CSI 3131
Operating Systems

SYLLABUS

Spring/Summer 2018

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CSI3131 Operating Systems

Professor: Ayman El-Sawah

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Office hours: Thursday 2~4 pm, SITE 5000G

Teaching Assistants (TAs):

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LAB  Tuesday    14:30 - 15:50  STE 2060   Migao Wu                  mwu105@uottawa.ca
LAB  Friday     11:30 - 12:50  STE 2060   Bahareh Harandizadeh      bhara073@uottawa.ca
LAB  Monday     13:00 - 14:20  STE 2060   Obai Mandorah             OMAND067@uottawa.ca
TUT  Thursday   14:30 - 15:50  MHN 033    Vinicius Prado da Fonseca  VFONS006@uottawa.ca
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Course Material

- Virtual Campus: (Bright Space)
    - Internet communications tool for managing courses
    - Course material (notes and course policies); integrated WEB site
    - Syllabus (also available via professor WEB page)
    - Discussion forums
    - Assignment management
    - Grade tool
    - Course announcements

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Notes, Textbook and reading

- Course Notes:
  - Made available on Bright Space
- Textbook:
  - Operating System Concepts/Essentials, Silberchatz, Galvin, Gange, Wiley, 2011
    - ✓ Available online
- Other useful books:
  - "William Stallings, Operating Systems: Internals and Design Principles, 4th edition, Prentice-Hall, 2001, ISBN: 0-13-031999-6
  - Applied Operating System Concepts, A. Silberschatz et al., Wiley, 2000.

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Assignments

LAB Assignments

- – C-programming under Unix/Linux (process creation/IPC)
- – Process synchronization using semaphores (in Java)
- – Implementing parts of a basic OS in a simple simulator (in Java)
- – File system implementation (Linux and Virtual PC)

Assignments

- – Theoretical questions/problems associated with the course material

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Exams

Exams
- – Closed book
- – Diverse format: short answer questions, solve problems
- – Need to know and understand concepts and algorithms, as well as being able to apply this knowledge

Midterm
- – To be announced
- – Tentative material, Module 1 to 5, Process synchronization (Ch 1 to 6 in textbook).

Final
- – Comprehensive, with more weight on post-midterm topics

Quizzes
- – In class quick quizzes covering most recent material
- – Used as bonus marks for participating students

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Grading

- Assignments (A):   15%
- Labs (L):   15%
- Midterm (M):   20%
- Final exam (E):   50%
- Bonus Quizzes (B):   5%

You have to get at least 50% on exams (M+E) to pass.

   if (M+E   35) then mark = A+L+M+E+B

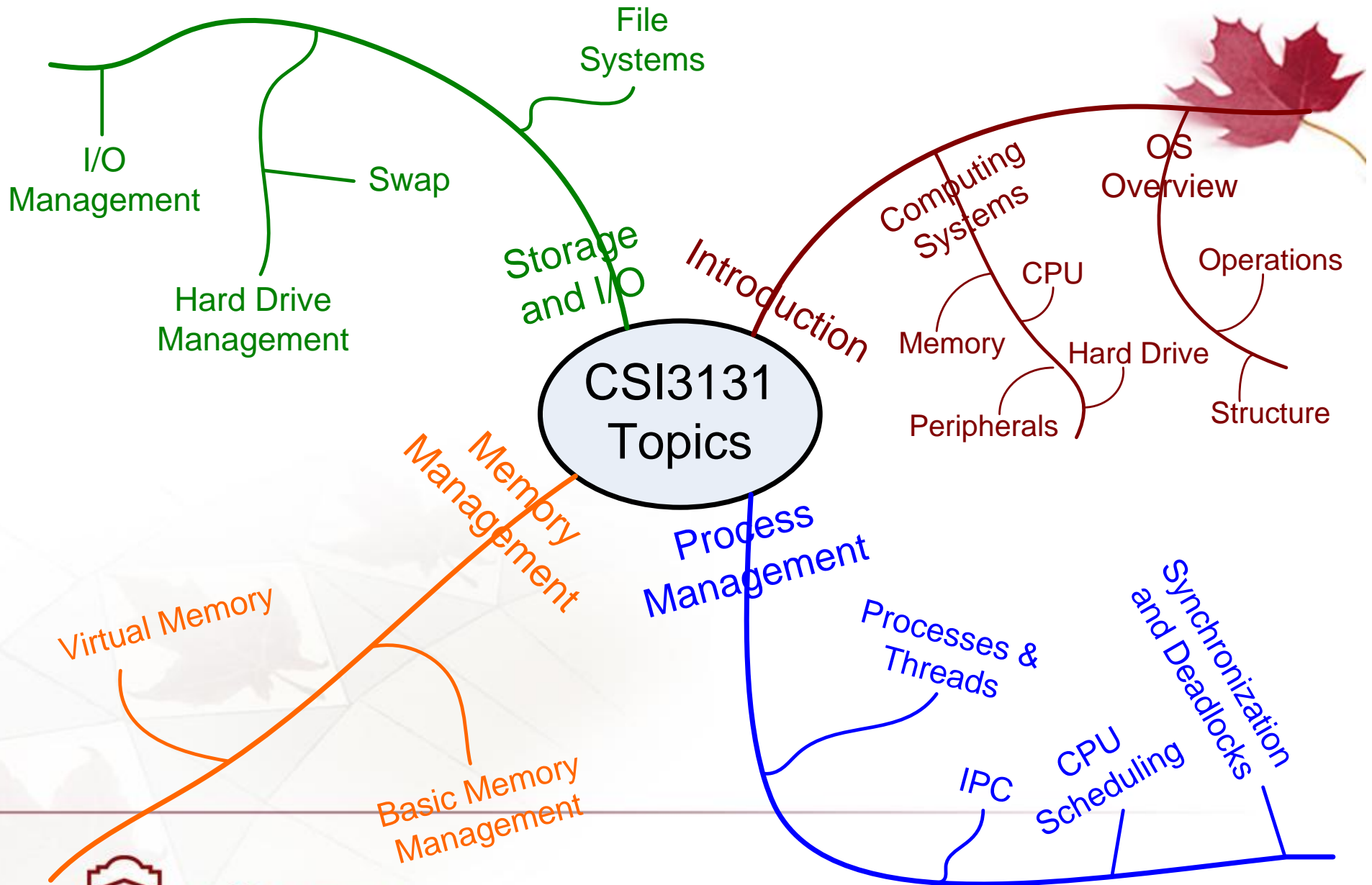   else   mark = 100/70*(M+E)

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Course Objectives

- **learn basic concepts** and principles behind the design of operating systems

- **get exposed** to the problems operating systems designers face, explore the tradeoffs and solutions to these problems

- **see how are these issues solved in practice** in real operating systems

- **be able to apply these concepts** and techniques in relevant circumstances

- **get some hands-on experience** programming OS type problems (process creation, inter-process-communications, process synchronization, mutual exclusion, deadlock avoidance)

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CSI3131 Topics

Storage and I/O
- File Systems
- I/O Management
- Swap
- Hard Drive Management

Introduction
- Computing Systems
  - Memory
  - Peripherals
  - CPU
  - Hard Drive
- OS Overview
  - Operations
  - Structure

Memory Management
- Virtual Memory
- Basic Memory Management

Process Management
- Processes & Threads
- IPC
- CPU Scheduling
- Synchronization and Deadlocks

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Topics Covered

- What Operating Systems Do
- Computer-System Organization
- Computer-System Architecture
- Operating-System Structure
- Operating-System Operations

Background/intro

- **Process Management**
- **Memory Management**
- **Storage and I/O Management**

The main stuff

- Protection and Security
- Distributed Systems
- Special-Purpose Systems
- Computing Environments

Advanced topics, not covered

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Topics Covered

Introduction/Background/Overview

- Computer systems overview
- Operating systems overview:
    - ✓ interface,
    - ✓ system calls,
    - ✓ design and implementation issues,
    - ✓ OS structure

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Topics Covered

Process Management

- Processes and threads
- Inter-process communication
- CPU scheduling – algorithms and criteria
- Process/thread synchronization – problems and solutions
- Deadlocks – prevention, avoidance, detection, recovery

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Topics Covered II

Memory Management

- Basic main memory management
  - ✓ swapping,
  - ✓ contiguous memory allocation,
  - ✓ paging,
  - ✓ segmentation
- Virtual memory
  - ✓ demand paging,
  - ✓ copy-on-write,
  - ✓ page replacement,
  - ✓ allocating kernel memory

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Topics Covered II

Storage Management and Input/Output

- – File-System interface (files, directories, mounting file system, file sharing)
- – File-System implementation
- – Mass-storage structure (disk structure, scheduling, management)
- – Swap space management
- – I/O systems (hardware, application I/O interface, kernel I/O subsystem)

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