Professional Masters
in
Electrical and Electronic Engineering
(PMEEE)

Department of Electrical and Electronic Engineering
University of Dhaka
Dhaka –1000
Bangladesh

Detailed Syllabus of Courses

The rules and regulations for the PMEEE program presented in this document have been formulated in accordance with the guidelines of the 'Professional/Executive Masters Program and Post-Graduate Diploma/Certificate/Training Program Rules', commonly referred to as the 'Irregular Academic Program Management Rules' of the University of Dhaka.

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1. Introduction

The Department of Electrical and Electronic Engineering (EEE) is a prominent department within the Faculty of Engineering and Technology at the University of Dhaka, Bangladesh. Originally founded in September 1965 as the Department of Applied Physics, it began by offering an M.Sc. program under the leadership of Professor Shah Md. Fazlur Rahman, its founding chairman. Over the decades, the department evolved to meet the changing demands of the electronics industry. In 1974, it was renamed the Department of Applied Physics and Electronics, with a revised M.Sc. curriculum tailored to the growing electronics job market. A year later, the department launched its B.Sc. program in Applied Physics and Electronics. With the rise of the telecommunications sector, another transformation occurred in October 2005, becoming the Department of Applied Physics, Electronics, and Communication Engineering. In June 2008, it officially joined the Faculty of Engineering and Technology. The final transition came in January 2015, when it became the Department of Electrical and Electronic Engineering, its current identity.

Throughout these changes, the department has continued to adapt, positioning itself at the forefront of the rapidly evolving fields of electronics, communication, and power systems. With Bangladesh's growing demand for skilled engineers, a degree in EEE has become more vital than ever. To meet this national need, the department is introducing the *Professional Masters in Electrical and Electronic Engineering (PMEEE)* program. This advanced degree is designed for professionals aiming to deepen their expertise and accelerate their careers in modern technologies. The curriculum includes cutting-edge courses in communication and signal processing, nanotechnology, VLSI design, and electrical power systems. It emphasizes innovation, hands-on experience, and research, empowering students to contribute to the country's technological advancement.

The program also fosters personal development, preparing students to take on complex engineering challenges and leadership roles. Opportunities for collaboration with faculty, industry professionals, and peers will further enhance students' networks and career prospects. Ultimately, the PMEEE will serve as a strategic investment in both personal and national development—equipping graduates with the skills, confidence, and vision to thrive in Bangladesh's dynamic technological landscape. Through this initiative, the Department of EEE reaffirms its commitment to building a highly skilled workforce for the future.

2. Academic Rules and Regulations

This section outlines the rules and regulations governing the academic activities of the program. It mainly includes the name of the program along with duration and seat capacity, the framework of the semester system, class time, admission requirements and procedure, examination, evaluation and grading system, lecture methods, and eligibility of course instructors/project supervisors for the program

2.1 Title of the Program

The program will be titled "Professional Masters in Electrical and Electronic Engineering" and abbreviated as PMEEE.

2.2 Duration of the Program

The duration of the PMEEE program will be 1 year and 6 months (3 semesters, each lasting 6 months).Students will require completing the degree within 5 academic years (10 semesters).

2.3 Seat Capacity for the Program

Maximum seat capacity will be 40 for the PMEEE program.

2.4 Class Time for the Program

Classes will start at 6:00 PM during weekdays. In weekend, class time may be arranged as suitable.

2.5 Total Credit in the Program

The total credit requirement for the PMEEE program will be 36 credits.

2.6 The Framework of the Semester System

The duration of the PMEEE program will be one year and six months, consisting of 3 semesters, each lasting six months. One semester will run from January to June, while the other will span from July to December. The framework of the semester system will be as follows:

Class	14 weeks
Preparatory Leave (PL)	02 weeks
Final Examination	02 weeks
Result Publication	04 weeks
Total	**22 weeks**

Semester-wise course and credit distributions will be as follows:

Semester	**Total Courses**	**Total Credits**	**Total Marks**
Semester I	Theory Courses: 04	4×3 = 12	4×100 = 400
Semester II	Theory Courses: 04	4×3 = 12	4×100 = 400
Semester III	Theory Courses: 02	2×3 = 6	2×100 = 200
	Project: 01	1×6 = 6	1×200 = 200
		Total Credit: 36	**Total Marks: 1200**

2.7 Admission Sessions for the Program

There will be two admission sessions in an academic year namely ‘January to June’ and ‘July to December’ sessions. Students will be admitted in each of these two sessions.

2.8 Admission Requirements for the Program

Students seeking admission into the PMEEE program must have an undergraduate degree. The applicant must have a minimum CGPA of 2.5 out of 4.0 or equivalent in his undergraduate degree. Third division or CGPA lower than 2.5 out of 5.0 in any public examination will not be allowed. Applicants having bachelor/master degrees from abroad must have to take equivalence certificates from the ‘Equivalence Committee’ of the University of Dhaka. Candidates having job experience will be given preference and they must apply through proper channel. Students who have completed a Bachelor's degree (B.Sc.) in the following programs will be directly eligible for the PMEEE program.

- Electrical and Electronic Engineering (EEE)
- Electronics and Telecommunication Engineering (ETE)
- Applied Physics, Electronics and Communication Engineering (APECE)
- Applied Physics and Electronics (APE)
- Computer Science and Engineering (CSE)
- Robotics and Mechatronics Engineering (RME)
- Information and Communication Engineering (ICE)
- Information and Communication Technology (ICT)
- Electronics and Communication Engineering (ECE)
- Biomedical Engineering (BME)
- Materials Science and Engineering (MSE)
- Nuclear Engineering (NE)

However, students with an undergraduate degree in other engineering programs may be eligible for the PMEEE program if approved by the 'Program Management Committee (PMC)' based on their undergraduate coursework/professional experience.

2.9 Admission Procedure for the Program

Students will be admitted to the PMEEE program based on merit through a written admission test, with a passing mark of 40%.

2.10 Examination and Evaluation Procedure for the Program

Course instructors will be solely responsible for conducting and evaluating mid-term examinations, term papers, case presentations, quizzes, and other assessments, as well as assigning marks for all evaluations, including class participation. Course instructors

will present mid-term examination scripts and other assessments to students for review and submit the marks to the 'Examination Committee (EC)' before the final examination. The final examination will be administered with the assistance of the 'Examination Committee (EC)' in accordance with the 'Irregular Academic Program Management Rules' of the University of Dhaka. In case of emergencies, a makeup exam may be arranged with the prior approval of the 'Program Management Committee (PMC)'. The examination and evaluation process will adhere to the following guidelines.

(a) **For a theory Course:** Total marks (100) will be distributed as follows:

Class Participation	05%
Term Paper/Case Presentation/ Quiz	15%
Two (02) Midterm Examinations	30%
Final Examination	50%
Total	**100%**

However, the examination and mark distribution outlined in the above table, except for the final Examination, may be modified or adjusted with prior approval from the 'Academic Committee' of EEE department, depending on the nature of the course. The final examination and the evaluation of its scripts will be conducted as per the 'Irregular Academic Program Management Rules' of the University of Dhaka.

(b) **For the Project:** Total marks (200) will be distributed as follows:

Project Report	60%
Viva Voce	40%
Total	**100%**

(c) **Class Participation:** Total marks (05) will be distributed as follows:

Attendance	**Marks**
90% and above	5.00%
85% to < 90%	4.50%
80% to < 85%	4.00%
75% to < 80%	3.50%
70% to < 75%	3.00%
65% to < 70%	2.50%
60% to < 65%	2.00%
Less than 60%	0.00%

Students with 75% attendance and above in each course will be eligible to sit for the semester final examinations. Students having attendance >=60% and <75% will be considered to sit for the examination (as a non-collegiate) after paying the fines as per university rules. Students having an attendance below 60% will not be eligible to appear in the final examination.

2.11 Grading System for the Program

The program will follow the University Grants Commission (UGC) approved grading system, as per university rules. The grading system will be as follows:

Marks	Letter Grade	Grade Point
80% and above	A+	4.00
75% to < 80%	A	3.75
70% to < 75%	A-	3.50
65% to < 70%	B+	3.25
60% to < 65%	B	3.00
55% to < 60%	B-	2.75
50% to < 55%	C+	2.50
45% to < 50%	C	2.25
40% to < 45%	D	2.00
Less than 40%	F	0.00

2.12 Degree Requirements

A student completing the total required 36 credits within 5 academic years (10 semesters) of admission, maintaining a minimum CGPA of 2.50 out of 4.00, and having no 'F' grade in any course will be eligible for the degree. A student's admission will be automatically canceled if he fails to complete the required 36 credits within the timeframe of 5 academic years (10 semesters).

2.13 Transcript and Certificate for the Recipient

The transcript and certificate will be issued to the degree recipient in a prescribed format approved by the University of Dhaka. Similar to other regular programs, the transcript and certificate for this PMEEE program will be signed by the Controller of Examinations, University of Dhaka. The applicable fees for the transcript and certificate will be the same as those for regular students.

2.14 Course Retake/Improvement Policy

Students who receive an 'F' grade in any course may retake the course in the next available semester by paying the full course fees. To improve a grade, students may also reappear for the mid-terms and/or final examination in subsequent semesters by paying 50% of the course fees. In such cases, the higher grade will be considered toward fulfilling the degree requirements. No special examinations will be conducted outside the regular semester schedule. Any other exceptional circumstances will be decided by 'Academic Committee' of the EEE department.

2.15 Program Discontinuation Policy

A student may be allowed to discontinue the program for a specified period with previous grades intact if permitted by the 'Program Management Committee (PMC)'.

However, the degree must be completed within 5 academic years (10 semesters) from the time of admission. Otherwise, the student will not be eligible to obtain the degree.

2.16 Mode of Class and Examination in the Program

Classes in the PMEEE program will primarily be conducted on-campus. In exceptional circumstances, online classes may be permitted with the approval of the 'Academic Committee' of the EEE department. However, online classes will not exceed 30% of the total classes. It is worth to mention that all examinations will be conducted in person, and online examinations will not be permitted unless specifically mandated by the University of Dhaka in exceptional circumstances.

2.17 Hall Affiliation

All students admitted to the PMEEE program must be affiliated with a student hall of residence of University of Dhaka. A student will receive an identity card from the assigned student hall of residence, displaying the name of the Professional Masters program. However, as per the rules and regulations of the University of Dhaka, students of PMEEE, being part of an irregular program, will not be considered regular residential students of the assigned hall. They will not be entitled to any hall privileges or permitted to participate in any hall-related programs or activities.

2.18 Other Facilities

Apart from the facilities provided by the EEE department, students enrolled in the PMEEE program will be treated as irregular students and will not be entitled to other facilities applicable to regular students at the University of Dhaka.

3. Detailed Syllabus of Courses

3.1 Course Code and Title

Professional Masters in Electrical and Electronic Engineering (PMEEE)

Total Credit: 36

SL#	Course Code	Course Title	Credits
1.	PMEEE5101	Advanced Digital Signal Processing	3
2.	PMEEE5102	Nanoscience and Engineering	3
3.	PMEEE5103	Advanced Power Plant Engineering	3
4.	PMEEE5104	Engineering Project Management	3
5.	PMEEE5201	Advanced Communication Systems	3
6.	PMEEE5202	Advanced VLSI Design	3
7.	PMEEE5203	Smart Power Grid Systems	3
8.	PMEEE5204	Machine Learning and Internet of Things	3
9.	PMEEE5301	Network and Information Security	3
10.	PMEEE5302	Scientific and Industrial Instrumentation	3
11.	PMEEE5000	Capstone Project	6

3.2 Detailed Syllabus of the Courses

Professional Masters in Electrical and Electronic Engineering (PMEEE)

PMEEE5101	Advanced Digital Signal Processing

Review of DSP Concepts: Convolution, Correlation, Hardware Implementation of Discrete-Time LTI Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Z-Transform, Analysis of LTI System in Z-domain, Causality and Stability of LTI Systems, Frequency Response of LTI Systems.

Digital Filter Design: Structures of FIR and IIR Filters, Concepts and Design Techniques of FIR Filters, Concepts and Design Techniques of IIR Filters.

Adaptive Digital Filter: Concepts of Adaptive Filter, Components of Adaptive Filter, Basic Wiener Filter Theory, LMS Adaptive Algorithm, Recursive Least Squares Algorithm, Adaptive Filter as Noise Canceller, Acoustic Echo Cancellation, Inverse System Modeling, Biomedical Signal Processing.

Multirate Digital Signal Processing: Sampling Rate Alteration Systems, Fundamentals of Decimation and Interpolation, Filters in Sampling Rate Alteration Systems, Fractional Sampling Rate Alteration Techniques, Multistage Design of Decimators and Interpolators, Polyphase Decomposition, Digital Filter Banks, QMF Filter Banks, Discrete wavelet transform, Multiresolution Analysis.

Power Spectrum Estimation: Random Variable, Expected Value, Cumulative Distribution Function, Probability Density Function, Power Spectral Density, Non-Parametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation.

PMEEE5102	Nanoscience and Engineering

Fundamentals: Unique properties of nanomaterials (optical, electrical, mechanical, thermal), Classification of nanomaterials: 0-D, 1-D, 2-D, and 3-D, Size effects at the nanoscale.

Synthesis and Fabrication Techniques: Chemical Methods: Sol-gel, Hydrothermal, Solvothermal, Colloidal; Physical/Vapor Methods: CVD, PVD, Sputtering, Laser Ablation; Special Nanomaterials: CNTs, Graphene, Quantum Dots, Nanocomposites; Nanolithography: Photolithography, EBL, Nanoimprint.

Characterization Techniques: Microscopy Techniques: SEM, TEM, AFM; Diffraction and Spectroscopic Techniques: XRD, EDX, Raman Spectroscopy, UV-Vis Spectroscopy, XPS; Surface and Thermal Characterization: TGA, DSC, Zeta Potential.

Applications: Sensing and Diagnostics: Development of nano-sensors, environmental monitoring, biomedical diagnostics; Healthcare and Therapeutics: Drug delivery systems, photothermal therapy, tissue engineering; Energy Systems: Advanced photovoltaics

(Quantum Dots, Perovskites), energy storage (Batteries, Supercapacitors), fuel cells; Electronics and Communication: Nanoscale transistors, molecular electronics, flexible and wearable devices.

PMEEE5103	Advanced Power Plant Engineering

Sources of Energy: Fossil Fuel-Coal, Oil, Natural Gas, Nuclear, Coal Classification, Coal Composition and Analysis, Coal Properties, Oil Composition and Analysis, Combustion of Fuels, properties of nuclear fuels.

Power Plant Operations: Classifications, Operation of thermal, hydro, and renewable Power plants.

Power plants' dynamic analysis: thermodynamic, Hydrodynamic, and aerodynamic analysis with power plants.

Performance Analysis: Thermal, mechanical and electrical performance analysis of power plants.

Emergency Power Backup for power plants: Necessity of emergency power backup, types, and standards.

Load and Generation Forecast: Load estimations, methods of load estimation and forecast, challenges to load and generation forecast.

Energy and Power Plant Economics: Variable loads, plant operation cost, economic performance analysis of power plants, energy policy and tariff.

PMEEE5104	Engineering Project Management

Introduction: Engineering Design, and Project Management Overview.

Project Management Types: Project Integration Management, Project Scope Management, Project Time Management, and Project Cost Management, Earned Value Analysis, Project Quality Management, Project Procurement Management, Project Human Resource Management, Project Communication Management, and Project Risk Management.

Project Design and Decision: Project Closeout, Project Design Reviews, Making Technical Decisions, and Management of Team Conflict.

PMEEE5201	Advanced Communication Systems

Overview of Digital Communications: Fundamentals of Digital Communications, Formatting of Analog Signals, Review of Noise, Basic SNR Parameter for Digital Communication, Matched Filter, Correlator detector, Intersymbol Interference (ISI), Delay-in-Detection, Nyquist Bandwidth Constraint, Raised-Cosine Filter, Channel Equalization.

Digital Modulation and Demodulation: Digital Modulation Schemes (ASK, FSK, PSK, DPSK, QPSH, MSK, GMSK, QAM, OFDM), Bandwidth Requirements, Noise Performance, Detection, Multilevel Signaling, M-Ary Modulation Techniques, Spread Spectrum Modulation Techniques, DSSS, FHSS.

Microwave and Satellite Communications: Basics of Microwave Communications, Microwave Propagation and Waveguides, Antenna Systems and Beamforming, Radar and Remote Sensing Applications, Fundamentals of Satellite Communication Systems, Satellite Orbits, Frequency Bands, Satellite Transponders, Earth Stations, Modulation, Multiple Access in Satellite Communications, Link Budget Analysis, VSAT and GPS Systems, Emerging Trends: CubeSats, High-Throughput Satellites (HTS), 5G NTN.

Wireless and Cellular Mobile Communications: Introduction to Wireless Communications, Evolution of Mobile Radio Communications (1G to 6G), Cellular Concept and Frequency Reuse, Cell Splitting and Cell Sectoring, Handoff and Roaming in Cellular Networks, Multipath Propagation, Multipath Fading, Doppler Spread, Models for Radio Propagation, MIMO and Massive MIMO systems, Security in Wireless Communication.

Optical Fiber Communications: Fundamentals of Optical Fiber Communication, Modes of Propagation, Fiber Attenuation and Dispersion, Nonlinear Effects in Optical Fibers, Optical Sources (LEDs, LASERs) and Detectors, Modulation and Multiplexing in Optical Systems (WDM, DWDM), Optical Components and Amplifiers, Optical Networks and Photonic Switching, Future Trends: Free-Space Optics, Quantum Communication, LiFi.

PMEEE5202	Advanced VLSI Design

Review of CMOS Circuits: MOSFET characteristics and modeling, CMOS inverter: DC and transient characteristics, Static and dynamic power dissipation, Logical effort and delay analysis, Scaling of MOS devices, Subthreshold leakage and short-channel effects.

Overview and Process Flow of a CMOS Fabrication: CMOS process technology: n-well, p-well, twin-well processes, Lithography, etching, oxidation, and doping, Ion implantation and diffusion, interconnects.

CMOS Circuit and Logic Design: Combinational logic design using CMOS, Dynamic logic, Low-power circuit design techniques, Clocking strategies and clock distribution, Power and timing optimization techniques, CMOS layout design and design Rules.

Arithmetic and Memory Elements Design: Design of adders: Ripple carry, carry look-ahead, carry-save, Multipliers, Design of shifters and ALU components, SRAM and DRAM design considerations, Non-volatile memory design (Flash, MRAM, ReRAM).

Digital System Design using Verilog: RTL design and coding guidelines, Combinational and sequential circuit modeling, Synchronous vs asynchronous design considerations, Design verification and testbench creation, FPGA-based implementation of VLSI circuits, Synthesis, timing analysis, and optimization.

PMEEE5203	Smart Power Grid Systems

Smart Grid Architectural Designs: Overview of Conventional Power system, Comparison of Power grid with Smart Grid, General View of the Smart Grid Market Drivers, Stakeholder Roles and Function -Measure, Representative Architecture, Functions of Smart Grid Components.

Smart Grid Communications and Measurement Technology: Communication and Measurement, Monitoring, Phasor Measurement Unit (PMU), Smart Meters, Wide area monitoring systems (WAMS), and Advanced metering infrastructure.

Performance Analysis of Smart Grid Design: Overview of power system single-line diagram (SLD) and Load Flow Studies, Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods, Load Flow State of the Art: Classical, Extended Formulations, and Algorithms, Load Flow for Smart Grid Design-Contingencies Studies for Smart Grid, Optimization Problem and its Application to Power Systems, Modeling of Uncertainties.

Stability Analysis Tools for Smart Grid: Voltage and frequency Stability Analysis Tools, Voltage Stability Assessment Techniques, Voltage Stability Indexing, Application and Implementation Plan of Voltage Stability in Smart Grid, Angle Stability Assessment in Smart Grid, and Energy Management in Smart Grid.

Renewable Energy and Storage: Renewable Energy Resources, Sustainable Energy Options for the Smart Grid, Penetration and Variability Issues Associated with Sustainable Energy Technology, Demand Response Issues, Electric Vehicles and Plug-in Hybrids-PHEV Technology-Environmental Implications, Storage Technologies, Grid Integration, Issues of Renewable Energy Sources.

Cyber Security for Smart Grid: Cyber Security Risk Assessment, Security Index Computation, and Network Security Automation.

PMEEE5204	Machine Learning and Internet of Things

Introduction to IoT and ML: Overview of IoT: Components, architecture, and applications; IoT communication protocols (MQTT, CoAP, HTTP, etc.); Introduction to Machine Learning: Supervised, Unsupervised, and Reinforcement Learning; Synergy of IoT and ML: Challenges and Opportunities

IoT Devices and Data Acquisition: Sensors, actuators, and embedded systems; Data collection and preprocessing techniques; IoT data transmission: Edge vs. Cloud processing; Case study: IoT-based environmental monitoring

Machine Learning for IoT Data: Feature engineering and dimensionality reduction; Supervised learning models (Regression, SVM, Decision Trees, etc.); Unsupervised learning models (Clustering, Anomaly Detection, etc.); ML pipelines for IoT data

Deep Learning and Edge AI for IoT: Neural Networks and CNNs for IoT applications;

Federated Learning for distributed IoT systems; TinyML: Running ML models on microcontrollers; Deploying ML models on an IoT device

IoT Security and ML-based Anomaly Detection: IoT security challenges and ML-based solutions; Intrusion detection using ML models; Privacy-preserving ML techniques; Case study: ML for IoT cybersecurity

Predictive Analytics and Smart IoT Systems: Predictive maintenance with ML; Time-series forecasting for IoT data; Reinforcement Learning in IoT; Case study: Smart Agriculture or Smart Healthcare

Cloud and Edge AI Integration: Cloud computing platforms for IoT (AWS IoT, Google IoT, Azure IoT); Edge AI and Fog computing concepts; Deploying ML models on cloud and edge platforms

Future Trends: Emerging trends in ML and IoT (5G, Digital Twins, AIoT); Ethical and societal implications of AI in IoT.

PMEEE5301	Network and Information Security

Overview: Security Goals, The OSI Security Architecture, Security Attacks, Services and Mechanism, A Model for Network Security.

Symmetric Ciphers: Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard (DES), Basic Concepts in Number Theory and Finite Fields, Advanced Encryption Standard (AES), Block Cipher Operation, Pseudorandom Number Generation and Stream Ciphers.

Asymmetric Ciphers: Mathematics of Asymmetric-Key Cryptography, Public- Key Cryptography and RSA, Diffie-Hellman Key Exchange Algorithm, Man-in- the-Middle Attack, other Public-Key Cryptosystems.

Cryptographic Data Integrity Algorithms: Cryptographic Hash Functions: Secure Hash Algorithm (SHA), Message Authentication Codes: Security, Requirements, HMAC, Digital Signatures: Properties, Attacks and Forgeries, Digital Signature Standards.

Mutual Trust: Key Management and Distribution: Symmetric-Key Distribution, Public Key Distribution, Public Key Infrastructure, X.509 Certificates, User Authentication: Kerberos, Personal Identity Verification.

Network and Internet Security: Network Access Control and Cloud Security, Transport-Level Security: SSL, TLS, HTTPS and SSH, Wireless Network Security: IEEE 802.11i, Electronic Mail Security: PGP, S/MIME and DKIM, Network Layer Security: IPsec and Internet Key Exchange (IKE).

System Security: Intruders, Intrusion Detection System (IDS), Password Management, Malicious Software, Viruses, Worms, Antivirus Approaches, Distributed Denial of Service (DDoS) Attacks, Firewalls, Cybercrime: Legal and Ethical Aspects.

PMEEE5302	Scientific and Industrial Instrumentation

Spectroscopic Methods: UV-Vis Spectroscopy-Principles, instruments, applications in qualitative and quantitative analysis,Infrared (IR) Spectroscopy- Principles, instrumentation, and applications in chemical analysis,Nuclear Magnetic Resonance (NMR) Spectroscopy: Basics, types of NMR, and applications, Fluorescence Spectroscopy- Principle, instrumentation, and applications.

Chromatographic Techniques: Gas Chromatography (GC) - Principles, instruments, and applications. Liquid Chromatography (HPLC)-Principles, types, instrumentation, and applications.Thin Layer Chromatography (TLC)-Principle, method, and uses in qualitative analysis. Ion Chromatography- Basic principles and applications in ion analysis.

Electrochemical Methods: Electrochemical Cells-Working principles of galvanic and electrolytic cells. Potentiometry and Voltammetry-Measurement techniques, instrumentation, and applications, Conductivity and Ion-Selective Electrodes-Principles and practical applications. Electrophoresis analyzers.

Thermal and Gravimetric Analysis: Thermogravimetric Analysis (TGA) - Basic principles, instrumentation, and applications, Differential Scanning Calorimetry (DSC) - Principles and applications in materials science, Thermomechanical Analysis (TMA)- Techniques and applications.

Microscopy and Imaging Techniques: Optical Microscopy- Principles, types of microscopes, and applications, Electron Microscopy- Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) principles, Atomic Force Microscopy (AFM)- Principles and applications in surface analysis.

Advanced Instrumentation and Techniques: X-ray Diffraction (XRD)-Principles and applications in material science and crystallography.X-ray Fluorescence (XRF) - Principle and applications in elemental analysis.Laser-Based Techniques-Laser-induced breakdown spectroscopy (LIBS), and Raman spectroscopy.Neutron Activation Analysis (NAA) - Technique and applications. Physical properties measurement system (PPMS) – Resistivity, Heat capacity, AC/DC magnetometry. Mass spectrometry measurement techniques and application.

Environmental and Pharmaceutical Instruments: Environmental Monitoring-Techniques for analyzing air, water, soil, and pollutants.Pharmaceutical Analysis-Techniques used in drug analysis, quality control, and formulation, Food and Beverage Industry- Analytical methods in food quality, additives, and contaminants analysis.

Biomedical Instrumentation and Measurements: Therapeutic and prosthetic devices – Ventilator, Inhaler, Defibrillator, Pacemaker, Respirator.

Safety and Ethics in Instrumentation: Laboratory Safety- Safe handling of chemicals, instrumentation, and hazardous materials, Ethical Considerations- Data integrity, reliability, and proper reporting of results.

PMEEE5300	Capstone Project

Under normal circumstances, each student will be assigned a single project at the beginning of the first semester, which will continue until the last semester under the supervision of a faculty member from the EEE department. However, based on resource availability and faculty capacity, two students may be grouped to work on a single project under the supervision of a faculty member of the EEE department.Additionally, the department may seek to hire project supervisors from other departments at the University of Dhaka, other universities, or industry experts in relevant fields.

Students will undertake a research project in one of the following fields under the guidance of a project supervisor.

Electronics and Materials Science: This includes but not limited to, Analog and Digital Electronics, VLSI Circuit Design, Electronic and Optoelectronic Devices, Photonics, Nanoscience and Technology, Materials Science, Biomedical Engineering.

Instrumentations and Control: This includes but not limited to, Algorithm Design, Artificial Intelligence, Robotics, Computer Architecture, IoT, Microcontroller-Based Systems, Microprocessor, Big Data Analytic.

Communications and Signal Processing: This includes but not limited to, Telecommunication Engineering, Mobile Cellular Technology, 3G, 4G, 5G Wireless Networks, Satellite and Radar Communication, Signal Processing, Optical Fiber Communication and Sensors.

Power Systems: This includes but not limited to, Power Electronics, Power Generation, Transmission, Distribution, Fault Detection, Protection, Photovoltaic Systems, and Renewable Energy.

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