Signal Integrity Course Syllabus

1. Frequency and time domain signals: *Application to high-speed communication (224G/448G)*
    a. Continuous Fourier transform
    b. FFT as computational tool
    c. Important parameters and their effects on conversion (implications on high-speed)
        i. Max frequency
        ii. Resolution frequency
        iii. Missing DC point
    d. Duality of time and frequency domains uncertainty
    e. Frequency domain importance in high-speed comm: LTI, filters, equalizers
    f. Power Parseval's theorem
    g. Random signals (PSD and autocorrelation)
    h. NRZ, PAM4 (freq and time representation)
2. Network parameters and application to broadband applications
    a. Common parameters (Z, Y, ABCD, S)
    b. 2-port network
    c. Response (freq and time, MIMO)
    d. Physical meaning of S-parameters and Z0
    e. Fundamentals of transmission line theory
    f. S-parameters in time domain
    g. Cascade of S-parameters
    h. Principles of de-embedding
    i. TDR and impulse response
    j. Mixed mode vs single ended
3. Fundamentals of EM and applications to package and pcb
    a. EM
    b. Material electrical properties Dk& conductivity …wide band, roughness, temperature
    c. Numerical solvers (freq and time)
    d. Eigen value problem →wave equation "application to interconnect"
4. Use of EM solver in PKG/PCB modeling
    a. Practical considerations
    b. Mesh, convergence
    c. What do we look for?
    d. Application to 3D packaging
5. Freq/time domain applications for high speed measurements
    a. Calibration
    b. Main parameters
    c. Post processing measurements
6. Introduction to system sims
    a. Modelling TX and RX
    b. Modelling interconnects
    c. Adding passives
    d. Post processing (pulse response , eye,…)
    e. Demo
    f. IBIS-AMI