Course Name: Digital Signal Processing
Course Code: IT341

I. Basic Course Information

Major or minor element of program: Both Major Minor
Department offering the course: Information Technology Department

Academic level: 300 Level
Semester in which course is offered: First (fall) Semester
Course pre-requisite(s): Signals and Systems (IT241)

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

Introducing the student to the theory and application of Digital signal processing and linear systems. Topics include time domain analysis of discrete-time linear time-invariant (LTI) systems, solution of difference equations, system function and digital filters, stability and causality, discrete-time Fourier series, discrete-time Fourier transform and discrete Fourier transforms, different discrete signals transformations, and the conversion of continuous time signals to discrete time signals. Students use analysis tools to design systems that meet functional specifications. Students gain experience in analysing and designing digital signal processing systems through computer projects.

III. Program ILOs covered by course

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
K1,K17	I6,I10,I16,I18	P18,P20	G2,G6,G9

IV. Intended Learning Outcomes of Course (ILOs)

a. Knowledge and Understanding

On completing the course, students should be able to:

K.1 Study discrete-time signals and their representation.
K.2 Differentiate discrete signals transformations and their inter-relationships.
K.3 Study the conversion of continuous time signals to discrete time signals.
K.4 Learn system implementation of discrete time systems.
K.5 Study the design techniques of discrete-time systems.

b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

I.1 Analyse discrete-time systems with respect to their properties.
I.2 Breakdown discrete-time systems to their basic structures with different representations.
I.3 Demonstrate spectral analysis of discrete-time signals.
I.4 Choose appropriate methods of converting continuous-time signals to discrete time.
I.5 Design digital filters.

c. Practical/Professional Skills

On completing the course, students should be able to:

P.1 Implement different discrete-time signal processing techniques using Matlab and signal processing toolbox.
P.2 Interpret and report on work carried out in the lab.
P.3 Integrate all algorithms implemented into a single working GUI framework using the MATLAB tool.

d. General and Transferable Skills

On completing the course, students should be able to:

G.1 Explore, analyse and find effective solutions for designing discrete-time systems.
G.2 Work effectively as part of a team to implement various algorithms presented throughout the course.
G.3 Improve the presentation and discussion skills.

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 Digital Signal Processing	0.5	K1	I2	P1	All
2-	Discrete-Time Signals	0.5	K1,K2	I2	P1,P2	All
3-	Discrete-Time Systems	1	K1,K2,K3,K4	I1,I2	P1,P3	All
4-	The Z-Transform	2	K2	I1,I2	P2,P3	All
5-	Sampling of Continuous Time Signals	2	K1,K2,K3	I1,I2	P1,P3	All
6-	Structures for Discrete-Time Systems	1.5	K2,K4,K5	I1,I2	P1,P2	All
7-	Filter Design Techniques	2	K2	All	P1,P2	All
8-	The Discrete-Fourier Transform	1.5	K1,K2	I1,I2	P3	All

9-	Computation of the Discrete-Fourier Transform	1	K1,K2	I1,I2,I3	All	All
10-	Revision	1	All	All	All	All
	Net Teaching Weeks	**13**				

VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours*
1	Introduction to Digital Signal Processing	2.5	2.5	
2	Discrete-Time Signals	4	2.5	1.5
3	Discrete-Time Systems	4	2.5	1.5
4	The Z-Transform	4	2.5	1.5
5	Sampling of Continuous-Time Signals	4	2.5	1.5
6	Sampling of Continuous-Time Signals	4	2.5	1.5
7	**Midterm Exam**			
8	Structures for Discrete-Time Systems	4	2.5	1.5
9	Filter Design Techniques	4	2.5	1.5
10	Filter Design Techniques	4	2.5	1.5
11	The Discrete-Fourier Transform	4	2.5	1.5
12	The Discrete-Fourier Transform	4	2.5	1.5
13	Computation of the Discrete-Fourier Transform	4	2.5	1.5
14	Revision	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			All
Tutorials	*	All	All		All
Computer lab Sessions					
Practical lab Work	*			All	All
Reading Materials					
Web-site Searches					
Research & Reporting					
Problem Solving / Problem-based Learning	*		All		All
Projects					
Independent Work					
Group Work	*		All	All	All
Case Studies					

Presentations	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Simulation Analysis	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others (Specify):	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

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	[ ]	[ ]	20 %	7
Final Exam	*	All	All	[ ]	[ ]	60%	15
Quizzes	*	All	All	[ ]	[ ]	6 %	[ ]
Course Work	*	[ ]	All	[ ]	[ ]	6%	[ ]
Report Writing	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Case Study Analysis	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Oral Presentations	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Practical	*	[ ]	[ ]	All	All	6 %	[ ]
Group Project	*	[ ]	[ ]	[ ]	All	2 %	[ ]
Individual Project	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others (Specify):	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

IX. List of References

Essential Text Books	• A V Oppenheim, R W Schafer & J R Back, Discrete-time Digital Signal Processing, Prentice Hall Int 1999.
Course notes	• Course slides handed out throughout the course.
Recommended books	• A V Oppenheim , A S Willsky & S H Nawab, Signals and Systems, Prentice Hall Int 1996. Includes companion book with Matlab examples • J G Proakis and D G Hanolakis, Digital Signal Processing, Maxwell Macmillan Int 1992
Periodicals, Web sites, etc …	• None

X. Facilities required for teaching and learning

• Seminar hall with data show Computer labs with Matlab (latest version) installed.

Course coordinator: Prof. Mahmoud Shoman

Head of Department: Prof. Reda Abd el-Wahab

Date: September 2014