Basic Course Information CS 5370

Course Title: Scheduling Algorithms

Units: 3

C/S Classification #: C-2

Component (select one): Lecture

Instructional Mode (select all appropriate choices): Face-to-Face and web-assisted

Grading Basis (select one): Graded only

Repeat Basis (select one): May be taken only once

Cross listed Course (if offered with another department):

Dual-listed Course (if offered as lower/upper division or undergraduate/graduate):

Major course/Service course/GE course (select all appropriate choices): Major course

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I Catalog Description

The alpha/beta/gamma notation. Scheduling theory. Deterministic scheduling. Basic scheduling algorithms. Single machine models. Parallel machine models. Other scheduling models. Real-time scheduling. Applications.

II Required Coursework and Background

Pre-requisite(s): CS 5300 or consent of instructor

III Expected Outcomes

On successful completion of this course, students will be able to:

1. Gain an overall perspective of the complexity hierarchy of scheduling problems
2. Comprehend basic scheduling techniques
3. Apply the classical scheduling algorithms for single machine models and parallel machine models with different optimization objectives
4. Learn other scheduling models and applications

Outcomes of this course will build student capacity in each of the following areas as defined by programmatic objectives for the computer science major.

P-SLO 1. An ability to frame and model real-world problems that can be addressed computationally, and evaluate multiple computational approaches and select the most appropriate one.

IV Instructional Materials

Texts may vary with instructor and over time. Examples of possible texts include:

J. Y. Leung, “Handbook of Scheduling: Algorithms, Models, and Performance Analysis,” CRC Press, 2004

M. L. Pinedo, "Scheduling: Theory, Algorithms, and Systems," Second Edition, Prentice Hall, 2002

E. G. Coffman, “Computer and Job Shop Scheduling Theory,” J. Wiley, 1976

Richard. W. Conway, W. L. Maxwell and Louis W. Miller, “Theory of Scheduling,” Addison-Wesley Publishing Company, 1967

V Minimum Student Material

Course textbooks

VI Minimum College Facilities

Computer laboratories, Library, Blackboard, classroom with a projection system

VII Course Outline

Introduction and Notation: Strong NP-completeness and ordinary NP-completeness, relationship between pseudo-polynomial time algorithms and strong NP-completeness, heuristics, deterministic Scheduling, alpha|beta|gamma notation.

Some Basic Scheduling Algorithms: Coffman-Graham algorithm, Hu algorithm, Muntz-Coffman algorithm, Hodgson-Moore algorithm, Lawler algorithm, SPT and other related algorithms.

Single Machine Models: Total weighted completion time, maximum lateness, number of tardy jobs, total tardiness, total weighted tardiness.

Parallel Machine Models: Makespan without preemptions, makespan with preemptions, total completion time without preemptions, total completion time with preemptions, due date related objectives.

Other Scheduling Models: Scheduling with due date assignment, minimizing both earliness and tardiness, scheduling parallel tasks.

Real-Time Scheduling: Scheduling real-time tasks, vehicle routing, scheduling imprecise computation tasks, routing real-time messages on networks.

Applications: Scheduling problems in airlines, sports scheduling, crew scheduling.

VIII Instructional Methods

Lecture

Problem-solving

Discussion

Project-based learning

IX Evaluation of Outcomes

A. Student Assessment

i homework assignments

ii exam

iii term paper

B. Meaningful Writing Assignment

Students shall produce written solutions or proofs to problems that are assigned as homework and explain their reasoning. Students are required to write a term paper after conducting a research study on an advanced topic of scheduling algorithms.

C. A Matrix of Course Student Learning Outcomes vs Methods of Assessment

If the course is being evaluated for accreditation purposes, approved department accreditation assessment tools will additionally be utilized.

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| --- | --- | --- | --- |
| Course Learning Outcomes | Methods of Assessment | | |
| Homework Assignments | Team Paper | Exams |
| Gain an overall perspective of the complexity hierarchy of scheduling problems | x | x | x |
| Comprehend basic scheduling techniques | x | x | x |
| Apply the classical scheduling algorithms for single machine models and parallel machine models with different optimization objectives | x | x | x |
| Learn other scheduling models and applications | x | x | x |