Faculty of Engineering
at Shoubra

Model No.12
Course Specifications : Adaptive Filtration

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

1- Course Data

Course Code : ECE٤٤٥ Course Title : Adaptive Filtration Study Year : 4th year communic

Specialization :

Teaching Hours:

Lecture : 3 Tutorial : 2 Practical :

2- Course Aim

For students undertaking this course, the aims are to:

2.1- describe the basics of c and estimation.

2.2- describe the methods of least squares, fast fixed-order and order-recursive (lattice) filters.

2.3- demonstrate of the adaptive filters in the frequency domain (convergence and tracking analyses, stability issues, finite precision effects).

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will be able to:

a- 1- Define concepts and theories of mathematics of Optimal filtering , appropriate to filtration . (a1)

a- 2 - Describe principles of design including elements design, process and/or a system related to adaptive filters. (a5)

a- 3 -Describe principles of analyzing and design of filters. (a19)

a-4 Describe analysis of channel estimation and equalization. (a29)

b- Intellectual Skills

At the end of this course, the students will be able to:

b- 1- Think in a creative and innovative way in problem solving and design. (b4)

b- 2 - Plan, conduct and write a report on a project on designing filter. (b15)

b- 3 - Synthesize and integrate electronic systems for certain specific function using the resistors and capacitors and op-amp.(b18)

c- Professional Skills

On completing this course, the students are expected to be able to:

c-1- Apply knowledge of designing of Optimal filter, science, information technology, design, business context and engineering practice to solve Filtering problem.(c1)

c- 2 - Create and/or re-design a process, component or system, and carry out specialized engineering designs.(c3)

c- 3 - Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design filters, collect, analyze, and interpret results. (c5)

c- 4 - Identify appropriate specifications for required devices.(c18)

d- General Skills

At the end of this course, the students will be able to:

d- 1 - Work in stressful environment and within constraints. (d2)

d- 2- Communicate effectively .(d3)

d- 3 - Effectively manage tasks, time, and resources.(d6)

d- 4 - Develop skills related to creative and critical thinking as well as filtering problem solving .(d12)

4- Course Contents

No.	Topics	Hours
1	Ideal linear filters	3
2	Calmann and Fainer filters	6
3	Maximum decay method	3
4	Minimum repetition squares	3
5	LMS and RLS-type adaptive filters	6
6	Applications to channel estimation, equalization, and echo cancellation	6
7	Least-squares problems	6
8	Lattice filters.	3

5- Teaching and Learning Methods

5.1- Modified Lectures
5.2- Class activity
5.3- Assignments

6- Teaching and Learning Methods of Disables

6.1- nothing

7- Student Assessment

a- Student Assessment Methods

1	Assignments to assess knowledge, intellectual and professional skills.
2	Quiz to assess knowledge, intellectual and professional skills.
3	Mid-term exam to assess knowledge, intellectual skills
4	Final exam to assess knowledge, intellectual skills.

b- Assessment Schedule

No.	Assessment	Week
1	Assessment 1 Assignments	3, 7, 11, 13
2	Assessment 2 Quizzes	4, 6, 10, 12
3	Assessment 3 Mid-term exam	8
4	Assessment 5 Final exam	15

c- Weighting of Assessments

Assessment	Weight
Mid_Term Examination	10 %
Final_Term Examination	60 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	15 %
Other types of assessment	15 %
Total	100 %

8- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- A. H. Sayed, Adaptive Filters, Wiley, NJ, 2008.

c- Recommended Books

1- A. H. Sayed, Fundamentals of Adaptive Filtering, Wiley, NJ, 2003.

Course Instructor:

- Course Coordinator : Dr. Mohamed HasanRizk Salem

- Head of Department : Prof. Dr. Sayed Abo -Elsood Ward

Faculty of Engineering at Shoubra

Model No.11A
Course Specifications : Adaptive Filtration

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

Matrix of Knowledge and Skills of the course

NO00..	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Optimal and linear least-mean-squares estimation; orthogonality principle	1	a1,a2	B1	C2,c4	
2	Steepest-descent algorithms; convergenc	2	a1,a2	B1	C2, c4	
3	Stochastic gradient algorithms.	3	a1,a2,a3	B1,b3	C2, c4	
4	LMS and RLS-type adaptive filters	4	a1,a2,a3	B1,b3	C2,c3, c4	
5	Applications to channel estimation, equalization, and echo cancellation.	5	a1,a2,a4	B1,b3	c1,c2,c3, c4	
6	Steady-state, tracking, and transient performance of adaptive filters; energy conservation.	6	a1,a2,a3	B1,b3	C2,c3, c4	
7	Least-squares and regularized least-squares problems	7	a1,a2	B1,b3	C2,c3, c4	
8	Mid term exam	8	a1,a2,a3	B1,b3		D1
9	Recursive least-squares and fast-least-squares algorithms	9	a1,a2	B1,b3	C2,c3, c4	
10	Bode-Plot and frequencyresponse	10	a1,a2	B1,b3	C2,c3, c4	
11	Array algorithms	11	a1,a2,a3	B1	C2,c3, c4	
12	Lattice filters	12	a1,a2,a3	B1	C2,c3, c4	

13	QR methods	13	a1,a2,a3	B1	C2,c3, c4	
14	Final exam	14	a1,a2,a3	B1,b3		D1

Course Instructor:

- Course Coordinator : Dr. Mohamed HasanRizk Salem

- Head of Department : Prof. Dr. Sayed Abo -Elsood Ward

Matrix of course content and ILO's

Course Title: Adaptive Filtration **Code**: ECE445
Lecture:3 **Tutorial**: 2 **Practical**: -**Total:**5
Program on which the course is given: B.Sc. ElectricalEngineering (Communications)
Major or minor element of program: Major
Department offering the program: ElectricalEngineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Fourth** Year / **First** Semester2014-2015
Date of specifications approval: 20/6/2010

Course content	a1	a2	a3	A4	b1	b2	b3	c1	c2	c3	c4	d1
Ideal linear filters	✓	✓			✓				✓		✓	
Calmann and Fainer filters	✓	✓	✓		✓		✓		✓		✓	
Maximum decay method	✓	✓	✓		✓		✓		✓		✓	
Minimum repetition squares	✓	✓	✓		✓		✓		✓		✓	
LMS and RLS-type adaptive filters	✓	✓			✓		✓	✓	✓	✓	✓	
Applications to channel estimation, equalization, and echo cancellation	✓	✓		✓	✓		✓	✓	✓	✓	✓	
Least-squares problems	✓	✓	✓		✓				✓			
Lattice filters.	✓	✓	✓		✓				✓		✓	

Matrix of course aims and ILO's

Course Title: Adaptive Filtration **Code**: ECE445
Lecture: 3 **Tutorial**: 2 **Practical**: -**Total:**5
Program on which the course is given: B.Sc. ElectricalEngineering (Communications)
Major or minor element of program: Major
Department offering the program: ElectricalEngineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Fourth** Year / **First** Semester2014-2015
Date of specifications approval: 20/6/2010

Course aims	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	c4	d1
Describe the basics of c and estimation.	✓	✓	✓		✓		✓		✓		✓	
Describe the methods of least squares, fast fixed-order and order-recursive (lattice) filters.	✓	✓			✓		✓	✓	✓	✓	✓	
Demonstrate of the adaptive filters in the frequency domain (convergence and tracking analyses, stability issues, finite precision effects).	✓	✓	✓	✓	✓				✓		✓	✓

Course Instructor:

- Course Coordinator : Dr. Mohamed HasanRizk Salem

- Head of Department : Prof. Dr. Sayed Abo -Elsood Ward