



## Course Specifications

Course Title:	Graph Theory
Course Code:	454 Math-3
Program:	Mathematics
Department:	Mathematics
College:	Science and Arts
Institution:	Najran University

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## A. Course Identification

1. Credit hours:3			
2. Course type			
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>
b.	Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Others <input type="checkbox"/>
3. Level/year at which this course is offered: 7 / 4			
4. Pre-requisites for this course (if any): 262 Math-3			
5. Co-requisites for this course (if any): Non			

## 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	Blended	---	---
3	E-learning	---	---
4	Correspondence	---	---
5	Other	---	---

## 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	45
2	Laboratory/Studio	---
3	Tutorial	---
4	Others (Exams)	3
	<b>Total</b>	48
<b>Other Learning Hours*</b>		
1	Study	30
2	Assignments	10
3	Library	10
4	Projects/Research Essays/Theses	---
5	Office hours	15
	<b>Total</b>	113

\* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times



**B. Course Objectives and Learning Outcomes****1. Course Description**

This course covers fundamental concepts for the theory of graphs for both directed and undirected graphs,...etc. Topics include graph isomorphism, Eulerian and Hamiltonian graphs, connectivity; Adjacency matrix for directed graph, complete graph, planar graph and Euler formula, isomorphism between graphs; Eulerian and Hamiltonian graphs, infinite and dual graphs. The course emphasis on algebraic graph theory: chromatic number, chromatic polynomial.

**2. Course Main Objective**

To learn the basic terminology and some of the theory associated with trees and graphs and to explore applications of them in coding.

**3. Course Learning Outcomes**

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge:</b>	
1.1	Define vertices, edges of trees, and graphs.	
1.2	Identify whether graphs are directed, undirected, Hamiltonian and/or Eulerian..etc.	
1.3	---	
1...	---	
<b>2</b>	<b>Skills :</b>	
2.1	Demonstrate induced sub-graphs, and proper sub-graphs	
2.2	Solve problems involving vertex and edge connectivity, planarity and edge coloring.	
2.3	---	
2...	---	
<b>3</b>	<b>Competence:</b>	
3.1	Interpret adjacency matrix and operations on graphs.	
3.2	Model real world problems using graph theory.	
3.3	---	
3...	---	

**C. Course Content**

No	List of Topics	Contact Hours
1	Fundamental concepts: Trees; Characterization of trees	6
2	Types of graphs: Undirected graphs, Directed graphs and weighted graphs and related notions such as paths and cycles, degree of graph ...etc.	9
3	Connectivity; Adjacency matrix for directed graph, complete graph, planar graph and Euler formula.	9
4	Isomorphism between graphs; Eulerian and Hamiltonian graphs, infinite and dual graphs	12
5	Algebraic graph theory: chromatic number, chromatic polynomial.	9
...	---	
<b>Total</b>		<b>45</b>



**D. Teaching and Assessment****1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods**

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	<b>Knowledge</b>		
1.1	Define vertices, edges of trees, and graphs.	- Lecture - Discussions	- Quiz - Written Exam
1.2	Determine whether graphs are directed, undirected, Hamiltonian and/or Eulerian..etc.	- Lecture - Discussions	- Quiz - Written Exam
...	---	---	---
2.0	<b>Skills</b>		
2.1	Identify induced subgraphs, and proper subgraphs	- Lecture - Discussions	- Exercises - Homework - Quiz/Written Exam
2.2	Solve problems involving vertex and edge connectivity, planarity and edge coloring.	- Lecture - Discussions	- Exercises - Assignments - Homework - Quiz - Written Exam
...	---	---	---
3.0	<b>Competence</b>		
3.1	Interpret adjacency matrix and operations on graphs.	- Lecture - Discussions	- Oral Exam
3.2	Model real world problems using graph theory	- Lecture - Discussions	- Oral Exam - Rubrics
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**2. Assessment Tasks for Students**

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises, Homework& Assignments	Open	10%
2	Oral Exam and Rubrics	14 <sup>th</sup> Week	5%
3	Quizzes	Open	5%
4	Written Test(1)	7 <sup>th</sup> Week	15%
5	Written Test(2)	13 <sup>th</sup> Week	15%
6	Final Exam	End of Semester	50%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

**E. Student Academic Counseling and Support****Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:**

- Introducing the course syllabus, grading scale and the distribution of marks for the course in the first lecture of the course.
- Arrangements for availability of teaching staff for individual student consultations and academic advice (include amount of time teaching staff are expected to be available each week).
- Office hours for a teaching staff for one hour weekly.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	- Robin J. Wilson (2011), Introduction to graph theory, Prentice Hall
<b>Essential References Materials</b>	- J. A. Bondy and U. S. R. Murty (2011), Graph Theory, London, New York.
<b>Electronic Materials</b>	- B. West(2000), Introduction to Graph theory, Prentice Hall.
<b>Other Learning Materials</b>	- <a href="http://en.wikipedia.org/wiki/Graph_theory">http://en.wikipedia.org/wiki/Graph_theory</a>

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> <li>Lecture Hall by the number of seats = 25 seat approximately.</li> </ul>
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> <li>Datashow</li> <li>Smart Board</li> <li>Wi Fi</li> </ul>
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> <li>None</li> </ul>

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student course evaluation survey at the end of semester.	Students	Questionnaire (Indirect)
Effectiveness of teaching and assessment	Peer Reviewer	Rubrics (Indirect)
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Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	
<b>Reference No.</b>	



Date	
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