SARVAJANIK UNIVERSITY
SarvajanikCollege of Engineering and Technology
Bachelor of Technology

B.Tech. – I Year Semester I

Subject Name: Signals and Systems **Subject Code: BTEL13183**

Type of course: **Professional Core Course**
Prerequisite: Basic knowledge of mathematics
Rationale: Automation in industries and domestic level has made engineers to understand about various systems and signals. The interfacing of the machines with the different controllers specifically needs to calculate and estimate the basics about the signals and systems. Every domain expects engineers to be fundamentally clear about the signals and systems. This subject clears mainly the classification of the signals and systems with their various time and frequency domain analysis for future applications.

Teaching and Examination Scheme:

				Theory Marks		Practical Marks		Total
L	T	P	C	TEE	CAT	TEP	CAP	
3	1	0	4	60	40	0	0	100

CAT: Continuous Assessment (assignments/projects/open book tests/closed book tests **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CAP:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction to Signals and Systems: Signals and systems everyday life, biomedical, instrumentation domestic and industries. Representations of Signals, Classifications of Signals – Continuous time, Discrete time, comparison among Analog, Digital and Discrete Signals, Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, and the complex exponential. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	10	**13%**
2.	Mathematical operations on Signals and Systems: Addition, subtraction, multiplication and division of the signals, parallel and series combinations of the systems, cascading of the systems, Impulse response characterization and convolution integral for CT- LTI system, signal responses to CTLTI system, properties of convolution, LTI system response properties from impulse response, Examples. Impulse response characterization and convolution sum, Causal signal response to DT-LTI	16	**27%**

	systems. Properties of convolution summation, Impulse response of DT-LTI system. DT-LTI system properties from Impulse response. System analysis from difference equation model, examples.		
3.	Fourier, Laplace and z-transforms: Representation of periodic functions, Fourier series, Frequency spectrum of aperiodic signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform and its properties. Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	16	**31%**
4.	Sampling & reconstruction: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	8	**13%**
5.	Applications based on IoT: Introduction of the Internet of Things, Types of sensors, Types of actuators, Introduction of Arduino Interfacing of the sensors and actuators with Arduino. Programming in Arduino. Signals storage and its analysis using Arduino, Design of a minor project based on Arduino.	10	**16%**

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**20**	**30**	**10**	**10**	**10**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students andteachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Signals andSystems	Alan V. Oppenheim, Alan S. Wilsky and Nawab,	Prentice Hall	1822	2nd

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2.	Signals and Systems	Anand Kumar	PHI	2011	3rd
3.	Signals and Systems	K. Gopalan	Cengage Learning	2008	Indian Edition
4.	Linear Systems and Signals	B.P.Lathi	Oxford University Press	2017	3rd
6.	Signal, Systems and Transforms	Charles L. Philips, J. M. Parr and E. A. Riskin	Pearson	2014	5th
7.	Internet of Things, Technologies, Applications, Challenges and Solutions	B. K. Tripathy & J. Anuradha	CRC Press	2017	1st
8.	Internet of Things: A Hands-On Approach	ArshdeepBagha. Vijay Madisetti	ArshdeepBagha. Vijay Madisetti	2014	1st

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO 1	Describe the type of system and signal in Industries and Domestic level for Interfacing.	15%
CO 2	Derive mathematical model of the systems and signals for the applications.	30%
CO 3	Analyze the response of system for the efficient usage of the systems.	35%
CO 4	Design of the system from the available input signals and expected output signals of the industrial model.	20%

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	3	3	3	2	-	2	1	2	1	1	2	3	2	1
CO-2	2	3	1	2	1	-	-	-	-	-	-	2	3	3	-
CO-3	2	2	3		3	3	-	-	2	-	-	2	3	3	1
CO-4	2	3	3	3	3	3	-	-	1	-	-	2	3	3	1

List of Open Source/learning website:

- http://www.scilab.org/
- http://www.gnu.org/software/octave/
- http://www.vlab.co.in
- http://www.arduino.cc
- A course on NPTEL "Signals and System"

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