Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Digital Signal Processing

(14034407-3)

Course Specification

Institution	**Umm Al-Qura University**
College/Department	**College of Computer & Information Systems**

A Course Identification and General Information

1. Course title and code: **14034407-3 Digital Signal Processing**
2. Credit hours **3**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **Dr. Imran Tasadduq**
5. Level/year at which this course is offered **Level 9 or 10**
6. Pre-requisites for this course (if any) **Signals and Systems**
7. Co-requisites for this course (if any)
8. Location if not on main campus **Al-Abidiyah Umm Al Qura University - Makkah Al Mukarramah**

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course. Classification of signals and their mathematical representation. Discrete-time systems classification. Linear shift-invariant system response, difference equations, convolution sum, and frequency response. Discrete Fourier transform. z-transform and its application to system analysis. Realization forms. Sampling and aliasing. Finite-impulse response (FIR). Design windowing technique. Introduction to infinite impulse-response (IIR). Filter design techniques
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field) 1. Involving students in presentation of advance topics in signal processing to know current research in the field. 2. Use of Simulation tools to virtually observe the system performance and verifying using real-time experiments 3. Lecture slides and tutorials, Animations to further clarify the theoretical concepts 4. Use of Matlab to analyse and understand different signal processing techniques

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1. Topics to be Covered

List of Topics	No of Weeks	Contact hours
Classification of signals, Linear shift- invariant systems	1,2	6
System response; Convolution, Stability and causality	3,4	6
The z- Transform: Definitions and region of convergence	5,6,7	9
System function; Frequency response, Difference equations	8,9	6
Discrete- Time Networks, Signal flow graphs, Realizations forms: Direct, cascade, and parallel forms	10,11	6
Sampling and Discrete- Time Fourier Transform: Definitions; Convergence, conditions, Properties of the DTFT, Aliasing; Analog- to- digital and digital- to-analog conversions	12,13	6

Introduction to Discrete Fourier Transform: Definitions; Properties; Efficient, computation of the DFT, FFT algorithms	14,15	6
Introduction to Digital Filters Design: FIR versus IIR; Linear- phase filters, Windowing design techniques for FIR	16	3

2. Course components (total contact hours per semester):				
Lecture: 48	Tutorial:	Laboratory	Practical/Field work/Internship	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

3 x 50 mins lectures

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

A student who successfully fulfills the course requirements will have demonstrated:

1. an ability to manipulate and understand digital signals
2. an ability to find the response of digital LTI systems to any input signal by convolution sum
3. an understanding of the definitions and basic properties (e.g. time-shift, modulation, Parseval's Theorem) of discrete-time Fourier series, discrete-time Fourier transforms, z-transforms and an ability to compute the transforms and inverse transforms of basic examples an understanding of the fundamentals of FIR and IIR filters

(ii) Teaching strategies to be used to develop that knowledge

1. Assignments and solutions to the assignments, so that student can know their problems
2. Open-communication with students – show willingness to assist and take questions from

students and clarify explanations in the class

3. Students presentations
4. Simulations assignments using Matlab.

(iii) Methods of assessment of knowledge acquired

1. Exercises & Home works , Quizzes, Midterm, Project , Final Exam
2. Review outputs from the assignments in the computer lab and also from their assignments and projects.

b. Cognitive Skills

(i) Description of cognitive skills to be developed

1. Ability to solve problems.
2. Ability of deduction and inference.
3. Ability of analysis and design network architectures

(ii) Teaching strategies to be used to develop these cognitive skills

1. Assignments.
2. Labs

(iii) Methods of assessment of students cognitive skills

1. Mid and Final Exams
2. Labs Exams.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

Students should be able to

1. Understand and communicate to others the importance and relevance of statistics in the modern world
2. Be an independent learner, able to acquire further knowledge with some guidance or support.
3. Participate in group discussions
4. Manage time and meet deadlines.

(ii) Teaching strategies to be used to develop these skills and abilities

1. Numerical Assignments.
2. Students Presentations
3. Practical programming problems in Matlab.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

1. Mid and Final Exams
2. Labs Exams.

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

1. Case studies: the key method of discovering a student's dexterity in analyzing their recommendations, opinions and suggestions
2. Assignments, exams, reports, presentations and quizzes will test their analytic skills and communication skills
3. Class discussions should indicate a student's prowess in responding

(ii) Teaching strategies to be used to develop these skills

1. Written Examinations
2. Assignments
3. Quizzes

(iii) Methods of assessment of students numerical and communication skills

1. Assignments, exams, reports, presentations and quizzes will test their analytic skills and communication skills
2. Class discussions should indicate a student's prowess in responding

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

(ii) Teaching strategies to be used to develop these skills

(iii) Methods of assessment of students psychomotor skills

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	**Attendance, Participation and Labs evaluation**	Throughout Semester	25
2	**Quiz**	3	5
3	**Midterm 1**	4	10
4	**Home work**	Throughout Semester	10
5	**Midterm II**	10	10
6	**Final Exam**	16	40
7			
8			

D. Student Support

1. 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)

Faculty is available 10 hours per week for student help and consulting.

E Learning Resources

1. Required Text(s)
   1. J.G. Proakis and D. G. Manolakis, Digital Signal Processing, Algorithms and Applications (4th Edition), Prentice Hall, 2007

2. Essential References
   1. J.G. Proakis and D. G. Manolakis, Digital Signal Processing, Algorithms and Applications (4th Edition), Prentice Hall, 2007.

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

4-.Electronic Materials, Web Sites etc

www.dspguru.com

www.mathworks.com

5- Other learning material such as computer-based programs/CD, professional standards/regulations

Matlab

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

1. A Lecture room having Multimedia projector for lectures and students presentation.
2. Internet

2. Computing resources

1. There is computer lab available for practical algorithms using Matlab simulation .
2. Students are encouraged to bring in their laptops and use them in solving problems in the class room.

3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching

1. Course Survey and students Feedback for each learning outcome of the course.

2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department

1. Faculty meetings to discuss best practices and issues related to the course
2. Comparison of the course content with similar courses offered in others colleges

3. Updating course curriculum according to latest research done in the field.
3 Processes for Improvement of Teaching 1. Departmental Meetings 2. Faculty Trainings
4. Processes for Verifying Standards of Student Achievement (eg. 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)
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 1. Departmental Meetings