Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Digital Signal Processing (DSP)

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: **University of Baghdad**

Faculty/Institute: **Al–Khwarizmi College of Engineering**

Scientific Department: **Mechatronics Engineering Department**

Academic or Professional Program Name: **B. SC.**

Final Certificate Name: ……

Academic System: **Quarterly**

Description Preparation Date: **April 5, 2024**

File Completion Date: **April 5, 2024**

Signature:

Head of Department Name:

Date:

Signature:

Scientific Associate Name:

Date:

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Approval of the Dean

1. Program Vision

This program aims to develop an advanced understanding of digital signal processing. Topics include discrete time signals and systems; the discrete Fourier transform properties and fast algorithms; the z-transform; frequency response from z-plane; FIR and IIR filter design and structures for digital filters. The module also includes a specialist component in an applied or advanced signal processing application area.

2. Program Mission

Upon completion of this module students will be able to calculate responses (in various ways) of discrete-time systems to given signals; classify discrete-time systems according to their properties (eg. stability); derive frequency responses for given digital filters; design FIR and IIR filters for desired frequency and phase responses; be able to select best filter architecture for a specific implementation and use appropriate windows in spectrum estimation. They will also have basic familiarity with methods in selected areas where signal processing is applied.

3. Program Objectives

(1) To introduce digital signal processing techniques and applications, and
(2) To design and implement IIR and FIR digital filter.

4. Program Accreditation

N/A

5. Other external influences
N/A

6. Program Structure				
Program Structure	**Number of Courses**	**Credit hours**	**Percentage**	**Reviews***
Institution Requirements				
College Requirements				
Department Requirements				
Summer Training				
Other				

* This can include notes whether the course is basic or optional.

7. Program Description				
Year/Level	**Course Code**	**Course Name**	**Credit Hours**	
2023-2024 Third		**DSP**	**theoretical**	**practical**
			30	**30**

8. Expected learning outcomes of the program	
Knowledge	
Learning Outcomes 1	Information plus Understanding • Representation of discrete-time signals and systems, both in time and frequency domains.

	• Discrete-time Fourier transformers, Z-transforms, wavelet and other joint time-frequency transforms, and their applications. • How to convert between continuous-time and discrete-time domains. • Using digital signal processing for filtering applications.
Skills	
Learning Outcomes 2	Application of Knowledge • Be able to calculate responses (in various ways) of discrete-time systems to given signals. • Classify discrete-time systems according to their properties. • Convert between different but equivalent representations of linear time - variant systems. • Design and implement FIR filters for specific applications. • Develop an understanding and application of the design / synthesis procedure.
Ethics	
Learning Outcomes 3	The innovation of signal processing technology in both stationary and mobile communication networks influences societal values and raises ethical questions. This raises challenging questions in relation to the values of society and how we design technology (a) to promote positive values around

	ageing, (b) to enhance ageing experience, (c) to protect human rights, and (d) to ensure human benefit. To this end up, this program reviews the relevant ethical considerations in relation to signal processing engineering.

9. Teaching and Learning Strategies

Wide range of teaching methods that they deem the most appropriate for a particular course. These include:

- lectures where the students write information presented to them via slide show, overhead or written by the lecturer;
- lectures where the students have some printed notes/handouts and may annotate, or expand these during a spoken lecture;
- lecture material placed on web-pages or another e-learning environment;
- small group and large group tutorial sessions;
- question and answer sessions during lectures or staff office hours;
- active learning, where students should be active and involved in the learning process inside the classroom, will be emphasized in the delivery of this module; and
- different active learning methods/approaches such as: Engaged Learning, Project-Based Learning, Cooperative Learning, Problem-Based Learning, Structured Problem-Solving, will be used.
- The teaching method that will be used on this module will be composed of a series of mini lectures interrupted with frequent discussions and

brainstorming exercises. Power point presentations will be prepared for the course materials.

- The typical lecture would start with a short review (~ 5 minutes) using both power point presentations and the whiteboard. This review will also depend on discussions, which will gauge the students' digestion of the previous material. The lecture presentation will be paused every $15 - 20$ minutes with brainstorming questions and discussions that will allow the students to reflect and think in more depth about what they learned in that presentation. Then, some example problems will be presented and discussed with the students to illustrate the appropriate problem-solving skills that the students should learn. The lecture will be continued for another $15-20$ minutes, followed by examples and/or a quiz covering the materials taught in the previous two weeks.

10. Evaluation methods

- Mid-term exam,
- Quizzes,
- Assignments,
- Lab reports, and and
- Seminars.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Lecturer	Electrical Engineering	Computer Engineering			Yes	

Professional Development
Mentoring new faculty members
Professional development of faculty members

12. **Acceptance Criterion**

13. **The most important sources of information about the program**
• Digital Signal Processing by S. Salivahanan, Third Edition, 2015. • Digital Signal Processing System Analysis and Design by P. Diniz et al, Second Edition, 2010. • https://www.ece.uvic.ca/~aalbu/elec310_spring2010.htm

14. Program Development Plan
(1) Staying updated with the latest developments in DSP engineering field.

(2) Using modern technologies in teaching by providing new ways to engage students, individualize instruction, and improve educational outcomes.

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Third		DSP	Basic	x											

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:
Digital Signal Processing (DSP)
2. Course Code:
3. Semester / Year:
Second Semester 2024
4. Description Preparation Date:
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
Weekly 4 hours (Total 60 hours)/ 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Alaa Abdulameer Hasan Email: alaa@kecbu.uobaghdad.edu.iq
8. Course Objectives

Course Objectives	(1) To introduce digital signal processing techniques and applications, and (2) To design and implement IIR and FIR digital filter.

9. Teaching and Learning Strategies

Strategy	(1) Detailed explanation of the scientific material. (2) Students' participation in solving mathematical problems in the class t (3) Discussion and dialogue about vocabulary related to the topic.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method
1	2		Signals and Systems	
2	2		Signals and Systems	

3	2		Fourier Analysis	
4	2		Fourier Analysis	
5	2		Sampling	
6	2		The Z-Transform	
7	2		Transform Analysis of Systems	
8	2		Transform Analysis of Systems	
9	2		The DFT	
10	2		The FFT	
11	2		Implementation of Discrete-Time Systems	
12	2		Implementation of Discrete-Time Systems	
13	2		Filter Design	
14	2		Filter Design	
15	2		Filter Design	
16	2		Preparatory week before the final exam	

11. Course Evaluation

- Mid-term exam,
- Quizzes,

- Assignments,
- Lab reports, and
- Seminars.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	N/A
Main references (sources)	• Digital Signal Processing by S. Salivahanan, Third Edition, 2015. • Digital Signal Processing System Analysis and Design by P. Diniz et al, Second Edition, 2010.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://www.ece.uvic.ca/~aalbu/elec310_spring2010.htm