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| Title: | Operating Systems APPROVED | | |
| Long Title: | Operating Systems | | |
| Module Code: | SOFT7006 | Duration: | 1 Semester |
| Credits: | 5 | | |
| NFQ Level: | Intermediate | | |
| Field of Study: | Computer Software | | |
| Valid From: | Semester 1 - 2017/18 (September 2017) | | |
| Module Delivered in | 8 programme(s) | | |
| Module Coordinator: | Donna OShea | | |
| Module Author: | PAUL ROTHWELL | | |
| Module Description: | Operating system software has had to solve a number of fundamental problems in order to provide fair and efficient services to the applications that run on a computer system. This module examines the detail of and solutions to those problems as implemented in modern operating systems. | | |
| Learning Outcomes | | | |
| <i>On successful completion of this module the learner will be able to:</i> | | | |
| LO1 | Explain the solutions used in the scheduling of processes. | | |
| LO2 | Discuss problems and solutions in virtual memory management schemes. | | |
| LO3 | Outline the structure and management of a variety of file system types and input/output mechanisms. | | |
| LO4 | Compare and contrast the solutions to process concurrency issues. | | |
| LO5 | Use programs to emulate and investigate algorithms and methods used in solutions to operating systems problems. | | |
| Pre-requisite learning | | | |
| Module Recommendations | | | |
| <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i> | | | |
| 12705 | COMP6042 | Operating Systems in Practice | |
| 12785 | SOFT7006 | Operating Systems | |
| Incompatible Modules | | | |
| <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i> | | | |
| 12785 | SOFT7006 | Operating Systems | |
| Co-requisite Modules | | | |
| No Co-requisite modules listed | | | |
| Requirements | | | |
| <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i> | | | |
| No requirements listed | | | |
| Co-requisites | | | |
| No Co Requisites listed | | | |

Module Content & Assessment

Indicative Content

Process Management

CPU Scheduling algorithms; Threads, multi-threading.

Memory Management

Review of Paging scheme (storage efficiency, address mapping); Virtual memory (paged). Issues in virtual memory (page fault handling, resident set management, page replacement).

Concurrency

Mutual exclusion: (semaphores). Mutual exclusion and synchronisation, producer/consumer problem, readers/writers problem.

File Systems

I/O devices, organisation of I/O function, file directories, Disk structure, Disk Scheduling algorithms, Linux inodes, security and Linux permissions, free space management, space allocation methods. Description of FAT and NTFS file systems and RAID.

Laboratory Work

Use of programming language library functions to investigate system service implementations (e.g. As available for Python - <https://docs.python.org/2/library/index.html>). Use of short programs to emulate and investigate algorithms and methods discussed. For example: CPU scheduling algorithms, Paging address mapping, Page replacement, Producer/consumer problem, Readers/writers problem, Disk Scheduling, Disk space allocation.

| Assessment Breakdown | % |
|----------------------------------|--------|
| Course Work | 50.00% |
| End of Module Formal Examination | 50.00% |

| Course Work | | | | |
|------------------------|---|-------------------|------------|-----------------|
| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
| Short Answer Questions | The purpose of the assessment is to evaluate the theoretical content that is delivered in class. | 1,2 | 20.0 | Week 6 |
| Project | An assignment to investigate OS services & algorithms. This will involve the use of short programs to emulate and investigate algorithms and methods discussed. For example: CPU scheduling algorithms, Paging address mapping, Page replacement, Producer/consumer problem, Readers/writers problem, Disk Scheduling, Disk space allocation. | 5 | 30.0 | Week 10 |

| End of Module Formal Examination | | | | |
|----------------------------------|-----------------------------------|-------------------|------------|-----------------|
| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
| Formal Exam | End-of-Semester Final Examination | 1,2,3,4 | 50.0 | End-of-Semester |

| Reassessment Requirement |
|---|
| <p>Repeat examination <i>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</i></p> |

The institute reserves the right to alter the nature and timings of assessment

Module Workload

| Workload: Full Time | | | | |
|---|------------------------------------|--------------|------------------|--|
| <i>Workload Type</i> | <i>Workload Description</i> | <i>Hours</i> | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| Lecture | Presentation of theory. | 2.0 | Every Week | 2.00 |
| Lab | Investigation of lecture material. | 2.0 | Every Week | 2.00 |
| Independent & Directed Learning (Non-contact) | Independent & directed learning. | 3.0 | Every Week | 3.00 |
| Total Hours | | | | 7.00 |
| Total Weekly Learner Workload | | | | 7.00 |
| Total Weekly Contact Hours | | | | 4.00 |

| Workload: Part Time | | | | |
|---|------------------------------------|--------------|------------------|--|
| <i>Workload Type</i> | <i>Workload Description</i> | <i>Hours</i> | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| Lecture | Presentation of theory. | 2.0 | Every Week | 2.00 |
| Lab | Investigation of lecture material. | 2.0 | Every Week | 2.00 |
| Independent & Directed Learning (Non-contact) | Independent & directed learning. | 3.0 | Every Week | 3.00 |
| Total Hours | | | | 7.00 |
| Total Weekly Learner Workload | | | | 7.00 |
| Total Weekly Contact Hours | | | | 4.00 |

Module Resources

Recommended Book Resources

- William Stallings 2014, *Operating Systems: Internals and Design Principles*, 8th Ed., Pearson [ISBN: 9781292061351]

Supplementary Book Resources

- Abraham Silberschatz, Peter Baer Galvin, Greg Gagne 2013, *Operating system concepts*, 9th Ed., Wiley [ISBN: 9781118093757]
- A.S. Tanenbaum 2014, *Modern Operating Systems: International Version*, 4th Ed., Pearson Education [ISBN: 9781292061429]

This module does not have any article/paper resources

Other Resources

- website: Stallings, William 2014, *Book Companion website*
<http://williamstallings.com/OperatingSystems/OS8e-Student/>
- Website: Python *The Python Standard Library*, Python Software Foundation
<https://docs.python.org/2/library/index.html>

Module Delivered in

| Programme Code | Programme | Semester | Delivery |
|-----------------------|---|-----------------|-----------------|
| CR_KSDEV_8 | <u>Bachelor of Science (Honours) in Software Development</u> | 3 | Mandatory |
| CR_KDNET_8 | <u>Bachelor of Science (Honours) in Computer Systems</u> | 3 | Mandatory |
| CR_KITMN_8 | <u>Bachelor of Science (Honours) in IT Management</u> | 3 | Mandatory |
| CR_KITSP_7 | <u>Bachelor of Science in Information Technology</u> | 3 | Mandatory |
| CR_KCOMP_7 | <u>Bachelor of Science in Software Development</u> | 3 | Elective |
| CR_KCOME_6 | <u>Higher Certificate in Science in Software Development</u> | 3 | Elective |
| CR_KCMSD_8 | <u>Higher Diploma in Science in Cloud & Mobile Software Development</u> | 1 | Mandatory |
| CR_KCLCO_8 | <u>Higher Diploma in Science in Cloud Computing</u> | 1 | Mandatory |