University of Macau
Faculty of Science and Technology
Department of Computer and Information Science
SFTW330 – Operating Systems II
Syllabus
1st Semester 2012/2013

Part A – Course Outline

Compulsory course in Computer Science

Catalog description:
(3-2) 4 credits. Scheduling, Embedded Operating systems, Security, Distributed systems, and other topics. It is an advanced level undergraduate course that covers in detail further topics in the study of the design principles and implementation issues of contemporary computer operating systems.

Course type:
Theoretical with substantial laboratory/practice content

Prerequisites:
SFTW231 Operating Systems I

Textbook(s) and other required material:
Operating Systems Internals and Design Principles, William Stallings, Pearson Prentice Hall, Seventh Edition, 2012. ISBN: 9780273751502

References:
- *Operating System Concepts, 8th Edition,* Abraham Silberschatz, Peter B. Galvin, Greg Gagne, John Wiley & Sons (Asia) Pte Ltd, 2010. ISBN: 9780470233993
- James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach*, Addison-Wesley, Fifth Edition, 2010. ISBN: 9780136079675

Major prerequisites by topic:
- Basic principles of operating systems.
- Knowledge of UNIX and C/Java programming.

Course objectives:
- Continued study of advanced topics in operating system design and implementation. [a, e]
- Analyze the tradeoffs inherent in operating system design. [a, e, k]
- Expose students to system issues in distributed systems. [a, e, k]
- Gain hands-on experience by doing programming projects. [a, e, k]

Topics covered:
- **Uniprocessor Scheduling (6 hours)**: Types of scheduling, scheduling criteria, scheduling algorithms, and traditional UNIX scheduling.
- **Multiprocessor Scheduling (3 hours)**: Classification of multiprocessor systems, design issues, process scheduling, and thread scheduling.

- **Real-Time Scheduling (3 hours)**: Characteristics of real-time operating systems, real-time scheduling, deadline scheduling, rate monotonic scheduling, priority inversion, Linux scheduling, Unix SVR4 scheduling, and Windows scheduling.
- **Embedded Operating Systems (3 hours)**: Embedded systems, characteristics of embedded operating systems, adapting an existing commercial operating system, purpose-built embedded operating system, eCos, and TinyOS.
- **Computer Security Threats (3 hours)**: Computer security concepts, threats, attacks, and assets, intruders, malicious software overview, viruses, worms, bots, and rootkits.
- **Computer Security Techniques (6 hours)**: Authentication, access control, intrusion detection, malware defense, and dealing with buffer overflow attacks.
- **Distributed Processing, Client/Server, and Clusters (3 hours)**: Client/Server computing, middleware, distributed message passing, remote procedure calls, and clusters.
- **Distributed Process Management (9 hours)**: Process migration, distribute global states, distributed snapshot algorithm, distributed mutual exclusion concepts, ordering events in a distributed system, distributed queue, a token-passing approach, distributed deadlock in resource allocation and message communication.

Class/laboratory schedule:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No/Duration of exam papers
Lecture	**Tutorial**	**Lab**				
3	1	1	14	70	4	1 / 2 hours

Student study effort required:

Class contact:	
Lecture	42 hours
Tutorial & Lab	28 hours
Other study effort	
Self-study & Survey	14 hours
Homework	5 hours
Projects	14 hours
Total student study effort	103 hours

Student assessment:

Final assessment will be determined on the basis of:

Homework	10~15%
Survey	10%
Projects	25~30%
Midterm Test	20%
Final Exam	30%

Course assessment:

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

- Homework, projects, test and exam
- Course evaluation

Course outline:

Weeks	Topic	Course work

1, 2	Uniprocessor Scheduling	Homework#1
3	Multiprocessor Scheduling	Project#1
4	Real-Time Scheduling	Homework#2
5	Embedded Operating Systems	Homework#3
7	Computer Security Threats	Survey
8, 9	Computer Security Techniques	Homework#4 Midterm Test
10	Distributed Processing, Client/Server, and Clusters	Project#2
11, 12, 13	Distributed Process Management	Homework#5

Contribution of course to meet the professional component:

This course presents the advanced topics in the design of contemporary operating systems.

Relationship to Computer Science program objectives and outcomes:

This course primarily contributes to Computer Science program outcomes that develop student abilities to:
(a) an ability to apply knowledge of mathematics, science, and engineering.
(e) an ability to identify, formulate, and solve engineering problems.
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Relationship to Computer Science program criteria:

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

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**
0%	100%	0%	100%

Persons who prepared this description:

Dr. Yan Zhuang

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Part B General Course Information and Policies

1st Semester 2012/2013

Instructor: Dr. Yan Zhuang — Office: N414
Office Hour: Wed. Thur. 4:30 – 5:30pm or by appointment — Phone: 8397-4464
Email: syz@umac.mo

Time/Venue: Mon. 14:30 – 17:30, N204 (Lecture)
Sat. 8:30 – 10:30/10:30pm – 12:30, NG03 (Tutorial & Lab)

Grading Distribution:

Percentage Grade	Final Grade	Percentage Grade	Final 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 projects. You are encouraged to look at other sources (other texts, etc.) to complement the lectures and text.

Homework and Project Policy:
Doing homework and projects is of vital importance to help the students to master the concepts covered, therefore:

- There will be approximately 5 homework assignments, 2 course projects with demonstration in lab, and 1 survey with presentation in class.
- Course projects and survey are both group projects of 2-3 students per group.
- No late submission is accepted.
- Possible revision of homework/project grades may be discussed within one week from the grade announcement.

Test and Exam:
One midterm test and one final exam will be held during the semester. Both are 2-hour and closed book.

Note

- Attendance at both lectures and lab classes is strongly recommended.
- Check UMMoodle (http://ummoodle.umac.mo) for announcement, homework and lectures. Report any mistake on your grades within one week after announcement.
- No make-up test is given except for clear medical proof.
- Cheating is absolutely prohibited by the university.

Appendix:

Rubric for Program Outcomes

Rubric for (a)	5 (Excellent)	3 (Average)	1 (Poor)
Understand the theoretic background	Students understand theoretic background and the limitations of the respective applications.	Students have some confusion on some background or do not understand theoretic background completely.	Students do not understand the background or do not study at all.
Rubric for (e)	**5 (Excellent)**	**3 (Average)**	**1 (Poor)**
Modeling, problem formulation and problem solving	Students choose and properly apply the correct techniques.	Students model correctly but cannot select proper technique or model incorrectly but solve correctly accordingly.	Students at loss as to how to solve a problem.
Rubric for (k)	**5 (Excellent)**	**3 (Average)**	**1 (Poor)**
Use modern principles, skills, and tools in engineering practice	Student applies the principles, skills and tools to correctly model and analyze engineering problems, and understands the limitations.	Student applies the principles, skills and tools to analyze and implement engineering problems.	Student does not apply principles and tools correctly and/or does not correctly interpret the results.