NED University of Engineering and Technology

Department of Electrical Engineering

Bachelor of Engineering (Electrical)

DEPARTMENTAL OUTCOME BASED EDUCATION (OBE) CATALOGUE

Batch 2018

Contents

1. Vision Statement

a. University Vision

Be a leader in enabling Pakistan's social and economic transformation.

b. Department Vision

Be an innovator in electrical engineering education and research to spearhead sustainable and environment-friendly socio-economic growth.

2. Mission Statement

a. University Mission

Acquire education and research excellence in engineering and allied disciplines to produce leadership and enabling application of knowledge and skills for the benefit of the society with integrity and wisdom.

b. Programme Mission

To inculcate students with essential knowledge, skills and values required for sustainable design, development and innovation in the field of electrical engineering for socio-economic growth and enabling them for lifelong learning to contribute towards interdisciplinary engineering solutions.

3. Program Educational Objectives (PEOs)

PEO-1: Demonstrate clear understanding and a vision of the core domains of electrical engineering as well as contemporary interdisciplinary research areas.

PEO-2: Identify prevalent engineering problems in work/social environments, propose and initiate their solutions by applying relevant knowledge and skill set innovatively while adhering to work ethics and social contribution mainly.

PEO-3: Pursue lifelong learning goals, continual professional development and sustainable growth of the society.

4. Mapping of PEOs to University and Departmental Vision and Mission

Vision and Mission		Program Educational Objectives (PEOs)		
		PEO-1	PEO-2	PEO-3
University Vision	Be a leader[1] in enabling Pakistan's social[3] and economic transformation[2].	✓	✓	✓
University Mission	Acquire education and research excellence[1] in engineering and allied disciplines to produce leadership[2] and enabling application of knowledge and skills for the benefit of the society[3] with integrity and wisdom.	✓	✓	✓
Department's Vision	Be an innovator in electrical engineering education[1] and research to spearhead[2] sustainable and environment-friendly socio-economic growth[3].	✓	✓	✓
Programme's Mission	To inculcate students with essential knowledge, skills and values[1] required for sustainable design, development and innovation in the field of electrical engineering[2] for socio-economic growth and enabling them for lifelong learning to contribute towards interdisciplinary engineering solutions[3].	✓	✓	✓

5. Program Learning Outcomes (PLOs)

PLO-1 Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PLO-2 Problem Analysis: An ability to identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PLO-3 Design / Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PLO-4 Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

PLO-5 Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.

PLO-6 The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

PLO-7 Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PLO-8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PLO-9 Individual and Teamwork: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

PLO-10 Communication: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PLO-11 Project Management: An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

PLO-12 Lifelong Learning: An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

6. Mapping of PLOs to PEOs

Program Learning Outcomes (PLOs)	Program Educational Objectives (PEOs)		
	PEO-1	PEO-2	PEO-3
PLO 1: Engineering Knowledge	✓		
PLO 2: Problem Analysis	✓		
PLO 3: Design / Development of solutions		✓	
PLO 4: Investigation	✓		
PLO 5: Modern Tool Usage		✓	
PLO 6: The Engineer and Society		✓	
PLO 7: Environment and Sustainability			✓
PLO 8: Ethics		✓	
PLO 9: Individual and Team Work		✓	
PLO 10: Communication			✓
PLO 11: Project Management		✓	
PLO 12: Lifelong Learning			✓

7. Scheme of Studies

Electrical Engineering

First Year

Fall Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-125	Basic Electrical Engineering	3	1	4
PH-122	Applied Physics	3	1	4
HS-114	Functional English	3	0	3
ME-107	Basic Mechanical Engineering	3	1	4
MT-114	Calculus	3	0	3
	Total	**15**	**3**	**18**

Spring Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-156	Engineering Drawing	0	2	2
EE-126	Circuit Analysis	3	1	4
MT-227	Differential Equations	3	0	3
CE-109	Engineering Surveying	2	1	3
EE-163	Computers and Programming	3	1	4
HS-105/ HS-127	Pak. Studies/ Pak. Studies (For Foreigners)	2	0	2
HSK-I	Chinese Language			NC
	Total	**13**	**5**	**18**

Second Year

Fall Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EL-240	Electronic Devices and Circuits	3	1	4
EE-264	Data Structures and Algorithms	2	1	3
MT-272	Linear Algebra and Geometry	3	0	3
MT-226	Multi Variable Calculus	3	0	3
HS-214	Academic Writing	3	0	3
HS-205/ HS-209	Islamic Studies / Ethical Behavior	2	0	2
HSK-II	Chinese Language			NC
	Total	**16**	**2**	**18**

Spring Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-382	Electromagnetic Fields	2	0	2
EE-223	Instrumentation and Measurement	2	1	3
EE-231	Signals and Systems	3	1	4
CS-205	Logic Design and Switching Theory	3	1	4
MT-331	Probability and Statistics	3	0	3
HS-200	Community Service			NC
	Total	**13**	**3**	**16**

Third Year

Fall Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-345	Electrical Machines	3	1	4
EE-394	Digital Signal Processing	2	1	3
EE-359	Electrical Power Distribution and Utilization	3	1	4
EL-343	Power Electronics	3	1	4
MT-442	Numerical Methods	3	0	3
	Total	**14**	**4**	**18**

Spring Semester

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-362	Power System Analysis	3	1	4
EE-352	Electrical Power Transmission	3	0	3
EE-374	Feedback Control Systems	3	1	4
TC-307	Communication Systems	3	1	4
HS-304	Business Communication & Ethics	3	0	3
	Total	**15**	**3**	**18**

Final Year

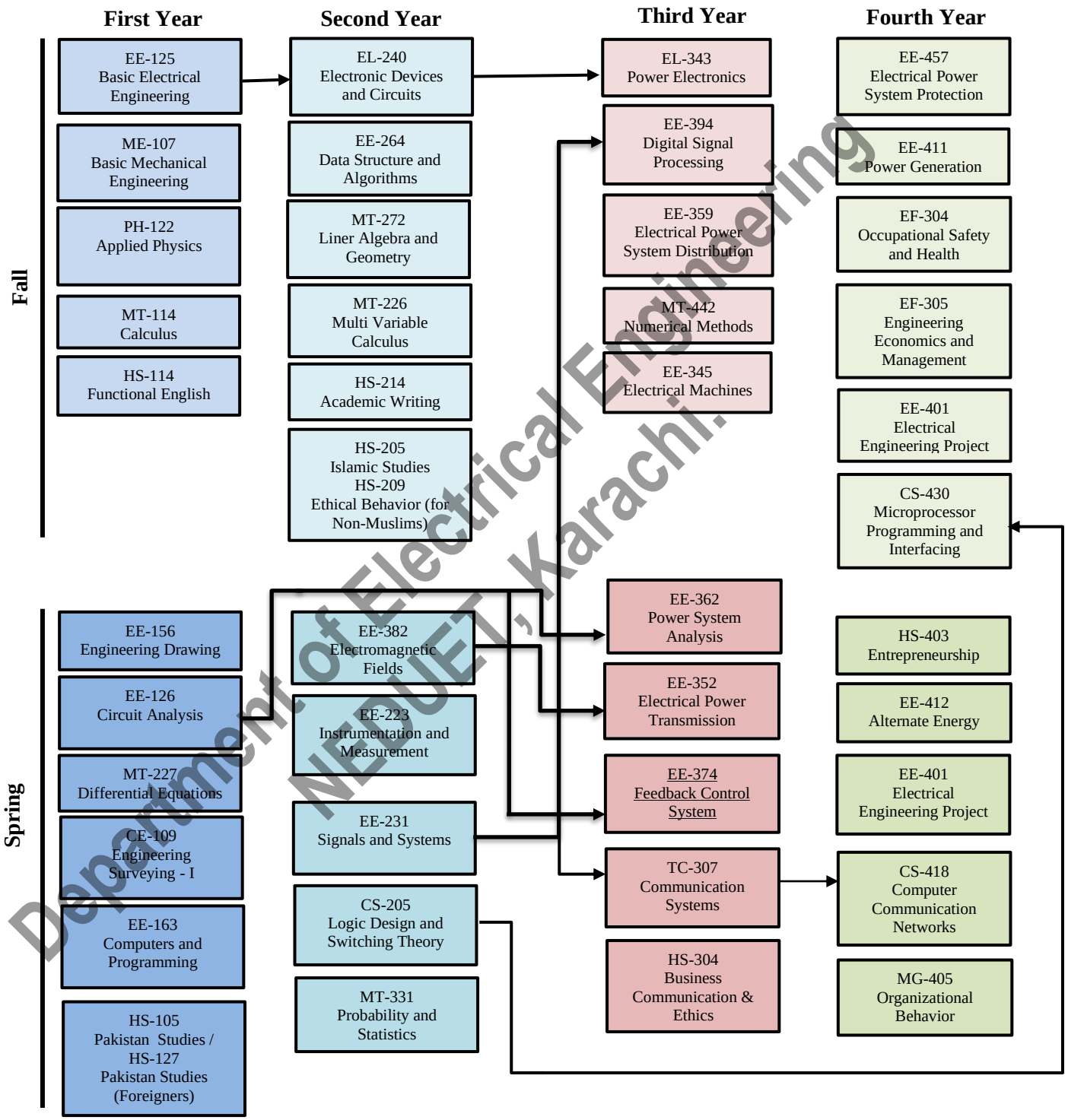
Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-401	*Electrical Engineering Project	0	3	3
EE-457	Electrical Power System Protection	3	1	4
EE-411	Power Generation	3	0	3
CS-430	Microprocessor Programming and Interfacing	3	1	4
EF-304	Occupational Safety and Health	2	0	2
EF-305	Engineering Economics and Management	3	0	3
	Total	**14**	**5**	**19**

Course Code	Course Title	Credit Hrs		
		Th	Pr	Total
EE-401	*Electrical Engineering Project	0	3	3
HS-405	Organizational Behaviour	3	0	3
HS-403	Entrepreneurship	2	0	2
EE-412	Alternate Energy Systems	3	0	3
CS-418	Computer Communication Networks	2	1	3
	Total	**10**	**4**	**14**

** Duration one academic year: Requires literature survey and preliminary work during this Semester*

Department of Electrical Engineering

Prerequisite Courses – Bachelor of Engineering (Electrical)



8. Mapping of Curriculum to PLOs

		Electrical Engineering Courses	Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
First Year	Fall	EE-125 Basic Electrical Engineering	C3	C4, A2, P3										
		PH-122 Applied Physics	C3, P3	C3, A2										
		HS-114 Functional English									C3	C3, A3		
		ME-107 Basic Mechanical Engineering	C3	C4, A3, P3										
		MT-114 Calculus	C3	C3, A2										
	Spring	EE-156 Engineering Drawing	C3, A3				P3							
		EE-126 Circuit Analysis	C3	C4, A2, P3										
		MT-227 Differential Equations	C3, A2	C3										
		CE-109 Engineering Surveying	C3, A2, P3	C3										
		EE-163 Computers and Programming	C3				C3, A2							
		HS-105/HS-127 Pak. Studies/ Pak. Studies (For Foreigners)						C3			C2, A3			
		HSK-I Chinese Language												
Second Year	Fall	EL-240 Electronic Devices and Circuits	C4, A3	C4	C4, P3									
		EE-264 Data Structures and Algorithms			C4, P4		C4, A2							
		MT-272 Linear Algebra and Geometry	C3	C3, A2										
		MT-226 Multi Variable Calculus	C3	C3, A2										
		HS-214 Academic Writing									C4	CA, A3		
		HS-205/HS-209 Islamic Studies / Ethical Behavior								C3, A3				C3
		HSK-II Chinese Language												
	Spring	EE-382 Electromagnetic Fields	C5	C5, A3										
		EE-223 Instrumentation and Measurement	C3	C4, A3, P3										
		EE-231 Signals and Systems	C4	C4, A2, P3										
		CS-205 Logic Design & Switching Theory	C3		C5, A2, P4									
		MT-331 Probability and Statistics	C3	C3, A2										
		HS-200 Community Service						A3						A2

		Electrical Engineering Courses	Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
Third Year	Fall	EE-345 Electrical Machines	C2		C3, A4, P3									
		EE-394 Digital Signal Processing	C1		C6	C4, P3							A4	
		EE-359 Electrical Power Distribution and Utilization			C6	C5, P3								A4
		EL-343 Power Electronics	C4, A3		C5, P3									
		MT-442 Numerical Methods		C5	C4	C5, A3								
	Spring	EE-362 Power System Analysis		C4	C5	P3					A3	C6		
		EE-352 Electrical Power Transmission		C4		C5		A3	C2					
		EE-374 Feedback Control Systems		C4	C6	P3					A3		C5	
		TC-307 Communication Systems	C3	C4			P2							
		HS-304 Business Communication & Ethics								C3		C6, A3		
Fourth Year	Fall	EE-401 Electrical Engineering Project		C	C				C	A	A	A	A	
		EE-457 Electrical Power System Protection			C6	C5, P3								
		EE-411 Power Generation	C4	C4					C4, A4					
		CS-430 Microprocessor Programming and Interfacing	C3	C4			P3							
		EF-304 Occupational Safety and Health						C2	C4	A2				A2
		EF-305 Engineering Economics and Management							C2	C1			C3	
	Spring	EE-401 Electrical Engineering Project		C	C					A	C, A	C, A	C	C
		HS-405 Organizational Behaviour						C4			A3			C2
		HS-403 Entrepreneurship								A3			C3	C2
		EE-412 Alternate Energy Systems						C4	C5	A4			C5	
		CS-418 Computer Communication Networks	C2	C3			P3							
		Internship	C	C				A		A	A	A		

9. Key Performance Indicators (KPIs)

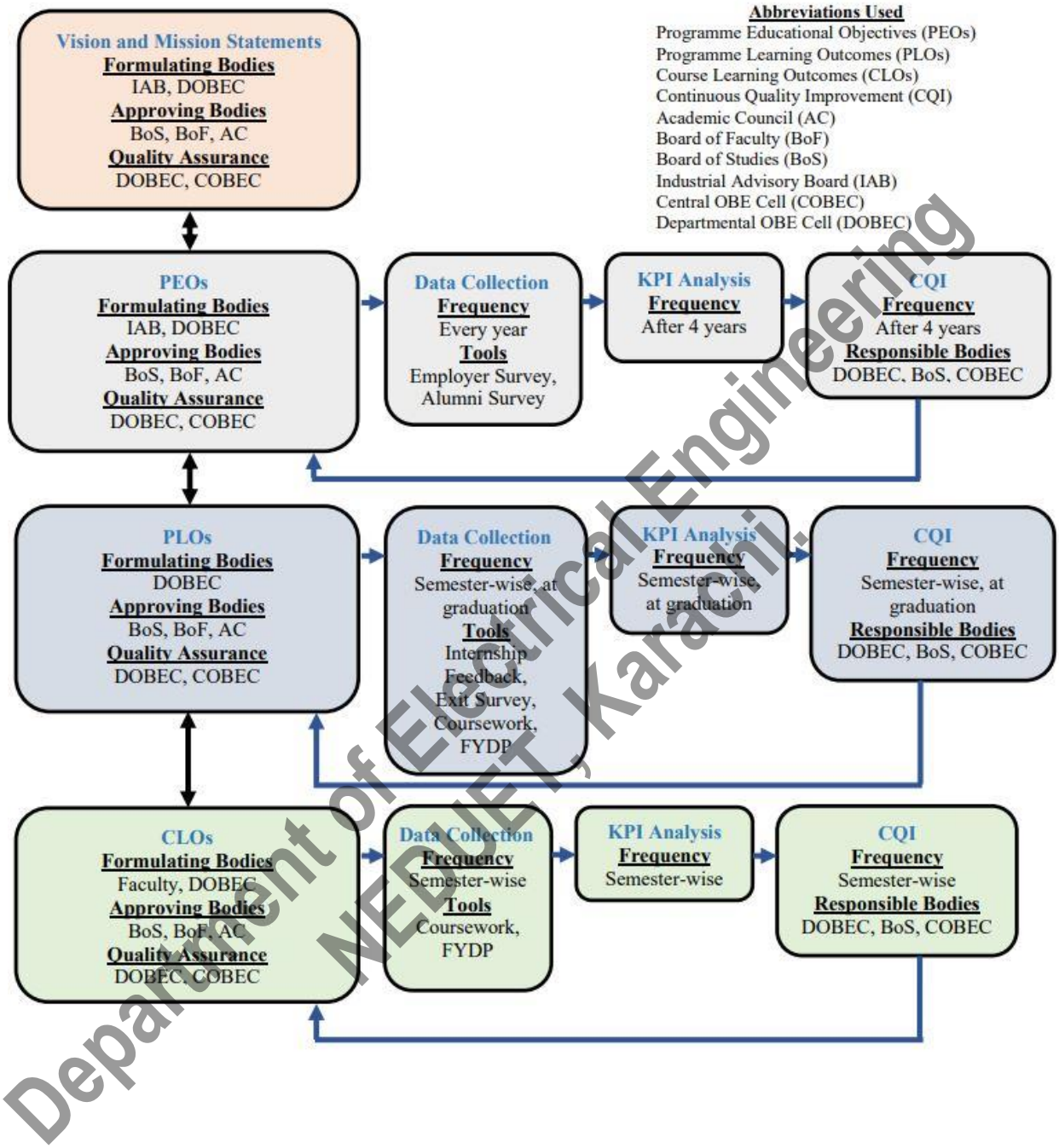
		Evaluation Tool	KPI	Data Collection Frequency	Analysis Frequency
PEO	Programme	▪ Employer Feedback Survey ▪ Alumni Feedback Survey ▪ Employment Statistics	50% of the Survey Form responses must attain a score of 3 or above (on a scale of 1 to 5), and 50% of the graduates must be employed and/or engaged in higher studies.	Every Year	4 years from graduation
PLO	Student	▪ CLO scores of the student in the mapped course(s)	Each PLO must be attained in at least 50% of the respective mapped course(s), with an average score of at least 55%.	Every Semester	Every Semester
	Course	▪ PLO scores of all the students in the mapped course	At least 55% of the students must attain that PLO	Every Semester	Every Semester
	Programme	▪ Final PLO attainment statistics of all the courses including FYDP ▪ Internship Feedback Form ▪ Exit Survey	At least 50% of the mapped courses must attain the PLO and at least 55% of the students/ responses must attain a score of 3 or above on a scale of 1 to 5.	At graduation	At graduation
CLO	Student	▪ Course work	The student must obtain at least 55% average percentage score from all attempts.	Every Semester	Every Semester
	Course	▪ CLO scores of all students in the course	At least 55% of the students must attain that CLO	Every Semester	Every Semester

10.Continuous Quality Improvement (CQI)

The following table shows the post KPI evaluation actions, severity-wise, as outlined in the Manual of Uniform OBE Framework.

	PEO CQI	PLO CQI			CLO CQI	
	Program KPI	**Student KPI**	**Course KPI**	**Programme KPI**	**Student KPI**	**Course KPI**
KPIs Achieved	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action
KPIs Not Achieved	1. Review of curriculum strategies. 2. Review of assessment methods. 3. Review of the relevant KPIs. 4. Review of PEOs. 5. Revisions implemented.	1. Warning through the progressive attainment sheet. 2. Student counselling.	1. Review of teaching and learning process. 2. Review of CLOs assessment methods. 3. Review of CLO-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented	1. Review of teaching and learning process. 2. Review of PLOs assessment methods. 3. Review of Course-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented.	1. Student provided further chances through direct assessment tools. 2. Student counselling.	1. Review of CLO assessment methods. 2. Review of CLOs and taxonomy levels. 3. Review of students' course feedback. 4. Review of CLO KPIs. 5. Faculty advice by Departmental OBE Cell. 6. Faculty training.

The following figure shows the overall OBE framework for an Engineering Programme as outlined in the Manual of Uniform OBE Framework.



11.Course Profiles

Course profiles of all the engineering and non-engineering courses listed in the Scheme of Studies are given in this section. Course contents, as approved from Academic Council, are provided in the course profiles.

First Year

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-125 & Basic Electrical Engineering	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Fundamentals of Electric Circuits: Charge, Current, Voltage and Power, Voltage and Current Sources, Ohm's Law. Equivalent resistance of a circuit.

Voltage and Current Laws: Node, Loop and Branches, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), single-loop circuits, single Node Pair Circuit, Series and Parallel Connected Independent Sources.

Circuit Analysis Techniques: Nodal Analysis, Mesh Analysis, Linearity and Superposition, Source Transformations, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer theorem.

Capacitors and Inductors: Capacitor, Inductor, Inductance and Capacitance Combination, voltage current relationship for inductor and capacitor. Energy storage.

Introduction to AC Circuits: Sinusoids and Phasors, Phasor Relationships for Circuit Elements, Impedance and Admittance, Kirchhoff's Laws in the Frequency Domain, Impedance Combinations, Instantaneous and Average Power, Maximum Average Power Transfer, Effective or RMS Value, Apparent Power and Power Factor, Complex Power, Conservation of AC Power.

Sinusoidal Steady-State Analysis: Nodal Analysis, Mesh Analysis, Superposition Theorem, Source Transformation, Thevenin and Norton Equivalent Circuits.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Have understanding of basic circuit analysis laws and **apply** them to solve various electric circuits	**C3**	**PLO1**
CLO2	To enable students to use various techniques to solve and **analyze** electric circuits and problems effectively	**C4**	**PLO2**
CLO3	Have ability to **manipulate** various electrical circuits under guidance and are able to verify different network theorem experimentally	**P3**	**PLO2**
CLO4	**Participate willingly** in solving various and analyzing electric circuit problems	**A2**	**PLO2**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
PH-122 & Applied Physics	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

INTRODUCTION: Types of Errors and Error Calculation, Graphical Techniques (Log, semi-log and other non-linear graphs).

VECTORS: Coordinate Systems, Review of vectors, Vector Differentiation (Ordinary and Partial Differentiation), Vector Integrations.

MECHANICS: Motion under Constant Acceleration, Newton Laws and their Applications, Frictional Forces, Work-Energy Theorem, Law of Conservation of Mechanical Energy, Angular Momentum.

ELECTROSTATICSAND MAGNETISM : Coulombs Law, Continuous charge distribution, Electrostatic potential energy of discrete charges, Gauss's Law, Electric field around conductors, Magnetic fields, Magnetic force on current, Hall effect, Biot-Savart Law, Ampere's Law, Field of rings and coils, Magnetic dipole, Diamagnetism, Paramagnetism and Ferromagnetism.

SEMICONDUCTOR PHYSICS: Energy levels in a semiconductor, Hole concept, Intrinsic and Extrinsic regions, Law of Mass Action, p-n junction, Transistor.

WAVES AND OSCILLATIONS: Simple Harmonic Oscillator, Damped Harmonic Oscillation, Forced Oscillation and Resonance, Type of Waves and Superposition Principle, Wave Speed on a stretched string.

OPTICS AND LASERS: Huygens Principle, Two-slit interference, Single-Slit Diffraction, Resolving power of Optical Instrument Principals for laser action, Types of laser, Applications of laser.

MODERN PHYSICS: Planck's explanations of Black Body Radiation Photoelectric Effect, Compton Effect, Bohr's Theory of Hydrogen Atom, Atomic Spectra, Reduced Mass, De-Broglie Hypothesis, Electron Microscope, Atomic Nucleus and Properties of Nucleus, Radioactive Decay and Radioactive Dating, Radiation Detection Instruments, Nuclear Reactions and Nuclear Reactor, Nuclear Fusion

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	APPLY principle of physics; and explain the concept of classical and modern physics to solve related problems	**C3**	**PLO1**
CLO2	USE the concept of classical physics for engineering problems	**C3**	**PLO2**
CLO3	PARTICIPATE WILLINGLY in applying principle of physics; and explain the concept of classical and modern physics to solve related problems	**A2**	**PLO2**

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

CLO4	PRACTICE of operating equipment/tools to understand principles of physics under supervision	**P3**	**PLO1**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
HS-114 Functional English	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Introduction and Introductory activities: Self-introduction get to know each other activities.

Listening skills: Types of Listening (content, critical, selective, active, reflective, empathic etc.), Problems in listening and coping strategies, Listening skills and sub skills, Practice in Listening

Vocabulary Development: Words easily confused, compound words, prefixes and suffixes, Forming adjectives, descriptive adjectives (personalities), Using synonyms and Antonyms, homophones, Use of idioms in current language, Exposure and practice to develop everyday vocabulary for formal and informal situations

Reading: Skimming, scanning, predicting, and anticipating, Guessing meanings of unfamiliar words from the context, Reading strategies, Reading practice through variety of reading texts and comprehension exercises
Beyond reading [speaking and writing outputs)**Writing:** Making notes, Social formal letters (elements, style, formatting, organization and structure, types e.g. requests, invitation, thank you, condolence etc), Short reports (structure, format, and types i.e. informational, event and analytical)

Grammar: Tenses, Frequency, time and quantity expressions, Punctuation, Conditional Sentences, Active and passive, Semantic markers, Phrasal Verbs
Speaking: Giving a presentation, Discussion, Beginning a discussion, Entering a discussion (at a subsequent stage), Interrupting a discussion without giving offence, Changing your stance / point of view in the course of a discussion, Summing up a discussion, Role play / dialogue (e.g. interviewing: with respect to social interaction)

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
01	**Demonstrate** effective presentation skills in academic settings.	A3	PLO10
02	**Comprehend** explicit and implicit information through reading and listening strategies.	C3	PLO10
03	**Compose** drafts of various academic genres using writing processes and strategies.	C3	PLO9

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
ME-107 & Basic Mechanical Engineering	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Thermodynamics: Work, Heat, Open, Closed and Steady flow systems, Thermodynamics Properties and Processes, Absolute & Gauge Pressure, Pressure Temperature and Flow Measurement, Equation of Continuity, Bernaulli's Equation, Two Phase Systems, Ideal Gas, Conservation of Mass & Energy, Simple Heat Engine & Refrigeration Thermodynamic cycles.

Engineering Mechanics: Fundamental concepts, Definitions and Units, Newton's First Law, Forces, Moments and couples, Laws of Equilibrium, Free Body Diagrams, Structures, Frames and Mechanics.

Dynamics: Fundamentals of Dynamics, Rigid Body Dynamics, Newton's Second Law, Analysis of Motion in Two- & Three-Dimensional Spaces, Rectilinear & Curvilinear Motions, Work & Energy, Conservation of Energy.

Solid Mechanics Design: Stress, Strain, Elastic & Plastic deformation, Hysteresis, Mechanical Power Transmission, Pulleys, Chains, Fly wheel, Shaft, Coupling, Friction, Bearings.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Understand and **solve** problems of thermodynamics	**C3**	**PLO1**
CLO2	Understand, Illustrate, Solve & **analyze** the fundamental problems of Engineering Mechanics	**C4**	**PLO2**
CLO3	**Adopt** behavior in order to Understand, Illustrate, Solve & analyze the fundamental problems of Engineering Mechanics	**A3**	**PLO2**
CLO4	**Practice** the fundamental problems of Engineering Mechanics	**P3**	**PLO2**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-114 Calculus	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Set and Functions: Define rational, irrational and real numbers; rounding off a numerical value to specified value to specified number of decimal places or significant figures; solving quadratic, and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, DeMorgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.

Differential Calculus: Differentiation and Successive differentiation and its application: Leibnitz theorem. Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series. Taylor and Maclaurin series, L' Hospital's rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints. Solution of non-linear equation, using Newton Raphson method.

Integral Calculus: Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence. Beta and Gamma functions and their identities, applications of integration. Centre of pressure and depth of centre of pressure.

Sequence & Series: Sequence, Infinite Series, Application of convergence tests such as comparison, Root, Ratio, Raabe's and Gauss tests on the behavior of series.

Complex Number: Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions).

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	*Apply* differential and integral calculus to *interpret* the physical systems and processes.	C3	PLO-1
2	*Demonstrate* understanding of complex numbers and determine the behavior of sequence and series with *application* to engineering problems.	C3	PLO-2
3	*Express* in his/her own words the key concepts of functions, differential & integral calculus, sequences, series and complex numbers.	A2	PLO-2

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-156 & Engineering Drawing	■ SPRING ☐ FALL	TH ☐3 ☐2 ☐1 ■0 PR ☐3 ■2 ☐1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

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 transformer 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

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Have understanding of different architectural (civil), mechanical and electrical drawings and have ability to **ILLUSTRATE** them.	**C3**	**PLO1**
CLO2	Have ability to **COPY** or **IMITATE** different architectural (civil), mechanical and electrical drawings both on drawing sheets and AUTOCAD software.	**P3**	**PLO5**
CLO3	**Choose** at least two types of electrical hazards and accordingly select safety measures and write a short report on that.	**A3**	**PLO1**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-126 & Circuit Analysis	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

AC Circuits - Sinusoids and Phasors, Phasor Relationships for Circuit Elements, Impedance and Admittance, Kirchhoff's Laws in the Frequency Domain, Impedance Combinations

Sinusoidal Steady-State Analysis - Nodal Analysis, Mesh Analysis, Superposition Theorem, Source Transformation, Thevenin and Norton Equivalent Circuits, Op Amp AC Circuits

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 Three Phase Systems

Magnetically Coupled Circuits - Mutual Inductance, Energy in a Coupled Circuit, Linear Transformers, Ideal Transformers, Ideal Autotransformers, Three Phase Transformers

Two-Port Network - Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relationship between Parameters, Interconnection of networks

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Apply** solving techniques for first order and second order electric circuits	**C3**	**PLO1**
CLO2	**ANALYZE** magnetic circuits, two port networks and three phase systems.	**C4**	**PLO2**
CLO3	**Imitate** circuits on breadboards and PERFORM electrical measurements using modern engineering tools	**P3**	**PLO2**
CLO4	**Participate willingly** in applying solving techniques for first order and second order electric circuits	**A2**	**PLO2**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-227 & Differential Equation	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

1st Order Differential Equations: Basic concept; Formation of differential equations and solution of differential equations by direct integration and by separating the variables; Homogeneous equations and equations reducible to homogeneous from; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations . Application in relevant Engineering: orthogonal trajectories; Numerical approximation to solutions ; Solution in series. Euler method, Euler modified method, Runge Kutta method of order 4.

2nd and Higher Orders Equations: Special types of II nd order differential equations with constant coefficients and their solutions; The operator D; Inverse operator l/D ; Solution of differential by operator D methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering.

Partial Differential Equation: Basic concepts and formation of partial differential equations; Linear homogeneous partial differential equations and relations to ordinary differential equations; Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution: Various standard forms.

Laplace Integral & Transformation: Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals. Laplace transform of functions tn F(t) and F(t)/ t, Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential using Laplace transform.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Student should be able to **analyze** physical systems described by the differential equations	C3	PLO-1
2	Students should be able to apply appropriate methods to solve differential equations (like Laplace transform)	C3	PLO-2
3	Student should be able to responds to different class based activities/assignments/quizzes	A2	PLO-1

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
CE-109 Engineering Surveying	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Basics of surveying: Introduction, definition, types, evolution, methods, referencing, error and mistake

Tape measurement: Methods, types, taping corrections, slope corrections, erroneous tape length, temperature, tension, sag corrections.

Levelling: Definitions, Theory of Differential Leveling. Effects of Curvature and Refraction, Types of Levels, Levelling, Types of Leveling, Leveling Operations, Techniques of Leveling, Benchmark Leveling (Vertical Control Survey), Reciprocal Leveling, Errors in Leveling.

Contouring: Contours and their characteristics, Various methods of Contouring, Horizontal and Vertical Angles, Meridians, Types of Horizontal angles.

Angles and directions: General idea, azimuths, bearings, azimuth-bearings relationship and computation. Magnetic direction

Transits/Theodolites: Theodolites, Repeating, Directional and Electronic Theodolites, Temporary adjustments, Measurement of Horizontal and Vertical Angles. Prolonging a Straight Line, Permanent Adjustments, use of Tachometers in computation of Horizontal and Vertical Distances.

Transverse Surveys: Open and closed traverse, balancing angles, latitudes and departures and its computation to determine error of closure and accuracy

Electronic Surveying Measurement: Principles of EDM, its characteristics, accuracy and operation, Total stations, construction layout using total station

Global Positioning System: Background, receivers, satellites and signals, position measurements, GPS applications

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	SOLVE basic surveying techniques used for surveying and levelling.	**C3**	**PLO1**
CLO2	PREPARE maps, contour maps, profiles, cross-sections, traverses etc. using surveying techniques.	**C3**	**PLO2**
CLO3	OPERATE various survey equipment for measurements with required accuracy	**P3**	**PLO1**
CLO4	COMPLY to various standards used in surveying	**A2**	**PLO1**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-163 & Computers & Programming	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

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.

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.

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.

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.

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.

Object Oriented Programming: Classes, Constructors and Destructors, Objects and Member Functions, Objects as Members of Classes, Operator Overloading, Inheritance, and Polymorphism

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Demonstrate** proficiency in usage of basic structured programming building blocks	**C3**	**PLO1**
CLO2	Select appropriate tool (integrated development environment) and **apply** structured and/or Object Oriented Programming (OOP) techniques to solve programming problems.	**C3**	**PLO5**
CLO3	**Operate under guidance** the appropriate IDE and compiler to practice code in structured and/or OOP style to solve programming problems.	**P3**	**PLO5**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program: BE(Electrical)

F/QSP 11/17/01

Course Profile

COURSE CODE & TITLE	SEMESTER	CREDIT HOURS
HS-127 – Pakistan Studies	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH:** 2018

COURSE CONTENTS

Land of Pakistan: Land & People – Physical features and demography; Geographical and strategic importance of Pakistan; Natural resources – Mineral, water, and power; Natural Landscape; Environmental issues in Pakistan; Cultural heritage: important remnants of ancient civilizations in Pakistan

Creation of Pakistan: A brief Historical survey of Muslim community in the sub-continent; Two-Nation theory – its origin & development; Rationale for Pakistan – Factors leading to the demand of Pakistan; Emergence of Pakistan; Role of Quaid-e-Azam the struggle for Pakistan

Government & Politics in Pakistan: Political History of Pakistan – A brief account (1947 to date); Constitution of Pakistan 1973 – Salient features; Governmental structure – Federal, Provincial and Local

Pakistan in the Community of Nations: An overview of Pakistan's foreign policy; Relations of Pakistan with neighbors, Super Powers, and the Muslim World

Pakistan's Stand Point on Human Rights: Constitutional provisions; Comparative analysis of Western and Islamic perspective of Human Rights; Pakistan's Stand on national and international level

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
01	**Demonstrate** the historical, ideological, socio-economic, and political aspects of Pakistan as a nation and state.	**C3**	**PLO6**
02	**Discuss** Pakistan's culture, issues, and challenges through appropriate actions and advocacy	**C2**	**PLO9**
03	**Express** concern on issues and challenges through appropriate actions and advocacy	**A3**	**PLO9**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

Second Year

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EL-240 & Electronic Devices and Circuits	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Semiconductor Basics: Conduction, N and P Types;

Diode: Biasing, V-I Characteristics, Equivalent circuits, Diode as full and half Wave Rectifier, Limiting and Clamping Circuits, Zener and Optical Devices, and their applications;

BJTs: Structure, Operation, Characteristics and Parameters, BJTs as amplifier and switch, Biasing Circuits;

FETs: Basics, Characteristics and Parameters, Biasing, FET as amplifiers;

Power Amplifier: their classes and application

Operational Amplifier: Input modes and parameters, Negative feedback, Bias Current and offset voltage, Open and Closed Loop Response

Basic Op-Amp Applications: Comparators, Summing Amplifiers, Integrators and Differentiators, Instrumentation Amplifiers

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Apply the knowledge and the skills to **ANALYZE** the functionality of diode, BJT, MOSFET, Operational amplifier and Power Amplifier.	**C4**	**PLO1**
CLO2	To be able to **ANALYZE** electronic circuits diode, BJT, MOSFET, Operational amplifier and Power Amplifier.	**C4**	**PLO2**
CLO3	To **OPERATE** and hand **PRACTICE** the design of electronic circuits involving diode, BJT, MOSFET ,Operational amplifier and Power Amplifier.	**P3**	**PLO3**
CLO4	**Use resources to** be able to analyze electronic circuits diode, BJT, MOSFET, Operational amplifier and Power Amplifier.	**A3**	**PLO1**
CLO5	To be able to **ANALYZE** electronic circuits diode, BJT, MOSFET, Operational amplifier and Power Amplifier.	**C4**	**PLO3**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-264 & Data Structures and Algorithms	☐ SPRING ■ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Algorithm Fundamentals and Complexity Analysis: Algorithm as technology, Design Approach (Design Paradigms), Representation Techniques, Time and Space Complexity, Order of Growth, common Growth Functions, standard notations.

Data Structure Fundamentals: Revision of C/C++ Data-types and Structures, Abstract Data Type (ADT) concept, 1D Array as ADT, ADT for varying-length character Strings, 2D Array as ADT, Structures and Classes as ADT, Pointer Arrays and Records as ADT.

Recursion, Stacks and Queues: Program design with Recursion, Complexity of recurrence problem, Stack ADT, Stack implementation with Arrays, C++ Template as Stack, Stack applications, Recursion with Stacks, Queue as ADT and, Queue implementation.

String Processing: String Operations, Word Processing, Pattern Matching Algorithms.

Numeric and Number Theoretic Algorithms: Calculating Polynomial Equations, Matrix Multiplication, Linear Equations, Trapezoidal Integration, Root Finding of polynomial, Greatest Common Divisor, Primality Testing, Integer Factorization.

Divide and Conquer Approach: Sorting and Searching Algorithms.

Linked Lists: Linked List as Data Structure, List Operations, Implementation using Arrays and Dynamic Variables, Circular and Doubly Linked List, Linked List Implementation in C++, Linked List applications.

Trees: Binary Trees, Representation in memory, Binary Tree Traversals, Lists as Binary Trees, Finding and Deleting element in Tree, Tree Traversal Algorithms, Binary Search Trees, Heaps, Heap-Sort Algorithm.

Graphs: Representation in memory, Graph implementation, elementary Graph Algorithms, Traversal Algorithms, Shortest Path Algorithms

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Analyze** engineering challenges in data storages and software developments and **compare** various types of data structures used to build object-oriented data storage	**C4**	**PLO3**
CLO2	**Analyze** usage of software tools and abstract data types to implement algorithms on data structures.	**C4**	**PLO5**
CLO3	**Produce** implementation of optimal algorithms and data structures for common software development problems in C/C++/Python.	**P4**	**PLO3**
CLO4	**Participate willingly** in implementation of optimal algorithms and data structures for common software development problems in C/C++/Python.	**A2**	**PLO5**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-272 & Linear Algebra & Geometry	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Linear Algebra: Linearity and linear dependence of vectors, basis, dimension of a vector space, field matrix and type of matrices (singular, non- singular, symmetric, non- symmetric, upper, lower, diagonal tri-diagonal matrix), Rank of a matrix using row operations and special method, echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, transitions matrix.

Euclidean Spaces and Transformation: Geometric representation of vector, norm of vector, Euclidean inner product, projections and orthogonal projections, Euclidean n spaces n properties Cauchy-Schwarz inequality, Euclidean transformations, apply geometric transformations to plane figure, composition of transformations.

Application of linear Algebra: Leontief Economic models, Electrical Networks, Scaling, translation, rotation, and projection etc.

Eigen values & Eigen Spaces: Interpret eigenvectors and eigenvalues of a matrix in terms of transformation it represents, convert a transformation into a matrix eigen value problem, find the eigenvalues and eigenvectors of order not more than 3×3 matrices algebraically, determine the modal matrix for a given matrix, reduce a matrix to diagonal (form and Jordan form, state the Cayley-Hamilton theorem and use it to find powers and the inverse of a matrix, understand a simple numerical method for finding the eigenvectors of a matrix, use appropriate software to compute the eigenvalues and eigenvectors of a matrix, Define quadratic form and determine its nature using eigenvalues.

Solid Geometry: Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions. Transformations (Cartesian to polar & cylindrical).

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Apply** formation of system of linear equations and solid geometry to explain physical situations	**C3**	**PLO1**
CLO2	**APPLY** appropriate methods to solve system of linear equations in relevant engineering problems.	**C3**	**PLO2**
CLO3	**Comply** to appropriate methods to solve system of linear equations in relevant engineering problems.	**A2**	**PLO2**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-226 & Multivariable Calculus	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Advanced Calculus: Define a stationary point of a function of several variables, define local maximum and saddle point for a function of two variables the stationary points of a several variables, obtain higher partial derivatives of simple functions of two or more variables, iterated integrals, double and triple integrations with applications (area, centroid, moment of inertia, surface area, and volume, use multiple integrals in solutions of engineering problems.

Vector Calculus: Dot and cross product, Vector differential operator, directional derivative, gradient, divergence, curl of a vector field, and Laplacian operators with applications. (Solenoid, conservative, etc).

Vector Integrations: Evaluate line integrals along simple paths, apply line integrals to calculate work done, apply Green's theorem in the plane to simple examples, evaluate surface integrals over simple surface, use the Jacobean to transform a problem a new coordinate system, apply Gauss' divergence theorem to simple problems, apply Stokes theorem to simple examples.

Curvilinear Coordinates: Unit vectors in curvilinear system; Transformation of coordinates; Orthogonal coordinate system; Cylindrical coordinate system; Spherical coordinate system; Parabolic cylindrical coordinates; Elliptical cylindrical coordinate system

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Apply** multivariable calculus to explain physical situations	**C3**	**PLO1**
CLO2	**Use** Vector calculus and curvilinear coordinate system to solve relevant engineering problems	**C3**	**PLO2**
CLO3	**Follow** various multivariable techniques to demonstrate physical systems	**A2**	**PLO2**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
HS-214 & ACADEMIC WRITING	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Writing Process

Identifying topic area, narrowing topic, planning, brainstorming, mind mapping, outlining, writing first draft, reviewing, revising, proofreading, writing final draft

Reading & Writing

Analyzing different texts: identifying point of views, claims, assumptions, differentiate facts from opinions Practicing Academic Language: differentiate using language of opinion and fact Synthesize information, developing critical write up with relevant factual information, personal views, academic evidence, examples, cause and effect etc. Presenting and describing visuals (tables & graphs) Avoiding plagiarism and ensuring originality: summarizing, paraphrasing and quoting sources, citing, documenting sources through a referencing system (MLA / APA / Harvard style, as suggested by the discipline)

Writing products

Writing a well-structured paragraph (topic sentence, supporting details, conclusion) Writing narrative, descriptive, expository, and argumentative essays Developing an effective essay using thesis statement, adequate development and argument, supporting details, and conclusion Writing short reports (technical reports)

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Discriminate** explicit and implicit information in various academic texts using relevant reading strategies.	**C4**	**PLO9**
CLO2	**Compose** organized, coherent, and effective texts of various academic genres using writing processes and strategies.	**C6**	**PLO10**
CLO3	**Adopt** paraphrasing, summarizing, and referencing skills to avoid plagiarism.	**A3**	**PLO10**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE HS-205 & Islamic Studies	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	DATE OF COURSE CONTENT APPROVAL 2017	APPLIED FROM BATCH 2018

COURSE CONTENTS

Section-A: Quranic Verses

Tauheed: Al-Ambiya-22, Al-Baqarah - 163&164.

Prophet Hood: Al-Imran-79, Al –Huda-7, Al-Maida0h-3.

Here-After: Al –Baqarah-48, and one Hadith.

Basic Islamic Practices: Al-Mu' minun-1-11, and two Ahadith

Amer-Bil-Ma'Roof Wa-Nahi Anil Munkar: the concept of Good & Evil, Importance and necessity of Da'wat-e-Deen Al- Imran – 110 Method of Da'wat-e-Deen An-Nehl-125, Al-Imran-104, and two Ahadith

Unity of the Ummah: Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An' am – 108, and two Ahadith.

Kasb-e-Halal: Ta ha-81, Al- A'raf-32-33, Al-Baqarah-188, and two Ahadith.

Haquq-ul-Ibad: Protection of life Al-Maidah-32 Right to Property Al-Nisa-29 Right to Respect & Dignity Al-Hujurat -11-12 Freedom of Expression: Al-Baqarah-256 Page 16 of 33 Equality: Al-Hujurat-13 Economic Security: Al-Ma'arij-24-25 Employment Opportunity on Merit: An-Nisa-58 Access to Justice: An- Nisa-135

Women's Rights: An-Nehl-97, Al-Ahzab-35, An-Nisa -07

Relations with Non-Muslims: Al-Mumtahanah-8-9, Al-Anfa'al-61 and The last Sermon of Hajj of Holy Prophet (PBUH): Relevant extracts

Section B:

Seerat (life) of the Holy Prophet (PBUH): Birth life at Makkah declaration of prophet hood preaching & its difficulties migration to Madina brotherhood (Mawakhat) & Madina Charter The Holy Wars of the Prophet (Ghazwat-e-Nabawi) Hujjat-ul-Wida The last sermon of Khutbatulwida: Translation and important points

Section C:

Islamic Civilization: In the sub-continent: pre- Islamic civilizations. The political, social & moral impacts of Islamic civilization. In the world: academic, intellectual, social & cultural impact of Islam on the world.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Demonstrate** the given Quranic verses and Hadiths to their tangible meaning and message.	**C3**	**PLO8**
CLO2	**Commit** to the lessons learned studied during the course	**A3**	**PLO8**
CLO3	**Describe** the basic concepts of Shariah, the features of Seerat-un-Nabi (SAW), and the impact of Islam on our society.	**C3**	**PLO12**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-382 & Electromagnetic Fields	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Vector Analysis: scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vector field, the dot product the cross product, other coordinate systems, circular cylindrical coordinates, the spherical coordinate system, transformations between coordinate systems.

Coulomb's Law and Electric Field Intensity: The experimental law of coulomb, Electric field intensity, field of a point charge, field due to a continuous volume charge distribution, field of line charge, field of sheet charge, streamlines & sketches of fields.

Electric Flux Density Gauss's Law and Divergence: Electric flux density, Gauss's law, application of Gauss's law, some symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation for electrostatics, the divergence theorem.

Energy and Potential: Energy expanded in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole, energy density in the electrostatic field.

Conductor Dielectrics and Capacitances: Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, semiconductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines, current analogies.

The Steady Magnetic Field: Biot Savart's Law, Amperes circuit law, curl, Stoke's theorem, Magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivation of steady magnetic field laws.

Magnetic Forces Materials and Inductance: Force on a moving charge, force on a differential current element, force between differential current element, force and torque on a closed circuit, the nature of magnetic materials, Magnetization and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance.

Time Varying fields and Maxwell's Equations: Faraday's Law, displacement current, Maxwell's equation in point form, Equation in integral form, the related potentials

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Apply mathematical tools to ***formulate***, ***analyze*** and ***evaluate*** problems of electrostatics from basic to engineering levels.	**C5**	**PLO1**
CLO2	Describe, explain and apply mathematical tools to ***formulate***, ***analyze*** and ***evaluate*** problems in fundamentals of electrodynamics.	**C5**	**PLO2**
CLO3	**Use resources to** apply mathematical tools to formulate, analyze and evaluate problems of electrostatics from basic to engineering levels.	**A3**	**PLO2**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-223 & Instrumentation and Measurements	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

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 meggar, 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

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	To ***apply*** the basic knowledge acquired in order to design various instruments.	**C3**	**PLO1**
CLO2	To ***analyze*** performance of instruments based on different working principles	**C4**	**PLO2**
CLO3	To **operate** the use of different instruments under guidance and **replicate** hardware project involving analog/digital instrumentation.	**P3**	**PLO2**
CLO4	**Use resources to** apply the basic knowledge acquired in order to design various instruments.	**A3**	**PLO2**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-231 & Signal and Systems	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

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

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Analyze** signals using Fourier series, Fourier transform, and Laplace transform techniques and should have understanding of formulating these techniques	**C4**	**PLO1**
CLO2	**Analyze** systems (especially electrical systems) with the help of time-domain technique (i.e. differential equations and convolution integral) and frequency domain techniques	**C4**	**PLO2**
CLO3	**Observe** experimentally dynamics of linear signals and systems, and verify results of analytical tools developed for signals and systems in theory	**P3**	**PLO2**
CLO4	**Follow** dynamics of linear signals and systems, and verify results of analytical tools developed for signals and systems in theory	**A2**	**PLO2**

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
CS-205 Logic Design and Switching Theory	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Computer Operations, Truth Function: Evaluation of the computer, basic organisation of digital computer, instruction formats, some different types of computers, special purpose and general-purpose computers. Binary connectives, evaluation of truth functions, many statement compounds, physical realisations, sufficient sets of connectives, a digital computer example.

Number Systems: Conversion between bases, arithmetic with bases other than ten, negative numbers, binary coded decimal numbers, octal and hexadecimal number systems.

Boolean Algebra: Truth functional calculus as Boolean Algebra, duality, fundamental theorems of Boolean algebra, examples of Boolean simplifications, remarks on Switching functions.

Switching Devices: Switches and relays, logic circuits, speed and delays in logic circuits, integrated logic circuits.

Minimisation of Boolean Functions: Standard Forms of Boolean functions, minterm and maxterm, Designation of Boolean functions, Karnaugh map representation of Boolean functions, Simplification of functions on Karnaugh maps, map minimization of product of sum expressions, incompletely specified functions

Tabular Minimization: Cubical representation of Boolean Functions, Determination of prime implicants, Selection of an optimum set of prime implicants.

Universal Functions: Design of Nand and Nor Networks and properties of combinational networks. Introduction to design and Nand and Nor Networks, Switching expressions for Nand and Nor networks.

Introduction to sequential Networks: Latches, Sequential Networks in fundamental mode.

Sequential Networks: Introduction to the synthesis of Sequential Networks, Minimization of the number of states.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1.	**Apply** knowledge digital logic design to build gate level circuits	C3	PLO1
2.	**Select** appropriate logic to design combinational and sequential networks	C5	PLO3
3.	**Respond** to queries about design and implementation of logic circuits.	A2	PLO3
4.	**Demonstrate** the ability to implement logic circuits in hardware.	P4	PLO3

REMARKS (if any):

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Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-331 & Probability & Statistics	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Statistics: Introduction, Types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types.

Measures of Central Tendency and Dispersion: Statistics Averages, Median Mode, Quartiles, Range, Moments, Skew ness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems.

Curve Fitting: Introduction, fitting of a first- and second-degree curve, fitting of exponential and logarithmic curves, related problems. Principle of least squares, Second order Statistics & Time series not in bit detail.

Simple Regression & Correlation: Introduction, Scatter diagrams, Correlation & its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), Related problems.

Sampling and Sampling Distributions: Introduction, Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling, Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems.

Statistical Inference and Testing Of Hypothesis: Introduction, Estimation, Types of Estimates, Confidence interval, Tests of Hypothesis, ChiSquare distribution/test, one tails & two tails tests. Application in related problems.

Probability: Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability. Conditional probability, Baye's nile. Related problems in practical significance.

Random Variables: Introduction, Discrete & Continuous random variables, Random Sequences and transformations. Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F.), Markove random walks chain/ Related problems.

Probability Distributions: Introduction, Discrete probability distributions, Binomial Poisson, Hyper geometric & Negative binomial distributions. Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Apply** the fundamental concepts in Probability and Statistics	**C3**	**PLO1**
CLO2	**Use** data to produce mathematical or probabilistic models in relevant engineering problems	**C3**	**PLO2**
CLO3	**Follow** the fundamental concepts in Probability and Statistics	**A2**	**PLO2**

REMARKS (if any):

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Third Year

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-345 & Electrical Machines	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Transformer: Fundamental laws of Electrical machines, Construction, Principle and working of Transformer, Derivation of EMF Equation of Transformer, Ideal Transformer, Transformation ratios, Types of transformer, Eddy Currents, Leakage flux, Harmonics and transient in transformer, No load working and vector diagram of transformer, magnetizing current, Vector diagram on load, Equivalent circuit of transformer, Poly phase transformers, star delta and zig-zag connections for parallel operation, sharing of load, tertiary windings, Auto Transformer.

Induction Motor: Construction, working and principle of Induction Motor, slip and its effect on Induction motor, losses and efficiency, Speed control techniques, Single phase Induction motor principle and starting, Rotating field theory, Development of torque in induction motor, torque equation of induction motor, maximum torque equation of induction motor, No load and block rotor test of induction motor, Inrush current of Induction Motor, torque-slip characteristics curve of Induction Motor**.**

Synchronous Generator: Synchronous generator: construction, Speed of rotation, Internal generated voltage, Excitation system, Equivalent Circuit, Phasor Diagram, Power and Torque relationship, Modes of an alternator Operation (standalone and parallel), voltage regulation of alternators. Operation of generator with large power system.

Synchronous Motor: Starting of Synchronous motors and control of torque speed, Overexcited and under-excited motors, power factor and power fact, V-curves circle diagram.

DC Machines: DC Machines: Construction armature reaction, DC Generators: Types, emf equation, Losses, Efficiency, Performance characteristics and their curves, DC Motors: Types, Back EMF, speed regulation, performance characteristics and their curves, losses and efficiency

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
01	**Apply knowledge** to **describe** Construction and working principles of Electrical machines	**C2**	**PLO1**
02	**Carry out** the performance analysis of Electrical machines and **develop solution** under different operating conditions.	**C3**	**PLO3**
03	Differentiate ability of students to respond for the particular **process** of electrical machine **to meet the specified** outcome.	**A4**	**PLO3**
04	**Indicate** ability to respond while learning to operate and **meet specified** outcome of electrical machines with respect to given objective.	**P3**	**PLO3**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-394 Digital Signal Processing	☐ SPRING ■ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Overview of Discrete-time Signals and Systems: Sampling, Aliasing, Quantization, Convolution, Correlation, Properties of Discrete time Signals and Systems

Linear Constant Coefficient Difference Equations: Modeling 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.

Multirate Signal Processing: Downsampling and Up sampling, Decimation and Interpolation

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Identify** constraints for discretizing continuous time signal	C1	PLO1
2	**Analyze** discrete signals using Fourier series, Fourier transforms, and z-transform techniques and should have understanding of formulating and optimizing analysis techniques	C4	PLO4
3	**Design** and Analyze discrete-time systems with the help of various techniques (difference equation, convolution and frequency domain techniques)	C6	PLO3
4	**Practice** experimental verification of the analytical and design techniques developed for discrete time signals and systems.	P3	PLO4
5	**Classify** discrete-time systems with the help of various techniques (difference equation, convolution and frequency domain techniques)	A4	PLO11

REMARKS (if any):

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NED University of Engineering and Technology

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-359 & Electrical Power Distribution and Utilization	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Distribution System Planning and Automation – Introduction and Factors affecting system planning, Present Planning Techniques and Modules, Upcoming Planning techniques, Futuristic Nature of Distribution Planning, Distribution System Automation.

Load Characteristics - Relationship between load and loss factors, Load Forecasting, Load Management, Rate Structure, and Electric Meter Types;

Applications of Distribution Transformers –Types, Regulation, Transformer Efficiency, Terminal or Lead markings, Transformer Polarity, Distribution Transformer loading guides, Three phase connections;

Substation Design - Schemes, Substation location, Rating, Comparison of four and six feeders, SCADA, Substation Cabling and Grounding;

Design Consideration of Primary System - Radial and Loop Type primary feeders, Primary Network, Tie Lines, Radial Feeders with uniformly and nonuniformly distributed loads;

Voltage Drop and Power Loss Calculations in different configurations, Power Factor Improvement Calculations.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Propose** economic solutions by analyzing the problems in electrical power distribution system such as lighting design, tariffs, economic power factor.	**C6**	**PLO3**
CLO2	**Assessment** of the faults occurred in underground power cables and **selection** of proper cable size as per application and standards.	**C5**	**PLO4**
CLO4	**Organize** the report giving due consideration to scholarly ethics	**A4**	**PLO12**
CLO5	**Operate under supervision,** experiments based on trainers and verify the experimental results.	**P3**	**PLO4**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EL-343 POWER ELECTRONICS	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Power Electronic Devices: Introduction & Scope of Power Electronics, Power Electronic Devices

Halfwave Rectifiers: Single phase halfwave uncontrolled & controlled rectifiers with resistive, RL & Inductive loads

Fullwave Rectifiers: Single phase fullwave uncontrolled, half controlled and controlled rectifiers

3 Phase Rectifiers: 3 phase uncontrolled, half controlled and controlled rectifiers

Commutation Techniques: Thyristor Commutation Techniques (self-commutation, impulse commutation), Thyristor Commutation Techniques (impulse commutation (contd…), series capacitor commutation, parallel capacitor commutation)

DC DC Converters: Buck Converter, Boost Converter, Buck-Boost Converter, Classification of chopper circuits

Inverters: Inverters (half bridge, full bridge), Performance Parameters of Inverters

PWM: PWM, SPWM, Modified SPWM

Power Supplies: Design & Analysis of Regulated Power Supplies, UPS

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO 1	ANALYSE the converter circuits to obtain current, voltage equations, graphical waveforms and average output using the theoretical knowledge of power electronics	**C4**	**PLO1**
CLO 2	SELECT the appropriate power semiconductor devices to design converter circuits.	**C5**	**PLO 3**
CLO 3	To EXECUTE the design of different types of rectifier.	**P3**	**PLO 3**
CLO 4	To USE RESOURCES to analyze different power electronic circuits	**A3**	**PLO 1**

REMARKS (if any):

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Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
MT-442 & Numerical Methods	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Error Analysis: Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any Computational tools to Analysis the Numerical Solutions.

Linear Operators: Functions of operators, difference operators and the derivative operators, identities.

Difference Equations Linear homogeneous and non-homogeneous difference equations.

Solution of Non-linear Equations: Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method.

Solution of Linear Equations: Numerical methods for finding the solutions of system of linear equations (Gauss Elimination, Gauss-Jordan Elimination, triangularization, Cholesky, Jacobi and Gauss – Seidel).

Interpolation &- Curve Fitting: Lagrange's, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves).

Numerical Integration & Differentiation: Computation of integrals using simple Trapezoidal rule, 1/3th Simpson's rule, 3/8th Simpson's rule, Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, Runge Kutta method of order 4). Numerical Solutions of Partial differential Equations, Optimization problem (Simplex, Method). Steepest Ascent and Steepest Descent Methods.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Explain** numerical method to solve system of linear equations and non-linear equation	**C5**	**PLO4**
CLO2	**Apply** numerical method to solve system of linear equation and non-linear equations in relevant engineering problems	**C4**	**PLO3**
CLO3	**Apply** numerical differentiation and numerical integration in relevant engineering problems	**C5**	**PLO2**
CLO4	**Use resources to** apply numerical differentiation and numerical integration in relevant engineering problems	**A3**	**PLO4**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-362 & Power System Analysis	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Fundamentals: Phasors, Instantaneous Power in single phase circuits, complex power, Network Equations, Balanced three Phase Circuits, Power In balanced three phase circuits, Advantages of Balanced three phase circuits' v/s singles circuits.

Power Transformers: Per Units System, Three phase transformer connections and phase shift, per unit equivalent circuits of balanced three phase two winding transformers, three winding transformers, Autotransformers. **The**

Admittance Model and Network Calculations: Branch and Node admittances; Mutually coupled Branches in Y-bus; Equivalent Admittance Network; Modification of Y-bus; Impedance matrix and Y-bus; the method of successive elimination; Node Elimination (Kron Reduction); Triangular Factorization;

Power Flow: Direct Solutions to Linear Algebraic Equations; Gaussian Elimination, Iterative Solutions to linear algebraic equations, Jacobian Gauss Siedal, Iterative Solutions to nonlinear algebraic equations; Newton Raphson Method, The Power Flow Problem, Power Flow Solutions,

Symmetrical Faults: Series RL circuits transients, three phase short circuitUnloaded Synchronous Machine, Power System three phase short circuits, Bus Impedance Matrix.

Symmetrical Components: Definition of symmetrical components, Sequence networks of impedance loads, sequence networks of series impedances, sequence networks of three phase lines, sequence networks of rotating machines, Per unit sequence models of three two winding and three winding transformers., Power in Sequence Networks.

Unsymmetrical Components: System Representation, Single line to ground fault, Line to line fault, double line to ground fault, Sequence bus impedance matrix.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	To ANALYZE the given power system by formulating the system equations.	**C4**	**PLO2**
CLO2	To EVALUATE the given power system by designing the solutions for different system studies.	**C5**	**PLO3**
CLO3	**Compose** organized, coherent, and effective report of assigned project/topic using writing processes and strategies. **(CEP)**	**C6**	**PLO10**
CLO4	**Acknowledge** and **value** the need for teamwork, leadership, diversity of ideas and inclusion. **(CEP)**	**A3**	**PLO9**
CLO5	**To operate and manipulate under guidance** on a given power system in the laboratory.	**P3**	**PLO4**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-352 Electrical Power Transmission	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Systems of Transmission: Systems of DC and AC Transmission; Transmission and sub-transmission, standard voltages in and abroad for transmission and sub transmission, WAPDA & KESC practices.

Basic Concepts: Phasor notation, complex power, power triangle, direction of power flow, current and power in balanced three-phase circuits.

Representation of Power Systems: Percent and Per-Unit quantities, Selection of base and change in base of p.u. quantities, Node Equations, One-line diagram, impedance and reactance diagrams.

Series Impedance of Transmission Lines: Conductor types, Resistance, Skin effect, Line inductance based on flux considerations. Inductance of single phase 2-wire line, inductance of composite conductor line, use of tables. Inductance of 3-ph line with equilateral and unsymetrical spacings, transposition, inductance of Bundled conductors.

Capacitance of Transmission Lines: Review of Electric field on a long straight conductors, capacitance of two-wire, 3-ph line; Effect of Earth on capacitance; capacitance of bundled conductors, paralled circuit lines.

Current and Voltage Relations on a Transmission Line: Representation of lines; The short, medium and long transmission lines, solution of equations and their interpretation travelling waves, Hyperbollic form of the equation, Equivalent circuits, power flow through the line, voltage regulation and power circuit diagram, line surges.

Mechanical Design of Overhead Lines: Line supports, sag and tension calculations, total length of conductor, supports at different levels, mechanical degree of safety, effect of wind pressure & ice loading, conductor vibration & use of dampers.

Insulators: Insulator material, types of insulators, voltage distribution over insulator string, string efficiency, methods of improving the string efficiency, testing of insulators.

Corona: The phenomenon of corona, disruptive critical voltage and visual critical voltage, conditions effecting corona loss, power loss due to corona, radio interference due to corona.

Power System Stability: stability problem, steady state and transient stability, rotor dynamics and swing equation, the power angle equation, equal area criterion of stability, solution of swing equation by graphical method.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Analyze** transmission line Electrical / Mechanical parameters for practical geometries used in Literature/Utility companies.	**C4**	**PLO2**
CLO2	**Evaluate** and **select** transmission line parameters to optimize the system performance	**C5**	**PLO4**
CLO3	**Comprehend** the environmental impact of transmission line.	**C2**	**PLO7**
CLO4	**Assume responsibility** as a team member to assess health and safety issues with regard to solution of complex engineering problem. **(CEP)**	**A3**	**PLO6**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-374 & Feedback Control Systems	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S)	**DATE OF COURSE CONTENT APPROVAL**	**APPLIED FROM BATCH**
Nil	2017	2018

COURSE CONTENTS

Introduction: Introduction to control systems, examples and classifications, Feedback and its characteristics. Nature and representation of control system problem, block diagram fundamentals, terminology of block diagram for a feedback control system, block diagram representation of various control systems.

Linear Systems and Differential Equations: Methods of writing differential equations of various physical systems such as static electric circuits, mechanical translational and rotational systems, thermal systems, hydraulic linear and rotational transmission systems, electromechanical dynamic systems DC and AC speed control systems.

Time-Response of Linear Systems: Types of standardized inputs to linear systems, steady state response and transient response of systems to standard inputs, response of second order systems time response specifications.

Laplace Transforms: Definition, derivation of Laplace transforms of simple functions, Laplace transform theorems, transformations of differential equations of physical systems, inverse transformation techniques, stability, Routh's stability criterion.

Block Diagram Algebra: Transfer functions of physical systems, canonical and unity feedback forms of control system block system block diagram, block diagram reduction techniques, signal flow graph algebra, block diagram reduction using signal flow graphs.

Control System Characteristics: Classification of feedback systems by type, analysis of system types, error coefficients, error constants, sensitivity.

Root Locus: Introduction, rules for construction of root locus, qualitative analysis of root locus, the spirule, analysis of performance characteristic of systems in time domain, dominant pole zero approximations, gain margin and phase margin, root locus compensation. Phase & gain compensation, root locus compensation, PID controller.

Frequency Response: Introduction, transfer function of systems in frequency domain, magnitude and phase angle frequency response of plots of closed loop control systems.

Introduction to Digital Control: Computer as control device, Single-loop digital control system, Digital control: pros and cons, Data Converters.

Linear Difference Equations (LDE) and z-transform: Scalar difference equation, z-transform of simple sequences and inversion, solving LDE using partial fraction and z-transform, z-domain transfer function and impulse response, relation between S and z-domain.

Digital control system design techniques: Digital control strategies and implementation, closed-loop characteristic equation, z-domain design considerations, General PID digital control algorithm, Tuning procedure for PID controller.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	To develop the ability of **analyzing** the output of systems by modeling and **categorizing** different types of control systems with identification of respective system elements and laws governed and then find time response of systems.	**C4**	**PLO2**
CLO2	To prepare students to **apply, modify** and **design** physical systems by applying mathematical methods for **analysis, modification** and **design** including stability criteria, steady state error, transient response analysis, sensitivity and root locus.	**C6**	**PLO3**
CLO3	***Interpret*** design specifications in order to ***select*** hardware requirements and/or software constructs best suited for given design constraints. **(CEP)**	**C5**	**PLO11**
CLO4	**Acknowledge** and **value** the need for teamwork, leadership, diversity of ideas and inclusion. **(CEP)**	**A3**	**PLO9**
CLO5	To practice **design** of 1st, 2nd and higher order complex systems as per the design specifications, **manipulate** responses using time domain specifications and derive valid conclusions by Lab work.	**P3**	**PLO4**

REMARKS (if any):

CEP will be given related to the control system design of a physical system

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
TC-307 Communication System	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Introduction to Communication: Introduction to Communication, elements of Communication system, Fundamental Limitations, Hartley Shannon law, Needs and benefits of Modulation, electromagnetic spectrum, multiplexing and multiple access, Phasors and Line Spectra

Probability & Random Variable: Review of probability and random variables, statistical measures, Probability models, Introduction to random processes.

Analog communication: Linear CW (AM, SSB, DSB, VSB) Modulation and demodulation techniques, modulator and demodulator Circuits, AM and SSB Transmitters and Receivers, SSB Filters, Transmission Bandwidth for AM, Angle/ Exponential CW (FM, PM) Modulation and demodulation techniques, Modulator and demodulator Circuits, FM/ PM Transmitter, FM Generation Methods, Transmission Bandwidth for FM/PM , Carson's rule, PLL Systems, Pre-emphasis and De-emphasis circuits, Narrowband and wideband FM, Demodulation of FM/PM and Receivers

Noise: Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems

Digital Communication Systems: Digital transmitters and receivers, Pulse Modulation, Pulse Amplitude Modulation, Pulse Position and Pulse width Modulation, BER, Introduction to information theory , Digital CW modulation, Coherent and non-Coherent systems, Digital modulation error-control coding

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Understanding and applying fundamental concepts basics of analog and digital communication system	**C3**	**1**
2	Ability to analyze analog modulation schemes	**C4**	**2**
3	Able to develop and test different types of analog modulation and demodulation circuits	**P2**	**5**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
HS-304 & Business Communication & Ethics	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Communication Skills (oral): Definitions and Conditions, Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc. Language, perception, Non-verbal, body language, physical appearance, cultural differences etc. Personal and interpersonal skills / perceptions. Communication dilemmas and problems Public Speaking – speaking situation, persuasion, Making presentations, Interviews

Business Writing: Formal / Business letters, e-mails: a) job applications and resumes/ cv, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc. Memos: layout, language, style Page 27 of 33 Meeting management: notice, agenda, conducting / participating, writing minutes. Contracts and agreements (basic theoretical knowledge and comprehension), Research / scientific reports : types, structure, layout / presentation, writing process etc. Tenders (basic theoretical knowledge and comprehension)

Engineering / Business Ethics: Need and objectives for code of ethics and its importance Type of ethics, involvement and impact in daily life Problems / conflicts / dilemmas in application (case studies) Sexual Harassment / discrimination in the workplace why it occurs, myths regarding sexual harassment, how to deal with it, gender equality, respect etc.

Codes of conduct: Pakistan Engineering Council Code for Gender Justice, Brief study of other codes of conduct

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Demonstrate/exhibit** effective oral communication and interpersonal skills in simulated professional and business situations.	**A3**	**PLO10**
CLO2	**Compose** effective business messages for various purposes and audiences.	**C6**	**PLO10**
CLO3	**Apply** principles, theories, and codes of ethics in situations related to professional practice.	**C3**	**PLO8**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

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Final Year

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-457 & Electrical Power System Protection	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Circuit Breakers and Switchgears: Introduction, Principle of circuit interruption, Short circuit studies in a power system, Faults at Generator Terminals, Faults in the system, Circuit breaker-Types and characteristics, Type of switchgear, Interrupting capacity of a circuit breakers and switchgears, Ratings of circuit breakers, Circuit Breaker operating mechanism, HVDC circuit breaking, Current Limiting Reactors; Use and location, Short circuit currents and size of reactor.

Modern Circuit Breakers: Construction and testing, Modern trend in HV circuit breakers, Vacuum Circuit breakers, SF6 Power Circuit breakers, Transients in power system, Switching Transients, Testing of circuit breaker, Test techniques for high rating circuit breaker, Selection of circuit breaker.

Protective Relays - Need for protective relaying in power systems, Basic requirements of protective relaying, Principles and characteristics of protective relaying, Theory and classification of relays, Theory of application of relays, Instrument Transformers, Types of relays, Auto reclosing, Under frequency/over frequency relays, Microprocessor based relays, Numerical relays, Protection Coordination.

Protection of Generators - Allocation of protective devices for stator, rotor, and prime mover of a generator, Faults in Generator windings, Generator Protection

Protection of Transformers - Busbars and Motors: Transformer Protection, Short circuit protection of Transformers by percentage differential relays, Differential Protection of a three winding transformer, Generator transformer Unit Protection, Gas accumulator and pressure relays, Protection of Motors, Protection of induction motors by static relays.

Protection of Transmission Lines - Busbar protection, Distance protection, Zones of protection

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	DESIGN the protection scheme for a given case study/ problem and run its simulation.	**C6**	**PLO3**
CLO2	ASSESS and EVALUATE the minimum/maximum level of protection scheme for a given system based on cost and reliability trade-off.	**C5**	**PLO4**
CLO3	**Practice** of protection schemes and evaluate their performance in laboratory sessions.	**P3**	**PLO4**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-411 & Power Generation	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Power Stations – Introduction, Types of power Station, Choice of type of Generator, Cost of Electrical Energy .

Hydro Electric Stations - Introduction, Types of Hydro Electric Power Stations, Principle of working of a Hydro Electric Plant, Power Station Structure and Layout, Types of Turbine and their characteristics, Arrangements and location of Hydro Electric Stations, Types of Hydro Electric Plants and Dam, Characteristics of Generators, Costs of Hydro Electric Stations .

Steam Power Plants - Introduction, Main Parts and working of a steam Station, Plant Layout, Rankine Cycle and its types, Types of Boiler and their characteristics, characteristics of steam turbines, Design of a steam Power Station, Steam station auxiliaries, Cost of Steam Station .

Gas Turbines - Introduction, Main Parts of Gas turbine plant, Plant Layout, Principle of Operation, Characteristics of Gas Turbine plants, Gas Turbine Power Plant operation and Control, Combined Cycles Cost of Gas Turbine Stations .

Diesel Electric Station - Introduction of Diesel Engine, Principle of working, characteristics of diesel engines, sizes and dimensions of generator sets, Coordination of Engine and Generator Characteristics, Use of Diesel Sets as Alternative Power Plant, cost of diesel Plants .

Nuclear Power Stations - Introduction, Nuclear Reaction, Main Parts of Nuclear Power Stations, Plant Layouts, Principle of Nuclear Energy, Nuclear reactor and reactor control, Types of Power Reactor, Comparison of various types of reactor, Economics of Nuclear Power Stations

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Outline** the necessary theoretical knowledge for basic and advanced concepts in Electrical Power Generating Stations.	C4	PLO1
CLO2	**Analyze** and evaluate the technical/economical parameters of Power Generating stations	C4	PLO2
CLO3	**Compare** the impact of different power generating stations on the environment and sustainability.	C4	PLO7
CLO4	**Classify** the students' performance based on task related to sustainability and environment.	A4	PLO7

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
CS-430 Microprocessor Programming and Interfacing	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Computer, Architecture, Instruction Cycle, Memory Organization, Address decoding, Memory Hierarchy, Interrupts, Bus Arbitration Schemes, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, General Purpose and Special Purpose Processors, Internal Registers, Internal Bus Architecture, Pin Functions, Addressing Modes, Instruction Set Architecture: (Data Transfer Instructions, Arithmetic & Logic Instruction, Branch (Instruction), Assembly programming and Testing Assemble Directives, Macros, Procedures, Instruction Encoding, Bus Cycles, Reset Circuit, Clock Generation Circuit, Wait States, Memory Interfacing, Memory Speed Requirements, I/O Interfacing, Programmable Peripheral Interface, Programmable Interval Timer, Programmable Interrupt Controller, Microprocessor System Design, Recent Microcontroller Architectures.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Explore internal microprocessor architecture and operations	C3	PLO-1
2	Illustrate interfacing techniques of a microprocessor with memory and I/O devices	C4	PLO-2
3	Simulate and probe Instruction Set Architecture of a representative microprocessor	P3	PLO-5

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EF-304 & Occupational Safety and Health	☐ SPRING ■ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Introduction

Introduction to Occupational Safety and Health, Historic development in the subject, Safety Legislations, Safety and Ethics

Hazards

Hazards-Mechanical and Machine, Falling, lifting and Vision related hazards, Temperature and Pressures, Electrical, Fire, Radiation, Chemical and Material, Noise and Vibration, Computers and Automation related Hazards, Industrial Hygiene and Confined Spaces; Case Studies

Hazard Analysis

Hazards Analysis, Concepts of Risks, Incidents and Accidents, Accidents Prevention and Control, Personal Protective Equipment, Management Responsibilities, Accident Causation, reporting and Investigation; Case Studies

Developing and maintaining Codes

Developing and maintaining Codes, Standards and Regulations, ISO Standards 14001 and 45001/BS OHSAS 18001

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Understanding** the fundamental concepts of OSH and ISO-OHSAS standards.	C2	PLO6
CLO2	**Identify** and **analyze** hazards and to recommend possible actions in the given vicinity/lab	C4	PLO7
CLO3	**Locate** and **execute** the emergency response plan and explain to the higher management.	A2	PLO8
CLO4	Valuing the organizational safety model, integrating it to private and public life, along with neighborhoods and society. Making safety a habit.	A2	PLO12

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EF-305 & Engineering Economics and Management	☐ SPRING ■ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Introduction: Basic Concepts and principles of Economics, Micro- and Macro-economic theory, the problem of scarcity. Basic concepts of Engineering Economy, Financial effectiveness and non-monetary factors

Economic Environment: Consumers and producer goods, Goods and services, Demand & Supply concept. Market Equilibrium, Elasticity of demand, Elasticity of Supply, Measures of Economics worth, Price, supply-demand-relationship, Revenue, Cost and profit function.

Elementary Financial Analysis: Basic accounting equation. Development and interpretation of financial statements-Income Statement, Balance Sheet and Cash Flow, Working capital management, Financial Ratio Analysis.

Time Value of Money and Financial Returns: Concepts of simple, compound and effective interest rates, Less often than compounding period and more once a year; Present Value, Future Value and Annuities concepts, Uniform gradient and geometric sequence of cash flow.

Depreciation and Taxes: Depreciation concept, Economic life, Methods of depreciation, Gain (loss) on the disposal of an asset, Depreciation as a tax shield

Basic cost concepts and Break Even Analysis: Types of costs and cost curves; Determination of Cost/Revenues. Numerical and graphical presentations. Practical applications, BEA as a management tools for achieving financial/operational efficiency

Linear Programming: Mathematical statement of linear programming problems, Graphical solutions, Simplex method, Duality Problems.

Business Organizations and financial Institutions: Type of ownership, single ownership, partnerships, corporation, type of stocks and joint stock companies, Banking and specialized credit institutions.

Project Management: Integration of Organization Strategy with Projects, Defining the project, developing a network plan, managing risk, reducing project time, project selection and comparing alternatives techniques scheduling resources

Introduction to Projection Management and Production Concepts: Basic production function, stages of production, returns to scales, Production lead time, Production rate, capacity, operations, planning and control, order processing, Scheduling, planning, line of balance

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Remember** ethical principles and commit to professional ethics and responsibilities and norms of engineering practice in accounting, depreciation calculations and determining time value of money following objectivity principle of accounting.	**C1**	**PLO8**
CLO2	**Identify** and **analyze** microeconomic environment that includes goods and services, market force and equilibrium to help determine price etc.	**C2**	**PLO7**
CLO3	**Apply** project management principles to business and economic scenarios.	**C3**	**PLO11**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
HS-405 & Organizational Behaviour	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Introduction to Organizational Behavior Foundations of OB: Management functions, roles, and skills Effective versus successful managerial activities Replacing intuition with systematic study Exploring OB challenges and opportunities facing globalization: Improving quality and productivity Improving people skills Managing work force diversity Responding to globalization Empowering people Stimulating innovation and change Coping with temporariness Handling declining employee loyalty Improving ethical behavior

Foundations of Individual Behaviour Individuals & Organizations: Biographical traits and ability Personality Perceptions and individual decision making: Understanding perception and its significance, factors influencing perception Linking perception and individual decision making Optimizing decision making model Alternative decision making models Issues in decision making Values, attitudes and job satisfaction: Importance, sources, types of values Sources and types of attitude Attitude and consistency Measuring job satisfaction Determinants of job satisfaction Effect of job satisfaction on employee performance Ways employees can express dissatisfaction Motivation - basic concepts and applications

Foundations of Group Behaviour Group in OB: Defining and classifying groups Stages of group development, work group behaviour Dynamics of groups Understanding work teams: Team versus group; types of teams, creating high performance teams Turning individuals into team players Communication: communicating at interpersonal and organizational level Leadership: basic approaches and contemporary issues Conflict & negotiation: defining conflict; transition in conflict thought Conflict process Negotiation - strategies, process and issues

Foundations of Organizational Structure Organizational structure and design Work design Work stress Organizational culture: definition Culture's functions, employees and organizational culture Organization change and development: forces for change Managing planned change, resistance to change Approaches to managing organizational change

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**EXPLAIN** key organizational behavior concepts and its implications	**C2**	**PLO12**
CLO2	**ANALYZE** organizational behavior practices from the perspective of ethical criteria	**C4**	**PLO6**
CLO3	Express strategies to change individual & group behaviors for organizational success	**A3**	**PLO9**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
HS-403 & Entrepreneurship	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Entrepreneurship Mind-set: The revolution impact of Entrepreneurship, The individual Entrepreneurship Mind-set, Corporate Entrepreneurship Mind-set, The Social and Ethical perspectives of Entrepreneurship

Launching Entrepreneurship Ventures: Creativity and innovations, Methods to initiate ventures, Legal challenges in Entrepreneurship, The search for Entrepreneurship Capital

Formulation of Entrepreneurship Plan: The assessment of function with opportunities, The marketing aspects of new ventures, Financial statements in new ventures, Business plan preparation for new ventures

Strategic Perspectives in Entrepreneurship: Strategies growth in Entrepreneurship, Valuation challenges in Entrepreneurship, Final harvest of a new venture

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	Explain basic functions and importance of entrepreneurship	**C2**	**PLO12**
CLO2	Value business ethics on entrepreneurial activities	**A3**	**PLO8**
CLO3	Demonstrate the entrepreneurial skills to develop business plan	**C3**	**PLO11**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
EE-412 Alternate Energy Systems	■ SPRING ☐ FALL	TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Introduction to Renewable Energy and Alternate Energy – Cons of Fossil fuel usage, global warming, Introduction to the types of alternate energy (Solar, Wind, Biomass, Hydro, Tidal), Wave Energy, Geothermal Energy, Ocean thermal Energy, Fuel cell. List of agreements of protection of environment, greenhouse gases, Global warming potential, emission factor, carbon footprint etc.

Solar Thermal Technologies- Black body, Electromagnetic Spectrum, Earth's geometry, Latitudes, Sun's fusion reaction, Horizon, Equinox, Solstice (Summer and Winter), Solar Noon, Spreading out Sunlight, Solar Declination angle, Altitude angle, Zenith angle, Solar Azimuth Angle, Hour Angle, Nature of solar radiation (Direct, Reflected and Diffuse), Introduction to Solar Thermal Collectors, Unglazed Panels, Flat plate collectors, Evacuated tube collectors, Efficiency of Flat Plate Collectors, Parabolic trough, Fresnel Reflectors, Solar dish and Solar power tower, Thermal Energy Storage, Efficiency of Concentrated Collector, Daylighting, Active Solar hot water systems (Direct and Indirect Circulation system, Environmental Impact of Solar Thermal Technologies.

Photovoltaics and Integration of PV into future energy systems -Photovoltaic effect and its History, Electricity generation from PV, Structure of PV cell, Types of PV cell (Monocrystalline, Polycrystalline and amorphous silicon), Other Innovative Technologies, PV Cell I-V characteristics, Impacts of temperature and Insolation on IV curve, grid connected system, stand- alone system/remote power system, Environmental and Economic Impact of PV

Introduction to Wind power system - Introduction to Wind Energy, Wind facts and its origination, lift vs. drag, advantages and disadvantages of wind power, Wind turbines types and its terms (HAWT, VAWT), power and energy from wind turbines, wind speed characteristics of a site, economics of wind turbine, Angle of attack, wind turbine operation, turbine power efficiency, economics of wind turbine, wind turbine generators, Commercial development and wind energy potential.

Fuel cells - Fuel cell basics , History Working. design, new development in fuel cells, Hydrogen, production and storage of hydrogen types, possibility of future use.

Biomass and Bioenergy- Introduction, Past and present, Biomass as a fuel source, Biomass generations, extracting energy, Energy crops.

Integration of Renewable energy sources- Environmental benefits and impacts, Economics, New Technologies, Future Prospects. Changing patterns of energy use, Balancing economic options

NED University of Engineering and Technology

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Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
CLO1	**Analyze** basic social, political, economic and ecological factors impacting Renewable energy resources, their adaptation regionally and globally according to environment	**C4**	**PLO6**
CLO2	**Evaluate** problem solving skills and critical thinking in both hands on and written technical environment to maintain a sustainable scenario in the form of a group and presentation report.	**C5**	**PLO7**
CLO3	**Interpret** design specifications in order to **select** hardware requirements and/or software constructs best suited for given design constraints. (CEP)	**C5**	**PLO11**
CLO4	**Organize** the report giving due consideration to scholarly ethics. (CEP)	**A4**	**PLO8**

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)

NED University of Engineering and Technology

Department of Electrical Engineering

Program BE-Electrical

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE	SEMESTER	CREDIT HOURS
CS-418 Computer Communication Networks	■ SPRING ☐ FALL	TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) Nil	**DATE OF COURSE CONTENT APPROVAL** 2017	**APPLIED FROM BATCH** 2018

COURSE CONTENTS

Markov chains and queuing theory, Open and closed networks of queues, Priority queuing, Scheduling, Performance models of communication networks, Network design, Protocols, Evaluating circuit and data flow graph, Routing, Local Area Networks, Satellite protocols, Broadcast networks, Ring networks.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Discuss basic computer network topologies and reference models	C2	PLO-1
2	Explore the operation and design issues of Computer Networks	C3	PLO-2
3	Practice configuration and troubleshooting of computer networks using modern tools	P3	PLO-5

REMARKS (if any):

Recommended by: _____ **Approved by:** _____

(Chairperson/Date) (Dean/Date)