Annex: A

Scheme of Studies

First Year Fall Semester					First Year Spring Semester				
Course Code	Course Title	Credit Hrs.			Course Code	Course Title	Credit Hrs.		
		Th	Pr	Total			Th	Pr	Total
EE-125	Basic Electrical Engineering	3	1	4	EE-127	Circuit Analysis	3	1	4
EA-128	Functional English	3	0	3	MT-221	Linear Algebra & Ordinary Differential Equations	3	0	3
MT-116	Calculus & Analytical Geometry	3	0	3	EE-164	Computer Programming	2	1	3
EF-101	IT Fundamentals & Applications	2	1	3	ES-108	Ideology and Constitution of Pakistan	2	0	2
ES-206 / ES-209	Islamic Studies / Ethical Behavior	2	0	2	PH-129	Applied Physics	3	0	3
ES-105/ ES-127	Pak. Studies/Pak. Studies (For Foreigners)	2	0	2					
CY-100	Essentials of Chemistry (For Computer Science backgorund Students)	NC		NC					
	Total:	**15**	**2**	**17**	**Total:**		**13**	**2**	**15**
Second Year Fall Semester					**Second Year Spring Semester**				
Course Code	Course Title	Credit Hrs.			Course Code	Course Title	Credit Hrs.		
		Th	Pr	Total			Th	Pr	Total
EL-240	Electronic Devices and Circuits	3	1	4	EE-282	Electromagnetic Fields	3	0	3
EE-264	Data Structures and Algorithms	2	1	3	EE-233	Signals and Systems	3	0	3
MT-226	Multi Variable Calculus	3	0	3	CS-220	Digital Logic Design	3	1	4
EA-244	Academic Reading and writing	3	0	3	EF-200	Community Service	-	-	NC
EE-111	Engineering Drawing & Workshop Practice	0	2	2	CE-109	Engineering Surveying-I	2	1	3
EF-201	Civics and Community Engagement	2	0	2	ME-116	Basic Mechaincal Engineering	3	0	3
					EE-348	Electrical Machines I	2	0	2
	Total:	**13**	**4**	**17**	**Total:**		**16**	**2**	**18**
Third Year Fall Semester					**Third Year Spring Semester**				
Course Code	Course Title	Credit Hrs.			Course Code	Course Title	Credit Hrs.		
		Th	Pr	Total			Th	Pr	Total
EE-396	Digital Signal Processing	3	1	4	EE-362	Power System Analysis	3	1	4
MT-442	Numerical Methods	3	0	3	EE-355	Embedded Systems	2	1	3
EE-224	Instrumentation and Measurement	2	1	3	EA/ES ###	Foreign Language-I	-	-	NC
MG-485	Entrepreneurship	2	0	2	EE-314	Power Electronics	3	1	4
MT-331	Probability and Statistics	3	0	3	EE-359	Electrical Power Distribution and Utilization	3	1	4
EE-347	Electrical Machines II	2	1	3	EE-265	Artificial Intelligence	2	1	3

Final Year Fall Semester					Final Year Spring Semester				
Course Code	Course Title	Credit Hrs.			Course Code	Course Title	Credit Hrs.		
		Th	Pr	Total			Th	Pr	Total
EE-457	Electrical Power System Protection	3	1	4	MG-482	Organizational Behaviour	3	0	3
EE-401	*Electrical Engineering Design Project	0	3	3	CS-439	Computer Communication Networks	2	0	2
EE-352	Electrical Power Transmission	3	0	3	EE-401	Electrical Engineering Design Project	0	3	3
EE-375	Feedback Control Systems	3	1	4	EE-414	Power Generation	3	0	3
EA/ES ###	Foreign Language-II	-	-	NC	EF-305	Engineering Economics and Management	3	0	3
TC-306	Communication Systems	3	0	3	EF-309	Occupational Safety and Health	1	0	1
	Total:	**12**	**5**	**17**	**Total:**		**12**	**3**	**15**

Foreign Language-I		
Course Code	**Course Title**	**Credit Hrs**
EA-220	Chinese Language-I	NC Course
EA-231	Turkish Language-I	
EA-224	German Language-I	
EA-226	French Language-I	
ES-222	Arabic Language-I	
EA-233	Japanese Language-I	
EA-235	Russian Language-I	

Foreign Language-II		
Course Code	**Course Title**	**Credit Hrs**
EA-221	Chinese Language-II	NC Course
EA-232	Turkish Language-II	
EA-225	German Language-II	
EA-227	French Language-II	
ES-223	Arabic Language-II	
EA-234	Japanese Language-II	
EA-236	Russian Language-II	

NED University of Engineering and Technology

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COURSE DESIGN FORM

EE-111 Engineering Drawing and Workshop Practice

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-156 Engineering Drawing				**EE-111 Engineering Drawing and Workshop Practice**				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th	**0**	**0**	**0**	**Th.**	**0**	**0**	**0**	
Pr.	**2**	**6**	**100**	**Pr**	**2**	**6**	**100**	**REMARKS**
Mechanical Drawing Drawing equipment and the use of instruments. Basic drafting techniques and standards. Pictorial Drawing and their Projections including Isometric view, Oblique view, Orthographic projections and standard practices, Development of Isometric views from orthographic Projects. **Section Views -** Intersection at various positions of geometrical bodies, such as pyramids, Cylinders and Cones, section views of transformers and motor. **Civil Drawing -** Plan, Elevations (front, left and right) and details of buildings such as Bungalows, Flats, Offices, Workshops, school and market etc., Elements of Perspective drawings. **Electrical Drawing -** Understand of basic electrical symbols, Schematic Diagrams of substations, lighting and power distribution boards, home electrical wiring, industrial wiring, electrical drawings of industrial buildings and their specifications. Control drawings and their operation using simple diagrams of automation systems used in substation. Electrical Symbols and One-line diagrams of a typical power system ,11 KV Electric substation building plan including equipment layout, Trenches (for cabling etc.) Manholes, Doors, Windows, Ventilators etc				**Mechanical Drawing -** Pictorial Drawing and their Projections including Isometric view, Oblique view, Orthographic projections and standard practices, Development of Isometric views from orthographic Projects. **Section Views -** Intersection at various positions of geometrical bodies, such as pyramids, Cylinders and Cones, section views of transformers and motor. **Civil Drawing -** Plan, Elevations (front, left and right) and details of buildings such as Bungalows, Flats, Offices, Workshops, school and market etc., Elements of Perspective drawings. **Electrical Drawing -** Understand of basic electrical symbols, Schematic Diagrams of substations, lighting and power distribution boards, home electrical wiring, industrial wiring, electrical drawings of industrial buildings and their specifications. Control drawings and their operation using simple diagrams of automation systems used in substation. Electrical Symbols and One-line diagrams of a typical power system ,11 KV Electric substation building plan including equipment layout, Trenches (for cabling etc.) Manholes, Doors, Windows, Ventilators etc **Workshop safety –** Demonstration of safety equipment, Tools and safety gear in accordance with safety regulations, electric shock treatment. **Measurement –** Measurement of electrical quantities such as current, voltage, power, inductance, capacitance etc. **Familiarization with Electric Cables and Switching Devices –** Familiarization with the type of cables and electric accessories including switches, plugs, circuit breakers, fuses, etc., comprehending their symbols for electrical wiring schematics. **Wiring Circuits and Earthing Concepts –** Assembling a parallel electric wiring circuit for a hotel and its testing in accordance with wiring regulations, Demonstration of earthing concepts and installation of an earthing cable. **Introduction to Circuit Designing & PCB Printing –** Introduction to circuit designing and simulation using Proteus, Introduction to PCB printing (Fabrication of PCB) and etching in PCB design, demonstration and evaluation of a complete PCB design and fabrication.				Course revised to include Electrical Workshop Practice as per PEC Framework

Recommended book(s) for the proposed course

(Author's name, "*Title",* edition, publisher, publication year).

Text book(s)

1.Brain Scaddan, "Electrical Installation Work", Taylor and Francis Group, 9th ed. 2018.

2. N. D. BHATT, "Engineering Drawing", Charotar Publishing House PVT. LTD., 54th ed. 2023

Reference Book(s)

1.Paul Scherz and Simon Monk "Practical Electronics for Inventors", McGraw Hill, 4th ed. 2016.

2.Thomas M. Shoemaker, "Lineman's and Cableman's Handbook", McGraw Hill, 14th ed. 2023.

Other Equivalent Courses

(offered in this University)

Note: Please attach updated Scheme(s) of Studies.

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COURSE DESIGN FORM

EE-127 Circuit Analysis

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EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-126 Circuit Analysis				**EE-127 Circuit Analysis**				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th.	**3**	**3**	**100**	**Th.**	**3**	**3**	**100**	
Pr.	**1**	**3**	**50**	**Pr**	**1**	**3**	**50**	**REMARKS**
Introduction to Circuit Analysis: Definition of circuit, analysis, modeling significance of circuit analysis for engineers **Basic RL and RC Circuits:** The Source-Free RL Circuit, Properties of the Exponential Response, the Source-Free RC Circuit, the Unit-Step Function, Driven RL Circuits, Natural and Forced Response, Driven RL Circuits. **The RLC Circuit:** The Source-Free Parallel Circuit, the overdamped Parallel RLC Circuit, Critical Damping, the under damped Parallel RLC Circuit, the Source-Free Series RLC Circuit, the Complete Response of the RLC Circuit, the Lossless LC Circuit **AC Power Analysis** - Instantaneous and Average Power, Maximum Average Power Transfer, Effective or RMS Value, Apparent Power and Power Factor, Complex Power, Conservation of AC Power, Power Factor Correction **Three-Phase Circuits** - Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection, Balanced Delta-Delta Connection, Balanced Delta-Wye Connection, Power in Balanced System, Unbalanced ThreePhase Systems **Magnetically Coupled Circuits** - Mutual Inductance, Energy in a Coupled Circuit, Linear Transformers, Ideal Transformers, Ideal Autotransformers, ThreePhase Transformers **Two-Port Network** - Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relationship between Parameters, Interconnection of networks				**Introduction to Circuit Analysis**: Definition of circuit, analysis, modeling significance of circuit analysis for engineers **Basic RL and RC Circuits:** The Source-Free RL Circuit, Properties of the Exponential Response, the Source-Free RC Circuit, the Unit-Step Function, Driven RL Circuits, Natural and Forced Response, Driven RL Circuits. **The RLC Circuit:** The Source-Free Parallel Circuit, the overdamped Parallel RLC Circuit, Critical Damping, the under damped Parallel RLC Circuit, the Source-Free Series RLC Circuit, the Complete Response of the RLC Circuit, the Lossless LC Circuit **AC Power Analysis** - Instantaneous and Average Power, Maximum Average Power Transfer, Effective or RMS Value, Apparent Power and Power Factor, Complex Power, Conservation of AC Power, Power Factor Correction **Three-Phase Circuits** - Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection, Balanced Delta-Delta Connection, Balanced Delta-Wye Connection, Power in Balanced System, Unbalanced ThreePhase Systems **Magnetically Coupled Circuits** - Mutual Inductance, Energy in a Coupled Circuit, Linear Transformers, Ideal Transformers, Ideal Autotransformers, ThreePhase Transformers **Two-Port Network** - Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relationship between Parameters, Interconnection of networks **Measurement of Electrical Quantities** -Basics of electromechanical instruments, Active and Reactive power measurement, Max. Demand indicator, Induction type KWH meter, p.f meter. Measurement of resistance, measurement of Inductance and capacitance. Measurement of dielectric strength of insulators, high voltage surges. Electronic and digital voltmeters, digital frequency meter, time interval measurement				Since EE-223 (Instrumentation & Measurement) has been revised, eliminating the chapter on "Measurement of Electrical Quantities". These topics are being introduced in this course (EE-127). This topic is important because it helps students in understanding the working and design of different electrical quantities measuring meters.

Recommended book(s) for the proposed course

(Author's name, "*Title",* edition, publisher, publication year).

Text book(s)

1. Charles K Alexander & Sadiku Matthew, "*Fundamentals of Electric Circuits*", 6th Edition, McGraw-Hill Education, 2016.

Reference Book(s)

1. William H. Hayt.," Engineering Circuit Analysis", 8th Edition, McGraw-Hill Education, 2011.

Other Equivalent Courses

(offered in this University)

Note: Please attach updated Scheme(s) of Studies.

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COURSE DESIGN FORM

EE-164 Computer Programming

F/QSP 07/05/01

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-163 Computers & Programming				**EE-164 Computer Programming**				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th.	**3**	**3**	**100**	**Th.**	**2**	**2**	**100**	
Pr.	**1**	**3**	**50**	**Pr**	**1**	**3**	**50**	**REMARKS**
Introduction and History of Computing: Contribution of Charles Babbage, foundation of IBM, Allan Turing's Bombe, Post-WWII era: digital electronic computers, Micro-processor revolution, evolution of computer programming (programming paradigms) and its modern outlook.								History portion is omitted, it is covered in another course CS-113.
Introduction to C/C++: Brief history and development, Typical C/C++ development environment, structure of C/C++ programs, compilation process and debugging.				**Introduction to C/C++:** Brief history and development, Typical C/C++ development environment, structure of C/C++ programs, compilation process and debugging.				
C/C++ Building Blocks: Data-types, Variables, representation of variables in memory, IEEE 754 Floating Point Standard, Input/output Functions, Operators, Comments.				**C/C++ Building Blocks**: Data-types, Variables, representation of variables in memory, IEEE 754 Floating Point Standard, Input/output Functions, Operators, Comments.				
Structured Programming: Loops (for() loop, while() loop and do-while() loop), Decision making constructs (if() and if()-else statements), nested loops and nested decision making constructs				**Structured Programming:** Loops (for() loop, while() loop and do-while() loop), Decision making constructs (if() and if()-else statements), nested loops and nested decision making constructs, Applications of Loops and Decision making in algorithms				
Arrays and Vectors: Array as linear data structure, Defining and manipulating 1D and 2D arrays, array memory allocation – Static vs. Automatic, C++ Standard Library Class Template Vector.				**Arrays and Vectors**: Array as linear data structure, Defining and manipulating 1D and 2D arrays, array memory allocation – Static vs. Automatic, C++ Standard Library Class Template Vector.				
Functions: C++ Standard Library Header Functions, Function Prototype, Function Definition with multiple arguments, return multiple outputs with Global variables, Storage Classes and Scope rules, Array as argument to Function, Function Over-loading, and Recursion				**Functions**: C++ Standard Library Header Functions, Function Prototype, Function Definition with multiple arguments, return multiple outputs with Global variables, Storage Classes and Scope rules, Array as argument to Function, Function Over-loading, and Recursion				
Pointers: Pointer Overview, Returning data from functions, Pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers, Pointers to perform disk I/O operation.				**Pointers**: Pointer Overview, Returning data from functions, Pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers, Pointers to perform disk I/O operation.				
Structures: Classical C Structure, Structure of Array, and Union.				**Structures**: Classical C Structure, Structure of Array, and Union.				
Object Oriented Programming: Classes, Constructors and Destructors, Objects and Member Functions, Objects as Members of Classes, Operator Overloading, Inheritance, and Polymorphism								Based on course review report, the portion of Object Oriented Programming is omitted for effective coverage of topics in due time.

Recommended book(s) for the proposed course

(Author's name, "*Title",* edition, publisher, publication year).

Text book(s)

1. Dietel, Paul; Dietel, Harvey "*C++ How to Program*", 10td Edition, Pearson, 2017.

Reference Book(s)

1. Stroustrup, Bjarne. Programming: principles and practice using C++. Pearson Education, 2014.

Other Equivalent Courses
(offered in this University)

Note: Please attach updated Scheme(s) of Studies.

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COURSE DESIGN FORM

F/QSP 07/05/01

EE-224 Instrumentation and Measurement

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course
EE-223 Instrumentation and Measurement				EE-224 Instrumentation and Measurement				
	Cr. Hrs.	Contact Hrs.	Exam Marks		Cr. Hrs.	Contact Hrs.	Exam Marks	
Th.	2	2	100	Th.	2	2	100	Applicable from **Batch 2025**
Pr.	1	3	50	Pr	1	3	50	**REMARKS**

General Theory-Classification of instruments, Block diagrams of various instrumentation schemes, Performance characteristics of instruments.

Measurement of Electrical Quantities -Basics of electromechanical instruments, moving coil and electrodynamometer instruments as ammeter, voltmeter and ohmmeter, Extension of ranges. **Instrument Transformers** - their burden and accuracy, clamp meter, Active and Reactive power measurement, Max. Demand indicator, Classification of energy meter, Induction type KWH meter, p.f meter.

Measurement of resistance by bridge method and megger, Measurement of Inductance and capacitance. Measurement of dielectric strength of insulators, high voltage surges.

Electronic Instruments - Data Acquisition, A/D conversion. Electronic and digital voltmeters, digital frequency meter, time interval measurement, Power and energy meter.

Transducers - Temperature transducers, Pressure transducers, Variable, resistance and inductance transducers, linear variable differential transformer (LVDT), capacitive, photoconductive, and piezo-electric transducers, thermo electric transducers.

Measurement of Nonelectrical Quantities - Measurement of temperature, pressure, flow, strains, thermal conductivity, motion, speed and vibrations.

Introduction and Performance Characteristics:
Definitions, classification, and interfacing requirements; Input/output characteristics and transfer function; Electrical considerations; performance metrics; Accuracy and error analysis; Temporal and frequency response; Calibration and reliability.

Mechanical & Temperature sensors and thermal actuators:
thermo-resistive sensors; thermoelectric sensors; p–n junction temperature sensors; thermomechanical sensors and actuators; heating actuators and their types; resistance-alloy heating elements; immersion-type heating element; ceramic-type heating element; induction-type heating; Force sensors; accelerometers; pressure sensors; velocity sensing.

Electric, magnetic & optical sensors and actuators:
photoelectric sensor; CCD sensors and detectors; thermal-based optical sensors; capacitive sensors and actuators; inductive sensors; Hall effect sensors; magnetometers; magnetic actuators; voltage and current sensors.

Interfacing Methods and Circuits:
Operational Amplifier Circuits; ADC/DAC architectures (Flash, Delta-Sigma, Successive Approximation), PWM and PWM amplifiers; Power and Signal Conditioning; Data Acquisition and Transmission; digital data transmission protocols and buses; Noise and Interference.

Communication Protocols: I^2C and one-wire protocols and their usage and detailed specifications; brief discussion of SPI, CAN Bus and GPIB protocols.

Interfacing to Microprocessors:
Microprocessor Architecture and Operation; System Resources and Peripherals; Sensor and Actuator Integration: Interfacing requirements and error considerations; Virtual Instrumentation.

Course contents have been revised to not only teach fundamentals of measurements but also instruments like various sensors and actuators. This course also includes interfacing of these sensors with microprocessors making meaning full measurements.

Recommended book(s) for the proposed course

Text book(s)

1. Nathan Ida, "Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction", 2nd edition, IET, 2020.

Reference Book(s)

1. H. S. Kalsi, "Electronic Instrumentation and Measurements", 4rd edition, McGraw Hill, 2019.

Other Equivalent Courses
(offered in this University)

NED University of Engineering and Technology

F/QSP 07/05/01

COURSE DESIGN FORM

EE-233 Signals and Systems

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-232 Signals and Systems				EE-233 Signals and Systems				
	Cr. Hrs.	Contact Hrs.	Exam Marks		Cr. Hrs.	Contact Hrs.	Exam Marks	
Th.	3	3	100	Th.	3	3	100	
Pr.	1	3	50	Pr	0	0	0	**REMARKS**
LTI Systems: Continuous time LTI Systems, modeling of different physical systems (Electrical, Mechanical and coupled systems), state-space representation of LTI systems, Type of inputs, Zero-input response, Convolution Integral, transient and forced/steady-state response, complete response of LTI systems using classical solution of differential equations, second order systems and their responses (underdamped, overdamped, critically damped) **Fourier Series:** Fourier Series Representation of continuous time periodic signals, properties of continuous time Fourier series, exponential form of Fourier series (analysis and synthesis equations) **Fourier Transform:** Fourier Transform Representation of continuous time aperiodic signals, properties of continuous time Fourier transform, **Laplace Transform:** Definition, derivation of Laplace transforms of simple functions, inverse transformation techniques Properties, application of Laplace for solution of differential equations of physical systems, analysis of LTI systems using Laplace transform **Magnitude-Phase**: representation (for Frequency response) of LTI systems, transfer functions, Bode-plots, frequency responses of first and second order transfer functions. Design of passive and active 1st and 2nd order analog filters				**LTI Systems:** Continuous time LTI Systems, modeling of different physical systems (Electrical, Mechanical and coupled systems), state-space representation of LTI systems, Type of inputs, Zero-input response, Convolution Integral, transient and forced/steady-state response, complete response of LTI systems using classical solution of differential equations, second order systems and their responses (underdamped, overdamped, critically damped) **Fourier Series:** Fourier Series Representation of continuous time periodic signals, properties of continuous time Fourier series, exponential form of Fourier series (analysis and synthesis equations) **Fourier Transform:** Fourier Transform Representation of continuous time aperiodic signals, properties of continuous time Fourier transform, **Laplace Transform:** Definition, derivation of Laplace transforms of simple functions, inverse transformation techniques Properties, application of Laplace for solution of differential equations of physical systems, analysis of LTI systems using Laplace transform **Magnitude-Phase**: representation (for Frequency response) of LTI systems, transfer functions, Bode-plots, frequency responses of first and second order transfer functions. Design of passive and active 1st and 2nd order analog filters				The course contents are same however the labs credits are omitted.
Recommended book(s) for the proposed course (Author's name, "*Title",* edition, publisher, publication year). **Text book(s)** 1. B.P. Lathi and Roger A. Green, "Linear Systems and Signals", Oxford University Press, 3rd ed. 2018 **Reference Book(s)**								**Other Equivalent Courses** *(offered in this University)*

Note: Please attach updated Scheme(s) of Studies.

NED University of Engineering and Technology

COURSE DESIGN FORM

F/QSP 07/05/01

EE-265 Artificial Intelligence

EXISTING				APPROVED				√ New Course • Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
				EE-265 Artificial Intelligence				
	Cr. Hr	Contact Hrs.	Exam Marks		Cr. Hrs.	Contact Hrs.	Exam Marks	
Th				Th.	2	2	100	
Pr				Pr	1	3	50	REMARKS
N/A				**Introduction:** The idea of machine learning, Importance and relevance to electrical engineering, type of machine learning, important tools (e.g., Python, Scikit learn etc.) **Supervised Learning**: **Linear Regression**: Simple linear regression, cost function, normal equation, gradient descent (batch, stochastic, mini-batch), learning rate, multinomial regression, regularization (lasso, ridge) **Logistic Regression**: Introduction to classification problems, sigmoid function, logit function, log loss cost function, multinomial logistic regression, softmax function. **Support Vector Machines (SVM):** Preprocessing data with min-max scaling, standardization, idea of support vectors, linear SVM classification, soft margin classification, hard margin classification, ridge loss, SVM for nonlinear decision boundaries, kernel trick, polynomial kernel, radial basis function, Support Vector Classification **Decision Trees:** Introduction to non-parametric methods, decision trees structure for classification, gini impurity, entropy impurity, regularization hyperparameters, regression using decision trees **Neural Networks**: idea of neuron, perceptron, multi-layer perceptron (MLP), backpropagation, regression MLP, classification MLP, implementation with Keras, **Unsupervised Learning**: Clustering, K-means algorithm, PCA **Advanced Topics in AI:** Deep Learning (DL): Activation functions, vanishing and exploding gradients, optimization function (momentum, adam, RMSProp, etc), regularization, Vision application with DL; Fuzzy Logic (FL): Introduction and FL theory, Fuzzy sets and membership functions, linguistic variables and fuzzy rules, engineering application of fuzzy logic; Ethics in AI: Fairness, Bias, and Discrimination; Privacy and Surveillance; Accountability and Transparency; Automation and Impact on Employment; Autonomous Systems and Safety; Deepfakes, Misinformation, and Manipulation; Governance, Regulation, and Policy; Environmental Impact of AI.				New Course

Recommended book(s) for the proposed course

Text book(s)

1. Aurélien Géron, "*Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow*", 2td Edition, O'Reilly, 2019.
2. Timothy J. Ross "*Fuzzy Logic with Engineering Applications*", 4th Edition, Wiley, 2016.

Reference Book(s)

1. Goodfellow, I., Bengio, Y., & Courville, A. "*Deep learning*". MIT press, 2016.

Note: Please attach updated Scheme(s) of Studies.

NED University of Engineering and Technology

COURSE DESIGN FORM

EE-314 Power Electronics

F/QSP 07/05/01

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-313 Power Electronics				**EE-314 Power Electronics**				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th.	**3**	**3**	**100**	**Th.**	**3**	**3**	**100**	
Pr.	**1**	**3**	**50**	**Pr**	**1**	**3**	**50**	**REMARKS**
Introduction: SSDs in power electronics, power diodes, power transistors, Power MOSFETS, Thyristors, Triacs, Diac. Characteristics of GTO, RCT, etc. Series and parallel operation of SCR, LASCR. Thyristor turn on, integral cycle control and phase angle control, elementary and advanced firing schemes, sequence and close loop control. **Thyristor Commutation:** Self-commutation, impulse commutation, series capacitor commutation, parallel capacitor commutation. **Uncontrolled and Controlled Rectifiers:** Single phase, three phase, semi converter, full converter, dual converter, analysis and performance, parameters as harmonic factor, utilization factor, power factor, distortion factor, etc. rectifiers with purely resistive, highly inductive and RL loads. Application of Uncontrolled and Controlled rectifiers in electrical drives and power system. **DC Chopper:** Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buck-boost regulator, Cuk regulator, Choppers using thyristors. Application of DC Choppers in electrical drives and power system. **Protection Analysis:** Over voltage, over current, di/dt & dv/dt protection, heat sinks. **Inverters:** Principles, half bridge, full bridge inverters, constant phase width modulation, variable PW modulation, sinusoidal PW modulation, modified SPWM. Application of inverters in electrical drives and power system. **Electronic Power Supplies:** Design and analysis of regulated power supplies, switch mode power supplies, Uninterrupted power supplies. Application of Electronic Power supplies in electrical drives and power system.				**Introduction:** SSDs in power electronics, power diodes, power transistors, Power MOSFETS, Thyristors, Triacs, Diac. Characteristics of GTO, RCT, etc. Series and parallel operation of SCR, LASCR. Thyristor turn on, integral cycle control and phase angle control, elementary and advanced firing schemes, sequence and close loop control **Uncontrolled and Controlled Rectifiers:** Single phase, three phase, semi converter, full converter, dual converter, analysis and performance, parameters as harmonic factor, utilization factor, power factor, distortion factor, etc. rectifiers with purely resistive, highly inductive and RL loads. Application of Uncontrolled and Controlled rectifiers in electrical drives and power system. **DC Chopper:** Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buck-boost regulator, Cuk regulator, Choppers using thyristors. Application of DC Choppers in electrical drives and power system. **Protection Analysis:** Over voltage, over current, di/dt & dv/dt protection, heat sinks. **Inverters:** Principles, half bridge, full bridge inverters, constant phase width modulation, variable PW modulation, sinusoidal PW modulation, modified SPWM. Application of inverters in electrical drives and power system. **Electronic Power Supplies:** Design and analysis of regulated power supplies, switch mode power supplies, Uninterrupted power supplies. Application of Electronic Power supplies in electrical drives and power system.				Removed Thyristor Commutation methods as they are obsolete.

Recommended book(s) for the proposed course

(Author's name, "*Title",* edition, publisher, publication year).

Text book(s)

1. Muhammad H. Rashid, "Power Electronics Devices, Circuits, and Applications" 4th edition, Pearson, 2014.
2. Erickson, Robert W, "Fundamentals of Power Electronics", 3rd edition, Springer, 2020

Reference Book(s)

1. Ned Mohan, Power Electronics: Converters, Applications, and Design, 3rd edition, Wiley, 2002

Other Equivalent Courses

(offered in this University)

1. Power Electronics (EL-344)

Note: Please attach updated Scheme(s) of Studies.

NED University of Engineering and Technology F/QSP 07/05/01

COURSE DESIGN FORM

EE-348 Electrical Machines-I

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-346 Electrical Machines-I				EE-348 Electrical Machines-I				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th.	**2**	**2**	**100**	**Th.**	**2**	**2**	**100**	
Pr.	**1**	**3**	**50**	**Pr**	**0**	**0**	**0**	**REMARKS**

Fundamentals of Electrical Machinery: A linear machine, Left hand rule, right hand rule, a simple single loop AC and DC. Magnetic flux, flux density, magneto motive force, permeability, hysteresis, Faraday's law, Lenz's law, induced force on wire, induction of voltage on a conductor. **DC Generators:** Construction and working, types, emf equation, losses, efficiency, armature reaction, performance characteristics and their curves. **DC Motors:** Types, Back EMF, torque, speed and speed regulation, performance characteristics and their curves, losses and efficiency. **Transformers**: Types of transformer, single phase and three phase transformer, construction, principle of working, emf equation, Transformation ratios, no load working and vector diagram, magnetizing current, vector diagram on load, Equivalent circuit, Poly phase transformers, star delta and zig-zag connections for parallel operation, sharing of load, tertiary windings, harmonics and transients in transformers, on load tap changing transformers, auto transformers, vector groups, distribution and power transformer.	**Fundamentals of Electrical Machinery:** A linear machine, Left hand rule, right hand rule, a simple single loop AC and DC. Magnetic flux, flux density, magneto motive force, permeability, hysteresis, Faraday's law, Lenz's law, induced force on wire, induction of voltage on a conductor. **DC Generators:** Construction and working, types, emf equation, losses, efficiency, armature reaction, performance characteristics and their curves. **DC Motors:** Types, Back EMF, torque, speed and speed regulation, performance characteristics and their curves, losses and efficiency. **Transformers:** Types of transformer, single phase and three phase transformer, construction, principle of working, emf equation, Transformation ratios, no load working and vector diagram, magnetizing current, vector diagram on load, Equivalent circuit, Poly phase transformers, star delta and zig-zag connections for parallel operation, sharing of load, tertiary windings, harmonics and transients in transformers, on load tap changing transformers, auto transformers, vector groups, distribution and power transformer.	No theory contents are changed. Only Labs portion is adjusted in Electrical Machines – II.
Recommended book(s) for the proposed course (Author's name, "*Title",* edition, publisher, publication year). **Text book(s)** 1. Stephen Chapman, "*Electric Machinery Fundamentals*", 5th Edition, McGraw Hill, 2011. **Reference Book(s)**		**Other Equivalent Courses** *(offered in this University)*

Note: Please attach updated Scheme(s) of Studies.

NED University of Engineering and Technology

COURSE DESIGN FORM

EE-355 Embedded Systems

F/QSP 07/05/01

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from **Batch 2025**
EE-354 Embedded Systems				**EE-355 Embedded Systems**				
	Cr. Hrs	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th	**2**	**2**	**100**	**Th.**	**2**	**2**	**100**	
Pr	1	3	50	**Pr**	**1**	**3**	**50**	**REMARKS**
Microprocessor and Microcontroller (latest) Architecture. Internal Registers, Machine code, addressing modes and Instruction Set, C and the Compiler, Debugging Software and Hardware, Threads, Tasks and Simple Scheduling, Branching, Interrupt handling, I/O and Communication Ports programming, Digital and Analog I/O Peripherals, Analog to Digital (A/D) and Digital to Analog (D/A) interfacing, Simulation design and debugging, Introduction and applications of Internet of Things (IoT).				**Introduction to Microcontrollers:** Microcontroller and microprocessor architectures; Harvard and Von Neumann architectures; data representation. **The ARM Instruction Set Architecture (ISA):** ARM assembly instruction sets; ARM Cortex-M organization; ARM C to ARM assembly translation. **Assembly Programming for the ARM Cortex-M:** Program status register; shift and rotate; addition, subtraction, multiplication and division; bit-wise operations; sign and zero extension; data movement between registers; big- and little-endian data storage; memory addressing; branch instructions; loops. **Structured Programming for the ARM Cortex-M in C and Assembly**: Basic control structures; register re-use; examples like factorial computation, counting ones in a word, counting digits in an integer, maximum of an array. **Procedural Programming for the ARM Cortex-M in C and Assembly:** Subroutines; stack implementation via STM and via LDM; preserving run-time environment via stack; passing arguments to subroutine, examples of problems solved with subroutines; **Mixing C and Assembly for the ARM Cortex-M:** Data types and access; data alignment and data structure padding; special variables (static and volatile); inline assembly; calling assembly subroutines from a C program; calling C functions from assembly programs. **Interrupt and Interrupt Handling for the ARM Cortex-M:** Introduction to interrupts; Interrupt Service Routine (ISR); interrupt vector table; Nested Vector Interrupt Controller (NVIC); system timer; external and software interrupts. **Instruction Encoding and Decoding:** Trade-off between code density and performance; encoding 16-bit and 32-bit instructions; calculating target memory address; instruction decoding examples. **ARM Cortex-M Peripherals:** General Purpose Input/Output (GPIO); general-purpose timers and their applications; Direct Memory Access (DMA) controller; Analogue-to-Digital Converter (ADC); ADC architecture, modes and channels; Serial Communication Protocols (Universal Asynchronous Receiver Transmitter (UART), Inter-Integrated Circuit (IIC) communication bus; Serial Peripheral Interface (SPI) communication bus.				The course has been revised to a more contemporary standard. Previously, ATMEL atmega328p microcontroller was being taught which has been around for more than 30 years. This hindered the learning experience of our students as extremely novel and innovative changes in microcontroller architecture are underway. This new outline proposes to teach ARM series (Cortex-M3 and M4) of microcontrollers which are not only state-of-the-art but also widely accepted by the global industry.
Recommended book(s) for the proposed course (Author's name, "Title", edition, publisher, publication year). **Text book(s)** 1. Yifeng Zhu, "Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C", 3rd edition, E-Man Press, 2018. **Reference Book(s)** 1. Joseph Yiu, "The Definitive Guide to ARM Cortex M3 and Cortex M4 Processors", 3rd edition, Newnes, 2014.								**Other Equivalent Courses** (offered in this University)

Note: Please attach updated Scheme(s) of Studies.

NED University of Engineering and Technology

COURSE DESIGN FORM

F/QSP 07/05/01

EE-396 Digital Signal Processing

EXISTING				APPROVED				• New Course √ Revised Course √ Compulsory Course • Elective Course Applicable from ***Batch 2025***
EE-395 Digital Signal Processing				**EE-396 Digital Signal Processing**				
	Cr. Hrs.	**Contact Hrs.**	**Exam Marks**		**Cr. Hrs.**	**Contact Hrs.**	**Exam Marks**	
Th.	**2**	**2**	**100**	**Th.**	**3**	**3**	**100**	
Pr.	**1**	**3**	**50**	**Pr.**	**1**	**3**	**50**	**REMARKS**
Overview of Discrete-time Signals and Systems: Sampling, Aliasing, Quantization, Convolution, Correlation, Properties of Discrete time Signals and Systems. **Linear Constant Coefficient Difference Equations:** Modelling discrete systems, conversion of differential equations into difference equations, solution of difference equations. ~~**Discrete Time Fourier Series:** Representation of discrete time periodic signals, signal analysis using discrete time Fourier series, properties of discrete time Fourier series.~~ Discrete Fourier Transform: Frequency Domain Sampling, DFT Properties, Inverse DFT, Windowing and DFT Leakage, Direct Computation of DFT; **Fast Fourier Transform:** Divide and Conquer, Radix algorithms; Inverse FFT, Applications of FFT **Discrete time systems implementation:** Overview of z-transform, Analysis of discrete system, Structures of Discrete time systems, Fixed and Floating number types, Quantization effects. **Design of Digital Filters:** General Considerations, FIR and IIR Filters, Techniques of FIR and IIR filter Design.				**Overview of Discrete-time Signals and Systems:** *Concept of Frequency in Discrete time signals, Relationship with Frequency in Analog domain,* **Analog to Digital Conversion:** Sampling, Aliasing, Quantization, *resolution, Errors and Mitigation, data rates.* **Discrete Time Tools:** Convolution, Correlation, Properties of Discrete time Signals and Systems. **Linear Constant Coefficient Difference Equations:** Modelling discrete systems using difference equations, solution of difference equations. *System Realization using Block Diagrams DF-I and DF-II* **Discrete Fourier Transform:** Frequency Domain Sampling, DFT Properties, Inverse DFT, Windowing and DFT Leakage, Direct Computation of DFT; Linear Transformation **Fast Fourier Transform:** Divide and Conquer, Radix algorithms; Inverse FFT, Applications of FFT **Discrete time systems implementation:** Overview of z-transform, Analysis of discrete system, Structures of Discrete time systems, Fixed and Floating number types, Quantization effects. *Pole Zero maps, Bode Plots* **Design of Digital Filters:** General Considerations, FIR and IIR Filters, Techniques of FIR and IIR filter Design. ***Multi-rate Signal Processing:*** *Down sampling and Up sampling, Decimation, and Interpolation*				Analog to Digital Conversion is more elaborated with Errors introduced due to quantization and how to mitigate them, System Modelling has been enhanced with addition of System Realization. DFT has been more elaborated. Pole Zero Plots and Bode plots have been added to build foundation for Digital Filter Design. Discrete time Fourier Series has been illuminated as it doesn't find much application in DT system design.

Recommended book(s) for the proposed course

(Author's name, "*Title",* edition, publisher, publication year).

Text book(s)

1. Dimitris Manolakis and John G Proakis, "Digital Signal Processing", Pearson, 2021.

Reference Book(s)

Other Equivalent Courses

(offered in this University)

Note: Please attach updated Scheme(s) of Studies.

Department of Electrical Engineering

Prerequisite Courses - Bachelor of Engineering (Electrical)