

DHAKA UNIVERSITY OF ENGINEERING & TECHNOLOGY, GAZIPUR
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Proposed Postgraduate Courses

Course No.	Course Title	Credit
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Compulsory Course

EEE	6000	Thesis	18
EEE	6001	Project	6

Optional Courses

EEE	6002	Selected topics of EEE	3
EEE	6003	Engineering Analysis	3

EEE	6101	Energy Conversion	3
EEE	6102	Physical System Modeling	3

EEE	6201	Linear System Analysis	3
EEE	6202	Network Synthesis	3
EEE	6203	Neural Networks	3

EEE	6301	Optimization of Power System Operation	3
EEE	6302	Computer aided Power System Design	3
EEE	6303	Protective Relays	3
EEE	6304	Power System Stability	3
EEE	6305	Transients in Power System	3
EEE	6306	Reliability of Power System	3
EEE	6307	Power System Planning	3
EEE	6308	Power System Control	3
EEE	6309	Advanced High Voltage Engineering	3

EEE	6401	Statistical Communication Theory	3
EEE	6402	Telephone Traffic & Switching Engineering	3
EEE	6403	Information & Coding Theory	3
EEE	6404	Digital Signal Processing	3
EEE	6405	Optical Fiber Communication	3

EEE	6501	Modern Control Theory	3
EEE	6502	Optimal Control Systems	3
EEE	6503	Nonlinear Control System	3
EEE	6504	Digital Control Theory	3
EEE	6505	Intelligent Control Systems	3

EEE	6601	Generalized Machine Theory	3
EEE	6602	Special Machines	3
EEE	6603	Power Semiconductor Circuits	3
EEE	6604	Design of Power Electronic Circuits	3
EEE	6605	Active Circuit Design	3
EEE	6606	Advanced Digital Circuit Design	3
EEE	6607	Biomedical Electronics	3
EEE	6608	Electrical Drives	3
EEE	6609	Digital Integrated Circuit Design	3

Course No.		Subject Title	Credit
EEE	6701	Electric & Magnetic Properties of Materials	3
EEE	6702	Electronics of Solids	3
EEE	6703	Quantum Electronics	3
EEE	6704	Gaseous Electronics	3
EEE	6705	MOS Devices	3
EEE	6706	Optoelectronic Devices	3
EEE	6707	Solar Cell Operation & Technology	3
EEE	6801	Applied EM Theory	3
EEE	6802	Microwave Theory & Techniques	3
EEE	6803	Microwave Devices & Circuits	3
EEE	6804	Wave Theory	3
EEE	6805	Antennas and Propagation for Wireless Communication	3
EEE	6901	Microcomputers & Microcontrollers	3
EEE	6902	Data Communication & Computer Networks	3
EEE	6903	Advanced Database Systems	3
EEE	6904	Data Structure & Algorithm	3
EEE	6905	Systems Analysis and Design	3
EEE	6906	Knowledge Engineering and Expert System	3

EEE 6203 Neural Networks 3 Credits

Biological nervous system: the brain and the neurons. Artificial neural networks. Historical backgrounds. Hebbian associator. Preceptrions. learning rule, illustration, proof, failing. Adaptive Linear (ADALINE) and Multiple Adaptive Linear (MADALINE) networks. Multilayer preceptrons: generating internal representation. Backpropagation, cascade correlation and counter-propagation networks. Higher order and bidirectional association memory. Hopfield networks: Lyapunov energy function, attraction basin. Probabilistic updates: simulated annealing, Boltzman machine. Adaptive Resonance Theory (ART) network. ART1 ART2, Fuzzy ART mapping (ARTMAP) networks. Kohonen's feature map, Learning Vector Quantization (LVQ) networks, Applications of neural nets.

EEE 6301 Optimization of Power System Operation 3 Credits

General principles of optimization, its application to power system planning, design and operation. Probability analysis for bulk power security and outage data. Economic operation of power system, economic operation of thermal plants, combined thermal and hydro-electric plants. Theory of economic operation of interconnected Areas. Development and application of transmission loss formulae for economic operation of power systems. Methods of optimum scheduling and despatch of generator.

EEE 6302 Computer aided Power System Design 3 Credits

General review of network and matrix theory. Algorithms for formation of network matrix. Three-phase networks fluxlinkage Calculations. Line parameter calculations, Short Circuit Calculations load flow studies, system stability studies, prediction of reliability, over voltage and relay co-ordinations.

EEE 6303 Protective Relays 3 Credits

Relay design and constructions; Main characteristics of protective relays. Over current, directional, differential, distance and pilot relays. Static relays, Comparators. Error introduced by C. T's & P. T's on relays operation. Linear computers.

EEE 6304 Power System Stability 3 Credits

The stability problems of power system. Distinction between steady state and transient stability. The swing equation and its solution. Solution of networks for stability studies. Transient stability limits criteria; Two machine and multi-machine problems. Stability under different types of faults. Typical stability studies and methods of improving stability.

EEE 6305 Transients in Power System 3 Credits

Transients in simple electric and magnetically linked circuits; Fundamentals; Impacts of switching on rotating machinery. Parallel operation of interconnected networks; Distribution of power impacts. Interaction of Governor's in power systems; Over voltages during power system faults. Systems voltage recovery characteristics. Effect of arc restricting on recovery voltage switching surges and over voltage arrested requirements. Over voltage caused by sudden loss of load and by open conductor.

EEE 6306 Reliability of Power System 3 Credits

Review of Basic probability theory. Basic reliability concepts. Markovian model of generation unit. Development of load models. Probabilistic simulation of generating systems. Reliability indices; Recursive, segmentation and cummulant method to obtain loss of load probability (LOLP). Modelling of forecast uncertainty. Reliability evaluation of energy limited systems. Different techniques of evaluating reliability, reliability indices of interconnected systems. Composite transmission and generating system reliability.

EEE 6307 Power System Planning 3 Credits

Basic objectives of power systems planning; Generation expansion planning process. Electrical demand forecasting; Current demand forecasting approaches. Generating planning economic analysis, expected energy generation, expected fuel cost, Booth-Baleriux, cummulant and segmentation methods. Probabilistic simulation of hydro and energy limited units. Expected energy production cost of interconnected systems. Economic aspects of interconnection. Different aspects of Load Management; effects of Load Management of reliability and on production cost. Joint ownership of generation.

EEE 6308 Power System Controlling 3 Credits

Introduction to power system monitoring and control: Voltage, power and frequency control. Principles of small-scale and large-scale power system control; applications of network decomposition and sparsity. Modern control schemes: closed loop generation control, load frequency control and security control. Centralized and decentralized computer control of power system: functional geographical and voltage level hierarchy. Analysis of various on-line functions; network topology, state estimation short term load forecasting, unit commitment, active and reactive power control. Applications of pattern recognition and artificial intelligence in power system restoration, voltage prediction and contingency analysis.

EEE 6309 Advanced High Voltage Engineering 3 Credits

Generation and conversion of AC and DC high voltage and their applications and comparison of AC and DC high voltage transmission.
General aspects of DC transmission; Converter circuits and their analysis; DC link controls; Faults and abnormal operation protection; Harmonics and filters; DC lines and cables; Stability aspects of synchronous and asynchronous links.
Impulse wave shapes, Mathematical analysis and design consideration of impulse generators.

EEE 6401 Statistical Communication Theory 3 Credits

Periodic and random signals; Stability random processes; Elements of probability theory, statistical characteristics of messages and noise; Autocorrelation; Cross-correlation and spectral analysis. Determination of correlation functions and separation of signals from noise. Application of correlation techniques. Synthesis of optimum linear systems. Correlator receiver, Matched filter receiver.

EEE 6402 Telephone Traffic & Switching Engineering 3 Credits

Introduction. Types of switching systems: Space Division Switching, Time Division Switching. Network traffic nature and parameters. Grade of service and Blocking probability. Modelling Switching Systems. Blocking Models and Loss estimate. Nonblocking networks. Traffic measurement, prediction and planning. Traffic simulation.

EEE 6403 Information & Coding Theory 3 Credits

Fundamentals of probability theory with a brief review of the methods for the representation and analysis of linear system. Definition of a measure of information. Discrete noiseless and noisy systems; Channel capacity. Elements of encoding and decoding. Coding for the continuous case and the discrete case.

EEE 6405 Optical Fiber Communication 3 Credits

Optical fibre: modes of propagation, transmission characteristics, waveguide analysis. Optical sources: light emitting diode (LED) and semiconductor laser diode (SLD); operational principles, characteristic curves; optical transmitter design using LED/SLD. Optical amplifiers: laser and fibre amplifiers. Photo detectors: P-i-N and avalanche photo detectors (APDs), noise sources.

Optional modulation and detection schemes. Direct and coherent detection receivers: configuration, operation, noise sources, sensitivity calculation, performance curves. Design of analog and digital receivers.

Transmission link analysis: point-to point and point-to multi-point links, system configuration, link power budget, rise time budget, line coding schemes, transmission system limitations, design of fibre-optic systems. Optical data buses, optical networks, fibre distributed data interface (FDDI) and synchronous optical network (SONET). Optional frequency division multiplexing (OFDM) and wavelength division multiplexing (WDM) transmission systems.

EEE 6404 Digital Signal Processing 3 Credits

Introduction discrete time systems, Z-transforms, Flow graphs and matrix representation of signal network wave digital filters, Discrete Fourier transform, Fast Fourier transform, Digital filter design; Hardware implementation of digital filters.

EEE 6501 Modern Control Theory 3 Credits

General Introduction; State space concept; System design by state Transition methods, concept of controllability and observability. Optimum control variational calculus method; Principles of maximum and dynamic programming; Stochastic and adaptive control processes. On-line computer control.

EEE 6502 Optimal Control Systems 3 Credits

The optimal control problem. Cost functional's. Use of calculus of variations in optimal control. Optimization by Pontrygin's maximum principle and dynamic programming applications. Linear regulator problems. Computational methods of solving two-point boundary value problems.

EEE 6503 Nonlinear Control System 3 Credits

General introduction; The phase plane; method of isoclines; Lienard's method; Pelts methods; Common non-linearities; Transient response from phase trajectory; Describing function and their application; Relay servo mechanism, Liapunov's method.

EEE 6504 Digital Control Theory 3 Credits

Basic review of linear dynamic system analysis: linear difference equation, discrete transfer function, signal analysis on dynamic response, properties of Z-transform, implementation of difference equation in microprocessor for real time application. System characteristics; State-space model; System representation and basic tools for analysis; State estimation; Linear regulation problem.

EEE 6505 Intelligent Control Systems 3 Credits

Introduction to intelligent and interactive systems; analysis and design of control systems. Applications of intelligent systems including neural networks, fuzzy logic, and evolutionary computation. Human-computer interaction, intelligent multimedia and intelligent tutoring systems. Mathematical concepts of control systems including robust and optimal control; implementation of the intelligent controller combining hardware and software. Specific applications of intelligent control in spacecraft, robots, and other systems in electrical and electronic engineering.

EEE 6601 Generalized Machine Theory 3 Credits

Introduction to generalized machine theory. Kron's primitive machine; Moving to fixed-axis transformation; Parke's transformation; Three-phase to d-q transformation; Variable co-efficiency transformation, other transformation; Matrix and tensor analysis of machine, Three-phase synchronous and induction motor. Smooth-motor two-phase doubly excited / machine; smooth airgap two-phase synchronous machine. Two-phase induction machine. The n-m winding symmetrical machine; Diagonalization by a change of variable; symmetrical three-phase machine and special limiting cases.

EEE 6602 Special Machines 3 Credits

Courses will be broadly on current research topics on electrical machines and devices. The following areas will be covered; Permanent magnet machines, hysteresis machine, eddy current torque devices; Homopolar machines PAM motors and reluctance machines.

EEE 6603 Power Semiconductor Circuits 3 Credits

Review of power semiconductor devices thyristors, triacs, power transistor, GTOs, etc. Circuit, operating principles and analysis of single and three phase ac voltage controllers, rectifiers, inverters and cycloconverters. DC to DC converter (choppers). Application of converters to motor drives.

EEE 6604 Design of Power Electronic Circuits 3 Credits

Characteristics and limitations of power semiconductor as switching devices. Effects of reverse recovery time, stray and series inductances on the commutation circuits. Design of power filter, heat sinks, fuse ratings, snubber and protection circuits. Design of firing and control circuits for different converter configurations. Microprocessor based firing control circuits.

EEE 6605 Active Circuit Design 3 Credits

Multi-stage; low pass and feedback amplifiers; High frequency band-pass amplifiers; Coupling and matching networks.

EEE 6606 Advanced Digital Circuit Design 3 Credits

Combinational circuit design using K-map, multiplexers and EPROMs. Introduction to sequential circuits. Concepts of state construction of state diagrams. Event driven circuits using RS latch, multiplexers and EPROMs. Clock driven circuits using JK flip-flops, counters and EPROMs. Microprogramming and use of AMD 2909 microsequencer in sequential circuits. Fault detection in combinatorial and sequential circuits. Reliable design theory and techniques.

EEE 6607 Biomedical Electronics 3 Credits

Bioelectric signals; Instrumentation for biology and medicine; Diagnostic and therapeutic electromedical equipment; Biological control systems; Simulation of biological systems; System approach to biomedicine. Use of computers in biomedical problems. Patient monitoring and hospital health care systems.

EEE 6608 Electrical Drives 3 Credits

Introduction to electrical drives; Dynamics of electrical drives, Control of electrical drives; Motor power rating; D.C. motor drives; Introduction to motor drives; Synchronous motor drives; Brushless d.c. motor drives; Stepper motor drives; Solar & Battery powered drives; Traction drives.

EEE 6609 Digital Integrated Circuit Design 3 Credits

Integrated circuits trends, Digital integrated circuits implementation methodologies, MOS devices theory, CMOS fabrication, Inverters and combinational circuits, Sequential circuits, Clocking and timing issues, Interconnect issues, Arithmetic and data path circuits, Memories and array circuits, Low power design, Packaging, power and I/O issues, Testing and design for testability, Design methodologies and tools, Full-custom IC design project.

EEE 6701 Electric & Magnetic Properties of Materials 3 Credits

Crystal structure; Dielectric of materials; Magnetic properties of materials; conduction in materials and semiconductors. Gaseous discharges and properties of plasma.

EEE 6702 Electronic of Solids 3 Credits

Crystallography; Energy bands and phonon transport theory of solids with emphasis on semiconductors; Superconductivity. Solid state devices, solid state diodes and triodes; Solid state microwave devices; integrated electronic circuits.

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EEE 6703 Quantum Electronics**3 Credits**

Topics in quantum theory important for measure and other quantum-electronic devices. Interaction of radiation and discrete energy level systems. Stimulated transitions rate equations; Generalized block equations; Micro wave solid state masers; Optical masers. Noise and fluctuation phenomena in masers and other amplifiers. Introduction to the quantized electromagnetic fields. Interaction of matter with quantized radiation field. Quantum statistics and description of noise; Non-linear quantum effects.

EEE 6704 Gaseous Electronics**3 Credits**

Introduction; Motion of gas particles. Excitation and ionization of gases; Mobility, Diffusion, Recombination; Basic process of spark breakdown in gases, Breakdown characteristics in gases; Corona discharge, Glow discharge. Arc discharge, High frequency discharge and Trigger discharge. Electrical breakdown in vacuum; Triggered vacuum gap switches.

EEE 6705 MOS Devices**3 Credits**

The two terminal MOS structure: flat-band voltage, inversion, properties of the regions of inversion and small-signal capacitance. The four terminal MOS structure: charge-sheet model, strong inversion, moderate inversion and weak inversion. Threshold voltage-effects of ion implantation, short channel and narrow width. The MOS transistor in dynamic operation, small signal model for low, medium and high frequencies. Charge coupled devices (CCD)

EEE 6706 Optoelectronic Devices**3 Credits**

Excess carriers in semiconductors, carrier lifetime, diffusion of carriers. Optical process in semiconductors: radiative and non-radiative recombination, optical absorption, luminescence. Light Emitting Diodes (LEDs): Visible and infrared LED, principle, material, construction. Photodetectors: photoconductor, junction photodiode, P-I-N photodiode, avalanche photodiode, phototransistor. Solar cell: silicon solar cell, thin film solar cell, heterostructure solar cell. Introduction to semiconductor lasers.

EEE 6707 Solar Cell Operation and Technology**3 Credits**

Solar photovoltaic basic, sunlight, semiconductor material for solar photovoltaic, electron-hole pair generation, recombination and the basic equation of device physics, carrier injections in photovoltaic p-n junction, dark characteristic, illuminated characteristic, solar cell output parameters, solar cell efficiency limits, losses and measurement, standard silicon solar cell technology, improved silicon cell technology, design of silicon solar cells, MIS solar cells, photo-electrochemical cells.

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EEE 6801 Applied EM Theory 3 Credits

Generalized approach to field theory: Introduction to reaction concept; Wave propagation through isotropic, anisotropic and gyrotropic media. Scattering of EM waves. Microwave antennas theory and design. Advanced topics in EM theory

EEE 6802 Microwave Theory & Techniques 3 Credits

Microwave oscillators amplifiers; Principles generation of millimeter and sub-millimeter wave; Detailed analysis of Klystrons, Magnetrons and TWT amplifiers and backward wave oscillators. Harmonic generators, Gunn-effect devices, Microwave circuits; Microwave network analysis and synthesis. Matrix representation and Scattering cavities and strip-lines Methods of microwave precision measurements.

EEE 6803 Microwave Design & Circuits 3 Credits

Electron guns and their design; Interaction of electron beams and electromagnetic fields. Details of microwave tubes. Masers, parametric amplifiers, solid state microwave devices, microwave circuits; Matrix representation of microwave component design. Analysis of waveguide discontinuation and on-reciprocal microwave circuits, selected topics.

EEE 6804 Wave Theory 3 Credits

Helmholtz equation, Numerical Simulation of waves. Representation of wave function by using Green function : (1) Green's theorem, Free space Green function, (2) Eigenfunction expansion to derive the Green function in bounded region. Boundary element method : (1) Boundary integral equation, (2) Discretization of integral equation. Finite element method : (1) Method of weighted residuals, (2) Finite element method. Physical optics approximation. Fast matrix solvers: (1) Gauss-Seidel method, (2) Conjugate gradient method.

EEE 6805 Antennas and Propagation for Wireless Communication 3 Credits

Fundamentals of Electromagnetic Radiation: Maxwell's equations, potential functions, wave equation, retarded potential, short current element, near and far fields, Poynting's theorem, etc. Fundamentals of Antennas: Principles, Basic Theory, Antenna Parameters. Practical Antennas: Wire Antennas, Aperture Antennas, Micro strip Antennas. Antenna Arrays, Uda-Yagi Antennas. Properties of Transmit-Receive System: Reciprocity, Effective Antenna area, Friis Transmission Formula, Radar Cross Section, etc. Propagation Mechanisms: Free Space Propagation, Reflection, Transmission, Scattering, Diffraction, Doppler Effect, Multipath Propagation, etc. Mathematical Consequences: Channel Impulse Response, Statistical Modeling, Bello Functions. Physical and Practical Consequences: Large-, Mid- and Small-Scale Variations (shadowing and fast-fading), Transitions between the Variations, Narrowband- and Wideband Receivers. Propagation Modeling Approach: Models for Field Prediction, Radio Channel Models (stored, deterministic, stochastic). Wireless Communication Links: Terrestrial Fixed, Satellite Fixed and Mobile Communication Links. Cellular Concept: Macro-, Micro- and Pico Cells.

EEE 6901 Microcomputers & Microcontrollers 3 Credits

Review of the hardware and software of microcomputers, programming in microcomputers. Hardware-software interfacing in microcomputer system design. The design of digital systems based around microcomputers-timing considerations. Input/output design and total system design. Case studies including CPU and peripheral IC's of intel, Motorola, Zilog etc.

EEE 6902 Data Communication & Computer Networks 3 Credits

Principles and practice of modern data communication techniques. Transmission-Codes, modes for data transmission, multiplexers, concentrators, terminals, Modems and interfaces. Digital network interface. Error control, cryption, security. Network protocols and line control procedures. Protocols for buffer Management, reassembly, queue control. Communication/ carrier systems planning. Distributed intelligence. Message and packet switching. Hardware and software interfacing. International data communication, analytical results on network topology, alternatives, resource sharing and life allocation.

EEE 6903 Advanced Database Systems 3 Credits

Data models, Relational model, ER model, Extended ER model, Transformation of ER model to relational model, Normalization, Query languages, Relational algebra and relational calculus, SQL, Transactions, Concurrency control. Reliabilities, Distributed transactions, Multimedia database systems, Data mining.

EEE 6904 Data Structure & Algorithm 3 Credits

Concept and notations of data structures & algorithms. Elementary data structures: Linear and Nonlinear data structures and their algorithms. Memory management. Sorting and Searching algorithms. Complexity analysis of algorithms. Introduction to software Engg.

EEE 6905 Systems Analysis and Design 3 Credits

The systems life cycle, Structured system analysis, Feasibility study, Detailed analysis: Tools for systems analysis, Information gathering techniques, Cost-benefit analysis. Systems design: Input/output and Forms design, Database design, File organization, Process design, Hardware design, Selection of CASE tool, Program development, Coding and testing, Documentation and maintenance, System management.

EEE 6906 Knowledge Engineering and Expert System 3 Credits

Introduction to Knowledge Engineering, its importance in developing Expert System. Various Expert Systems and their applications. Steps of developing Expert System, Knowledge acquisition, Knowledge representation. Design of Knowledge base, Development of rule based System, decision based Systems etc. Case study.