Finite Element Methods Course Specifications

Faculty: Faculty of computer and informatics

Department: Scientific Computing

Program(s) on which the course is given	:	Bachelor in Computer & Information Sciences
Major or Minor element of programs	:	Scientific Computing
Department offering the program	:	Scientific Computing
Department offering the course	:	Scientific Computing
Academic year / Level	:	4th Year/B.Sc.
Date of specification approval	:	20/10/2009

A. Basic Information

Title: Finite Element Methods **Code:** SCC 436

Lecture: 3 hrs/week **Tutorial:** 2 hrs/week **Practical:** ---

Credit Hours: --- **Total:** 5 hours/ week

B. Professional Information

1. Overall Aims of Course:

This course introduces students to advanced numerical technique (Finite Element Method) for modeling and solving differential equations.

2. Intended Learning Outcomes of Course (ILOs):

a. Knowledge and Understanding:

a1- Mention Galerkin's method to solve differential equation.

a2- Illustrate the finite element model of differential equation.

a3- Compare between the exact solution and FEM solution.

a4- Summarize Linear, quadratic and cubic shape functions and their application on approximation of functions.

a5- State one-dimensional model.

a6- List the students the bases of FEM model.

b. Intellectual Skills:

b1- Formulate the FEM model.

b2- Apply FEM method to second order and higher order differential equations in one and two dimensions.

b3- Propose FEM model for one-dimensional problems and higher.

b4- Understand the numerical solution and the exact solution.

c. Professional and Practical Skills:

c1- Develop effective computer programs to solve numerical problems.

c2- Use for the mathematical environment like Mathematica, MatLab, etc.

c3- Use MatLab toolbox to simulate the solution.

d. General and Transferable Skills:

d1- Write effective computer programs that employ efficient algorithms.

d2- Analyze and design algorithms for solving scientific problems related to other disciplines.

d3- Teach the students how to make a flow-chart.

d4- Present scientific work and explain technical material

e. Attitude

e1- A knowledge and respect of ethics and ethical standards in relation to a major area of study.

e2- Illustrate the use of example, analogy, and counter-analogy in ethical argument.

e3- Demonstrate an ethical behavior toward software copyrights.

e4- Relationship Emphasis a successful with other students.

e5- Learn how to make relation with other, and the limit of this relation.

e6- Explain the nature of privacy and how it is protected by the Data Protection.

e7- Know the danger of viruses and how to protect yourself from it.

e8- Know the culture of other peoples.

e9- Discuss the legal background of copyright in national and international law.

3. Contents:

Topic	No. of hours	Lecture	Tutorial/Practical
The basic concepts of finite element method (Part I)	5	3	2
The basic concepts of finite element method (Part II)	5	3	2
Variation formulation and approximation (Part I)	5	3	2
Variation formulation and approximation (Part II)	5	3	2
Finite element method of one-dimensional second-order equations (Part I)	5	3	2
Finite element method of one-dimensional fourth-order equations (Part II)	5	3	2
Finite element method of one-dimensional time-dependent problems (Part III)	5	3	2
Finite element method of two-dimensional second-order equations (Part IV)	5	3	2
Finite element method of two-dimensional time-dependent problems (Part V)	5	3	2
Finite element method of two-dimensional time-	5	3	2

dependent problems (Part VI)			
Finite element method of two-dimensional time-dependent problems (Part VII)	5	3	2
Finite element method of two-dimensional time-dependent problems (Part VIII)	5	3	2
Finite element method of two-dimensional time-dependent problems (Part IX)	5	3	2
Finite element method of two-dimensional time-dependent problems (Revision)	5	3	2

4. Teaching and Learning Methods:

4.1- Lectures

4.2- Class Activities(assignments)

5. Student Assessment Methods:

5.1- Assignments to assess progress on students' learning, effectiveness of course materials, and approaches to instruction

5.2- Mid-Term exam to assess level of knowledge acquisition and concepts understanding that can be used as a feedback for enhancing the learning process

5.3- Oral exam to assess communication of technical information that demonstrate scientific understanding

5.4- Term Final exam to assess level of mastery of the concepts, algorithms, and problem solving techniques learned in the course