NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ICE

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech		
Course Title	Signals and Systems		
Course Code	ICPC16	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	January 2020	Section (if, applicable)	B
Name of Faculty	Dr. D. Ezhilarasi	Department	ICE
Official Email	ezhil@nitt.edu	Telephone No.	9444878908
Name of Course Coordinator(s) (if, applicable)	NA		
Official E-mail	NA	Telephone No.	NA
Course Type (please tick appropriately)	✓ Core course	☐ Elective course	

Syllabus (approved in BoS)

Introduction to signals – Transformation of the independent variable – Basic continuous-time signals – Basic discrete-time signals – Step and Impulse functions – Sampling theorem. Introduction to systems – Properties of systems – Classification of systems – Mathematical model of systems – Concept of state variable – Normal form of system equations – Initial conditions.

Impulse response of physical systems – Stability analysis of dynamic systems – Introduction to convolution – Convolution integral – System impulse response and step response using Laplace transform – Numerical convolution. Z-transform – Convergence of Z-transform – Properties of Z-Transform – Inversion of Z-transform –Application of Z-transform in analysis of discrete-time systems – Evaluation of discrete-time system frequency response – Inverse systems – Deconvolution.

Representation of signals in terms of elementary signals – Condition of orthogonality – Representation of signals by elementary sinusoids – Fourier series representation of periodic signals – Power spectrum.

Fourier transform – System frequency response – Realizability of frequency response – Energy spectrum. Calculation of simple transforms. Discrete-Fourier transform (DFT) – Properties of Discrete Fourier Transform – Circular convolution

Classification of random signals – Auto-correlation function – Properties of auto-correlation function – Measurement of auto-correlation function – Application of auto-correlation functions. Cross correlation functions. Sum of random processes- Spectral density – Relation of spectral density to auto-correlation function

Auto-correlation function of system output - Cross-correlation between system input and output. White noise - Analysis of linear systems in time-domain using white noise - Mean and mean square

value of system output. Generation of pseudo random binary noise (PRBN) and its use in system identification - Analysis in the frequency domain.

Reference:

1. Oppenheim A.V., Wilsky and Nawab, Signals and Systems, Pearson India Education Services Private limited India, 2nd Edition, 2016.
2. Chen C.T., Systems and Signal Analysis - A Fresh Look, Oxford University Press India, 3rd Edition, 2004.
3. B.P. Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2009
4. S. Palani, Signals and Systems, Second Edition, Ane Books Pvt. Ltd, New Delhi (2016)

COURSE OBJECTIVES

1. To introduce the student to identify and represent the type of signals and systems.
2. To introduce the mathematical tools available to analyze the continuous time signals and systems.
3. To introduce the mathematical tools available to analyze the discrete time signals and systems
4. To introduce about the random phenomena in the real world, the mathematical models and pseudo-random signals in identifying systems

MAPPING OF COs with POs

Course Outcomes On completion of this course, the students will be able to	**Programme Outcomes (PO)** (Enter Numbers only)
1. Classify the signals and systems based on their properties and determine the response of LTI system using convolution	1, 4, 5
2. Analyze the spectral characteristics of continuous and discrete time signals and systems using Fourier transforms.	1, 4, 5
3. Apply Laplace and Z transform to analyze continuous and discrete time systems	1, 4, 5
4. understand the process of sampling and the effects of under sampling	1, 4, 5
5. Classify random signals using statistical concepts and characterize systems using pseudo-random signals	1, 4, 5

COURSE PLAN – PART II

COURSE OVERVIEW

A course on "signals and systems" serves as the prerequisite for additional coursework in the study of signal processing, control and communication. The principles, computing tools and concepts from signals and systems, such as sampling, fourier, laplace and Z transform are an important component of almost every engineering field.

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week/3 Hours	Signal types, transformation, properties	Chalk & Talk

2	2nd week/3 Hours	System classification and properties	Chalk & Talk
3	3rd week/3 Hours	State Variable, impulse response, stability analysis	Chalk & Talk
4	4th & 5thweek/6 Hours	Fourier Series	Chalk & Talk
5	6th &7th week/6 Hours	Fourier Transform	Chalk & Talk
6	8th week/3 Hours	Laplace Transform	Chalk & Talk
7	9th week/3 Hours	Sampling and Z Transform	Chalk & Talk
8	10th & 11th week/6 Hours	Random signal processing	Chalk & Talk
9	12th week/3 Hours	White noise, PRBN and its application in linear system analysis and system identification	Chalk & Talk

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment 1	2nd week of Feb/14.02.20	1 ½ Hour	20
2	Assessment 2	1st week of April 2020	1 ½ Hour	20
3	Assignment			10
CPA	Compensation Assessment*	Second week of April 2020	1 ½ Hour	20
5	Final Assessment *	Last week of April 2020	3 Hours	50

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Written feedback from students
Students' performance in tests

COURSE POLICY (including compensation assessment to be specified)

COMPENSATION ASSESSMENT : Compensation assessment will be conducted for students who miss Assessment 1 or Assessment 2. Students should get permission from the faculty by giving valid reason in written form to write compensation assessment.

REASSESSMENT:

- Refer to B. Tech Regulations B.10.1 and B.12

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty 5/2/20 **CC- Chairperson** 6/2/2020 **HOD** 10/2/2020