

Course Content for New Post Graduate Courses of Department of EEE, BUET

Faculty of EEE Meeting No 01/2026, Date: 27.04.2026

EEE 6513: Integrated Photonics

Division: EP, 3.0 Credit Hour

Introduction to Integrated Photonic Platforms and Material Systems: Silicon-on-insulator (SOI), Silicon Nitride (SiN), III-V Semiconductor, Indium Phosphide (InP), Thin-film Lithium Niobate (TFLN), heterogeneous and hybrid integration platforms; Photonic Design Workflow; Photonic interconnects: optical modes, modal confinement and dispersion engineering, bend loss and interconnect routing constraints; Optical Interfaces: edge coupling, grating coupling; Couplers and Interferometers: Y-branch, directional coupler, Mach-Zehnder interferometers, multimode interferometers; Photonic resonators: Q factor, free spectral range (FSR), coupling regimes; Photonic circuit modelling: S-parameters, compact models; Modulators: Mach-Zehnder Modulators, Ring modulators; Integrated photodetectors and Lasers: Ge PIN, detectors, heterogeneous/hybrid lasers; Co-packaged Optics and Advanced Integration Architectures: photonic-electronic integration, chiplet-based architectures; Manufacturability of photonic devices: yield and variability analysis; Recent Advances and Applications of Integrated Photonic Devices: Optical Transceiver, Biosensing, Photonic Computing, etc.

EEE 6618: Fourier Optics and Computational Imaging

Division: CSP, 3.0 Credit Hour

Two-dimensional signals and systems: Fourier analysis, sampling theory, space-bandwidth product; Scalar diffraction theory: Green's function, Kirchhoff/Rayleigh-Sommerfeld formulations, angular spectrum, Fresnel/Fraunhofer approximations, transport of intensity; Optical system analysis: Fourier-transforming property of thin lens, image formation, 4-f systems, wavefront modulation, spatial filtering (dark-field, phase contrast, VanderLugt filter); Coherence and interference: spatial/temporal coherence, van Cittert-Zernike theorem; Frequency analysis of imaging systems: amplitude, modulation and optical transfer functions; Image reconstruction: inverse/Wiener filtering, deconvolution; Applications: holography, PSF engineering, computational imaging (coded aperture, structured illumination, synthetic aperture, correlation imaging, QPI, super-resolution, compressive imaging), advanced imaging (3D, light-field, hyperspectral, extended depth-of-field, HDR); Modern paradigms: learned reconstruction, hardware-software co-design, physics-informed neural networks.

EEE 6619: Optimization Theory and Applications

Division: CSP and Interdisciplinary, 3.0 Credit Hour

Optimization fundamentals, convex sets and functions, convex analysis, linear, quadratic, semidefinite and geometric programming, least-squares and regularized approximation methods, optimality conditions, Karush-Kuhn-Tucker (KKT) conditions and duality theory, unconstrained and constrained optimization, first-order methods, second-order methods, interior-point methods, non-convex optimization methods, decomposition methods, applications in electrical engineering, including signal processing, communications, control systems, scientific machine learning, artificial intelligence, and engineering design.