



University of Tehran
School of Electrical and Computer Engineering

Course:	8101443 – Operating Systems I									
Course type:	EE*						CE*			Credit: 3
	Com	E	P	B	Con	D	SW	HW	IT	
	Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Elective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Level:	Undergraduate <input checked="" type="checkbox"/> Graduate <input type="checkbox"/>									
Co-requisite(s):	None.									
Prerequisite(s):	Computer Architecture (8101423)									
Prerequisite by topic:	Different architectures of computer systems, DMA, Caching, Memory hierarchy									
Textbook(s):	[1] A. Silberschatz, P. B. Galvin, and G. Gagne, “Operating System Concepts”, 9th Ed., 2013.									
Coordinator:	Kargahi, Professor, School of ECE									
Goals:	<p>The course provides computer engineering students to understand the ways that applications interact with the computer hardware as well as different methods of resource management and their respective algorithms. Further, they will learn of basic mechanisms which are used in the low level management of computer systems. Such a student will also learn how to design a system with the consideration of both hardware and software characteristics and limitations and improve the quality of programs. The course is a combination of both practice and theory.</p>									
Outcome:	<p>Upon successful completion of the course, students will have good insights</p> <ol style="list-style-type: none"> 1. in different types of computer systems and applications, 2. to design, build, and manage system software, 3. to better discover the reasons of degraded performance of computer systems and solving the problem, 4. to propose and implement resource management policies. 									
Topics:	<ol style="list-style-type: none"> 1) Introduction (Basic terminologies and concepts as well as different computer systems architectures and software systems, Interrupts, Dual-mode, ...) 2) Operating system structures (Different architectures for 									

	<p>operating systems, system calls, APIs, virtualization, cloud computing)</p> <p>3) Processes (PCB, context switch, short-term, medium-term and long-term schedulers, process creation and communication)</p> <p>4) Threads (Multithreading models, thread management)</p> <p>5) Process synchronization (Critical sections and respective solutions, semaphores, monitors, classic synchronization problems)</p> <p>6) CPU scheduling (Preemptive and non-preemptive scheduling, CPU scheduling algorithms, SMP, SMT, multicore scheduling, real-time scheduling)</p> <p>7) Deadlock handling (Necessary conditions for deadlock, resource-allocation graph, deadlock prevention, avoidance, detection, and recovery)</p> <p>8) Main memory management (Binding, physical and logical addresses, fragmentation, paging, TLB, shared pages, segmentation)</p> <p>9) Virtual memory management (Demand paging, page fault handling, copy-on-write, page replacement policies, Belady's anomaly, frame allocation, thrashing, memory-mapped I/O and files, kernel memory management)</p> <p>10) Storage management (File system structure, virtual file system, storage allocation methods)</p> <p>11) I/O management (Interrupts, I/O subsystem, I/O management and performance aspects)</p>
Computer usage:	Linux, Windows, C++
Assignments:	10 homework assignments
Projects:	4 Computer Assignments
Grading:	<p>Assignments: 5 %</p> <p>Computer Assignments 15%</p> <p>Midterm exams: 35 %</p> <p>Final exam: 45 %</p>
Further readings:	<p>[1] W. Stallings, <i>Operating Systems: Internals and Design Principles</i>, 5th Ed., 2005.</p> <p>[2] A.S. Tanenbaum, <i>Modern Operating Systems</i>, 3rd Ed., 2007.</p>
Prepared by:	Mehdi Kargahi
Date:	Oct. 6, 2009

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		