



Course Specification

Course Name: Genetic Algorithms

Course Code: CS464

I. Basic Course Information

Major or minor element of program: Major

Department offering the course: Computer science Department

Academic level: 400 Level

Semester in which course is offered: First (fall) Semester

Course pre-requisite(s): MA214 Mathematics-3

Credit Hours: 3

Contact Hours Through:

Lecture	Tutorial *	Practical *	Total
2.5	0.0	1.5	4.0

* 1.5 hours for **either** Tutorial or Practical

Approval date of course specification: September 2014

II. Overall Aims of Course

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III. Program ILOs covered by course

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
K4,K17	I13,I14,I16	P6,P13	G2,G6



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IV. Intended Learning Outcomes of Course (ILOs)

a. Knowledge and Understanding

On completing the course, students should be able to:

- K.1 Explain different concepts related to genetic algorithms, including basic GA, different representations and genetic operators from practical and theoretical perspectives.
- K.2 Discuss different concepts related to Neural Networks, including different architectures, training schemes and applications.
- K.3 Explain concepts related to Fuzzy Logic, including Theoretical Foundations of Fuzzy Logic and its applications.

b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

- I.1 Apply different genetic algorithms, including basic GA, different representations and genetic operators from practical and theoretical perspectives.
- I.2 Solve effectively machine learning applications and finding the optimal model parameters.
- I.3 Construct Fuzzy Inference Systems used for Fuzzy Control and Fuzzy Expert System.

c. Practical/Professional Skills

On completing the course, students should be able to:

- P.1 Use MATLAB toolboxes for soft computing in order to solve computational problems.
- P.2 Write programs using high level language for genetic algorithms applications.

d. General and Transferable Skills

On completing the course, students should be able to:

- G.1 Work as a part of team to produce reports.
- G.2 Work as a part of a team to find a solution for practical problems and projects.
- G.3 Write structural reports.
- G.4 Do specific task in certain period of time "training problems in labs".

V. Course Matrix Contents

	Main Topics / Chapters	Duration (Weeks)	Course ILOs Covered by Topic (By ILO Code)			
			K & U	I.S.	P.S.	G.S.
1-	Introduction to soft computing	2	K1	I1		G3
2-	Canonical Genetic Algorithm and Binary Representation	2	K1	I1		G1,G2,G4
3-	Schema Theory	1	K1	I1		
4-	Floating point representation and their operators	1	K1	I1		G1,G2,G4
5-	Applications for Genetic Algorithms	1	K1	I1	All	G1,G2,G4
6-	Introduction to Fuzzy Logic	1	K3	I3		G1,G2,G4
7-	Fuzzy Rule Base Systems	1	K3	I3	All	G1,G2,G4
8-	Feature Selection	1	K2,K3	I2,I3	All	G1,G2,G4
9-	Evolution of Fuzzy Rules with Genetics algorithms	1	K3	I3	All	G1,G2,G4
10-	Training of Neural Networks with Genetics Algorithms	1	K3	I3	All	G1,G2,G4
11-	Evolution Strategy	1	K1,K2	I1		G3
	Net Teaching Weeks	13				



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VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours *
1	Introduction to soft computing	2.5	2.5	
2	Introduction to soft computing	4	2.5	1.5
3	Canonical Genetic Algorithm and Binary Representation	4	2.5	1.5
4	Canonical Genetic Algorithm and Binary Representation	4	2.5	1.5
5	Schema Theory	4	2.5	1.5
6	Floating point representation and their operators	4	2.5	1.5
7	Midterm Exam			
8	Introduction to Fuzzy Logic	4	2.5	1.5
9	Fuzzy Rule Base Systems	4	2.5	1.5
10	Feature Selection	4	2.5	1.5
11	Evolution of Fuzzy Rules with Genetics algorithms	4	2.5	1.5
12	Training of Neural Networks with GA	4	2.5	1.5
13	Evolution Strategy	4	2.5	1.5
14	Review	4	2.5	1.5
15	Final Exam			
Total Teaching Hours		51	33	18

* No Practical/Tutorial during the first week of the semester

VII. Teaching and Learning Methods

Teaching/Learning Method	Selected Method	Course ILOs Covered by Method (By ILO Code)			
		K & U	Intellectual Skills	Professional Skills	General Skills
Lectures & Seminars	√	All			
Tutorials					
Computer lab Sessions					
Practical lab Work	√			All	G4
Reading Materials					
Web-site Searches					
Research & Reporting					
Problem Solving / Problem-based Learning	√		All		
Projects					
Independent Work					
Group Work	√		All	P2	G1,G2,G3
Case Studies					
Presentations					
Simulation Analysis					
Others (Specify):					



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VIII. Assessment Methods, Schedule and Grade Distribution

Assessment Method	Selected Method	Course ILOs Covered by Method (By ILO Code)				Assessment Weight / Percentage	Week No.
		K & U	I.S.	P.S.	G.S.		
Midterm Exam	√	All	All			10%	7
Final Exam	√	All	All			60%	15
Quizzes	√	All	All			10%	5,9
Course Work							
Report Writing							
Case Study Analysis							
Oral Presentations							
Practical	√			All	G4	10%	Every week
Group Project	√		All	P1	G1,G2,G3	10%	
Individual Project							
Others (Specify):							

IX. List of References

Essential Text Books	<ul style="list-style-type: none"> Introduction to Evolutionary Computing By A. E. Eiben Springer
Course notes	<ul style="list-style-type: none"> Dr. Provides Slides
Recommended books	<ul style="list-style-type: none"> None
Periodicals, Web sites, etc. ...	<ul style="list-style-type: none"> None

X. Facilities required for teaching and learning

List the facilities required <ul style="list-style-type: none"> Data show Labs with MATLAB installed
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Course coordinator: Prof. Amr Badr

Head of Department: Prof. Abeer El Korany

Date: September 2014