conductivity, 52, 147, 333
- Connectivity, 8, 148, 224
- Connor, J.C., 197
- Consistent source, 40, 44, 209, 211, 212, 294, 295, 297
- Constant Jacobian, 34, 340, 385
- Constant strain triangle, 183, 293, 297
- Constitutive matrix, 69, 75, 141, 143, 286, 287, 292, 298, 313, 333, 380, 392
- Constraint equations, 8, 30
- Continuous flux, 338
- Contours, 230, 239, 244, 248, 257, 259, 261, 262, 349, 351, 356, 358, 467
- Convection, 82, 85, 216, 236
- Convection loss, 83, 87, 247
- Convergence, 7
- Convergence rate, 212, 331, 336, 361
- Cook, R.D., 17, 167, 214
- Cookson, R.A., 197
- Coon's function, 187
- Coordinate transformation, 108, 177, 187, 307, 314
- COUNT_ELEMS_AT_ELEM, 376
- COUNT_L_ADJACENT_NODES, 375
- Craig, A.W., 372
- cross-derivatives, 403
- cross_wind, 409
- Cubic element, 36, 103, 105, 176, 187, 211, 212, 244, 304, 444
- Current density, 147
- Curve metric, 127, 128
- Cylindrical analysis, 131, 143
- Data, 73, 79, 86, 91, 135, 144, 161, 235, 238, 246, 267, 274, 300, 306, 424, 483, 488, 491, 497, 502
- DeBoor, C., 58
- Decinick, H., 455
- Degree of freedom number,
- Demkowicz, L., XX
- De-refinement, 394
- Derivative
 - global, 46, 181, 392
 - local, 179, 181, 203
 - nodal parameters, 105, 107
 - second, 34, 106, 394
- DERIV_C1_L, 107
- DERIV_3_L, 104
- DERIV_3_T, 169, 170
- DERIV_4_Q, 171
- DERIV2_C1_L, 107
- Desai, C.S., 17, 119, 282
- DeVries, G., 17
- Differential geometry, 188
- Diffusivity, 413
- Dirac delta distribution, 24
- Dirchlet condition, 8, 22, 28, 42, 44, 49, 89, 164, 216, 218, 221, 317, 337, 460
- Direct assembly, 8, 10, 11, 13, 301

- Direction cosines, 154
- Displacements, 4, 5, 147, 155, 283, 290, 301, 319, 334
- Distortion, 194, 197
- Distortional energy, 310
- Divergence theorem, 181
- Donea, J., 455
- Dual problem, 22
- Dunavant, D.A., 214
- Dunavant quadrature, 206-208
- Dym, C.L., 96
- D_Q_RULE, 207, 208

- Edge flux, 235
- Effective stress, 302, 305, 308, 310, 322
- Effectivity index, 336
- Eigenproblem, 53, 295
- ELASTIC_B_AXISYMMETRIC, 312
- ELASTIC_B_MATRIX, 292, 304, 512
- ELASTIC_B_SOLID, 510
- Elastic bar, 67, 74, 113
- Elastic modulus, XX, 298
- Electric network, 150
- Electrical energy, 147
- El-Zafrany, A., 197
- Element based patch, 393, 343, 385
- Element connectivity, 3, 65, 148, 150, 152, 163
- Element incidences, 12, 375
- Element interface, 172, 179
- Element loads, 294, 295
- Element matrices, 41, 47, 70, 80, 83, 132, 141, 149, 150, 153, 157, 159, 163, 218, 220, 223, 241, 251, 266, 293, 299, 382, 422, 426, 463, 473, 494
- Element properties, 33, 73, 76, 85, 143, 149, 158, 161
- Element reactions, 80, 81
- Element size, 233, 248, 249, 263, 271, 321, 394, 432, 435-454
- ELEM_COL_MATRIX, 32
- ELEM_SQ_MATRIX, 31, 32, 33, 34, 35, 36, 43, 76, 85, 133, 143, 149, 153, 159, 223, 254, 277, 303, 422, 426, 463, 470, 480, 482, 490, 496, 505, 510
- Elliptic problem, 1, 47
- Encapsulated, 272
- Energy norm, 248, 264
- Energy norm error, 233, 321, 328, 329, 331, 346, 356
- Equation numbers, 11, 12, 13
- Equation of motion, 295
- Equilibrium, 63, 78, 81, 147, 233, 250
- Equivalent form, 53, 61, 62
- Error estimates, 333-366, 465
- Error energy norm, 140, 336
- Estimated error, 344, 345, 356
- Essential boundary condition, 8, 22, 23, 28, 42, 44, 49, 89, 92, 164, 218, 317
- Euler theorem, 9, 90, 92, 217
- Exact error, 265, 344, 345, 347, 356, 358
- Exact integrals, 121, 199, 200, 201
- E_AXISYMMETRIC_STRESS, 287
- E_ISOTROPIC_STRESS, 304
- E_PLANE_STRAIN, 508
- E_PLANE_STRESS, 287
- E_SOLID_STRESS, 509

- Face based patch, 339, 373
- Face convection, 236
- Factorization, 28, 29, 390
- Failure criterion, 142, 293, 322
- Fenner, R.T., 167
- Ferrari, R.L., 17, 198
- Film thickness, 469
- Fin, 236, 240, 243-246
- First fundamental form, 189
- Fix, G.J., 59
- Flannery, B.P., 404
- Flick's law, 146
- Flow, around cylinder, 460
- Flow chart, 14
- Flux balance, 365
- Flux components, 4, 5, 231, 244, 260, 352, 355
- Flux conserving, 236
- Flux recovery, 78, 339, 382
- FORM_ELEMS_AT_EL, 378
- FORM_L_ADJACENT_NODES, 375

- Forces, 5, 147
- Forward substitution, 29
- Fourier law, 146, 334
- Franca, L.P., 455
- Frey, S.L., 455
- Functional analysis, 20
- Functional, 9

- Gago, J., 372
- GAUSS_COEFF, 125
- GAUSS_2D, 207
- GAUSS_3D, 207, 210
- Galerkin criterion, 7, 26, 30, 33, 34, 37, 39, 47, 51, 60, 406, 482
- Galerkin/Least Squares method, 408
- Gallagher, R.H., 332
- Gartling, D., 59, 96
- Gather, 8, 46, 63, 382
- Gauss' theorem, 18
- Gaussian quadrature, 31, 123, 124, 209, 210
- Gellert, M., 214
- Gerges, H., 455
- GET_DLH_AT_QP, 43, 85
- GET_DOF_INDEX,
- GET_ELEM_COORD,
- GET_ELEM_INDEX, 12
- GET_ELEM_NODES,
- GET_ELEM_QUADRATURES,
- GET_ELEM_TYPE_INFO,
- GET_G_AT_QP, 33, 43, 85
- GET_H_AT_QP, 33, 34
- GET_INDEX_AT_PT, 12
- GET_REACTIONS,
- GET_REAL_LP, 76
- GET_REAL_MISC, 85
- Global approximation, 23, 34-37, 57
- Global derivatives, 33, 39, 43, 46, 77, 181, 183, 203, 392, 402, 457
- Gradient, 36, 46, 114, 333, 335
- Gradient estimates, 115, 335, 392, 409
- Graph, 38, 48, 83, 136, 137, 139, 152, 342, 369, 476, 477, 485, 493
- Green's theorem, 19, 51, 58
- Gresho, P.M., 455
- Griebel, M., 119, 197
- Griffiths, D.V., 167, 332, 455
- Gupta, K.K., 17, 332

- H^1 norm, 21, 56
- Harbord, M. 214
- Haroun, M., 214
- Hayashi, H., 474
- Heat conduction, 1, 5, 82, 131, 259
- Heat convection, 82
- Heat generation, 213, 215, 220, 224, 226
- Heat flux, 5, 147, 216, 231, 262
- Heat loss, 83, 87, 242, 247
- Heat transfer, 82, 131
- Heinrich, J.C., 58, 455, 456
- Hermite interpolation, 105, 107, 252
- Hexahedra, 177
- Hierarchical
 - elements, 2, 15, 107, 122, 187
 - interpolation, 106, 108, 183, 186, 361
- Hinton, E., 130, 214, 332
- Hooke's law, 68, 159
- Hoop strain, 138, 140, 311
- Hu, K-K., 197
- Huang, H.C., 370, 455
- Huebner, K.H., 17, 408, 455, 469, 474
- Hughes, T.J.R., 17, 59, 130, 197, 214, 282, 332, 410, 413, 455
- Hulbert, G.M., 455
- Hyperconvergent, 341

- Idelsohn, S.R., 456
- Incompressibility, 286, 298
- Inertia tensor, 192
- Influence domain, 39, 40
- Initial strain, 75, 288, 293, 310, 313, 314
- Initial stress, 288
- Inner product, 20, 22, 335
- Integrate by parts, 22, 33, 39, 55, 409
- Interface, 31, 33, 34, 76, 376
- Interpolate solution, 50, 112
- Interpolation error, 114, 193
- Interpolation functions, 7, 33, 39, 40, 41, 69, 98-111, 168-187, 285, 290, 406
- Initial value problem, 53

- INVERT_2BY2, 28
 INVERT_3BY3, 28
 Inviscid flow, 457
 Irons, B.M., 96, 214, 474
 Isoparametric elements, 101, 175, 172, 178, 190

 Jacobian, 101, 120, 121, 127, 180, 181, 195, 196, 203, 251, 254, 340, 394, 402
 Jager, J.C., 282
 Jambunathan, K., 456
 Johnsson, S.L., 419, 430
 Johnston, P.R., 96, 145, 167, 332

 KEAST_UNIT_TET_RULE, 206
 Kelly, D.W., 370, 372
 Keyword, 31, 46, 73, 137, 158, 236, 237, 272, 273, 304, 374, 380, 402, 419, 429, 430, 454
 Krishnamoorthy, C.S., 119
 Kimser, P.G., 197
 Kizek, M., 370, 404
 Kondo, N., 408, 456
 Kreyszig, XX
 Kundu, T., 17, 119
 Kwon, Y.W., 282

 L_2 norm, 56, 335
 Ladeveze, D., 370
 Lagrange interpolation, 102-104, 202, 252, 409, 411
 Lakhany, A.M., 404
 Lamé constants, 298
 Lamé parameters, 190
 Laplace equation, 213, 273
 Laplacian, 334
 Least squares, 25, 30, 35, 118, 385, 480
 Legendre polynomials, 109
 Leguillon, D., 370
 Linear elements
 hexahedra, 177, 410
 line, 41, 44, 46, 70, 83, 99, 100, 132, 211
 quadrilateral, 169, 173, 176, 177, 179, 183, 187, 194, 203, 212, 436, 450
 tetrahedron, 202
 triangle, 101, 168, 172, 181, 193, 212, 220, 223-226, 235, 240, 410, 445
 Linear space, 20
 LIST_ELEM_FLUXES, 382-384
 LIST_ELEM_TORSION_STRESS, 279
 LIST_ELEM_TORSION_INTEGRAL, 280
 Liu, W.K., 332
 Liusternik, L.A., 59
 Lobatto rule, 125
 Local coordinates, 98, 202, 402
 Local derivatives, 43, 101, 128, 169, 171, 179, 181, 203
 Logan, D.L., 167
 Loubigna, G., 390, 404
 Lubrication, 469, 471

 Maddox, J.R., 404
 Magnetic flux density, 462
 Malkus, D.S., 214
 Martin, H.C., 167
 Mass matrix, 53, 121, 122, 252
 Mass properties, 192
 Material axes, 309, 313
 Matrix partition, 13, 44
 Maximum shear stress, 310
 McCorquodale, J.A., 455
 Meek, J.L., 17, 282, 332
 Method of moments, 27
 Metric matrix, 191
 M.H.D. plasma, 462
 Minimal integration, 210
 Mitchell, A.R., 59, 96, 455
 Mixed boundary condition, 8, 93, 216, 242, 256
 Mixed condition matrices, 220, 225
 MIXED_SQ_MATRIX, 23, 225, 256
 Moan, T., 214
 Mode shape, 53
 MODEL, 31, 32, 33, 47, 115, 193, 224, 243, 272, 316, 454
 Mohr's circle, 307
 Moment, 4, 5
 Moran, B., 332

- Morgan, K., 59, 372
 Multiple point constraint (MPC), 8, 30
 Myers, G.E., 96, 282
- Nassehi, V., 456
 Natural boundary conditions, 9, 22, 92, 217
 Natural coordinates, 100, 124, 126, 169, 174, 184, 207
 Natural frequency, 295
 Navier-Stokes equation,
 Neighbor lists, XX, 380
 Neittaanmaki, P., 370, 404
 Networks, 146
 Neumann condition, 8, 22, 92, 218, 221, 254, 337, 460
 Neutron diffusion,
 Nigro, N., 456
 Nishimiera, T., 456
 Nodal
 - based patch, 338, 373
 - boundary condition code, 3
 - constraints, 30
 - coordinates, 33
 - displacements, 4, 5, 147, 155, 283, 290, 301, 319, 334
 - forces, 147
 - moment, 4
 - pressure, 4
 - properties, 471
 - rotations, 105, 107
 - temperature,
 - thickness, 471
 - velocity,
- Nodally exact solution, 113, 407
 Norm, 20, 21, 335
 Normal flux, 225, 235, 254
 Normal vector, 52, 92, 189, 333, 335
 Norrie, D.H., 17
 Nowinski, J.L., 59
 Numerical integration, 31, 41, 85, 120-129, 133, 143, 183, 199-210, 253
- Oden, J.T., 17, 59, 130, 197, 332, 370, 404
 Onate, E., 455
 Optimal points, 119, 213
 Orthotropic material, 126, 257, 313, 314
 Oscillations, 406, 420, 421
 Osawa, Y., 425, 456
 Outer product, 35, 43, 85
 Overlapping patches, 391
 Owen, D.R.J., 130
- Papus' theorem, 122, 131
 Parabolic equations, 53
 Parallel axis theorem, 192
 Parametric equation, 127, 168, 169, 174, 176, 177, 185, 189, 200
 Parametric surface, 189, 190
 PARM_GEOM_METRIC, 254
 Park, Y.J., 425, 456
 Patch
 - element based, 339, 343, 374, 385
 - face based, 339, 373, 374
 - node based, 338, 374
 - overlapping, 391
 - selection, 339, 374
- Patch test, 88, 306, 308, 459
 Peclet number, 414, 425, 430
 Pepper, D.W., 58, 455
 Petrov-Galerkin method, 407
 Piecewise approximation, 3, 40, 63
 Pironneau, O., 17
 Pitkaranta, J., 130, 197
 Plane frame,
 Plane strain, 6, 284, 286, 288, 310, 316
 Plane stress, 6, 284, 286, 287, 288, 310
 Plane truss, XX, 502, 504, 505
 Plasma, 462, 464
 Plate, 6, 18
 Point load, 67
 Poisson equation, 20, 213, 216, 223, 240, 265, 269, 281
 Poisson ratio(s), 292, 313, 314
 Position vector, 188
 Positive-definiteness, 9, 20
 Post-solution calculations, 43, 46, 71, 72, 76, 77, 84, 147, 151, 153, 160, 236,

- 242, 272, 302, 380, 471, 473
- POST_PROCESS_ELEM, 32, 77, 88, 159, 278, 305, 471
- POST_PROCESS_GRADS, 381
- POST_PROCESS_MIXED, 242
- Potential energy, 61
- Potential flow, 4, 5, 457
- Press, W.H., 404
- Pressure, 142, 469, 473
- Principal stresses, 310

- Quadratic elements
 - hexahedra, 177
 - hierarchical, 106, 108
 - line, 102, 103, 106, 108, 117, 135, 144, 211, 122, 417
 - quadrilateral, 117, 175, 177, 187, 212, 443
 - tetrahedra, 202, 203
 - triangle, 101, 117, 172, 174, 212, 267, 272, 274, 304, 308, 448
- Quadratic functional, 9, 63, 92
- Quadratures, 120, 205, 206, 209
- Quadrilateral element, 177, 195, 212
- Quarter point element, 196

- Rank deficient, 210
- Rao, S.S., 17
- Razzaque, A., 96, 474
- Reactions, 5, 9, 44, 45, 50, 72, 80, 81, 91, 134, 135, 153, 229, 237, 247
- Rectangular element, 251
- Reddi, M.M., 474
- Reddy, J.N., 59, 96
- Reduced integration,
- Refinement, 394
- Refinement parameter, 393
- Residual error, 361
- Resistor, 150
- Result, 73, 79, 87, 91, 135, 145, 153, 162, 229, 237, 241, 242, 268, 302, 308, 368, 461, 472, 481, 484, 489, 492, 498, 499, 500
- Reynolds equation, 469
- Rice, J.G., 416, 456

- RMS, 18
- Rizzo, A.R.,
- Robin boundary condition, 8, 92, 216, 218, 221, 254, 256
- Robinson, J., 96
- Rockey, K.C., 145
- Roe, P.L., 455
- Ross, C.T.F., 145
- Rossettos, J.N., 119
- Rotation matrix, 156

- Sani, R., 455
- Scalar field, 3, 215-280
- Scatter, 8, 10, 63, 66
- Schnipike, R.J., 456
- SCP averages, 140, 229, 247, 261, 268, 276, 308, 461
- SCP_ERROR_ESTIMATES, 392-395
- Second derivatives, 394, 402
- Secrest, D., 130
- Seegerlind, L.J., 17, 198, 282
- SEG_COL_MATRIX, 32, 225, 255
- Selective integration, 210, 213
- Self-adjoint, 22, 463
- Semi-infinite element, 113
- Semi-norm, 21
- Serendipity elements, XX, 174, 175, 177, 209, 448
- Shames, I.H., 96
- SHAPE_3_L, 104
- SHAPE_3_T, 169, 170
- SHAPE_4_12_Q, 176
- SHAPE_4_P, 202
- SHAPE_4_Q, 171, 177
- SHAPE_6_T, 176
- SHAPE_8_H, 177
- SHAPE_8_Q, 177
- SHAPE_10_P, 203
- SHAPE_16_Q, 177
- SHAPE_20_H, 177
- SHAPE_32_H, 177
- SHAPE_CU,
- SHAPE_C1_L, 107
- Shear modulus, 268, 298
- Shear stress, 272, 273

- Shell, 6, 18
- Shemirani, F., 456
- Silvester, P.P., 17, 198, 282
- Simplex elements, 101, 201
- Single element solution, 34-38
- Singular Jacobian, 196
- Skyline,
- Slider bearing, 469
- Smith, I.M., 17, 167, 332
- Sobolev norm, 21
- Soblov, V.J., 59
- Solution techniques, 28, 30
- Source, 35, 39, 43, 52, 73, 215, 226, 333
- Source integrals, 43, 44, 53, 209, 211, 212
- Space-time form, 53
- Specific heat, 213, 407
- Sphere, 266
- Spring, 61
- Stabilization parameter, 407, 410, 417, 425, 430, 435-454
- Stabilized methods, 406-454
- Stegun, I.A., 119, 130
- Steinberg, R., 370, 404
- Step bearing, 471
- Stiffness matrix, 62, 143, 157, 159, 220, 297, 299
- STORE_COLUMN, 11, 15
- STORE_FULL_SQUARE, 11, 15
- Storti, M., 456
- Strain, 69, 77, 91, 138, 145, 194, 284, 289
- Strain energy, 68, 283, 315
- Strain-displacement, 69, 76, 285, 291, 292, 311, 313
- Strain transformation, 309
- Stream function,
- Streamline, 409, 411
- Stress, 69, 77, 91, 138
- Stress function, 269, 275
- Stress-strain law, 69, 292
- Stress transformation, 307, 314
- Strang, W.G., 59
- Strong form, 53
- Strong typing, 33
- Strouboulis, T., 370
- Stroud, A.H., 130
- Structural analysis, 61
- Subdomain method, 27
- Sub-parametric elements, 175
- Subset, 40
- Superconvergence patch (SCP), 140, 339, 343, 373-403
- SUPG method, 409, 413-454
- Surface metric, 190
- Surface normal, 192
- Surface tractions, 64, 67, 294, 298
- SVDC_BACK_SUBST, 390
- SVDC_FACTOR, 390
- Swartz, S.E., 197
- Symmetry, 9, 20, 30, 33, 222, 226, 235, 272, 333
- SYMRUL, 203, 205
- System equations, 8, 24, 41, 53, 78, 84
- Szabo, B., 17, 59, 119, 198, 332, 370, 404
- Tangent vectors, 128, 188, 190
- Tangential derivatives, 187
- Taylor, R.L., 17, 59, 96, 119, 130, 282, 404, 456
- Temperature, 82, 132, 136, 147, 230, 239, 257, 270
- Tetrahedra, 101, 202
- Teukolsky, S. A., 404
- Tezduyar, T.T., 409, 425, 456
- Thermal conductivity, 132, 147, 213
- Thermal expansion, 75
- Thermal load, 75, 78
- Thermal strain, 75, 79, 91, 293, 308, 315
- Thornton, E.A., 162
- TICAM, 188
- time derivative, 52
- Tong, P., 119
- Torque, 269, 273, 278, 280
- Torsion, 215, 269
- Tosaka, N., 456
- Total potential energy, 9, 61, 68, 156, 283, 290
- Touzot, G., 404
- Tractions, 294, 333

- Transformation matrix, 81, 154-156, 309, 315
- Transient applications, 51, 53
- Trapezoidal rule, 122
- Tresca criterion, 310
- Triangular elements, 65, 101, 117, 170, 172, 174, 181, 195, 200, 212, 220, 226, 239, 240, 274, 308
- Truss, 146, 154, 166
- Unit coordinates, 100, 121, 168, 200, 203, 204
- Unit tetrahedra, 101, 206
- Unit triangle, 101, 168, 202, 205
- Unit vector, 409
- Upwind elements, 407
- Upwind length, 410-413, 425
- Ural, O., 167
- Usmani, A.S., 370, 455
- Validation, 46, 84
- Variables, 4, 5
- Variational form, 6, 9, 54, 60
- Vector field, 18, 283-328
- Vector plot, 231, 243, 244, 260, 276, 319, 352, 354, 355, 459, 465
- Vector potential, 463
- Velocity potential, 4, 5, 457
- Velocity, 4, 5, 457
- Vettering, W.T., 404
- Viscous flow, 469
- Voltage, 147
- Volume, 71, 201, 268, 308
- Volume coordinates, 102, 202
- Von Mises stress, 310, 322, 329
- Wada, S., 474
- Wait, R., 59, 96
- Wave equation, 53
- Weak form, 54
- Weaver, W.F., 96, 145, 167
- Weighted residual, 6, 23, 406
- Weights, 31, 33, 124, 125, 205, 206, 208
- Wiberg, N-E, 371, 404
- Whiteman, J.R., 17, 59, 370
- Wooten, J.W., 474
- Work, 61, 67, 284
- Yu, C.C., 456
- Z-Z error estimator, 339
- Zero energy mode, 212, 213
- Zhang, Z., 372
- Zhu, J.Z., 372, 404
- Zienkiewicz, O.C., 17, 59, 96, 119, 130, 145, 198, 214, 288, 332, 372, 404, 456
- Ziukas, S., 371, 404
- Zois, D., 419, 430