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CE-711/811 ME-635 AE-640: F I N I T E E L E M E N T A N A L Y S I S 1

Fall'2009: (televised lectures, in room #222 gornto)
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Duc's televised lecture #01 (Monday, August 31'2009; 4:20pm-5:35pm)
Storage schemes for matrices, 4-rectangle elements example, assembly process, known boundary conditions = zero values, connectivity information, column height, maxa arrays, mapping between 2-d matrix array into 1-d vector array.

Duc's televised lecture #02 (Wednesday, September 2'2009; 4:20pm-5:35pm)
How to get column height information from a "very large" connectivity information ??,
Symmetric Positive/Negative/Indefinite matrix, Choleski factorization, forward, backward solution.
General factorized formulas for diagonal & off-diagonal terms of [U], how to get [U] based on the "picture" of the matrix ??, forward & backward general formulas and double do-loop programming.

Duc's televised lecture #03 (Monday, September 7'2009; LABOR holiday)
No lecture today !

Duc's televised lecture #04 (Wednesday, September 9'2009; 4:20pm-5:35pm)
Choleski's factorization 3-nested do-loop programming, LDL_T example & programming;
known boundary conditions = non-zero values;
Different physical engineering problems described by ODE;
collocation + least square + petro-galerkin + galerkin methods;
functional;
finite element terminology;

Duc's televised lecture #05 (Monday, September 14'2009; 4:20pm-5:35pm)
FEM-1D model problems (expressed by ODE);
finite element approx., weak formulation;
linear & bilinear/linear operators;
quadratic functional ---> Ritz method;

Duc's televised lecture #06 (Wednesday, September 16'2009; 4:20pm-5:35pm)
Given ODE (1-D problem) + boundary condition(s); 3-step weak formulation; B(w,u) and l(w) operators;
Quadratic functional; "finite element" approximation; "element stiffness" + "element load vector";
linear (and quadratic) "shape/interpolation" functions for 1-D element; properties of shape functions;

Duc's televised lecture #07 (Monday, September 21'2009; 4:20pm-5:35pm)
1-D finite element (complete) "math ODE" example; Duc's book "beam example" using 2-term Galerkin approx.;
How to select function(s) to satisfy all "system" boundary conditions ?
How to distinguish "geometric/essential" b.c. versus "natural" b.c. ?
1-D "finite element" distributed axial load rod/beam example;

Duc's televised lecture #08 (Wednesday, September 23'2009; 4:20pm-5:35pm)
Steel/Brass/Aluminum 1-D finite element (complete) "structural" example. Prof. Reddy's 2-D "heat conduction" example;
two-parameter Ritz approx. (homogeneous/non-homogeneous b.c.); more examples (such as beam, etc...).

Duc's televised lecture #09 (Monday, September 28'2009; 4:20pm-5:35pm)
3-step Weak Formulation for "Model 2-nd Order Equation: 1-D problem)
* using 2-term Ritz approximation method
* using Finite Element procedures
3-step Weak Formulation for "2-D HEAT TRANSFER problem)
* using 1-term Ritz approximation method
* using Finite Element procedures (via TRIAGULAR and/or RECTANGUR finite element SHAPE functions)

Duc's televised lecture #10 (Wednesday, September 30'2009; 4:20pm-5:35pm)
Final Exam, based on Duc Nguyen's first 5-week session !