VIETNAM NATIONAL UNIVERSITY - HCMC
HCMC UNIVERSITY OF TECHNOLOGY

SUBJECT SYLLABUS
FOR MASTER-LEVEL PROGRAMS

Discipline		Computer Science
Faculty		Faculty of Computer Science and Engineering
Department		Department of Computer Science
Subject Name		Advanced Algorithms
Subject Code		CO5115
Prerequisites		
Corequisites		
Credits		3
ECTS		6
Study Hours	*(Total)*	75
	(Lecture)	30
	(Tutorial)	45
	(Lab)	0
	(Others)	

1. OBJECTIVES

The lecture aim is to provide student analysis and design of algorithms. Topics include: dynamic programming, greedy, approximation for NP-complet decision problems.

2. DESCRIPTION

- Elementary analysis

- Red-black tree, algorithms on graph theory

- NP definition

- Greedy heuristics

- Dynamic programming & approximation scheme

- Other advance topics

3. TEXTBOOKS AND COURSE MATERIALS

[1]   Thomas H. Cormen& Charles E. Leiserson& Ronald L. Rivest& Clifford Stein, Introduction to algorithms, 3rd ed., Massachusetts Institute of Technology Press, 2009.

[2]   Steven S. Skiena, The algorithm design manual, 2nd ed., Springer-Verlag London, 2008.

[3]   Jon Kleinberg& Eva Tardos, Algorithm design, Pearson Education – Addison Wesley, 2005.

[4]   Vijay V. Vazirani, Approximation Algorithms, 3rd ed., Springer, 2003.

[5]   Shimon Even & Guy Even, Graph algorithms, 2nd ed., Cambridge University Press, 2012.

[6]   RichardBird, Pearls of functional algorithm design, Cambridge University Press, 2010.

[7]   Mehlhorn&Naeher, The LEDA Platform of Combinatorial and Geometric Computing, Cambridge University Press, 1999.

[8]   M.R. Garey& D.S. Johnson, Computers and Intractability: A Guide to the Theory of NP-Completeness, W.H. Freeman & Co 1990

[9]   Phan Thanh An, Le Hong Trang, Hình học tính toán -- Các thuật toán cơ bản và Thực thi, Nhà xuất bản Đại học Vinh, 2018

[10]   Phan Thanh An, Optimization Approaches for Computational Geometry, Nhà xuất bản Khoa học Tự nhiên và Công nghệ, Viện Hàn lâm Khoa học và Công nghệ Quốc gia, ISBN : 978-604-913-573-6. 2017.

4. LEARNING OUTCOMES

Knowledge: understand advanced algorithms

Cognitive Skills: apply advanced algorithms

Subject Specific Skills: analyse advanced algorithms

Transferable Skills: design algorithms

5. ASSESMENT
6. COURSE OUTLINE

Weeks	Topics	Activities	Readings
1	**Introduction to algorithm design and analysis**	The role of algorithm in computing Elementary analysis Solving recurrence	
2	**Data structures for sorting & searching problems**	List Tree Hash	
3-4	**Graph theory**	Graph traversal Shortest path problem Network flow problem	

Weeks	Topics	Activities	Readings
5	**NP and computational intractability**	Polynomial-time reductions Reductions via "Gadgets": the Satisfiability Problem Efficient certification and the Definition of NP NP-complete problems Sequencing problems Partitioning Problems Numerical Problem Co-NP and the Asymmetry of NP A partial taxonomy of hard problem	
6-7	**Greedy algorithms & Heuristic methods**	Introduction Sample problems Exercise	
10	**Exact methods**	Exact method introduction Lower/ Upper bounds	
11	**Dynamic programming**	Dynamic programming Approximation algorithms	
12	**Advance topics**		

7. INSTRUCTORS (at least 2 instructors)

Assoc Prof. Dr HUYNH TUONG NGUYEN (Principal)

Assoc Prof. Dr TRAN VAN HOAI

HCMC, ...

Department   **Instructor**

Assoc Prof. Dr PHAM HOANG ANH