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| **Course Title** | Electrical Network Analysis | **Course Code** | EE2004 |
| **Department** | Department of Electrical Engineering (DEE) | **Campus** | Lahore |
| **Knowledge Profile** | Engineering Fundamentals (WK3) | **Credit Hrs.** | 3 + 1 |
| **Knowledge Area** | Electrical Engineering Fundamental (KA06) | **Grading Scheme** | Relative |
| **HEC Knowledge Area** | Engineering Foundation | **Applicable From** | Fall 2023 |
| **SDG** | 4 | Quality Education | **PBL** | 1 |
| **Pre-requisite(s)** | EL1001, EE1001 | | |

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| **Course Objective** | The objective of this course is to apply linear circuit analysis tools to solve AC circuits using phasor-domain and Laplace transform analysis techniques. |

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| **No.** | **Assigned Program Learning Outcome (PLO)** |
| 1 | An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems |
| 2 | An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. |
| **I = Introduction, R = Reinforcement, E = Evaluation, A = Assignment, Q = Quiz, M = Midterm, F=Final, L = Lab, P = Project, W = Written Report.** | |

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| **No.** | **Course Learning Outcome (CLO) Statements** | **Assessment Tools** | **Taxonomy Levels** | **PLO** |
| 1 | Apply phasor-domain analysis to solve circuits containing R, L, C, and mutual inductance | A1, Q1, M1, F | C3 | 1 |
| 2 | Construct power triangle to compute power in AC circuits. | A2, Q2, M2, F | C3 | 2 |
| 3 | Analyze balanced three-phase circuits. | Q3, M2, F | C4 | 1 |
| 4 | Apply Laplace transform to analyze RLC circuits. | A3, F | C3 | 2 |
| 5 | Analyze various types of filters using s-domain analytics. | Q4, F | C4 | 2 |

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| **Text Book(s)** | **Title** | Electric Circuits, 10th Edition |
| **Author** | James W. Nilsson and Susan A. Riedel |
| **Publisher** | Prentice Hall |
| **Ref. Book(s)** | **Title** | Basic Engineering Circuit Analysis, 11th Edition |
| **Author** | J. David Irwin, R. Mark Nelms |
| **Publisher** |  |

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| **Week** | **Course Contents/Topics** | **Chapter\*** | **CLO** |
| 1 | Introduction to course, The Sinusoidal Source and Response | 9 | 1 |
| 2 | Phasor, Passive Elements in Frequency Domain | 9 | 1 |
| 3 | Kirchhoff’s Laws in Frequency domain, Series-parallel simplifications, Node and Mesh Analysis in frequency domain | 9 | 1 |
| 4 | Source Transformation and Thevenin Equivalent in frequency domain, Phasor Diagrams | 9 | 1 |
| 5 | Mutual Inductance, Transformers | 6.4, 9 | 1 |
| 6 | Instantaneous, Average, and Reactive Powers, RMS value, Complex Power | 10 | 2 |
| 7 | Power calculations, Maximum power transfer | 10 | 2 |
| 8 | Maximum power transfer with restrictions, Introduction to balanced 3-phase circuits | 10, 11 | 2, 3 |
| 9 | Analysis of Y-Y circuit, Analysis of Y-Δ circuit, Power in 3-phase circuits | 11 | 3 |
| 10 | Power in 3-phase circuits, Laplace Transform definition, Step Function, Impulse Function | 11, 12 | 3, 4 |
| 11 | Functional and Operational Transforms, Inverse Transforms | 12 | 4 |
| 12 | Inverse Transforms, Initial and Final-Value Theorems, Circuit Analysis in s-domain | 12, 13 | 4 |
| 13 | Application of Laplace Transform to determine the natural and transient response, The Transfer Function | 13 | 4 |
| 14 | Filters basics, Low-pass and High pass filters | 14 | 5 |
| 15 | Band-pass and Band-reject filters | 14 | 5 |
| **\*Reference book chapters are given in brackets** | | | |

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| **Assessment Tools** | **Weightage** |
| **Quizzes, Assignments** | 20.0% |
| **Midterm (I+II)** | 30.0% |
| **Final Exam** | 50.0% |