University of Macau
Faculty of Science and Technology
Department of Computer and Information Science
SFTW 111 – Algorithms and Data Structures I
Syllabus
2nd Semester 2011/2012
Part A – Course Outline

Compulsory course in Computer Science

Catalog description:
(4-2) 5 hours credit. Running time of algorithms and its analysis. Basic data structures.

Course type:
Theoretical with substantial laboratory/practice content

Prerequisites:
- SFTW120

Textbook(s) and other required material:
- Mark Allen Weiss, ***Data Structures and Algorithm Analysis,* 2**nd Edition, Addison-Wesley 1997 (Required).

References:
- Robert L. Kruse and Alexander J. Ryba, ***Data Structures and Program Design,*** Prentice Hall 1998.

Major prerequisites by topic:
1. Programming in high level language
2. Application of mathematical principals to the analysis of computing problems.
3. Discrete mathematics.

Course objectives:
1. Introduce to students the need of sound methods of organizing (large amount of) data [a].
2. Introduce to students the need of efficient algorithms [a]
3. Introduce to students mathematical methods for algorithm analysis [a].
4. Introduce to students basic data structures and algorithms [a,c,e].
5. Enhance students programming abilities [c,e].

Topics covered:
1. Introduction to algorithms and data structures (1 week)
2. Mathematical background (2 weeks)
3. Review and further introduction of C (1 week)
4. List (2 weeks)
5. Stack (1 week)
6. Queue (1 week)
7. Simple trees (2 weeks)
8. Hashing (2 weeks)

Class/laboratory schedule:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No/Duration of exam papers
Lecture	Tutorial	Practice				

4	Nil	2	14	84	5	1 / 3 hours

Student study effort required:

Class contact:	
Lecture	56 hours
Practice	28 hours
Other study effort	
Self-study and assignments	42 hours
Total student study effort	126 hours

Student assessment:

Final assessment will be determined on the basis of:
Homework and Quizzes 15% Exams 85% (Mid-term < Final Exam, precise percentage to be decided later).

Course assessment:

The assessment of course objectives will be determined on the basis of:

1. Homework, quizzes and exams
2. Course evaluation

Course outline:

Weeks	Topic	Course work
1	**Introduction and Quiz of Prerequisites** Introduce the need of sound methods of organizing (large amount of) data and efficient algorithms. Quiz of prerequisites.	
2,3	**Method of Running Time Analysis** Computation model for running time, Big O, Big Omega, Big theta, Small O, Recurrence equation method	Assignment#1
4	**Review and Further Introduction of C** Review of C learnt and introduce new features if necessary, particularly pointers.	Assignment#2
5,6	**List Abstract Data Type (ADT)** Introduce ADT and structuring of programs by ADT. List ADT and its applications (such as representations of large integers and polynomials, radix sort).	Assignment#3
7	**Stack ADT** Contiguous implementation, linked implementation, applications.	Assignment#4
8	**Queue ADT** Contiguous implementation, linked implementation, applications.	Assignment#5
9	**Review and Middle Term**	Middle Term Exam
	Hashing	Assignment#6

10-11	Separate chaining, open addressing, rehashing.	
12-13	**Tree ADT** Binary tree, traversal, binary search tree.	Assignment#7
14	There are several holidays in the semester. This week will be flexible, and if there is enough time, will introduce AVL tree.	

Contribution of course to meet the professional component:

This course prepares students to work professionally in the area of advanced programming.

Relationship to CS program objectives and outcomes:

This course primarily contributes to CS program outcomes that develop student abilities to:
(1) apply knowledge of computing, mathematics, science, and engineering (a)
(2) design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (c)
(3) an ability to identify, formulate, and solve engineering problems (e)
The course secondarily contributes to Computer Science program outcomes that develop student abilities to:
(4) an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations. (l).
Hence this course contributes to CS program objectives that develop student abilities to
(a) pursue advanced studies in Computer Science or a professional career in a related field
(b) apply knowledge to effectively analyze and assess practical problems and provide appropriate solutions.

Relationship to CS program criteria:

Criterion	DS	PF	AL	AR	OS	NC	PL	HC	GV	IS	IM	SP	SE	CN
Scale: 1 (highest) to 4 (lowest)	2	4	4				3						1	1

Discrete Structures (DS), Programming Fundamentals (PF), Algorithms and Complexity (AL), Architecture and Organization (AR), Operating Systems (OS), Net-Centric Computing (NC), Programming Languages (PL), Human-Computer Interaction (HC), Graphics and Visual Computing (GV), Intelligent Systems (IS), Information Management (IM), Social and Professional Issues (SP), Software Engineering (SE), Computational Science (CN).

Course content distribution:

Percentage content for			
Mathematics	Science and engineering subjects	Complementary electives	**Total**
10%	90%	0%	100%

Coordinator:

Prof. Chiman Pun

Persons who prepared this description:

Dr. Qiwen Xu, November 2010.

Part B General Course Information and Policies

2010

Instructor: Dr. Qiwen Xu Office: N327

Office Hour: Immediately after lecture, and in addition one hour in a week will be arranged depending on student time table, further office hours by appointment. Phone: 4337

Email: qwxu@umac.mo

Time/Venue: To be decided

Letter Grade:

100 – 93	A	92– 88	A—	87 – 83	B+	82–78	B
77 – 73	B—	72 – 68	C+	67 – 63	C	62 – 58	C—
57 – 53	D+	52 – 50	D	below 50	F		

Comment:

The objectives of the lectures are to explain and to supplement the text material. Students are responsible for the assigned material whether or not it is covered in the lecture. Students who wish to succeed in this course should work all homework and lab assignments, and are encouraged to look at other sources (other texts, etc.) to complement the lectures and text.

Homework Policy:

The completion and correction of homework is a powerful learning experience; therefore:

- There will be approximately 6 homework assignments.
- Homework is due two weeks after assignment unless otherwise noted, no late homework is accepted.
- Possible revision of homework grades may be discussed with the grader within one week from the return of the marked homework.

Quizzes:

There will be a 30-miniute in class quizzes (or exercise) from time to time.

Note

- Check course web for announcement, homework and lectures. Report any mistake on your grades within one week after posting.
- No make-up exam is given except for CLEAR medical proof.
- No exam is given if you are 30 minutes late in exam. Even if you are late in the exam, you must turn in at the due time.
- Cheating is absolutely prohibited by the university.