

Department of Electronics Engineering

Indian School of Mines Dhanbad

Lecture Plan of ECC-13103 (Network Theory and Filter Design) III Semester, B. Tech (ECE), Monsoon Semester (2016-17)

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| S. No. | Topics | No. of Lectures |
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| 1 | Basic Circuit Concepts: Electrical energy flow through the conductor and Basic Ohm's Law, Passive Lumped R, L, Cs and Ohm's Law, Types of Element, Sources, Kirchhoff's Laws, Nodal and Mesh Analysis, Source Transformation, Star-Delta and Delta-Star Transformation, Power Calculations, Application of Network Theory with OPAMP. | 8 |
| 2 | Circuit Theorems: Super Position Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Substitution Theorem, Millman's Theorem, Duality Principle and Tellegen's Theorem. | 8 |
| 3 | Graph Theory: Graphs of linear circuit, Tress and Co-trees, Loops, Cut-set and Tie set matrix, Matrix representation of graphs, Network response equation using incident matrix, Interrelation among Various Matrix. | 8 |
| 4 | Transient/Time Domain and AC Circuit Analysis: Application of Laplace Transform to Electric Networks, Steady State AC Circuits, Transient Analysis and Classification, DC Transients and Source-Free Circuits, Intial and Final conditions, Laplace Transforms for solving transient problems, Concept of resonanace, Phasor Representation and circuit analysis, AC transients. Coupled Circuits and Network with Mutual Inductance, Elements of Network Synthesis, State Equations for Networks. | 10 |
| 5 | Two Port Networks: Short Circuit Admittances (Y), Open Circuit Impedances (Z), Transmisson (ABCD) parameters, Inverse Transmission Parameter, Hybrid Parameters (h), and Interrelation between Parameters, Inter-connection of Two port network. | 6 |
| 6 | Filters: Classical Filters: Introduction, Classification of Filters, Characteristic Impedance, m-Derived Filters. Modern Filter Theory: Introduction, Filter Specifications, Butterworth Approximation, Chebychev Approximations, Comparison between Butterworth and Chebychev Approximations. Filter Design by Co-efficient Matching: Second Order Low Pass, High Pass and Band-pass Filters. | 6 |
| Total | | 46 |

Text Books

1. M. E. Van Valkenburg, 'Network Analysis', *Third Edition*, PHI Pvt. Ltd. New Delhi, India.

Reference Books

2. V. K. Aatre, 'Network Theory and Filter Designs', *Third Edition*, New Age International Publishers, New Delhi, India.
3. D. R. Choudhury, 'Networks and Systems', *Second Edition*, New Age International Publishers, New Delhi, India.
4. A. Chakrabarti, 'Circuit Theory Analysis and Synthesis' Dhanpat Rai Publications.
5. C. K. Alexander and M. N. O. Sadiku, 'Fundamentals of Electric Circuits', TMH New delhi, India.
6. M. S. Sukhija and T. K. Nagsarkar, 'Circuit and Networks', Oxford University Press, New Delhi, India.

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