



UNIVERSITAS NEGERI YOGYAKARTA
FAKULTAS MIPA

FRM/FMIPA/063-01
18 Februari 2012

SYLLABUS

Faculty	: Math. & Natural Science
Study Program	: Math. Ed International Class
Subject/Code	: Graph Theory/SMA 329
Credits	: Theory=2, Practicum=1
Semester	: 7
Prerequist	: Discrete Mathematics/MAT 238
Lecturer	: Emut, M.Si; Nur Insani, M.Sc

I. COURSE DESCRIPTION

Graph Theory course discusses the basic concepts of graphs, and its development and applications. The basic concept includes the definition, representation techniques, the definition of some basic graphs, sequences of degrees and some related theorems. The development of graph theory discusses some supporting material, such as planarity, planarity tests, connectivity, spanning tree, coloring and decomposition of a graph. Moreover, the course also discuss some application of graph theory including several algorithms used to determine the shortest path, minimum spanning tree and the chromatic number of a graph coloring.

II. STANDARD COMPETENCES

The students are expected to be able to explain the basic concepts of a graph including the definition of a graph and represent the graphs using different methods. The students are also expected to be able to determine the types of graphs based on its properties. Moreover, the students also have to be able to explain the definition of a planar graph, a connected/unconnected graph, a tree graph, a spanning tree graph, graph coloring and decomposition of graphs. Lastly, students are able to determine a planarity test, connectivity test, determine the number of spanning tree and determine graph factorization-1 in its decomposition. In its application, students are expected to have the ability to use Dijkstra's algorithm to determine the shortest path length and or Prime Kruskal algorithm for determining a minimal spanning tree graph.

III. ACTIVITY PLAN

Week	Based competency	Main topic	Learning strategy	References
1	Graph basic concepts	<ul style="list-style-type: none">• History of Graph Theory• Examples of Graph Application• Graph definition	Presentation & discussion	A1 : 5-10, 47-51, 45 A2 : 24-25 B2 : 319-329

2	Graphs Definition	<ul style="list-style-type: none"> • Incidency & Adjacency • Graph properties • Isomorphism 	Presentation & discussion	A1 : 12, 14-31 A2 : 25-39, 85-86 B2 : 330-341
3	Type of graphs	<ul style="list-style-type: none"> • Simple graphs • Regular graphs • Complete graphs • Bipartite graphs 	Presentation & discussion	A1 : 10-12, 36-37 A2 : 28-34
4	Connectivity	<ul style="list-style-type: none"> • Walk, Trail, Path • Connected graphs • Menger Theorem 	Presentation & discussion	A1 : 169-176 A2 : 60-65 B2 : 349-359
5	Tree graphs	<ul style="list-style-type: none"> • Definition of a tree graph and spanning tree graph • Determine spanning tree of a graph 	Presentation & discussion	A1 : 187-193 A2 : 49-53 B2 : 421-426
6	Optimal Paths	<ul style="list-style-type: none"> • Definition • Shortest path algorithm • Longest path algorithm 	Presentation & discussion	A1 : 157-166 A2 : 116-129 B2 : 376
7	Minimal Spanning Trees	<ul style="list-style-type: none"> • Definition of Minimal Spanning Tree • Kruskal Algorithm • Prime Algorithm 	Presentation & discussion	A1 : 187-197 A2 : 54-59 B2 : 439-450
8	MIDTERM			
9	Planarity	<ul style="list-style-type: none"> • Planar graphs • Euler Theorem 	Presentation & discussion	A1 : 215-218 A2 : 237-242 B2 : 466
10	Planarity tests	<ul style="list-style-type: none"> • Jordan Curve • Kuratowski Theorem • Extension of Euler Theorem 	Presentation & discussion	A1 : 12, 14-31 A2 : 25-39, 85-86 B2 : 466-475
12	Vertex Coloring	<ul style="list-style-type: none"> • Vertex and edge coloring definition • Chromatics number and chromatics polynomial • Example & Application 	Presentation & discussion	A1 : 235-244 A2 : 71-80 B2 : 476-487
13	Map Coloring	<ul style="list-style-type: none"> • Map coloring definition • Example & Application 	Presentation & discussion	A1 : 250-263 A2 : 71-80
14	Graph Decomposition_1	<ul style="list-style-type: none"> • Matching a graph • Factor-1 dan faktorisasi-1definition • Example & Application 	Presentation & discussion	A1 : 269-274
15	Graph Decomposition_2	<ul style="list-style-type: none"> • Optimal factor-1 graph • premature factor-1 graph • Optimal set dan prematur factor-1 	Presentation & discussion	A1 : 276-283 A2 : 256-257
16	REVIEW			

IV. REFERENCES

A. Compulsory

1. Robin J. Wilson and John J. Watkins, 1990. *Graphs An Introductory Approach*. John Wiley & Sons, Inc.
2. Fouinier, Jean-Claude, 2009. *Graph Theory and Applications*. John Wiley & Sons, Inc, USA

B. Additional

1. Siang, Jong Jek. 2002. *Matematika Diskrit dan Aplikasinya Pada Ilmu Komputer*. Andi. Yogyakarta
2. Goodaire, Edgar G., Parmenter., Michael M. 1998. *Discrete Mathematics with Graph Theory*. Prentice Hall, Inc. New Jersey.

V. EVALUATION

No.	Component	Weight (%)
1.	Individual tasks	10
2.	Group's task	15
3.	Midterm	35
4.	Final test	40
Total		100%

Yogyakarta, September 2014

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