18PEE22	DIGITAL SIGNAL PROCESSING FOR POWER ELECTRONICS	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To understand the need for filter, its design
2.	To learn selection of sensor and transducers to power applications and choice of conditioning
3.	To know different sampling techniques in AD converters
4.	To learn Digital filters and its design
5.	To understand and learn different parameter measurements

Unit I	INTRODUCTION TO DIGITAL SIGNAL PROCESSING	9	+	0

A/D Converters – Quantization Errors – Sampling – Sample and Hold Circuit – Sampling Theorem – Aliasing – Anti-Aliasing Filter and its Design - Total Harmonic Distortion

Unit II	INSTRUMENTATION AND CONTROL INTERFACES	9	+	0

Data Acquisition – Sensors and Transducers – Electronic Interface – Signal Conditioning Circuits – Circuits based on Operational Amplifier – Galvanic isolation

Unit III	ANALOG SIGNAL DISCRETIZATION	9	+	0

Sampling –Sequential – Simultaneous – Errors in Sampling – A/D Converters suitable for Power Electronics

Unit IV	SIGNAL FILTRATION AND SEPARATION	9	+	0

Derivative and Integral Value calculation - Digital Filters – Moving Average Filter - FIR – IIR – Design of filters - Implementation

Unit V	PARAMETER MEASUREMENTS	9	+	0

Algorithms – Measurement of Voltage and Current – Average – True RMS – Power – Average – Apparent – Power Factor – Reverse Power Flow – Energy – Fundamental Component identification – THD evaluation – Sequence Component identification

Total (L+T)=45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	*:*	*Understand errors in quantization and select appropriate anti-aliasing filter*
CO2	*:*	*Select and Design the suitable circuit for data acquisition*
CO3	*:*	*Select the correct AD converter and sampling technique*
CO4	*:*	*Choose and design appropriate software filter*
CO5	*:*	*Understand and implement measurement and processing for control application and develop, implement algorithms for parameter measurement*

Reference Books:

1.	Krzysztof Sozański, “Digital Signal Processing in Power Electronics ControlCircuits”, 2nd Edition, Springer, 2017
2.	Oppenheim, A.V., Schafer, R.W. and Buck, J.R., Discrete-Time Signals Processing, 2nd Edition, Prentice Hall, Englewood Cliffs, 1999.
3.	Arrillage, J., Smith, B.C., Watson, N.R. and Wood, A.R., Power System Harmonic Analysis, John Wiley & Sons, Inc., Hoboken
4.	Bhide S.R., “Digital Power System Protection”, Prentice Hall India, 2014
5.	Destro, R., Matakas, L., Komatsu, W. and Ama, N.R.N., “Implementation aspects of adaptive window moving average filter applied to PLLs—comparative study”, in Brazilian Power Electronics Conference (COBEP), Gramado, IEEE, pp. 730–736, 2013.

PO / CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1
CO1	*Understand errors in quantization and select appropriate anti-aliasing filter*	1	1	1	1	2						1
CO2	*Select and Design the suitable circuit for data acquisition*	1	1	1	1	1			1			1
CO3	*Select the correct AD converter and sampling technique*	1	1	2	2	1			1			1
CO4	*Choose and design appropriate software filter*	1	2	1	1	1			1			1
CO5	*Understand and implement measurement and processing for control application and develop, implement algorithms for parameter measurement*	1	1	1	1	1			1			1