# NOC:Networks and Systems(Course sponsored by Aricent) - Video course

## COURSE OUTLINE

Networks, signals and systems form the basic foundations of electrical engineering. Any electrical engineering product handles signals using electrical networks and circuits, which are called systems. Having a good understanding of signals and their time/frequency domain characterization is an absolute must for any electrical engineer. This course is a basic introduction to discrete and continuous-time signals, Fourier series, Fourier transforms and Laplace transforms.

## COURSE DETAIL

| Week. No | Topics |
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| 1. | Signals, Systems, Networks<br>1. Introduction to Systems, Signals, Networks<br>2. Representation and classification of systems<br>3. Linear systems, time-invariance and causality<br>4. Elementary signals: DC, sinusoidal, exponential, unit step, unit ramp, unit impulse or delta function<br>5. Complex frequencies of signals<br>6. Basic discrete-time signals<br>7. Characterization of a linear system<br>8. Impulse response<br>9. Convolution, Evaluation of convolution |
| 2. | Fourier series<br>1. Evaluating Fourier series coefficients<br>2. Symmetry conditions<br>3. Application to network analysis<br>4. Exponential Fourier series |

NPTEL

http://nptel.ac.in

Electronics & Communication Engineering

**Pre-requisites:**

1. Basic electrical circuits
2. Calculus

**Coordinators:**

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| | 5. Frequency spectrum<br>6. Use of impulses in evaluating Fourier series coefficients<br>7. Power and related ideas<br>8. Convergence of Fourier series<br>9. Properties of Fourier series | |
| 3. | Continuous-time Fourier transform<br><br>1. From Fourier series to Fourier transform<br>2. Fourier transform: definition and examples<br>3. Properties of Fourier transform<br>4. Energy considerations<br>5. Continuous-time Fourier transform of signals that are not absolutely integrable<br>6. Continuous-time Fourier trasnform of periodic signals<br>7. Continuous-time Fourier transform of unit step function and signum function<br>8. Continuous-time Fourier transform of truncated sinusoid<br>9. Convolution property of Fourier transform<br>10. Application of continuous-time Fourier transform to system analysis | |
| 4. | Laplace transforms<br><br>1. Introduction and definition<br>2. Laplace transforms of important functions: unit impulse, unit step, poles/zeros, notation<br>3. Properties: Linearity, differentiation in the time domain<br>4. Application of Laplace transform methods to circuit elements<br>5. Properties of Laplace transforms: Multiplication by `t', integration, application to circuit elements, shift in `s' domain, shift in time domain, scaling, division by `t', initial value theorem, final value theorem, convolution in time domain<br>6. Laplace transform of periodic functions<br>7. Inverse Laplace transformation<br>8. Partial fraction expansion: simple poles, multiple poles<br>9. Inverse Laplace transform by contour integration<br>10. Relationship between Laplace and Fourier transforms | |

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| 5. | Applications of Laplace transform<br><br>1. Applications of Laplace transform to network transients<br>2. Circuit analysis: Resistor, Mutual inductance<br>3. Example of Laplace transform method: Circuit with sinusoidal input, discontinuous current, discontinuous source<br>4. Advantages of Laplace transform approach<br>5. Application of Laplace transform method to a general LTI system<br>6. The many facets of the system function H(s)<br>7. Frequency response and stability<br>8. System analysis example: find impulse response, system function, response to exponential input, steady-state response to a sinusoid |