	Module Description/Course Syllabi Study Programme: Bachelor of Mathematics Faculty of Mathematics and Natural Sciences Universitas Andalas

1. *Course number and name*

MAT61232 Applications of Graph Theory

2. *Credits and contact hours/Number of ECTS credits allocated*

3 SKS / 4.52 ECTS

3. *Instructors and course coordinator*

Narwen, M.Si

4. *Text book, title, author, and year*

1.   J.A Bondy and U.S. R. Murty, *Graph Theory with Applications*, U.S.A, 1976

5. *Recommended reading and other learning resources/tools*

N. Harsfield and G. Ringer, Pearls in Graph Theory, 2nd edition, Academic Press, New York, 2001

6. *Specific course information*

A. Brief description of the content of the course (catalogue description)

This course discusses about some applications of graph theory: The shortest path problem and minimum spanning tree, Sperner Lemma and Connector Problems, The reliable network communication problem, The Chinese Postman Problem, The Traveling Salesman Problem, The Personnel Assignment Problem, The Optimal Assignment Problem, The Timetabling Problem, Schur Theorem, and Ramsey Theorem.

B. Prerequisites or co-requisites

MAT61231 Introduction to Graph Theory

C. Indicate whether a required or elective course in the program
Elective

D. Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)
First Cycle Bachelor

E. Year of study when the course unit is delivered (if applicable)
3rd Year

F. Semester when the course unit is delivered
Odd Semester

G. Mode of delivery (face-to-face, distance learning)
Face to face

7. Intended Learning Outcomes
ILO-2: Possesses profound knowledge of the basic concept mathematics PI-1: An ability to explain basic mathematical concepts PI-2: An ability to provide examples that are relevant to basic mathematical concepts PI-3: An ability to determine solutions to simple problems using basic mathematical concepts
ILO-3: An ability to identify, explain and generalize simple mathematical PI-1: An ability to identify simple mathematical problems PI-2: An ability to explain simple mathematical problems PI-3: An ability to generalize simple mathematical problems

ILO-4: An ability to use concept and fundamental technique of mathematics in solving simple mathematical problems

PI-1: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques

PI-2: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques

PI-3: An ability to solve simple mathematical problems using the proper concept and mathematical fundamental techniques

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ILO-5: An ability formally and correctly proves a simple mathematical statement using facts and methods that have been studied.

PI-1: An ability to identify formal structures and analogous forms in mathematics

PI-2: An ability to use facts and apply methods to prove simple mathematical statements

PI-3: An ability to present simple mathematical statement proof rigorously (sequentially and conscientious)

PI-4: An ability to conclude or interpret result of the proving simple mathematical statement

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ILO-6: Have ability data literacy and technology and can apply them in solving simple mathematical problems or other relevant fields

PI-1: Able to identify the right data and technology to solve simple mathematical problems or other fields

PI-2: Able to use data and technology and apply them to solve simple mathematical statements or other areas

PI-3: Able to process data using available technology in simple mathematical problems or other fields

PI-4: Able to conclude and interpret data processing results for simple mathematical problems or other fields

PI-5: Able to design an algorithm to solve simple mathematical problems or other fields

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8. *Course Learning Outcomes*

Understand the shortest path problem and minimum spanning tree, and be able to determine the shortest path and minimum spanning tree in each given graph.

Understand the Sperner Lemma and its proof

Understand the Connector Problems and the optimal trees in graphs

Understand the reliable network communication problem in graphs.

Understand the Chinese Postman Problem and minimum weighted graphs

Understand the Traveling Salesman Problem and Hamiltonicity in graphs

Understand the Personnel Assignment Problem and the Optimal Assignment Problem, and be able to determine the perfect matching in a graph

Understand the Timetabling Problem, and be able to determine some efficient time-schedule with edge coloring

Understand the Schur Theorem and Ramsey Theorem for some simple graphs.

9. *Brief list of topics to be covered*

1. The shortest path problem and minimum spanning tree
2. Sperner Lemma
3. Connector Problems
4. The reliable network communication problem
5. The Chinese Postman Problem
6. The Traveling Salesman Problem
7. The Personnel Assignment Problem and the Optimal Assignment Problem
8. The Timetabling Problem
9. Schur Theorem and Ramsey Theorem

10. *Learning and teaching methods*

Project-Based Learning, Student Centre Learning

11. *Language of instruction*

Bahasa

12. *Assessment methods and criteria*

Summative Assessment:
1. Mid-term exam: 30%
2. Final exam: 30%
3. Quiz: 20%
4. Task: 20%