



Najran University
College of Computer Science and Information Systems
Department of Computer Science

COURSE SPECIFICATIONS (CS)

Course Name: Algorithm Design and Analysis
Course Code: 474CSS-3

Prepared By:

MUHAMMAD AKRAM

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Course Specifications

Institution: Najran University	Date: 30/8/2017
College/Department : College of Computer Science and Information systems, Department of Computer Systems	

A. Course Identification and General Information

1. Course title and code: Algorithm Design and Analysis (474CSS-3)			
2. Credit hours: 3 (3,0,1)			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Bachelor Degree Program			
4. Name of faculty member responsible for the course Muhammad Akram (Course Instructor) Dr. Khairan Rajab (Course Coordinator)			
5. Level/year at which this course is offered: Level 8/4 th year including preparatory year.			
6. Pre-requisites for this course (if any): 212CSS-4			
7. Co-requisites for this course (if any): N/A			
8. Location if not on main campus: Offered at Main Campus of the College of Computer Science and in Girls Campus			
9. Mode of Instruction (mark all that apply):			
a. traditional classroom	<input type="checkbox"/>	What percentage?	<input type="checkbox"/>
b. blended (traditional and online)	<input checked="" type="checkbox"/>	What percentage?	100%
c. e-learning	<input type="checkbox"/>	What percentage?	<input type="checkbox"/>
d. correspondence	<input type="checkbox"/>	What percentage?	<input type="checkbox"/>
f. other	<input type="checkbox"/>	What percentage?	<input type="checkbox"/>

Comments:

Mainly following teaching strategies are used in classroom:

- Showing and delivering PPT presentation in the class.
- Explaining different algorithm design and analysis techniques on white board.
- Motivating students to be active during class by asking questions regularly.
- Five minutes before the end of every lecture, I will bring one student in front of class to briefly explain what we learn in today's lecture. (I predict that this strategy will be very helpful to boost the student confidence)
- Motivating students to work in home, to search from internet, to read related reference books by giving them assignments related to operating system types, comparison and scheduling algorithms.
- Video Lectures also uploaded on blackboard, so students can see the video lectures any time to get explanation of topic.

B Objectives

1. What is the main purpose for this course?

After successful completion of this course students should be able to:

- Describe important algorithmic problem types.
- Measure the efficiency of algorithms by evaluating the time complexity of an algorithm using the asymptotic notation (Big-O(), Omega(), Theta()).
- Analyze the expected performance of a particular algorithm in a particular context.
- Utilize mathematical techniques to analyze the efficiency of an algorithm and demonstrate the algorithmic correctness.
- Evaluate how to deal with problems for which no fast algorithms exist (NP Completeness).

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

- The course content/ syllabus should be updated/ modified periodically or in every 2 years.
- Providing journals as references for development in area of specialization.
- Make students to self-study on sample tests/ solve problems.
- Updating faculty website with all course related documents.
- Providing/ purchasing Text books/ Reference books.
- Counseling of students about his performance to understand my own weaknesses.
- Meeting with the student's academic advisor about his performance in my course and other courses

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

This course introduces various algorithm design paradigms and the basics of computational complexity analysis using different models of computations with the overview of mathematical essentials, space and time

complexities, asymptotic notations. Design and analysis of algorithms covers linear programming, greedy algorithms, divide-and-conquer, backtracking, branch-and-bound, search methods, graph algorithms and introduction to NP-Completeness.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fundamentals of algorithmic problem solving, important problem types and fundamental data structures	2	8
Asymptotic notations and mathematical analysis	2	8
Brute force	2	8
Divide and conquer	2	8
Dynamic Programming	1	4
Greedy Algorithms	2	8
Graph Algorithms	1	4
NP-completeness and reducibility	1	4
Coping with the Limitations of Algorithm Power: Backtracking, Branch and bound	1	4
Review		

2. Course components (total contact hours and credits per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planned	45	14	N/A	N/A		59
	Actual	45	14				59
Credit	Planned	3	0				3
	Actual						

3. Additional private study/learning hours expected for students per week.

5 - 8 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

At least 5-8 hours per week to refresh the topics discussed during the lectures and tutorials depending on students' ability to understand the class.

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	CLO 1: Explain/Describe important algorithmic problem types.	<p>Lectures, active learning, collaborative and cooperative learning and independent study assignments are used as teaching strategies.</p> <ul style="list-style-type: none"> • Showing and delivering PPT presentation in the class. • Using white board to explain important points in more detail. • Motivating students to be active during class by asking questions regularly during lecture. • Motivating students to work in home, to search from internet, to read related reference books by giving them assignments related to algorithm design and analysis techniques. • Let students to compute the space and time complexity of given algorithm/program in small groups and giving correction on their solution during class. • Motivating students to be active during class by asking questions regularly. • Giving students tutorial to solve examples. 	<p>Following methods are used to assess student's knowledge acquire in this course.</p> <ul style="list-style-type: none"> • Class Quizzes. • Assignment. • Midterm exam (Each exam consists of multiple choice questions, true/false, fill in the blanks, and theoretical questions.) • Final Exam
2.0	Cognitive Skills		

2.1	<p>Following are the cognitive skills which are developed in this course:</p> <p>CLO_1: Explain/Describe important algorithmic problem types.</p> <p>CLO_2: Measure the efficiency of algorithms by evaluating the time complexity of an algorithm using the asymptotic notation (Big-O(), Omega(), Theta()).</p> <p>CLO_3 : Analyze the expected performance of a particular algorithm in a particular context.</p>	<ul style="list-style-type: none"> • Compose more real life examples in the lecture relating to the surroundings of the students to draw attention that certainly helps them to concentrate more on the specific topic. • In some cases, pick one student who understood best a specific topic and let him describe in front of the class in his own manner. • Represent more easily understandable graphs/pictures in the class to describe certain topic and in that process use interesting words or interactive sounds to help students to improve their receptive memory. • Dictate students on certain topics during the lectures. • Recall the topics of last lecture and the critical issues based on different topics, which certainly helps students to recall memory frequently and store that topic in their memory for long term. • Before start a new topic or at the end of each topic, students are given couple of minutes to imagine the real life scenarios relating to that topic including implementation, advantages, deficiencies etc. to improve their logical thinking. 	<p>Following methods are used to assess student's cognitive knowledge in this course.</p> <ul style="list-style-type: none"> • Class Quizzes. • Midterm exams • Final Exam
2.2			
2,3			
3.0	Interpersonal Skills & Responsibility		
3.1	<p>CLO_3 : Analyze the expected performance of a particular algorithm in a particular context.</p> <p>CLO_4 : Use the mathematical techniques to analyze the efficiency of an algorithm and demonstrate the algorithmic correctness.</p> <p>CLO_5: Evaluate how to deal</p>	<ul style="list-style-type: none"> • One individual assignments which require investigation using provided reading material, library resources as a means of developing the self-study. • Student presentation to present their finding on assigned problems. • Explanation and examples given in class lectures. • Introductory class to make the 	<p>Capacity for independent study assessed in individual assignment.</p>

	with problems for which no fast algorithms exist (NP Completeness).	students alert and be conscious about the class attendance, timing, discipline during the contact hours.	
4.0	Communication, Information Technology, Numerical		
4.1	<p>CLO_3 : Analyze the expected performance of a particular algorithm in a particular context.</p> <p>CLO_4 : Use/Utilize mathematical techniques to analyze the efficiency of an algorithm and demonstrate the algorithmic correctness</p> <p>CLO_5: Evaluate how to deal with problems for which no fast algorithms exist (NP Completeness).</p>	<ul style="list-style-type: none"> • Deliver lectures in a steady pace with a loud voice and clear-perfect pronunciation. • Guide students on how to write a quality report maintaining all the formats. • Ask about different ideas on a specific topic in the lecture. • Group discussion/debate about certain idea. • Encourage to search the latest advancement or updated information in their leisure time. 	<ul style="list-style-type: none"> • Assignments. • Mid Term Exams and Final Exam • Encouraging self-assessment during the learning process.
5.0	Psychomotor		
5.1	N/A		
5.2			

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz # 01	3 th week	5%
2	Quiz # 02	6 th week	5%
3	Quiz # 03	8 th Week	5%
4	Assignments	9 th week	5%
5	Mid Term Exam-I	TBA	15%
6	Mid Term Exam-II	TBA	15%
7	Make up Mid Term Exam (<i>Only for exceptional cases</i>)	TBA	15%
8	Final Exam	Final Examination 17-04-1439	50%

D. Student Academic Counseling and Support

<p>1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)</p> <p>During the whole semester 10 hours/week are reserve for students to guide them, to help them, to explain them topic which are not clear for them etc.</p>

E Learning Resources

1. List Required Textbooks
<ul style="list-style-type: none"> Anany Levitin, Introduction to the Design and Analysis of Algorithms, Second Edition, Pearson-Addison Wesley, ISBN 0-321-36413-9.
2. List Essential References Materials (Journals, Reports, etc.)
<ul style="list-style-type: none"> T.H. Cormen, C.H. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Second Edition, The MIT Press (ISBN 0-262-03293-7) & McGraw-Hill Book Company (ISBN 0-07-013151-1). Jon Kleinberg and Eva Tardos, Algorithm Design, First Edition, Pearson-Addison Wesley, ISBN 0-321-29535-8. Horowitz, Sahni and Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications, ISBN 81-7515-257-5 <p><u>Note:</u> Handouts will be distributed in class, when appropriate, to cover some of the course topics.</p>
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
White board
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
N/A

F. Facilities Required


Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)
Lecture Rooms with 20 seats with smart table, Mic, Speaker, PC, Auto Projector with Screen, WIFI for virtual class and a white board or An smart board (male Section)
2. Technology resources (AV, data show, Smart Board, software, etc.)
Desktop/ Laptop computer Multimedia Projector
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)
A File cabinet to keep Class Stuffs, Markers, papers and students Files, and a printer to print program

screen shots.

G Course Evaluation and Improvement Processes

<p>1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching</p> <ul style="list-style-type: none"> Collecting students' questionnaire about the faculty and teaching. Collecting students' suggestions to facilitate more during the class. Student's questioner once during semester. Meeting with course coordinator and college coordinator periodically.
<p>2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department</p> <ul style="list-style-type: none"> Assistance from colleagues. Independent assessment of standard achieved by students.
<p>3. Processes for Improvement of Teaching</p> <ul style="list-style-type: none"> Note down the problem that face during class and try to solve those problems by discussing senior faculty members. Learning best teaching methods from the best teacher amongst all faculty members. Workshops to facilitate the exchange of experiences amongst faculty members.
<p>4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)</p> <ul style="list-style-type: none"> Every exam papers are reviewed by the course coordinator. Samples of students' assignments and exams are collected every semester and reviewed from time to time as per NCAAA and ABET standards.
<p>5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.</p> <ul style="list-style-type: none"> Preparing Course Report Planning to update Course syllabus

Name of Course Instructor: Muhammad Akram

Signature:  Date Specification Completed: 30/8/2017

Program Coordinator: Dr. Abdulrahman Al Thaqfan

Signature:  Date Received: _____