Syllabus for the Master of Science (Evening) in Electrical and Electronic Engineering (EEE)

Department of Electrical and Electronic Engineering

Islamic University, Kushita-7003, Bangladesh.

Session: 2023 (Winter and Fall Semester)
(15th & 16th Batch)

Duration of the Program

The Master of Science (Evening) degree program in **Electrical and Electronic Engineering** at the Department of Electrical and Electronic Engineering shall comprise for the students having B.Sc. (Honors) degree in Physics/B.Eng. degree in EEE/ Electronics & Communication/Telecommunication/Information Science/Computer Science and related subjects.

Each academic year is divided into two semesters – Fall Semester and Winter Semester. Prospective students should apply in June or December to get admission in the fall or winter semester respectively. Duration of each semester of the program shall be 6 (six) months. Each semester shall have at least 14 weeks for class teaching, 2 weeks recess before the semester final examination and 4 weeks for holding examination and publication of result. The duration of the program for students are as follows:

Eligibility	Duration	Name of Degree Awarded
B.Sc. (Honors) degree in Physics/B.Eng. degree in EEE/ Electronics & Communication/Telecommunication/ Information Science/Computer Science and related subjects	One year (2 semesters)	M.Sc.

Name of Courses and Distribution of Marks

The total marks of the program shall be 1200 and it will be distributed over two semesters. The marks shall be distributed among the theoretical courses, practical courses, viva-voce and project works.

Evaluation and Examination

(a) Performance of students in a teaching course will be evaluated as under:

Theoretical Courses	Marks
Class Attendance	10
In-course Test/Assignment	30
Semester-Final Exam	60
Total	100

Practical Courses	Marks
Lab Attendance	10
Laboratory Note Book	10
Lab Performance	20
Laboratory-Final Exam	60
Total	100

(b) The marks for in-course test shall be given on the basis of best three of four tests to be conducted by the course teacher during the class hours. Each in-course test shall be of minimum 40 minutes duration. The course teacher will submit a mark sheet including marks for both class attendance and in-course tests.

(c) The course teacher of related practical course will evaluate each student by performance, participation, and assignment. The course teacher will submit a mark sheet including marks for both Lab-attendances and Lab performance.

(d) The examination of each theoretical course shall be of 3 (three) hours duration and a student will answer 5 (five) questions out of 8 (eight) and each question will carry 12 marks.

(e)Students shall submit their laboratory notebook during this examination. The examination of each practical course shall be of 6 (six) hours duration.

(f) There shall be two examiners to be called 1st examiners (course teacher) and 2nd examiners for each theoretical course. The examination committee shall appoint the 2nd examiner in any course relevant to the subject from the department. The examiners will set questions and evaluate the answer scripts of semester- final examination. After evaluation the answer scripts the examiner will submit a detail mark sheet and a short mark sheet with answer scripts to the chairman of the examination committee and a short mark sheet to the controller of the examinations.

(g) The arithmetic mean of the marks given by two examiners shall be taken. If the marks given by two examiners differ by 20% or more, the Examination Committee shall recommend for third examination of the script. In this case, the arithmetic mean of two nearest marks shall be taken. In case of equal marks of two examiners, the highest two marks given by the examiners will be considered. Total marks of a student in each course shall be rounded up to next integral value.

(h)The Examination Committee of the concerned batch shall appoint a supervisor/guide to supervise each student's project work. The committee shall also appoint to examine the project report. Internal member of examination committee on the basis of report, oral presentation and viva-voce will evaluate Project.

(i)Total marks obtained in each course, Viva-voce Exam and the Project shall be converted into LG (Letter Grade) and GP (Grade Point).

(j)A student securing less than C+ grade (GP 2.5) in viva-voice examination and project shall have no credit i.e. this mark will not count in determining his/her results.

(k) The result will show the individual student's LG & GP in each course, CGPA (Cumulative Grade Point Average), LG and the corresponding Grade Points (the numerical marks will not be shown), the CGPA, LG and the interpretation of the CGPA and that will be calculated using the formula as shown in 'Appendix- A' of this ordinance.

(l) The Examination Committee shall ordinarily act as tabulators. Tabulator other than the members to the Examination Committee shall be appointed by the Vice Chancellor on the recommendation of the relevant Examination Committee. The tabulators will prepare 3 (three) sets of tabulated result sheets and the Chairman of the Examination Committee will send it to the Controller of Examination for publication duly signed by tabulators and the members of the Examination Committee.

(m) A resolution of the Examination Committee with recommendation for publication of results shall be attached with the tabulated results sheets and will send it to the Controller of Examinations.

(n) The Controller of Examinations shall publish the results of the program and shall provide the transcripts showing course wise LG and the corresponding Grade Points (the numerical marks will not be shown), the CGPA, LG and the interpretation of the CGPA of the candidates for the degree of Master of Science (M.Sc.)in Electronics and Communication Engineering. Final grades must be spelled out clearly in the certificate/transcript [as example: 'C+' (C plus); 'A-' (A minus); 'B' (B regular)'].

Semester wise Course Distribution

Semester	Course Code	Course Title	Marks	Credit
First	EEE-5101	Power System Engineering	100	3.5
	EEE-5102	Advanced Digital Signal Processing	100	3.5
	EEE-5103	Wireless & Broadband Communication Networks	100	3.5
	EEE-5104	Artificial Intelligence	100	3.5
	EEE-5105	Practical-I	100	3.0
	EEE-5106	Practical-II	100	3.0
	EEE-5107	Viva-Voce	50	1.0
Second	EEE-5201	Power Plant Engineering	100	3.5
	EEE-5202	VLSI Design	100	3.5
	EEE-5203	Medical Electronics and Instrumentation	100	3.5
	EEE-5204	Practical-III	100	3.0
	EEE-5205	Project	100	3.5
	EEE-5206	Viva-Voce	50	1.0
Total			1200	39

First Semester

EEE 5101: Power System Engineering

Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*

Credit: *3.5*

1. **Introduction to transmission lines:** Flux linkages, inductance due to external flux, inductance ofsingle-phase two-wire line, composite conductor lines, G.M.D, 3-phase line with equilateral and with unsymmetrical spacing, parallel circuit of 3-phase line, and use of tables.
2. **Capacitance of Transmission lines**: Electric field, capacitance of two wire line, three-phase lines with symmetrical & with equilateral spacing, effect of earth, parallel circuits lines,
3. **Representation of lines:** short, medium and long transmission lines, T and π representation, exact solutions, equivalent circuit of long transmission line. Underground and overhead lines.
4. **Generalized line constants:** General line equations in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks measurement of line constants.
5. **Power Network Representations:** P.U method of performance calculation, P.U. impedance of three winding transformers, Power flow in simple systems, Load flow studies of large systems using the Gauss-Seidel methods; Control of voltage, power and reactive power; Symmetrical three phase faults on synchronous machine,
6. **Symmetrical Components:** Sequence impedance and sequence networks of generators, transformers and lines, sequence network of systems,
7. **Unsymmetrical Faults:** Single line to ground fault, line to line fault, double line to ground fault.

Recommended Books*:*

01. Power Systems Analysis — John Granger, William Stevenson
02. Power System Analysis and Design — : J. Duncan Glover and Mulukutla S. Sarma
03. Power Systems Analysis. — : Hadi Saadat

04. Elements of Power System Analysis : W. D. Stefenson

EEE 5102: Advanced Digital Signal Processing

Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*

Credit: *3.5*

Multirate Digital Signal Processing: Multirate processing, fundamentals of decimation and interpolation, methods for optimizing processing throughput requirements via multirate designs, multirate techniques in filter banks, spectrum analyzers and synthesizers, structures and network theory for multirate digital systems.
Finite Arithmetic Error Analysis: Analog-to-Digital conversion errors, quantization effects of finite arithmetic for common digital signal processing algorithms including digital filters and FFTs, methods of calculating the noise at the digital system output due to arithmetic effects.
Linear Prediction theory: Representation of a stationary random process, discrete random signals, moments, bias-variance, linear stochastic models, ARMA (Auto Regressive Moving Average) modeling, properties of estimators bias/variance, Cramer Rao Lower Bound , MVU (Minimum Variance Unbiased) estimator, BLUE (Best Linear Unbiased Estimator), ML (Maximum Likelihood) estimation, Bayesian estimation, Forward and Backward Linear Prediction, Levinson-Durbin Algorithm, Properties of the Linear Predictors, The Concept of a Whitening Filter
Power Spectrum Estimation: Estimation of Autocorrelation and Power Spectrum of Random Signals, Non Parametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation
Statistical signal processing: Orthogonality principle, block and sequential forms, Wiener filter, adaptive filtering, Recursive Least Squares Estimation, Kalman Filter Theory, Adaptive Algorithms: LMS, RLS and their variants, Joint Multichannel Least Squares Lattice, Spatial filtering of equally and unequally spaced arrays.
Applications: Acoustic echo cancellation, signal enhancement, inverse system modelling, denoising.

Recommended Books*:*

01.	Digital Signal Processing: A computer-based approach	Sanjit K. Mitra, McGraw-Hill, 3rd edition, 2005.
02.	Digital Signal Processing - Principles, Algorithms and Applications	John G. Proakis and Dimitris G. Manolakis, Macmillan, New York, Third edition,1996.
03.	Theory and Application of DSP	L.R. Rabiner and B. Gold.
04.	Discrete-Time Signal Processing	Oppenheim, Schafer & Buck, Prentice-Hall, New Jersey, 2nd edition, 1999.
05.	Statistical and Adaptive Signal Processing	Manolakis, D., Ingle, M., Kogon, S., McGraw-Hill, 2000.
06.	Adaptive Filter Theory	Haykin, S., Prentice Hall, New Jersey, Third edition,1996
07.	Advanced Digital Signal Processing	Proakis, J. G., Rader, C. M., Ling, F., Nikias, C. and L., Macmillan, New York, 1992.
08.	Digital Signal Processing: A System Design Approach	DeFatta, D. J., Lucas, J. G., Hodgkiss and W. S., John, Wiley and Sons, New York, 1988.
09.	Introductory Digital Signal Processing with Computer Applications	P.A. Lynn, W. Fuerst and B.Thomas, John Wiley.
10.	Digital Signal Processing	M.H.Hayes, Schaum's Outline Series, McGraw Hill, 1999.
11.	Statistical Signal Processing	Scharf, L. L., Addison-Wesley, 1991.
12.	Digital Processing of Random Signals	Porat, B., Prentice Hall, 1994.
13.	Adaptive filters: Theory and Applications	B. Farhang-Boroujeny
14.	Fundamentals of Statistical Signal Processing: Estimation Theory	S. Kay, Prentice Hall.
15.	Statistical Digital Signal Processing and Modeling	Monson Hayes, Wiley, 1996.

EEE-5103: Wireless & Broadband Communication Networks

Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*

Credit: *3.5*

1. **OFDM :** Single carrier system, Multicarrier modulation (MCM) and OFDM, advantages of MCM over single carrier system, Emergence of OFDM, characteristics of OFDM, advantages, applications, frame format, allocation of subcarriers, transmitter and receiver, role of cyclic extension, OFDMA and sub-channelization.
2. **IEEE 802.11 Standard:** Architecture, protocol, PHY layer, MAC layer, Frame format, Addressing mechanism.
3. **WiMAX and LTE:** Introduction to IEEE802.16 and IEEE802.16e, emergence of broadband wireless, salient features of WiMAX, PHY layer and MAC layer, network architecture, estimating data rates in fixed and mobile WiMAX, uplink and downlink traffic, FEC, adaptive modulation and coding, subchannelization and link budget, frame structure of fixed and mobile WiMAX, allocation of carriers, difference between WiFi and WiMAX, introduction to LTE.

4. **IEEE 802.15 Standard:** Architecture of personal area network (PAN), Piconets, Scatternet, Bluetooth layers, Radio layer, Baseband layer, frame format, L2CAP.
5. **Wireless ADHOC Networks:** Introduction: Basics of wireless networks, Properties of wireless ad hoc networks, types of ad hoc networks, applications, MAC. Mobile Ad Hoc Networks (MANET): History, properties, routing including multicasting and broadcasting.
6. **Wireless SENSOR Networks (WSN):** Sensor Networks: History, properties, types, medium access control, routing, energy efficiency, topology management, coverage, quality of service, resource allocation, mobile sensor networks (MSN), applications. Wireless Mesh Networks.
7. **Frame Relay and ATM:** Drawbacks of X.25, Frame relay architecture and protocol, basic operation of frame relay, ATM protocol architecture, ATM logical connections, ATM cell format, ATM adaptation layer (AAL), call establishment using virtual path, advantages of ATM virtual path.
8. **Queuing system and Congestion Control and QoS:** Queuing models, single server and multiserver queue. Effects of congestion, congestion control- backpressure, choke packet, implicit and explicit congestion signaling. Traffic management, TCP traffic control.
9. Quality of service (QoS) for internet, RSVP goals and characteristics, RSVP operation, Protocol mechanisms, Connection oriented QoS support, RTP protocol.
10. **10.VOIP;** H.323 standard, protocol architecture, standards and services, SIP, schematic diagram and components of VOIP, comparison between VOIP and PSTN, advantages of VOIP.

***Recommended Books**:*

01.	Data Communications & Networking	Behrouz A. Forouzan, TATA McGraw-Hill, 4th edition.
02.	Mobile Broadcasting with WiMax: Princilples, Technology and Applications	Amitabh Kumar, Pub: Focal Press
03.	Communication networks	Alberto Leon-Garcia &IndraWidjaja, McGraw-Hill, 2000
04.	Voice over IP Technologies	Mark A. Miller, Wiley-dreamtech, 2005
05.	Computer Networks & Internets with Internet Applications	Douglas E. Comer, Pearson Education, 4th edition
06.	High-Speed Networks and Internets: Performance and Quality of Service	William Stallings, Prentice- Hall, 2nd Edition
07.	SONET	Walter Goralski
08.	Fundamentals of WiMAX: Understanding Broadband Wireless Networking	Jeffrey G. Andrews, Arunabha Ghosh and Rias Muhamed
09.	Ad Hoc Wireless Networks: Architectures and Protocols	Prentice Hall PTR, 2007
10.	Protocols & Architectures for Wireless Sensor	Networks, Wiley, 2005

EEE-5104: Artificial Intelligence

***Full Marks:** 100 (Semester final exam 60, In-course test/assignment 30, class attendance 10)*

***Credit:** 3.5*

1. **Symbolic Knowledge and Reasoning:** Logic, Propositional logic, First order logic, Inference in First order logic.
2. **Uncertain Knowledge and Reasoning:** Inconsistencies and uncertainties, Probabilistic reasoning, Fuzzy logic, Structured knowledge: Graphs, Frame and related structures.
3. **Knowledge Organization and manipulation:** Search strategies, Planning, Matching techniques, Knowledge Organization and management.
4. **Knowledge acquisition:** Introduction, Types of learning, General model, Connectionist models, Learning automata, Genetic algorithm, Learning by Induction.
5. **Perception and Communication:** Natural language processing, Overview of Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic Analysis & Structures, Natural Language generation and Systems, Pattern recognition, Visual image understanding.
6. **Expert Systems:** Introduction, Rule-based system Architectures, Non-production System architectures, Neural Networks, Applications, Computer Vision, Robotics.
7. **Logic programming:** Background, Representation and reasoning, Logic programs and programming styles, Programming in PROLOG, List processing, Arithmetic, I/O and memory operations and databases in PROLOG, User interface and interface engine of AI.

Recommended Books:

01.	Introduction to Artificial Intelligence and Expert System	Dan w. Patterson
02.	Intelligence: A Modern: A Modern Approach	Stuart Russell and Peter Norving
03.	Artificial Intelligence	E. Rich and K. Knight
04.	Logic Programming with Prolog	Max Bramer
05.	Prolog Programming for Artificial Intelligence	Ivan Bratko

EEE-5105: Practical-I

Full Marks: *100 (Laboratory final exam 60, Note book-10, Lab performance-20, Lab attendance 10)*
Credit: *3.0*

EEE-5106: Practical-II

Full Marks: *100 (Laboratory final exam 60, Note book-10, Labperformance-20, Lab attendance 10)*
Credit: *3.0*

EEE-5107: Viva-Voce

Full Marks: *50* ***Credit:*** *1.0*

Second Semester

EEE-5201: Power Plant Engineering
Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*
Credit: *3.5*

1. **Generation of Electricity and Sources of Energy:** Major sources of energy, Salient features, selection of site, basic schemes and constituents of Steam, Hydro, Nuclear, Diesel and Gas Turbine Power Stations. Cogeneration, Hydrothermal Energy coordination.
2. **Steam Power Plants:** Thermodynamic cycles and use of high steam pressure and temperature. Super heating of steam. Reheat cycle. Regenerative cycle. Binary vapour cycle. Coal Classification, use of high ash coal, Coal supply, storage and handling, Ash handling and dust collectors.
3. **Steam Generators:** Fire tube and water tube boilers. Modern boilers. Economiser and air preheater, condenser, supply of cooling water to condenser, cooling towers.
4. **Steam Primovers:** Impulse and reaction types. Heat balance and efficiency. Modern development in steam power plants.
5. **Hydro Electric Plants:** Selection of site, classification and basic schemes. Types of turbines, capacity calculation. Pump storage projects.
6. **Nuclear Power Plant:** Types of fuels. Classification of reactors, methods of cooling; moderators, methods of control, safety measures,
7. **Basic Schemes of Nuclear Power Stations:** Boiling water reactor, pressurized heavy water reactor, fast breeder reactor, Cost of Nuclear Energy. Nuclear Power Stations.
8. **Gas Turbine Power Plants:** Operation of gas turbine power plant, open cycle plant, closed cycle plant, Combined gas turbine and steam turbine cycle.

Recommended Books:

01.	Electric Power Generation, Transmission and Distribution	Leonjard L. Grigsby
02.	Power Station Engineering and Economy	Bernhardt G.A. Skrotzki, Tata McGraw Hill
03.	Power Plant Technology	EI Wakil M.M, McGraw-Hill 1984.
04.	A course in Power Plant Engineering	Arora S.C and Domkundwar S, Dhanpatrai, 2001.
05.	Power plant Engineering	Nag P.K, Tata McGraw-Hill, 1998.

EEE-5202: VLSI Design

Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*
Credit: *3.5*

1. **Basic MOS Structure:** Introduction, Evolution of VLSI Device Technology, Metal Oxide Semiconductor (MOS) and VLSI Technology, Basic MOS Transistor Operation, MOS Transistor Switches, NMOS Fabrication, Basic CMOS Technology, CMOS Process Enhancements, BiCMOS Technology
2. **MOS Device Characteristics:** Introduction, Static Behaviour of the MOS Transistor, Dynamic Behaviour of MOS Transistor, The Actual MOS Transistor-Secondary Effects, NMOS Inverter, Determination of Pull-up to Pull-down Ratio, Pull-up to Pull-down Ratio for an NMOS Inverter Driven Through One or More Pass Transistor,Device Models for Simulation
3. **MOS Circuit Design Process**: Introduction, Why Design Rules, MOS Layers, Stick Diagrams, Design Rules and Layout, Elements of Physicals Design

4. **Special Circuit Layouts**: Introduction, Tally Circuits, NAND-NAND, NOR-NOR, and AOI Logic, Exclusive-OR Structures, Barrel Shifter, Transmission Gates, Latches and Flip-flops,Fan-in and Fan-out of CMOS Logic Design
5. **CMOS Combinational Logic Circuits:** Introduction, Static CMOS Design, Dynamic CMOS Design, Complex Logic Gates in CMOS
6. **CMOS Sequential Logic Circuits**: Introduction, Timing Metrics for Sequential Circuits, Classification of Memory Elements, Static Latches and Registers, Dynamic Latches Registers, Alternative Register Styless, Non-bistable Sequential Circuits
7. **Programmable Logic Devices:** Introduction, NMOS PLAs, Other Programmable Logic Devices, The Finite-State Machine as a PLA Structure, Complex Programmable Gate Arrays (FPLA)
8. Field Programmable Gate Arrays (FPGA)
9. **CMOS Chip Design**: Introduction, Design Strategies, CMOS Chip Design Options, Verilog HDLBasic Concepts, Structural Gate-Level Modeling, Switch-Level Modeling, General VLSI System Components, Combinational Logic Designs, CMOS VLSI Latc

Recommended Books:

01.	Principles of CMOS VLSI Design	N. H. E. Weste, K. Eshraghian, 2nd ed., Addison-Wesley, 1994
02.	Physical Design Automation of VLSI Systems	B. T. Preas, M. Lorenzetti, The Benjamin- Cummings Publishing Co., 1988.
03.	Digital Systems Design Using VHDL	C. H. Roth, Jr. 1st ed., Thomson Engineering, 1998

EEE-5203: Medical Electronics and Instrumentation

Full Marks: *100 (Semester final exam 60, In-course test/assignment 30, Class attendance 10)*
Credit: *3.5*

1. **An Overview of the Human Body:** Anatomy & Physiology, Physiological systems of the body, The cardiovascular system, The respiratory system, The nervous system, Sources of biomedical signals.
2. **Introduction to Biomedical Instruments:** Basic medical instrumentation system, Performance requirements of medical instrumentation systems, Intelligent medical instrumentation systems, Use of microprocessors in medical instruments, Interfacing analog signals to microprocessors, PC based medical instruments, General constraints in design of medical instrumentation systems, Regulation of medical devices, Types of standards, Regulatory requirements, Standard related agencies.
3. **Transducers, Electrodes and Sensors:** Transducer classification, Characteristics of transducers, Transducer for body temperature measurement, Electrodes for biophysical sensing, Medical surface electrodes, Microelectronics, Electrodes for ECG, Electrodes for EMG, Electrical conductivity of electrode jellies and creams, Biosensors.
4. **Imaging Instruments:** Basic recording system, General considerations for signal conditioners, Electrocardiograph (ECG), Block diagram description of an ECG, ECG leads, Microprocessor based ECG system, Multichannel ECG machine, Phonocardiograph (PCG), Electroencephalograph (EEG), Block diagram description of EEG, Electromyography (EMG), X-ray, Magnetic Resonance Imaging(MRI) scan, Computed Tomogrphy(CT) scan.
5. **Blood flow measurement:** Electromagnetic blood flow meter and it's classification, Ultrasonic blood flowmeter, Nuclear magnetic resonance (NMR) blood flowmeter, Laser Doppler blood flowmeter.
6. **Ultrasonic Imaging:** Physics of Ultrasonic waves, Generation and detection of Ultrasound, Biological effect of Ultrasound, Medical Ultrasound, Basic pulse-echo technique, Ultrasound transducers, Doppler effect, Tissue interaction with Ultrasound, Ultrasonic blood pressure measurement.
7. **Cardiac Pacemakers and Defibrillators:** Need for cardiac pacemaker, Types of pacemakers, Types of implantable pacemakers, Classification codes of pacemakers, Reliability aspects of cardiac pacemakers, Development in implantable pacemaker, Need for a defibrillator, DC fibrillator.

Recommended Books:

1	Handbook of biomedical instrument	R.S. Khanpur
2	Introduction to Biomedical Equipment Technology	Joseph J. Carr
3	Medical Physics & Biomedical Engineering	B.H. Brown
4	Biomedical Instrumentation and Measurements	Leslie Cromwell

EEE-5204: Practical-III
Full Marks:*100(Laboratory final exam 30, Note book-5, Class performance-10, Class attendance 5)*

Credit:*3.0*

EEE-5205: Project
Full Marks: 100

Credit: *3.5*

EEE-5106: Viva-Voce
Full Marks: 50 ***Credit:*** *1.****0***