Sultan Qaboos University
College of Engineering

COURSE OUTLINE

Fortran Programming for Engineers (ENGR2216)
Spring 2010

Instructor:	Dr. Ahmad Sana
Time & Place:	Mon. 14:15-16:05 (C02); Wed. 14:15-16:05 (ENG 1014)
Office Hours:	Sat. and Mon. 10:00-12:50
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Course Description

This course exposes the students to the concept of programming in Fortran-90. It is basically an introductory course that deals with the fundamental concepts of programming and problem solving procedures. At the end of the course the students will be able to become familiar with most of the data types, program statements, I/O techniques and program development.
Two hour Lab will be used to demonstrate the following problem solving steps: Analysis of the problems, Mapping appropriate algorithms, Identifying input/output requirements, Mapping data structures, Coding algorithms as Fortran-90 prototypes and Testing them.

Required Background or Experience:

Prerequisites by course:

Prerequisites by topic:

Postrequisites: CIVL5146, MEIE4183 and PNGE3202

Textbook & Suplemental Materials:

Textbook:

Stephen J. Chapman, **Fortran 90/95 for Scientists and Engineers**, Mc Graw Hill, 2004.

Supplemental Materials:

- T. Ellis, I. Philips, T. Lahey, Fortran-90 Programming, Addison-Wesley 1994.

Course Objectives:

The main course objectives are to teach the students:

- The components of the computer.
- How to create flowcharts and/or pseudocode to solve problems using the Fortran program.
- The proper use of integers, floating point numbers, and characters in computer programs.
- How to identify and use an application program defined data types, constants, and variables.
- How to use arithmetic expressions in a computer program.
- How to use assignment statements in a computer program
- How to use logical expressions in a computer program.
- How to use subprograms, procedures, modules and functions.
- How to use the arrays in programming.
- How to use file I/O in a computer program.

Course Outcomes:

Upon completion of this course, the students should be able to:

- Identify the components of the computer.
- Be familiar with the concepts of flowcharts and/or pseudocode to solve problems using the Fortran program.
- Use the integers, floating point numbers, and characters in computer programs.
- Identify and use an application program, defined data types, constants, and variables.
- Use arithmetic expressions in a computer program.
- Use assignment statements in a computer program
- Use logical expressions in a computer program.
- Write subprograms, procedures, modules, and functions.
- Be familiar with the concepts of the arrays.
- Write computer programs that can read formatted inputs and write formatted outputs.

RELATIONSHIP BETWEEN COURSE AND PROGRAM OUTCOMES

Students will be expected to develop the following skills/understanding upon the successful completion of this course as per (a) to (k) requirements listed under ABET:

a) an ability to apply knowledge of mathematics, science, and engineering

e) identify, formulate and solve engineering problems

k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Contents:

The following topics will be covered in this course

1. **Introduction to Computers:** Computer components, operating systems, conventional machine organization and machine languages, translators: Assemblers, Interpreters, and Compilers, an overview of Fortran-90 **[a]**.
2. **Problem solving:** Algorithms and flowcharts, create, edit, execute & print programs **[a, e]**.
3. **Fundamentals of Fortran:** Constants, variables, data types: Integer, Real, Character; arithmetic expressions; assignment statement; List Directed Input and Output: READ and PRINT statements, simple file I/O with unformatted records; user-defined types; Intrinsic (built-in) Functions **[a, e, k]**.
4. **Decision Structures in Fortran:** Relational expressions**,** Logical expressions and logical variables; Block IF, Logical IF, and CASE construct **[a, e, k]**.
5. **Loops Structures in Fortran:** Count-controlled Do loops, nested DO loops, implementation of a DO-WHILE loop, EXIT, CYCLE, STOP, and GOTO statements **[a, e, k]**.
6. **Arrays:** Array declarations, DIMENSION statement, array constants and initial values; rules of using arrays; Implied DO loop; Arrays and Procedures; two-dimensional arrays, and multi-dimensional arrays **[a, e, k]**.
7. **Functions and Subroutines:** Function subprograms, Subroutine subprograms, and Modules **[a, e, k]**.
8. **Formatted Input and Output:** Inline and labeled formatted READ, WRITE and PRINT, various types of field specifiers for I/O editing, formatted file I/O **[a].**

Instructional Methods:

Lectures and Tutorials

There will be a 100 minutes class per week and a 100 minutes software lab per week. The Students are asked to be punctual in both class and lab.

Tutorials will be held during class lecture hours.

Course Assessment:

Evaluation of the Outcomes

The final course grade will be weighted according to the following scheme:

(1)	Assignments	5%
(2)	Quizzes (three)	15%
(2)	Mid-Semester Examination	20%
(3)	Lab Tests (two)	20%
(4)	Final Exam	40%

Homework (5%)
There will be at least four assignments. Whenever an assignment is given, you will have one week to complete it and submit. Group participation in solving an assignment problem is encouraged; however, you must turn in your own assignment. Late assignments would be accepted only with prior approval from the instructor.

Quizzes (15%)

There will be three pre-announced quizzes. These may be given in a lecture slot or during a lab cession.

Laboratory Tests (20%)

There will be two laboratory tests. During the laboratory test, each student will be asked to write, compile and run a computer program to solve a given problem. At the end of the test, the compiled program will be submitted electronically to the instructor.

Mid-Term Examination (20%)

This will be a closed book examination, covering all the theory, problems, laboratory experiments and design projects completed prior to it.

Final Exam (40%)

The final examination will cover the whole course contents completed prior to it.

Extra credit (up to 5%)
The students may receive up to 5% of their grade in extra credit by attending seminars and professional society meetings held in their respective departments or relevant conferences.

Explanation of grading system
The grades will be awarded using the following scale:

Total Score	Grade
85% and above	A
80-84.9%	A-
75-79.9%	B+
70-74.9%	B
65-69.9%	B-
60-64.9%	C+
55-59.9%	C
50-54.9%	C-
45-49.9%	D+
40-44.9%	D
Below 40%	F

Student Responsibilities
Minimum Student Materials:
Text books, class handouts, engineering calculator, and access to a personal computer.

Attendance Policy:
In accordance with the University Regulations, it is the student's responsibility to be punctual and to attend all classes including lectures and labs. Failure to attend classes without prior approval for whatever reason is considered as part of the percentage missed. Students bear full responsibility for checking their own attence record.

Mobile Phones:
MOBILE PHONES MUST BE SWITCHED OFF DURING ALL LECTURE AND EXAM TIME.

Code of Ethics

Academic misconduct is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following:

1. <u>Examinations</u>

a) copying, or attempting to copy, from another student's work, or permitting another student to copy from your work

b) using notes of whatever kind in the formation of answers in a closed book examination

c) impersonation of another student in an examination, seminar or other form of presentation

d) disrupting the conduct of examinations by illegally obtaining access to examination papers or answers, and/or distribution of this material to others

2. <u>Assignments, Essays, etc.</u>

a) *plagiarism:* Using the words, thoughts, ideas, results, etc., of another person in a written assignment, without acknowledging the source, as if it were the student's own work

b) *copying:* Copying another person's answers in an essay, assignment, paper, laboratory report, etc. and presenting it, either wholly or with only minor changes, as if it were the student's own work

c) *collusion:* Working with others on an assignment which is intended to be an individual assignment, and incorporating their material into your work

d) *switching:* Submitting work completed for one course in another course without the permission of the instructor

e) *falsification:* Inventing data or altering data that have been obtained from legitimate sources

3. <u>Forging University documents</u>

Submitting or using forged academic documents or forged signatures for the purpose of personal gain or fraud. If a student commits an act of academic misconduct, whether defined above or of a different nature, it may be documented and then one or more of the following penalties may be applied:

- written warning
- downgrading of an assignment or examination
- an 'F' grade given to the assignment or examination
- an 'F' grade given to the course
- suspension from the University for a specified period
- expulsion from the University

WEEKLY SCHEDULE

Week	Lecture	Material to be Covered	Homework/Assignments/ Quizzes
Week 1	1	Introduction – Chapter 1	
	2	Introduction – Chapter 1	
Week 2	3	Basic Elements- Chapter 2	
	4	Basic Elements- Chapter 2	Assignment 1
Week 3	5	Basic Elements- Chapter 2	
	6	Basic Elements- Chapter 2	
Week 4	7	Program Design – Chapter 3	Quiz 1
	8	Program Design – Chapter 3	
Week 5	9	Program Design – Chapter 3	
	10	Program Design – Chapter 3	
Week 6	11	Program Design – Chapter 3	Assignment 2
	12	Loops & Character – Chapter 4	
Week 7	13	Loops & Character – Chapter 4	Quiz 2
	14	Loops & Character – Chapter 4	**Lab Test 1**
Week 8	15	Loops & Character – Chapter 4	
	16	Loops & Character – Chapter 4	
Week 9	17	Basic I/O Concepts – Chapter 5	
	18	Basic I/O Concepts – Chapter 5	Assignment 3
Week 10	19	Basic I/O Concepts – Chapter 5	
	20	Basic I/O Concepts – Chapter 5	**Mid-Test**
Week 11	21	Intr. To Arrrays – Chapter 6	Quiz 3
	22	Intr. To Arrrays – Chapter 6	
Week 12	23	Intr. To Arrrays – Chapter 6	
	24	Intr. To Arrrays – Chapter 6	Assignment 4
Week 13	25	Intr. To Arrrays – Chapter 6	
	26	Intr. To Procedures– Chapter 7	
Week 14	27	Intr. To Procedures– Chapter 7	
	28	Intr. To Procedures– Chapter 7	Quiz 4
Week 15	29	Intr. To Procedures– Chapter 7	
	30	Intr. To Procedures– Chapter 7	**Lab Test 2**
		Final Examination	**June 2, 2010, 15:00-18:00**

Note that some dates may change according to the progress rate of the lectures.