Program Name	**BSc in Electronics**	**Semester Sixth Semester**
Course Title	**Signals and Systems**	
Course Code:	**DSC-ELE61**	**No. of Credits 4**
Contact hours	**60 Hours**	**Duration of SEA/Exam 2 Hours**
Formative Assessment Marks 40		**Summative Assessment Marks 60**

Course Objectives:

- Gain the knowledge on Signals and Systems
- Understand the operations on Signals
- Know the frequency domain representation of signals
- Know the Laplace Transform and its properties

Course Outcomes:

- Distinguish between continuous-time and discrete-time signals and systems
- Do basic operations on signals
- Apply Laplace transform technique
- Find DTFS and IDTFS of the Signals

60 Hrs

Contents

15 Hrs

Unit 1

Introduction to continuous-time and discrete-time signals: Understanding signals and systems, some real-world examples of signals and systems. Mathematical and graphical representation of signals, Classification of signals: 1- and 2-D, continuous and discrete, periodic and non-periodic, symmetries (even-odd) etc., related problems to enhance understanding of different signal types, elementary signals – unit impulse, unit step, exponential and sinusoidal signals. Introduction to continuous-time and discrete-time systems, examples of systems, interconnections of systems, Properties of systems: Linear, Non-linear, time variance-invariance, causal-noncausal, memory- memoryless systems, feed-back in systems, stability, inverse systems.

15 Hrs

Unit 2

Operations on signals: amplitude scaling, shifting, folding, time scaling, addition of two signals etc., Time-domain representation of systems, Linear time-invariant systems, Convolution integral and convolution sum, impulse and step response of systems, differential equation representation of LTI systems, properties and stability of LTI systems, solving differential equations.

15 Hrs

Unit 3

Frequency domain representation of systems, magnitude and phase spectrum, Introduction to transforms, need for transforms. Laplace transforms, unilateral Laplace transforms, Properties, Inverse Laplace transforms, application of Laplace transforms for analysis of systems, solving differential equations, stability analysis of systems.

15 Hrs

Unit 4

Continuous-time Fourier series representation of periodic signals, convergence of Fourier series representation, properties of continuous-time Fourier series and problems Discrete-time Fourier Series properties of discrete-time Fourier series and problems IDFS.

Reference Books

1 Alan V Oppenheim, Alan s. Willsky and Hamid Nawab, "Signals and systems", Pearson edition Asia/PHI, 2nd Edition, 2002.
2 Simon Haykin and Barry Van Veen, "Signals & Systems," Wiley, 2nd Edition, 2021.
3 M J Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB,",
TMG, Vinay Ingle, and John G. Proakias, "Digital Image Processing using MATLAB,"

Program Name	**BSc in Electronics**	**Semester Sixth Semester**
Course Title	**Signals and Systems Practicals**	
Course Code	**DSC-ELE61P**	**No. of Credits 2**
Formative Assessment Marks 25		**Summative Assessment Marks 25**

Note: Minimum of 10 programmes to be written and executed.

Write and execute following program using MATLAB/OCTAVE/SCILAB, etc.

1. Generate and plot unit sample, unit step, ramp, real sequences
2. Generate and plot sinusoidal, cosinusoidal and periodic sequences
3. Generate even & odd components of a sequence
4. Perform amplitude scaling, time scaling, folding and time-shifting operations on signals
5. Perform Up sampling and down sampling operation on a given sequence
6. Perform addition, subtraction and multiplication operation on signals
7. Find the linear convolution of two finite duration sequences.
8. Find the cross-correlation of two finite duration sequences
9. Evaluate & plot auto-correlation of a sequence
10. Compute the DTFS of a sequence and plot the magnitude and phase response
11. Compute the IDTFS of a sequence
12. Verify the sampling theorem

Program Name	**BSc in Electronics**	**Semester Sixth Semester**
Course Title	**Internet of Things**	
Course Code:	**DSC-ELE63**	**No. of Credits 4**
Contact hours	**60 Hours**	**Duration of SEA/Exam 2 Hours**
Formative Assessment Marks 40		**Summative Assessment Marks 60**

Course Objectives:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.

Course Outcomes:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.

➢ Acquire practical skills in designing and implementing IoT applications.

➢ Develop an understanding of IoT security and privacy considerations.

60Hrs

Contents

15 Hrs

Unit 1

Definition and evolution of the Internet of Things. IoT architecture and components. IoT communication protocols: MQTT, CoAP, HTTP. IoT application domains and use cases.

15 Hrs

Unit 2

Overview of IoT devices: microcontrollers, sensors, actuators. Types and characteristics of sensors used in IoT applications. Interfacing sensors with microcontrollers. Data acquisition and sensor fusion techniques.

15 Hrs

Unit 3

Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee, LoRaWAN, etc. IoT network topologies: star, mesh, and hybrid networks. IoT data management and storage. IoT protocols for device-to-device and device-to-cloud communication.

15 Hrs

Unit 4

IoT application development platforms and frameworks. Design and implementation of IoT applications. IoT security challenges and solutions. Privacy and ethical considerations in IoT.

Reference Books

1 Internet of Things: Principles and Paradigms by Rajkumar Buyya, Amir Vahid Dastjerdi, and Anton Y. Dongarra.

2 Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by Maciej Kranz.

3 IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Robert Barton.

4 Internet of Things with Arduino Cookbook by Marco Schwartz

5 Arduino Home Automation Projects by Marco Schwartz and Oliver Manickum

Program Name	**BSc in Electronics**	**Semester Sixth Semester**
Course Title	**Mini Project**	
Course Code	**DSC-ELE6MP**	**No. of Credits 2**
Formative Assessment Marks 25		**Summative Assessment Marks 25**

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