OUTCOME BASED EDUCATION

Course Curriculum

Program: B.Sc. in Electrical and Electronic Engineering
Semester: 2nd year 1st and 2nd Semester

Department of
Electrical and Electronic Engineering

Khulna Khan Bahadur Ahsanullah University
140, KDA, Khan Bahadur Ahsanullah Road, Choto Boyra, Khulna-9000

EEE 0713 2102: Electrical Shop Practice

1. Course Title: Electrical Shop Practice

2. Course Code: EEE 0713 2102

3. BNQF Code: 0713

4. Credit Value: 1.5

5. Credit Hours: 3.0 (every week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Electrician's tools, splices, soldering, code practices. Electrical and electronic symbols, Safety rules, electricity rules and electricity codes. Introduction to building regulations, Regulations in Bangladesh National Building Code. Electrical wiring system design drawing and estimation for residential and commercial house wiring and Industrial installation wiring. Familiarization with computer aided software based drawing tools for electrical wiring diagram, wiring system design and drafting of both low and high rise buildings.

Design of sub-station, bus-bar trunking (BBT), earthlings and lightning protection system of a building. A design problem on a multi-storied building using computer aided software.Use of meggers, Insulation test, Grounding earth resistance measurement using earth resistance tester; Battery charging; Calculation of illumination, total loads. Selection of cables and breakers.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): Electrical Circuits I (EEE 0713 1101) and Electrical Circuits II (EEE 0713 1201).

14. Name of the instructor(s) with contact details and office hours: *N/A*

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the basic electrical service design of residential and commercial buildings	1	2		
2	Construct wiring connections for different types of loads with supply lines	3			3
3	Calculate ratings of load, transformer, generator and PFI plant	2	4		
4	Construct wiring connections for security systems in a building	3			3

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P7**	
CO2	**K4**	**P1-P7**	
CO3	**K4**	**P1-P7**	
CO4	**K4**	**P1-P7**	**A1-A3**

18. Percentages of Assessment Methods

Method	Percentage
Attendance	10
Sessional Report	20
Design and Presentation	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Familiarization with computer aided software based drawing tools for electrical wiring diagram. Introduction to building regulations, codes and standards: BNBC.	
2	Terminology and definitions: fuses, circuit breakers, distribution boxes, cables with classification, bus-bars and conduits.	

	Familiarization with symbols and legends used for electrical services design.	Class Performance, Design, Presentation, Final Jury and viva-voce.
3	Calculation of illumination and current rating and selection of cables and breakers. Wattage rating of common electrical equipment. Electrical fittings and features layout.	
4	Electrical wiring for residential, commercial and industrial buildings. (light, fan, conduit layout and circuit diagram)	
5	Electrical wiring for residential, commercial and industrial buildings (power outlet, telephone, TV antenna, fittings-feature layout, conduit layout and circuit diagram.) External lighting and external area electrification.	
6	Submission of assignment 1 & 2, design test 1 and viva 1 based on lecture no 1-5	
7	Load calculation for a building. Specify the rated transformer, generator and power factor improvement panel for that building. Low voltage power distribution by a substation inside a building. Substation design for a high-rise building for normal and emergency power.	
8	Bus bar trunking (BBT) system and cable support system for a high-rise building.	
9	Familiarization with computer aided software based drawing tools for electrical wiring diagram, wiring system design and drafting of both low and high rise buildings.	
10-11	Earthling and lightning protection for a building. Familiarization with neutral and earthing wiring system. Multimedia presentation of electrical wiring diagram on some practical aspects (equipment, modern building wiring, sub-station, electrical load connections, etc.).	
12	Introduction to computer aided software for electrical wiring diagram.	
13	Submission of assignment 3, design test 2 based on 7-9 and viva 2 based on lecture no 7-9.	
14	A design Problem on a multi-stored building using computer aided software.	

20. References

20.1. Required (if any)

(i) F. S. Merrit, Building Engineering and system design, New York: Van Nostrand Reinhold Company, 1979.

(ii) B. L. Thereja, Text Book of Electrical Technology, 25th ed. New Delhi, India: S. Chand, 2008.

(iii)Building Construction Act of Bangladesh 1952, amended in 2008.

EEE 0713 2103: Electronic Devices and Circuits II

1. Course Title: Electronic Devices and Circuits II

2. Course Code: EEE 0713 2103

3. BNQF Code: 0713

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Electrical and Electronic Engineering (EEE) Department

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers, Basic feedback concept, positive and negative feedback, feedback voltage amplifiers, Stability study of feedback amplifier using Bode Plots, The oscillation criterion, Analysis and classification of oscillator, basic principle of sinusoidal oscillators, Op-Amp RC oscillators, RC phase shift oscillator, Wein bridge oscillator, Resonant circuit oscillators, and Crystal oscillator; Introduction, Mono-stable, Bi-stable, and A-stable multi-vibrator, BJT current sources, FET current sources/sinks, small signal analysis of active loads, design applications: an NMOS current source; differential and multistage amplifiers: BJT differential amplifier, FET differential amplifier, differential amplifier with active load, small signal analysis and frequency response of differential amplifiers.

Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, DC imperfections, DC analysis, small-signal analysis of different stages, gain and frequency response of 741, Op-Amp. Negative Feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation, Active Filters: Different types of filters and specifications, transfer functions, realization of first and second order law, high and band pass filters using Op-Amps; Signal Generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators, Power Amplifiers: Classification of output stages, class A, B and AB output stages; Applications and Design of Integrated Circuits: Active filter-types and design, realization of low-pass and high pass first order and second order Butterworth filter using Op-Amps, band pass and band reject filters, all pass filters; Voltage comparators, Schmitt trigger circuits, sample and hold circuit, IC comparator; 555 Timer IC and its Applications, integrated power amplifiers, voltage regulators.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any):

Electronic Devices and Circuits I (EEE 0713 1203)

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level:

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend some of the fundamental concepts and techniques (feedback, active filtering, oscillator design etc.) used in analog electronics.	**1**	**2**		
2	Distinguish the electronic devices operation and application in active and saturation region (filters, oscillators, buffers, comparators etc.).	**2**	**4**		
3	Solve mathematical problems related to various analog electronic circuits.	**2**	**3**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities:

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P3**	
CO2	**K4**	**P1-P3**	
CO3	**K4**	**P1-P3**	

18. Percentages of Assessment Methods:

Method	**Percentage**
Class Participation	10
Homework/Class Tests	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods:

Week	Topics	Assessment Method(s)
1-2	Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
3-4	Feedback and Stability: Basic feedback concept, positive and negative feedback, feedback voltage amplifiers, Stability study of feedback amplifier using Bode Plots.	
	Oscillators: The oscillation criterion, Analysis and classification of oscillator, basic principle of sinusoidal oscillators, Op-Amp RC oscillators, RC phase shift oscillator, Wein bridge oscillator, Resonant circuit oscillators, and Crystal oscillator;	
5	Multi-vibrators: Introduction, Mono-stable, Bi-stable, and A-stable multi-vibrator.	
6-7	Integrated Circuit Biasing and Active Loads: BJT current sources, FET current sources/sinks, small signal analysis of active loads, design applications: an NMOS current source; differential and multistage amplifiers: BJT differential amplifier, FET differential amplifier, differential amplifier with active load, Small signal analysis and frequency response of differential amplifiers.	
8	General Purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741.	
9-10	Operational Amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, DC imperfections.	
11	Active Filters: Different types of filters and specifications, transfer functions, realization of first and second order law, high and band pass filters using Op-Amps.	
12	Signal Generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, IC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages.	
13-14	Applications and Design of Integrated Circuits: Active filter-types and design, realization of low-pass and high pass first order and second order Butterworth filter using Op-Amps, band pass and band reject filters, all pass filters; Voltage comparators, Schmitt trigger circuits, sample and hold circuit, IC comparator; 555 Timer IC and its Applications, integrated power amplifiers, voltage regulators	

20. References

(i) A Text book of Electrical Technology (Electronic Devices And circuits) Volume IV by B. L Theraja & A. K Theraja

20.1. Required

(i) J. Millman and A. Grabel, Microelectronics, 2nd ed. New York: McGraw-Hill, 1987.
(ii) R. F. Coughlin and F. F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, 6th ed. London, England: Pearson, 2001.
(iii) R. Boylestad and L. Nashelksy, Electronic Devices and Circuit Theory, 11th ed. London, England: Pearson, 2012.

EEE 0713 2104: Electronic Devices and Circuits II Sessional

1. Course Title: Electronic Devices and Circuits II Sessional

2. Course Code: EEE 0713 2104

3. BNQF Code: 0713

4. Credit Value: 1.5

5. Credit Hours: 3.0 (every week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8. Faculty: Engineering

9. Conducted By: Electrical and Electronic Engineering (EEE) Department

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Laboratory experiments based on theory and concepts learnt in EEE 0713 2103.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	Cos	POs	Bloom's Taxonomy		
			C	A	P
1	Perform experiments to study the characteristics of BJT based negative feedback circuits.	**2**			**3**
2	Build BJT based power amplifier circuits.	**2**	**3**		
3	Design OPAMP based electronic circuits for various applications.	**3**			**3**

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K4**	**P1-P7**	
CO2	**K4**	**P1-P7**	
CO3	**K5**	**P1-P7**	**A1-A3**

18. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Setup test	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	**Topics**	**Assessment Method(s)**
1	Sessional 0: Introduction to Electronics-II Sessional.	Lab Report and Class Performance
2	Sessional 1: Study of Class A Power Amplifier.	
3	Sessional 2: Study of Class B and Class C Power Amplifier.	
4	Sessional 3: Study of a voltage series feedback amplifier circuit.	
5	Sessional 4: Study of a current series feedback amplifier circuit.	
6	Practice session for students	
7	Set-up Test-1 and Viva-1	
8	Sessional 5: Introduction to OPAMPs.	Lab Report and Class Performance
9	Sessional 6: Application of OPAMPs.	
10	Sessional 7: Design and study of a -40dB/decade low pass Butterworth filter.	
11	Sessional 8:Study of Wien Bridge Oscillator	
12	Practice session for students	
13	Set-up Test-2 and Viva-2	

14	Viva-voce

20. References

20.1. Required (if any)

(i) R. F. Coughlin and F. F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, 6th ed. London, England: Pearson, 2000.

20.2. Recommended (if any)

(ii) R. Boylestad and L. Nashelksy, Electronic Devices and Circuit Theory, 11th ed. London, England: Pearson, 2012.

(iii)J. Millman and A. Grabel, Microelectronics, 2nd ed. New York: McGraw-Hill, 1987.

EEE 0713 2105: Electrical Machine I

1. Course Title: Electrical Machine I

2. Course Code: EEE 0713 2105

3. BNQF Code: 0713

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

7. Faculty: Engineering

8. Conducted By: Electrical and Electronic Engineering (EEE) Department

9. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Elements of Electro-Mechanical Energy Conversion: Aspects of conversion, Magnetic field system: energy and co-energy, Rotary motion, Dynamic equations and system models, Statically induced emf and dynamically induced emf. **DC Generators**: Description of different parts of DC generators, emf equation, principle of DC generators, Different types of winding, Winding Table, Voltage build up, Armature reaction, losses and efficiency, Parallel operation of DC generators. **DC Motor**: Principle of operation, classification, losses and efficiency, Starting, Separately excited DC motor, Permanent magnet DC motor, Two and four-quadrant operation of DC motors; speed control by converter and chopper, Crane, traction and hoist application of DC motor, Choice of DC motors for different applications.

Transformer: Working principle, Construction and cooling, 'equivalent circuit, Ideal transformer-transformation ratio, no-load and load Vector diagram, voltage regulation, efficiency, Losses & efficiency, Parallel operation, Phase conversion.; Determination of transformer constants and polarity. Three phase operation of single-phase transformer; Open Delta and Scott connections, Harmonics in poly phase transformers, Induction voltage regulators, actual transformer-equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers; **Autotransformers**: three phase and single phase, Power transformers: bushing, Cooling, Tap Changing and parallel operation. **Single Phase Induction Motor:** Theory of operation, equivalent circuit and starting. **Three Phase Induction Motor:** Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control; Induction generator.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): Electrical Circuits II (EEE 0713 1201)

14. Name of the instructor(s) with contact details and office hours: *N/A*

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the basic knowledge of different types of machines i.e. DC generator, DC Motor, Synchronous Generator, Synchronous motor, Transformers (single phase and three phase) and Induction motors (single phase and three phase) including the constructional details, principle of operation and performance analysis, characteristics curves, starting and speed control methods of these machines	**1**	**2**		
2	Identify practical applications of these electrical machines in power system.	**1**	**1**		
3	Solve mathematical problems related to equivalent circuit models, performance tests, loss analysis, efficiency calculation, voltage regulation, parallel operation, behavior under different operating conditions etc. of these machines.	**4**	**3**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P4**	
CO2	**K3**	**P1-P4**	
CO3	**K8**	**P1-P4**	

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1-2	**Elements of Electro-Mechanical Energy Conversion:** Aspects of conversion, Magnetic field system: energy and co-energy, Rotary motion, Dynamic equations and system models, statically induced emf and dynamically induced emf.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
3-4	**DC Generators**: Description of different parts of DC generators, emf equation, principle of DC generators, Different types of winding, Winding Table, Voltage build up, Armature reaction, losses and efficiency, Parallel operation of DC generators.	
5-6	**DC Motor**: Principle of operation, classification, losses and efficiency, Starting, Separately excited DC motor, Permanent magnet DC motor, Two and four-quadrant operation of DC motors; speed control by converter and chopper, Crane, traction and hoist application of DC motor, Choice of DC motors for different applications.	
7	Efficiency and Parallel operation of transformers, Autotransformer	
8-10	**Transformer:** Working principle, Construction and cooling, 'equivalent circuit, Ideal transformer- transformation ratio, no-load and load Vector diagram, voltage regulation, efficiency, Losses & efficiency, Parallel operation, Phase conversion.; Determination of transformer constants and polarity. Three phase operation of single-phase transformer; Open Delta and Scott connections, Harmonics in poly phase transformers, Induction voltage regulators, actual transformer-equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers;	
11	**Autotransformers**: Three phase and single phase, Power transformers: bushing, Cooling, Tap Changing and parallel operation.	
12	**Single Phase Induction Motor:** Theory of operation, equivalent circuit and starting.	
13-14	**Three Phase Induction Motor:** Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control; Induction generator.	

20. References:

20.1. Required (if any)

(i) S. J. Chapman, Electric Machinery Fundamentals, 5th ed. New York: McGraw-Hill Education, 2011.

(ii) B.L. Thereja and A. K. Thereja, A Text Book of Electrical Technology - Volume II: AC & DC Machines, 23rd ed. New Delhi, India: S. Chand, 2006.

EEE 0713 2106: Electrical Machine I Sessional

1. Course Title: Electrical Machine I Sessional

2. Course Code: EEE 0713 2106

3. BNQF Code: 0713

4. Credit Value: 1.5

5. Credit Hours: 3.0 (every week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8 Faculty: Engineering

9. Conducted By: Electrical and Electronic Engineering (EEE) Department

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Laboratory experiments based on theory and concepts learnt in EEE 0713 2105. Design of simple systems using the principles learned in EEE 0713 2105.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): EEE 0713 1201, EEE 0713 1202

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

By the end of this course, students are expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Construct a distribution system based on the principle of electromagnetic induction	5			2
2	Analyze the performance of induction motor, Transformer, Synchronous machine and DC machine based on different loading effect.	4			3
3	Build interconnected system for a given problem in poly-phase distribution topology considering the involvement of DC machine.	3			3

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K6**	**P1-P4**	
CO2	**K8**	**P1-P4**	
CO3	**K5**	**P1-P4**	**A1-A3**

18. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Setup test	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	**Topics**	**Assessment Method(s)**
1	**Sessional 1:** Introduction to Energy Conversion Laboratory, Introduction to new equipment / parts and safety regulations.	Class Performance and Report
2	**Sessional 2:** Introduction to the construction and different parts of DC machines.	
3	**Sessional 3:** To find the Efficiency of a Shunt Generator	
4	**Sessional 4:** Speed Control of a DC Shunt Motor	
5	**Sessional 5:** Voltage and Speed regulation DC generator and motor with different loaded conditions.	
6	**Sessional 6:** Performance Tests on Single Phase Transformer.	
7	**Exam 1**	Viva-voce 1 & Setup Test 1
8	**Sessional 7** Measurement of equivalent circuit of Single Phase Transformer.	Class Performance and Report
9	**Sessional 8:** To determine the regulation of a transformer under different power factor.	
10	**Sessional 9:** Study the efficiency of Three-Phase Transformers.	
11	**Sessional 10:**	

	Star-delta starter of 3-phase Induction Motor (IM).	
12	**Sessional 11:** Stator and rotor test of 3-phase IM.	
13	**Review of Experiments**	
14	**Exam 2**	Viva-voce 2 & Setup Test 2

20. References

20.1. Required (if any)

(i) EEE 0713 2106 Sessional Manual.

20.2. Recommended (if any)

(i) S. J. Chapman, Electric Machinery Fundamentals, 5th ed. New York: McGraw-Hill Education, 2011.

(ii) B.L. Thereja and A. K. Thereja, A Text Book of Electrical Technology - Volume II: AC & DC Machines, 23rd ed. New Delhi, India: S. Chand, 2006.

ME 0715 2121: Basic Mechanical Engineering

1. Course Title: Basic Mechanical Engineering

2. Course Code: ME 0715 2121

3. BNQF Code: 0715

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Introduction to the sources of Heat energy: Renewable and non-renewable sources and their potential; Introduction to steam generation; **Steam generator:** Boilers and their classification; Working principle of few common and modern boiler; boiler mountings and accessories; Performance of boiler; **Heat engines:** Introduction to internal combustion engines and their cycles. Study of SI and CI engines and gas turbines with their accessories. Gas turbines, diesel engines, petrol engines, Fuel, lubrication and cooling systems of I.C engines. Energy and First law: Systems and surroundings; Conservation of energy; Different thermodynamic processes; Energy transfer as heat for a control volume; **Entropy and Second law**: Reversibility and irreversibility; Definition and corollaries of second law of thermodynamics. Entropy: its transfer and change. Characteristics of some thermodynamic cycles: Analysis of different thermodynamic cycles, vapor power cycles, Representation of various cycles on PV & TS planes. Basic concepts of refrigeration systems: Vapor compression refrigeration, Absorption refrigeration, cop, refrigerants and their classifications and properties.

Air conditioning: Introduction, objectives and major components of air conditioning systems; Humidity; Dew point. Study of fuels. Steam generation units with accessories and mountings. Study of steam generation and steam turbines; **Refrigeration equipment:** Compressors, condensers and evaporators. Refrigeration and its application; **Type of fluid machinery**: Study of impulse and reaction turbine. Pelton wheel and Kaplan turbine. Study of centrifugal and axial flow machines. Pumps, fans, blowers and compressors. Study of reciprocation pumps.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the fundamental principles of different mechanical systems like boiler, turbine, IC engine, air conditioner, centrifugal pump etc.	**1**	**2**		
2	Apply different analytical formula to solve engineering problems related to heat transfer, pump, refrigeration system etc.	**2**	**3**		
3	Analyze the problems of losses in fluid flow from real life situations and solve them using concepts	**2**	**4**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**		
CO2	**K3**		
CO3	**K3**		

18. Percentages of Assessment Methods

Method	Percentage
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Introduction & preliminary concepts of energy sources, boiler	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
2	Boiler mountings and accessories	
3	Steam turbine, Condenser	
4	Vapor cycle , related math, IC Engine	
5	Different cycles of IC engine	
6	Gas turbine and cycles of gas turbine	
7	Refrigeration and different refrigeration methods	
8	Refrigerant, Air conditioner	
9	Fluid properties, Fluid classifications	
10	Governing equations, Losses in flow	
11	Centrifugal pumps, compressors, fans and Blowers	
12	Modes of heat transfer	
13	One dimensional steady state conduction, critical thickness of insulation.	
14	Review and problem solving	

20. References

20.1. Required (if any)

(i) R.S. Khurmi and J. Gupta, A Textbook of Thermal Engineering, 1st ed. New Delhi, India: S. Chand, 2006.

(ii) R.S. Khurmi and J. Gupta, A Textbook of Refrigeration and Air Conditioning, 1st ed. New Delhi, India: S. Chand, 2006.

(iii) Y. A. Cengel and J. H. Cimbala, Fluid Mechanics Fundamentals and Applications, 3rd ed. New York: McGraw-Hill Education, 2013.

(iv) F. M. White, Fluid Mechanics, 7th ed. New York: McGraw-Hill Education, 2011.

(v) H. N. Gupta, Fundamentals of Internal Combustion Engines, 2nd ed. New Delhi, India: PHI, 2013.

ME 0715 2122: Basic Mechanical Engineering Sessional

1. Course Title: Basic Mechanical Engineering Sessional

2. Course Code: ME 0715 2122

3. BNQF Code: 0715

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8 Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Sessional works compatible to ME 071 2121: Basic Mechanical Engineering.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1.	Execute experimentation of Bernoulli's Theorem	**4**			**2**
2.	Perform to determine fluid flow rate through Venturimeter	**4**			**3**
3.	Perform to determine fluid flow rate through V- Notch	**4**			**2**
4.	Perform with Psychrometer and determination of air properties; acquire experience about the different types of refrigeration and air conditioning systems.	**4**			**3**
5.	Perform to find carbon residue of Diesel oil	**4**			**3**
6.	Perform the tension Test of a mild steel specimen	**4**			**2**

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	K3		
CO2	K3		
CO3	K3		
CO4	K3		
CO5	K3		
CO6	K3		

18. Percentages of Assessment Methods

Method	Percentage
Attendance	10
Sessional Report	20
Setup test	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Introduction	Class Performance and Report
3	Study of Bernoulli's Theorem	
5	Study of flow through Venturimeter	
7	Study of Psychrometry, AC and Refrigeration	
9	Study of flow through V-notch	
11	Tension test of mild steel specimen	
13	Perform to find carbon residue of Diesel oil	
14	Set-up Test and Viva-voce	

20. References

(i) F. M. White, *Fluid Mechanics*, 7th ed. New York: McGraw-Hill, 2011.

(ii) Y. A. Cengel and J. H. Cimbala, *Fluid Mechanics Fundamentals and Applications*, 3rd ed. New York: McGraw-Hill Education, 2013.

(iii) Y. A. Cengel and M. A. Boles, *Thermodynamics: An Engineering Approach*, 6th ed, Uttar Pradesh, India: Tata McGraw-Hill Education Private Limited, 2008.

MATH 0541 2131: Transform Domain and Vector Analysis

1. Course Title: Transform Domain and Vector Analysis

2. Course Code: MATH 0541 2131

3. BNQF Code: 0541

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

7. Faculty: Engineering

8. Conducted By: Department of Electrical and Electronic Engineering (EEE)

9. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Fourier analysis: Real and complex form of Fourier series, Finite transform, Fourier Integral, Fourier transforms and their uses in solving boundary value problems of wave equations. **Laplace Transforms:** Definition Laplace transforms of some elementary functions, sufficient conditions for existence of Laplace Transforms, Inverse Laplace Transforms, Laplace Transforms of derivatives. The unit step function, Periodic function, some special theorems on Laplace Transforms, Partial fractions, Solutions of differential equations by Laplace Transforms, Evaluation of improper integrals.

Vector Analysis:
Different Coordinate Systems (Polar, Cylindrical, Spherical Coordinates) Coordinate Systems in Two and Three Dimensions. Scalars and vectors, equality of vectors, addition and subtraction of vectors, geometrical interpretation, Multiple product of vectors, Linear dependence and independence of vectors, Differentiation and Integration of vectors together with elementary applications, Line, Surface and volume integrals, Gradient of a scalar functions, divergence and curl of a vector function, various formulae, Integrals form of gradient, divergence and curl, Divergence theorem, Stokes' theorem, Green's theorem and Gauss's theorem. Application of different theorems on applied electromagnetics.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: *N/A*

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Illustrate the concept of complex number system, complex functions, limit, continuity, differentiability, analyticity of complex valued functions.	**1**	**3**		
2	Apply the general theorems and integrals of complex function for solving various problems.	**1**	**3**		
3	Comprehend the concepts of different vector operations and vector calculus.	**1**	**2**		
4	Interpret general theorems in vector calculus for solving different problems.	**1**	**3**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K2**		
CO2	**K2**		
CO3	**K2**		
CO4	**K2**		

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Introduction complex number system: Discuss details of course outline and goals, Complex number system. General functions of a complex variable. Geometrical representation of complex number, modulus, argument.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
2	Theorems: DeMoivre's theorem and related theorems. Analytic Functions: Definition of limit, Continuity and Differentiability. Complex differentiation and the Cauchy-Riemann equation. Analytic and harmonic functions. Related theorems and problems	
3	Analytic Functions: Analytic and harmonic functions. Related theorems and problems Conformal Mapping: Mapping by elementary functions. Conformal mapping. Related theorems and problems	
4	Complex integration and related theorems: Line integral of a complex function. Cauchy's integral theorem, Cauchy's integral formula. Cauchy's integral formula for derivatives and related problems	
5	Complex integration and related theorems: Cauchy's integral formula for derivatives and related problems Singularities: Infinite series, Convergence and uniform convergence	
6	Residue and related theorems: Taylor's and Laurent's theorem. Singular points. Residue, Cauchy's residue theorem. Related theorems and problems	
7	Contour integration: Integration round the unit circle. Integration involving many valued functions. Improper integrals involving sines and cosines and related problems	
8	Vectors and Scalars: Different Coordinate Systems (Polar, Cylindrical, Spherical Coordinates) Coordinate Systems in Two and Three Dimensions. Scalars and vectors, equality of vectors. Addition and subtraction of vectors, geometrical interpretation. Laws of vector algebra. Components of a vector. Scalar and vector fields and related problems	
9	The dot, cross product and Vector differentiation: The dot and cross product. Multiple products of vectors. Linear dependence and independence of vectors and related problems. Ordinary derivatives of vectors. Space curves. Continuity and differentiability	
10	Vector differentiation: Continuity and differentiability. Partial derivatives of vectors and related problems Gradient, Divergence and curl: Gradient of a scalar functions, divergence and curl of a vector function	

11	Gradient, Divergence and curl: Gradient of a scalar functions, divergence and curl of a vector function, various formulae and related problems	
12	Vector integration: Integration of vectors. Line, Surface and volume integrals. Integrals form of gradient, divergence and curl and related problems	
13	The Divergence, Stokes and related integral theorem: Green's theorem, Divergence theorem and Stokes' theorem and related problems	
14	Integral theorems: Discuss integral theorems with related problems, application of different theorems on applied electromagnetics and review	

20. References

20.1. Required (if any)

(i) S. M. Alex et. al., Engineering Mathematics. New Delhi, India: Dorling Kindersley, 2008.

(ii) H. K. Dass, Advanced Engineering Mathematics. New Delhi, India: S. Chand, 1988.

20.2. Recommended (if any)

(i) M. F. Rahman, Complex analysis. Dhaka, Bangladesh: Titas Publications, 2008.

(ii) D. Spellman et. al., Schaum's Outline of Complex Variables, 2nd ed. New York, NY: McGraw Hill, 2009.

(iii) S. Lipschutz et. al., Schaum's Outline of Vector Analysis, 2nd ed. New Delhi, India: Tata McGraw Hill, 1959.

GED 0231 2141: History of Emergence of Bangladesh

1. Course Title: History of Emergence of Bangladesh

2. Course Code: GED 0231 2141

3. BNQF Code: 0231

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Introduction: Introduction of people and country including Land, Rivers, Hills, Tribes, Religion, Weather & Climate, Regional language etc., Importance of learning history of the emergence of independent Bangladesh. Brief Background History: The Mughal Bengal, Bhuyan's Bengal, Siraj-Ud-Daulah & Plassey's battle, British Bengal, Mughal Structure and Architecture etc. Bilingualism, Pakistan state structure and Discrimination: Sectarian politics, Lahore Proposition in 1940, Banga vanga and its causes, Discrimination between east and west Pakistan; Language Movement and Trial for Establishing Democratic Government: Different stages in language movement, Establishment of Juktofront in 1954, 21-point commitment of Juktofront election and its results, Juktofront government and its activities.

Martial Law of Ayub Khan and Development of Nationalism: Ayub martial law in 1958-1962, Reform activities of Ayub government, Revolution against Ayub, Presidential election of 1965, Resistance against Bengali cultural aggression, 6-point movement of Sheikh Mujibur Rahman, Agartala conspiracy; Mass Orchestration of 1969 and 11 Point Movement; Election of 1970 and Bangabandhu's Declaration of Independence; Liberation War of 1971: 25th March of 1971, Mujibnagar Government, Stages of war, Publicity of liberation war, Role of world superpower, Activities of Shanti committee; Al-badr; Al-shams and Razakar's. Killing of Bengali Intellectuals, Victory Day, 16th December 1971.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

By the end of this course, students are expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the importance and develop proper knowledge about independence of their nation	6	2		
2	Gain insight about the major historical events that lead to independence and the sacrifices of freedom fighters in liberation war	7	3		
3	Gather knowledge about the history of different aspects of Bangladesh	7	2		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K7**		
CO2	**K7**		
CO3	**K7**		

18. Percentages of Assessment Methods

Method	Percentage
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Introduction of people and country including Land, Rivers, Hills, Tribes, Religion, Weather & Climate, Regional language etc. Importance of learning history of the emergence of independent Bangladesh.	
2	The Mughal Bengal, Bhuyan's Bengal, Siraj-Ud-Daulah & Plassey's battle, British Bengal, Mughal Structure and Architecture etc	

3	Sectarian politics, Lahore Proposition in 1940, Banga vanga and its causes, Discrimination between east and west Pakistan	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
4-5	Different stages in language movement, Establishment of Juktofront in 1954, 21 point commitment of Juktofront election and its results, Juktofront government and its activities	
6-7	Ayub martial law in 1958-1962, Reform activities of Ayub government, Revolution against Ayub, Presidential election of 1965, Resistance against Bengali cultural aggression, 6 point movement of Sheikh Mujibur Rahman, Agartala conspiracy	
8	Mass Orchestration of 1969 and 11 Point Movement	
10	Election of 1970 and Bangabandhu's Declaration of Independence	
11	25th March of 1971, Mujibnagar Government,	
12	Stages of war, Publicity of liberation war, Role of world superpower	
13	Activities of Shanti committee; Al-badr; Al-shams and Razakar's. Killing of Bengali Intellectuals, Victory Day, 16th December 1971.	
14	Review classes	

20. References

20.1 Required:

(i) Muntassir Mamoon, Md. Mahbubur Rahman, History of the Emergence of Independent Bangladesh, University Grants Commission of Bangladesh. Dhaka, December 2017.

20.2 Recommended

(ii) R. Plunkett, A. Newton, B. Wagenhauser, and J. Murray, Lonely Planet guide to Bangladesh. Lonely planet, 2000.

EEE 0713 2202: Electronic Shop Practice

1. Course Title: Electronic Shop Practice

2. Course Code: EEE 0713 2202

3. BNQF Code: 0713

4. Credit Value: 1.5

5. Credit Hours: 3.0 (every week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8 Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Introduction to formal procedures of preventive maintenance. Circuit tracing, trouble shooting, fault repairing, soldering and de-soldering of electronic circuits. Design of PCB layout, etching. Radio receivers: Principles of operations, circuit tracing, fault finding by signal injection alignment. TV camera, B/W TV, color TV. CD and VCD player.

Design of paging & security system for a building: Design intercom, PABX, audio and video paging system, Design of security and protection systems including CCTV, fire detection and alarm system.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

By the end of this course, students are expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Apply engineering design procedure to meet specified needs.	2	3		
2	Analyze the performance of a designed circuits.	4	4		
3	Communicate effectively with a range of audiences.	5			3

17 Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P7**	**A1-A5**
CO2	**K4**	**P1-P7**	**A1-A5**
CO3	**K6**	**P1-P7**	**A1-A5**

18. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Design and Presentation	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	**Topics**	**Assessment Method(s)**
1	The engineering design process	
2	Lectures on the fundamental issues of electrical design, and literature review.	Class Performance, Design, Presentation, Final Jury and viva-voce.
3-4	Project selection and identification, Project management, planning and schedule	
5-7	Requirements and specifications, Building and documentation of a small electronic circuit which is used in household application.	
8-10	Design and present a small circuit for controlling power system and transmission system stability etc.	
11-14	Implement and present another mini-project for communication system.	

20. References

20.1. Required (if any)

(i) R. Ford, C. Coulston, 'Design for Electrical and Computer Engineers', McGraw Hill, 2008

20.2. Recommended (if any)

(i) C. L. Dym, P. Little, Engineering Design: A Project-Based Introduction, 3rd ed., John Wiley, 2008.

(ii) K. P. et al., Exploring Engineering: An introduction for Freshmen to Engineering and to the Design Process, Elsevier Inc., 2006.

(iii) G. E. Dieter, Engineering Design, 3rd ed., McGraw-Hill, 2000.

EEE 0714 2203: Power Electronic Devices

1. Course Title: Power Electronic Devices.

2. Course Code: EEE 0714 2203

3. BNQF Code: 0714

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE).

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Power semiconductor switches: BJT, MOSFET, GTO, TRIAC, UJT and DIAC SCRs, TRIACS power MOSFET and IGBT, Thyristor, converter, characteristics, commutation, dc motor speed control, harmonics, power factor control and cyclo-converter, Characteristics and operation, dc motor speed control, switching converter and power supplies. Three phase and single phase voltage source and current source inverters, voltage, frequency and harmonic control, PWM inverters, SVM inverter, Scalar and vector control of poly phase induction motors, rotor power control, synchronous motor and PMSM motor control, Introduction to resistance welding, saturable reactors and magnetic amplifiers, dielectric heating, induction heating.

Uncontrolled and controlled single phase and three phase rectifiers, Regulated power supplies: Linear-series and shunt, switching buck, buckboost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter. single phase and three phase current and voltage source inverter. AC motor and stepper motor control using inverter. Resonance inverters; Pulse width modulation control of static converters.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: **N/A**

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	Cos	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the differences between linear electronics and power electronics operation	**1**	**2**		
2	Recognize operating features of various power semiconductor switching devices along with the triggering devices	**1**	**2**		
3	Analyze the turn ON and OFF mechanisms of several semiconductor switches including their protection circuits	**2**	**4**		
4	Construct different power converters and supplies used for main power control along with their equations	**3**	**3**		
5	Compare several speed control circuits for electric motors	**2**	**5**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K4**	**P1-P7**	
CO2	**K4**	**P1-P7**	
CO3	**K4**	**P1-P7**	
CO4	**K5**	**P1-P7**	**A1-A5**
CO5	**K4**	**P1-P7**	

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1-3	**Semiconductor power and triggering devices**: BJT, MOSFET, GTO, TRIAC, UJT and DIAC SCRs, TRIACS power MOSFET and IGBT.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
4	**AC to AC converter:** Thyristor, converter, characteristics, commutation, dc motor speed control, harmonics, power factor control and cyclo-converter.	
5-6	**DC to DC converter:** Characteristics and operation, dc motor speed control, switching converter and power supplies. **DC to AC converter**: Three phase and single phase voltage source and current source inverters, voltage, frequency and harmonic control, PWM inverters, SVM inverter.	
7	**Introduction to power electronic control of motors:** Scalar and vector control of poly phase induction motors, rotor power control, and synchronous motor and PMSM motor control.	
8 - 9	**Industrial applications**: Introduction to resistance welding, saturable reactors and magnetic amplifiers, dielectric heating, induction heating.	
10	**Rectifiers**: Uncontrolled and controlled single phase and three phase.	
11 - 12	**Regulated power supplies:** Linear-series and shunt, switching buck, buckboost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter.	
13	**Inverters:** single phase and three phase current and voltage source. AC motor control. Stepper motor control.	
14	**Resonance inverters**. Pulse width modulation control of static converters.	

20. References

20.1. Required (if any)

(i) Muhammad H. Rashid, *Power Electronics Circuits, Devices and Applications*, Third Edition, Prentice-Hall of India Private Limited

20.2. Recommended (if any)

(i) Muhammad H. Rashid, Power Electronics Handbook Devices, Circuits and Applications, 3rd Edition, Elsevier.

(ii) Ned Mohan, Tore M. Undeland & William P. Robbins, Power Electronics Converters, Applications and Design, 2nd edition, John Wiley & Sons Inc.

(iii) Charles A. Schuler and William L. McNamee, Industrial Electronics and Robotics, International Edition, McGraw-Hill.

EEE 0713 2204 Power Electronic Devices Sessional

1. Course Title: Power Electronic Devices Sessional

2. Course Code: EEE 0714 2204

3. BNQF Code: 0714

4. Credit Value: 0.75

5. Credit Hours: 3.0 (every alternate week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Laboratory experiments based on theory and concepts learnt in EEE 0713 3203. Design of simple systems using the principles learned in EEE 0714 2203.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Explain experimental data and wave shapes of different power semiconductor circuits.	**4**			**2**
2	Reproduce experimental results with specialized equipment.	**5**			**3**
3	Build hardware project by individual and team effort.	**9**			**5**
4	Assess costing of different experimental and project equipment.	**11**	**5**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K4**	**P1-P7**	
CO2	**K4**	**P1-P7**	
CO3	**K4**	**P1-P7**	**A1-A5**
CO4	**K5**	**P1-P7**	

18. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Setup test	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	**Topics**	**Assessment Method(s)**
1	Characterizing and measurement of SCR, TRIAC, Power MOSFET, IGBT	Class Performance and Sessional Report.
3	Study of Thyristor firing circuit and isolation	
5	Discussion of Hardware Project and Project proposal submission	
7	Study of Single-phase Full-wave controlled rectifier	
9	Study of AC voltage controller	
11	Study of Switching Mode Power Supply (SMPS)	
13	Study of Single-phase SPWM inverter	
11	Study of Three-phase Full-wave controlled rectifier	
14	Set-up Test and Viva-voce	

20. References

20.1. Required (if any)

(i) Muhammad H. Rashid, *Power Electronics Circuits, Devices and Applications,* Third Edition, Prentice-Hall of India Private Limited

(ii) Ned Mohan, Tore M. Undeland & William P. Robbins, Power Electronics Converters, Applications and Design, 2nd edition, John Wiley & Sons Inc.

EEE 0713 2205: Electrical Machine II

1. Course Title: Electrical Machine II

2. Course Code: EEE 0713 2205

3. BNQF Code: 0713

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE).

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Alternators: Construction, theory of operation, armature windings, voltage regulation, armature reaction and reactance, control of excitation, two-reaction analysis, transient condition, losses and efficiency, synchronizing and load sharing, low power single-phase alternator. **Synchronous Generator:** Windings, excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance methods of predicting voltage regulation and its limitations. Parallel operation: necessary conditions, synchronizing, circulating current and vector diagram. **Synchronous Motor:** Operation, loading effect, effect of changing excitation, V-curves, and starting methods. **Single Phase Induction Motor:** Rotating field, characteristics of different types of motors, equivalent circuits and theories.

Special Machines: Series universal motor, permanent magnet DC motor, unipolars and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drives circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors. **Acyclic Machines:** Generators, conduction pump and induction pump. **Magneto Hydrodynamic Generators:** Fuel cells, thermoelectric generators, flywheels, vector control, linear motors and traction.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): Electrical Circuits II (EEE 0713 1201), Electrical Machine I (EEE 0713 2105)

14. Name of the instructor(s) with contact details and office hours: *N/A*

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend and differentiate among the features of different rotating electrical machines, such as alternators, synchronous generators, synchronous motors, etc.	**1**	**2**		
2	Introduce to different special machines	**1**	**2**		
3	Identify practical applications of these electrical machines in power system.	**1**	**1**		
3	Solve mathematical problems related to equivalent circuit models, performance tests, loss analysis, efficiency calculation, voltage regulation, parallel operation, behavior under different operating conditions etc. of these machines.	**4**	**3**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P4**	
CO2	**K3**	**P1-P4**	
CO3	**K3**	**P1-P4**	
CO3	**K8**	**P1-P4**	

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1-3	**Alternators:** Construction, theory of operation, armature windings, voltage regulation, armature reaction and reactance, control of excitation, two-reaction analysis, transient condition, losses and efficiency, synchronizing and load sharing, low power single-phase alternator.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
4-6	**Synchronous Generator:** Windings, excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance methods of predicting voltage regulation and its limitations. Parallel operation: necessary conditions, synchronizing, circulating current and vector diagram.	
7-8	**Synchronous Motor:** Operation, loading effect, effect of changing excitation, V-curves, and starting methods.	
9	**Single Phase Induction Motor:** Rotating field, characteristics of different types of motors, equivalent circuits and theories.	
10-12	**Special Machines:** Series universal motor, permanent magnet DC motor, unipolars and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drives circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors.	
13	**Acyclic Machines:** Generators, conduction pump and induction pump.	
14	**Magneto Hydrodynamic Generators:** Fuel cells, thermoelectric generators, flywheels, vector control, linear motors and traction.	

20. References

20.1. Required (if any)

(i) S. J. Chapman, Electric Machinery Fundamentals, 5th ed. New York: McGraw-Hill Education, 2011.

(ii) B.L. Thereja and A. K. Thereja, A Text Book of Electrical Technology - Volume II: AC & DC Machines, 23rd ed. New Delhi, India: S. Chand, 2006.

(iii) V.k. Mehta and R. Mehta, Principles of Electrical Machines, New Delhi, India: S. Chand, 2006.

20.2. Recommended (if any)

(i) C. I. Hubert, Electric Machines- Theory, Operation, Application, Adjustment and Control, 2nd ed. New Delhi, India: Pearson, 2002.

EEE 0713 2206: Electrical Machine II Sessional

1. Course Title: Electrical Machine II Sessional

2. Course Code: EEE 0713 2206

3. BNQF Code: 0713

4. Credit Value: 0.75

5. Credit Hours: 3.0 (every alternate week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Laboratory experiments based on theory and concepts learnt in EEE 0713 2205. Design of simple systems using the principles learned in EEE 0713 2205.

11. Type of course (core/elective): Core

12. Prerequisite(s) (if any): Electrical Machine I **(**EEE 0713 2105).

13. Name of the instructor(s) with contact details and office hours: N/A

14. Semester Offered: N/A

15. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

By the end of this course, students are expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Construct a distribution system based on the principle of electromagnetic induction.	5			2
2	Analyze the performance of induction motor, Synchronous machines and special machines based on different loading effect.	4			3
3	Build interconnected system for a given problem in poly-phase distribution topology considering the involvement of AC machines.	3			3

16. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K6**	**P1-P4**	
CO2	**K8**	**P1-P4**	
CO3	**K5**	**P1-P4**	**A1-A3**

17. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Set-up test	40
Viva-voce	30

18. Week wise distribution of contents and assessment methods

Week	**Topics**	**Assessment Method(s)**
1	**Sessional 1:** Stator and rotor test of single phase induction motor (IM).	Class Performance and Sessional Report.
3	**Sessional 2:** Voltage regulation measurement of single phase IM.	
5	**Sessional 3:** Measuring Synchronous Generator Model Parameters.	
7	**Sessional 4:** Phasor Diagram of a Synchronous Generator.	
7	**Exam 1**	
9	**Sessional 5:** Parallel Operation of Alternators.	
11	**Sessional 6:** Plotting of V-curves and Phasor Diagram of a Synchronous motor.	
13	**Sessional 7:** Introduction and performance measurement of special machines.	
14	Set-up Test and Viva-voce	

19. References

19.1. Recommended (if any)

(i) S. J. Chapman, Electric Machinery Fundamentals, 5th ed. New York: McGraw-Hill Education, 2011.

(ii) B.L. Thereja and A. K. Thereja, A Text Book of Electrical Technology - Volume II: AC & DC Machines, 23rd ed. New Delhi, India: S. Chand, 2006.

EEE 0713 2207: Digital Electronics

1. Course Title: Digital Electronics

2. Course Code: EEE 0713 2207

3. BNQF Code: 0713

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE).

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Analysis and Synthesis of Digital Logic Circuits: Number systems, codes, and conversion. Boolean algebra, De Morgan's law, logic gates and truth tables Representation of numbers in different bases, addition and subtraction in different bases; **Complement:** Subtraction using complements, binary multiplication & division; **Binary Codes:** Different coding system, Boolean algebra, various gates, sum of products and product of sums, standard and canonical forms and other logical operations minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits; **Simplification of Boolean Functions**: Karnaugh map method, tabular method of simplification; Implementation of logic circuit using various gates, universal gates. **Combinational Logic Circuit: Design Procedure**: Adder, subtractor, code converters, parity bit checker and magnitude comparator, analysis of different combinational circuits, encoder, decoder, multiplexer, de-multiplexer, ROM, PLA and their applications.

Flip-flops: SR, JK, Master slave, T and D type flip-flops and their characteristic tables & equations; triggering of flip-flops; flip-flop excitation table; **Sequential Circuits**: Introduction to sequential circuits, Different types of latches, flip-flops and their design using ASM approach, analysis and synthesis of synchronous and asynchronous sequential circuits timing analysis and power optimization of sequential circuits; **Counters**: Classifications, Synchronous and asynchronous counter design and analysis, ring counter, Johnson counters, ripple counter and counter with parallel load; **Registers**: Classification, Modular sequential logic circuit design, Shift registers, circular registers and their applications and registers with parallel load. Digital IC logic families: Brief description of TTL, DTL, RTL, ECL, I2 L, MOS and CMOS logic and their characteristics, principles of operation and application; **Programmable Logic Devices:** Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the design principles of combinational and sequential logic circuits, and Programmable Logic Devices	**1**	**2**		
2	Apply Boolean algebraic principles for design of combinational and sequential circuits	**2**	**3**		
3	Analyze appropriate digital system with acquired knowledge of a small-scale digital logic circuits appropriate to the day to day usage	**4**	**4**		
4	Evaluate performance of digital arithmetic and logic circuit	**2**	**5**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P4**	
CO2	**K3**	**P1-P4**	
CO3	**K3**	**P1-P4**	
CO4	**K4**	**P1-P4**	**A1-A3**

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week No	Topics	Remarks
1	**Analysis and Synthesis of Digital Logic Circuits:** Number systems, codes, and conversion. Boolean algebra, De Morgan's law, logic gates and truth tables Representation of numbers in different bases, addition and subtraction in different bases	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
2	**Complement:** Subtraction using complements, binary multiplication & division.	
3-4	**Binary Codes:** Different coding system, Boolean algebra, various gates, sum of products and product of sums, standard and canonical forms and other logical operations minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits.	
5	**Simplification of Boolean Functions**: Karnaugh map method, tabular method of simplification; Implementation of logic circuit using various gates, universal gates.	
6	**Combinational Logic Circuit: Design Procedure**: Adder, subtractor, code converters, parity bit checker and magnitude comparator, analysis of different combinational circuits, encoder, decoder, multiplexer, de-multiplexer, ROM, PLA and their applications.	
7	**Flip-flops**: SR, JK, Master slave, T and D type flip-flops and their characteristic tables & equations; triggering of flip-flops; flip-flop excitation table.	
8-9	**Sequential Circuits**: Introduction to sequential circuits, Different types of latches, flip-flops and their design using ASM approach, analysis and synthesis of synchronous and asynchronous sequential circuits timing analysis and power optimization of sequential circuits.	
10	**Counters**: Classifications, Synchronous and asynchronous counter design and analysis, ring counter, Johnson counters, ripple counter and counter with parallel load.	
11-12	**Registers**: Classification, Modular sequential logic circuit design, Shift registers, circular registers and their applications and registers with parallel load. Digital IC logic families: Brief description of TTL, DTL, RTL, ECL, I2 L, MOS and CMOS logic and their characteristics, principles of operation and application.	
13	**Programmable Logic Devices:** Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.	
14	Review and Discussion	

20. References

(i) M. M. Mano, Digital logic and Computer Design, 1st ed. New Jersey: Prentice Hall, 1979.

(ii) J. P. Hayes, Computer Architecture and Organization, 3rd ed. New York: McGraw Hill, 1998.

EEE 0713 2208: Digital Electronics Sessional

1. Course Title: Electrical Machine II Sessional

2. Course Code: EEE 0713 2208

3. BNQF Code: 0713

4. Credit Value: 1.5

5. Credit Hours: 3.0 (every week)

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 70

Final Jury/Viva-voce : 30

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Laboratory experiments based on theory and concepts learnt in EEE 0714 2207. Design of simple systems using the principles learned in EEE 0714 2207.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: *N/A*

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend different digital ICs, combinational logic circuits using basic gates and sequential circuits	**1**	**2**		
2	Solve different combinational circuits like adder, Subtractors, BCD adder, multiplexer, demultiplexer, encoder etc. and sequential circuit like flip-flop, shift register, counter etc.	**1**	**3**		
3	Construct logic circuits for a given function	**3**			**3**
4	Build logic circuits using Quartus-II software and FPGA development board	**5**			**3**

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K3**	**P1-P4**	
CO2	**K3**	**P1-P4**	
CO3	**K3**	**P1-P4**	
CO4	**K3**	**P1-P4**	**A1-A3**

18. Percentages of Assessment Methods

Method	**Percentage**
Attendance	10
Sessional Report	20
Set-up Test	40
Viva-voce	30

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	**Exp:0** Introduction to different digital ICs.	Class Performance and Report
2	**Exp: 1** Introduction to Combinational logic and K map minimization.	
3	**Exp: 2** Construction of adders, sub tractors, using basic logic gates.	
4	**Exp:3** Introduction to FPGA	
5	**Exp:4** Design a Combinational circuit that will act as an Adder if control bit is '0' and as a sub tractor if control bit is '1'.	
6	**Exp:5** Design a BCD adder that will add two BCD numbers and the sum will be also in BCD.	
7	**Set-up Test 1**	
8	**Exp:6** Introduction to Multiplexers.	Class Performance and Report
9	**Exp:7** Implementation of Demultiplexers and Priority Encoders.	
10	**Exp: 8** Design of Flip-flop using basic gates.	
11	**Exp:9** Introduction to shift register, counter using FPGA	
12	**Exp:10** Introduction to Seven segment Display.	
13	**Set-up Test 2**	
14	**Viva-voce**	

20. References

(i) M. M. Mano and M. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th ed. London, England: Pearson, 2017.

IPE 072 2221: Legal Issues and Management for Engineers

1. Course Title: Legal Issues and Management for Engineers

2. Course Code: IPE 072 2221

3. BNQF Code: 072

4. Credit Value: 2

5. Credit Hours: 2.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8 Faculty: Engineering

9. Conducted By: Department of Industrial & Production Engineering (IPE).

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Law of contract, elements of valid contract. Consideration, Parties competent to contact. Sale of goods, hire and purchase. Negotiable instrument, various ordinance payments of wages, legislation relating employment in industries, factories, shops and agriculture, trade union act, Human factors and motivation, leadership, group decision making and communication, job gradation, process of performance appraisal and reward systems, managing information for decision and management information systems.

Understanding marketing management, developing marketing strategies, conducting marketing research, analyzing consumer and business market, identifying market segments and targets, dealing with competition, Evolution of modern safety concepts, industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, safety standards and regulations for engineering works, fire safety, hazardous materials.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom's Taxonomy Level

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Study different industrial laws in context of Bangladesh and global.	**6**	**1**		
2	Comprehend the marketing and human resource management in business and industries.	**1**	**2**		
3	Implement health and safety issues for human resource and equipment.	**11**	**3**		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K7**		
CO2	**K3**		
CO3	**-**		

18. Percentages of Assessment Methods

Method	**Percentage**
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1-3	**Business and industrial Law**: Law of contract, elements of valid contract. Consideration, Parties competent to contact. Sale of goods, hire and purchase. Negotiable instrument.	Homework, Class Tests, Assignments,
4-5	**Industrial Law in Bangladesh**: various ordinance payments of wages, legislation relating employment in industries, factories, shops and agriculture, trade union act.	
6-7	**Human Resources Management in Business**: Human factors and motivation, leadership, group decision making and communication, job gradation, process of performance appraisal and	

	reward systems, managing information for decision and management information systems.	Mid-Semester and Final Examination.
8-10	**Marketing Management**: Understanding marketing management, developing marketing strategies, conducting marketing research, analyzing consumer and business market, identifying market segments and targets, dealing with competition.	
11-13	**Safety**: Evolution of modern safety concepts, industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, safety standards and regulations for engineering works, fire safety, hazardous materials.	
14	Revision	

20. References

(i) Management - Mary Coulter and Stephen P. Robins

20.1. Required (if any)

(i) Fundamentals of Management: Griffin, Ricky W.

(ii) Management - James A. Stoner & Deward R. Freeman

MATH 0541 2231: Matrix, Complex Variable and Statistics

1. Course Title: Matrix, Complex Variable and Statistics

2. Course Code: MATH 0541 2231

3. BNQF Code: 0541

4. Credit Value: 3

5. Credit Hours: 3.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Matrix: Meaning and Definition of matrix, Different types of matrix, Algebra of matrix, Adjoin and inverse of a matrix, Elementary transformations of matrix, Matrix polynomials, Calay-Hamilton theory with uses of rank and nullity, Normal and canonical forms, Solution of linear equations, Eigenvalues and eigenvectors. **Complex variable:** Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the Cauchy-Riemann equations, Mapping by elementary functions, Line Integral of a complex function, Cauchy's Integral theorem, Cauchy's Integral formula, Liouville's theorem, Taylor's theorem and Laurent's theorem. Singular points, Residue, Cauchy's Residue theorem. Evaluation of residues, Contour integration, Conformal mapping.

Statistical Analysis:
Frequency distribution; Mean, Median, Mode and other measures of central tendency; Standard deviation and other measures of dispersion; Moments skewness and kurtosis; Elementary probability theory and discontinuous probability distributions (Binomial, Poisson and negative binomial); Characteristics of distributions; Elementary sampling theory; Estimation; Hypothesis testing and regression analysis.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Bloom's Taxonomy level:

After completion of the course, the students will be expected to:

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the basic concepts of linear algebra and elementary transformation of matrices.	1	2		
2	Solve system of linear equations and find eigenvalues and eigenvectors by using the concept of matrices.	1	3		
3	Apply the concept of algebra with complex variables.	1	3		
4	Illustrate basic concepts of statistical Mathematics.	1	3		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	K2		
CO2	K2		
CO3	K2		
CO4	K2		

18. Percentages of Assessment Methods

Method	Percentage
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	Discuss details of course outline and goals. Meaning and Definition of matrix, Different types of matrix, Algebra of matrix.	

2	Adjoin and inverse of a matrix, Elementary transformations of matrix, Matrix polynomials.	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
3	Calay-Hamilton theory with uses of rank and nullity, Normal and canonical forms.	
4-5	Solution of linear equations, Eigenvalues and eigenvectors. Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems	
6	Complex differentiation and the Cauchy-Riemann equations, Mapping by elementary functions.	
8	Line Integral of a complex function, Cauchy's Integral theorem, Cauchy's Integral formula, Liouville's theorem.	
9	Taylor's theorem and Laurent's theorem. Singular points, Residue, Cauchy's Residue theorem. Evaluation of residues, Contour integration, Conformal mapping.	
10	Frequency distribution; Mean, Median, Mode and other measures of central tendency.	
11	Standard deviation and other measures of dispersion; Moments skewness and kurtosis;	
12	Elementary probability theory and discontinuous probability distributions (Binomial, Poisson and negative binomial).	
13	Characteristics of distributions; Elementary sampling theory; Estimation;	
14	Hypothesis testing and regression analysis.	

20. References

20.1. Required (if any)

(i) H. K. Das, *Advanced Engineering Mathematics*, 19th revised ed. New Delhi, India: S. Chand, 2008.

20.2. Recommended (if any)

(i) M. R. Spiegel, *Laplace transform*, 1st ed. New York: McGraw-Hill Education, 1965.

(ii) C. Mandal, *Linear Algebra*, Dhaka, Bangladesh: Nadi Publications, 2014.

(iii) S. Lipschutz and M. Lipson, *Linear Algebra*, 6th ed. New York: McGraw-Hill Education, 2017.

GED 0231 2241: Ethics and Professionalism

1. Course Title: Ethics and Professionalism

2. Course Code: GED 0231 2241

3. BNQF Code: 0231

4. Credit Value: 2

5. Credit Hours: 2.0

6. Total Marks: 100

7. Marks Distribution:

Continuous Assessment : 40

Final Exam : 60

8. Faculty: Engineering

9. Conducted By: Department of Electrical and Electronic Engineering (EEE)

10. Programme: B.Sc. in Electrical and Electronic Engineering (EEE)

11. Content:

Contents are divided into two sections: Section A & Section B in two paragraphs.

Understanding of socio-economic structure: agriculture, industry, service sectors, national issues, policies, and politics. Historical perspectives: social, economic, technical, and political. Population, health, and environment. Awareness of the responsibilities of a professional engineer in society: understanding of socio-economic, cultural and professional responsibilities. Principles of ethics: code of ethics, regulations of professional conducts and legal practices. Use of moral reasoning skills to examine, analyze and resolve ethical and legal issues. Truth telling, privacy, confidentiality, fairness vs. biasness. Economic considerations, exploitation, manipulation.

Development of professional knowledge, skills and legal responsibilities as an engineer to the advancement of human welfare. Knowledge of report preparation from engineering and other forms of work-experiences. Awareness of national and international rules and standards with respect to professionalism and research. Legal methodology and legal engineering practice: public laws and private laws. Legal relationship among the government, corporations, individuals, and protection of the individual rights. Company law: Law regarding formation, incorporation, management and winding up of companies; Labor law: Law in relation to wage hours, health, safety and other work conditions; Law of compensation.

12. Type of course (core/elective): Core

13. Prerequisite(s) (if any): N/A

14. Name of the instructor(s) with contact details and office hours: N/A

15. Semester Offered: N/A

16. Mapping of Course Outcomes with Bloom's Taxonomy and Program Outcomes

After completion of the course, the students will be expected to**:**

Sl. No.	COs	POs	Bloom's Taxonomy		
			C	A	P
1	Remember the definition, terms and different theories.	6	1		
2	Comprehend the knowledge about society, ethics and engineering laws.	6	2		
3	Apply proven ethical theories and knowledge regarding engineering laws in real life for the betterment of the society	8	3		

17. Mapping of COs with Knowledge Profiles, Range of Complex Engineering Problem Solving and Range of Complex Engineering Activities

Course Outcome	Knowledge Profile	Range of Complex Engineering Problem Solving	Range of Complex Engineering Activities
CO1	**K7**		
CO2	**K7**		
CO3	**K7**		

18. Percentages of Assessment Methods

Method	Percentage
Class Participation	10
Homework/Assignment/Class tests/Presentation/Viva-voce etc.	10
Mid-Semester Examination	20
Final Examination (Answering any 3 questions among 4 in each two Section: Section A and Section B)	60

19. Week Wise Distribution of Contents and Assessment Methods

Week	Topics	Assessment Method(s)
1	Introduction to Society, Ethics and Engineering Laws	
2	Comprehension of Socio-Economic Structure: Agriculture, Industry, Service Sectors, National Issues	
3	Historical Perspective: Social, Economic, Technical, and Political	
4	Population, Health, and Environment: Major Protocol and Treaties: Montreal And Kyoto Protocol	

5	Awareness of the Responsibilities of a Professional Engineer in Society: Comprehension of Socio-Economic, Cultural and Professional Responsibilities	Homework, Class Tests, Assignments, Mid-Semester and Final Examination.
6	Principles of Ethics: Ethical Theories and Problem Solving	
7	Use of Moral Reasoning Skills to Examine, Analyze and Resolve Ethical and Legal Issues	
8	Truth Telling, Privacy, Confidentiality, Fairness Vs. Biasness. Economic Considerations, Exploitation, Manipulation	
9	Development of Professional Knowledge, Skills and Legal Responsibilities as an Engineer to the Advancement of Human Welfare	
10	Awareness of National and International Rules and Standards with respect to Professionalism and Research	
11	Legal Methodology and Legal Engineering Practice: Public Laws and Private Laws	
12	Legal Relationship Among the Government, Corporations, Individuals, and Protection of the Individual Rights. Law of Compensation: Objects and Liabilities of Compensation, Accident and Dependents, Distribution of Compensation	
13	Company Law: Intro to Company Law, Different Company Acts, Laws Regarding Management, Laws Regarding Winding Up. Sessionalor law: Wages, Payment of Wages, Provisions for Fine, Working Hours and Leave, Laws Related to Health and Safety	
14	Review	

20. References

(i) M. Winston, R. Edelbach, *Society, Ethics and Technology*, 5th ed., Boston, MA: Wadsworth Cengage Learning, 2014

(ii) Gordon C. Andrews, *Canadian Professional Engineering & Geoscience: Practice and Ethics*, 5th ed., Nelson College Indigenous, 2013

(iii) M.C. Kucchal and V. Kucchal, *Mercantile Law*, 8th ed., Vikas, 2018

(iv) N. Dhar, *Sessionalour & Industrial Laws of Bangladesh with hints on Questions and Answers*, 2nd ed.