BACHELOR OF SCIENCE IN
ELECTRICAL & ELECTRONIC ENGINEERING (EEE)

Part-A

Faculty of Science and Engineering

Department of Electrical & Electronic Engineering (EEE)

North Bengal International University

1. Title of Academic Program
Bachelor of Science in Electrical & Electronic Engineering

2. Name of the University
North Bengal International University (NBIU)

3. Vision of the University
The vision of the university is to become a leading-edge educational institution of the country by providing high quality education to the young generation in order to equip them with the knowledge, skill and attributes necessary for the development of the country. It aims at attracting good students, faculty and staff from home and abroad.

4. Mission of the University
The mission of North Bengal International University is to achieve the goals of higher education and sustainable economic growth in the country by producing competent graduates in their selected disciplines. To fulfill our vision, we are intended to prepare our student as:

UM1	To critical thinkers with knowledge creation and necessary analytical skills.
UM2	To efficient in oral, written and digital communication.
UM3	To life-long learners with excellent leadership skills.
UM4	To self-inspired innovators.
UM5	To conscious about social justice and sustainability.

5. Name of the Program Offering Entity (Department)
Department of Electrical & Electronic Engineering (EEE)

6. Vision of the Program Offering Entity
Our vision is to provide a unique opportunity for the students to get quality education in the field of Electrical & Electronic Engineering to fulfill national and international requirements.

7. Mission of the Program Offering Entity

M1	To provide the best quality of higher education for the undergraduate students.
M2	To make students more innovative, skillful and research minded.
M3	To give continually, advisory and testing services to public and private industries including individual in the field of electrical and electronic engineering.

8. Objectives of the Program Offering Entity
a) Provide best quality education in the field of electrical and electronic engineering.
b) Produce graduates to work as engineering professionals in academia, government, and industry.
c) Conduct advanced researches in order to tackle dynamic challenges of expanding technological era and improve the quality of human life.

9. Name of the Degree

Bachelor of Science in Electrical & Electronic Engineering abbreviated as B.Sc. Engg. (EEE).

10. Description of the Program

The bachelor degree program is extended over a period of 4 years and requires 160 credits. This program is to be completed in 8 semesters, each year having 2 semesters. Total 160 credits and minimum CGPA 2.20 out of 4.00 are required to obtain B.Sc. Engg. Degree.

11. Graduate Attributes (based on need assessment)

Learning Outcome Domain	Level Descriptors
Cognitive Domain	1. Remember: Remember or recall information such as facts, terminology, problem-solving strategies, rules 2. Understand:Some degree of understanding is required in order to change the form of communication, translate, restate what has been read or heard, see connections or relationships among parts of a communication (interpretation), draw conclusions, see consequences from information (inference). 3. Apply:Use previously acquired information in a setting other than the one in which it was learned. Because problems at this level are presented in a different and applied way, one cannot rely on content or context to solve the problem. 4. Analyze: Identification of logical errors (e.g., point out contradictions, erroneous inference) or differentiate among facts, opinions, assumptions, hypotheses, conclusions. One is expected to draw relations among ideas and to compare and contrast. 5. Evaluate:Requires the formation of judgments and decisions about the value of methods, ideas, people, products must be able to state the bases for judgments (e.g., external criteria or principles used to reach conclusions.) 6. Create: Requires production of something unique or original. At this level, one is expected to solve unfamiliar problems in unique way, or combine parts to form a unique or novel solution.
Affective Domain	1. Receive:One is expect to be aware of or to passively attend to certain stimuli or phenomena. Simply listening and being attentive are the expectations. 2. Respond:One is required to comply with given expectations by attending or reacting to certain stimuli. One is expected to obey, participate, or respond willingly when asked or directed to do something. 3. Value:Display behavior consistent with a single belief or attitude in situations where one is forced or asked to comply. One is expected to demonstrate a preference or display a high degree of certainty and conviction. 4. Organization:Commitment to a set of values. This level involves 1)

	forming a reason why one values certain things and not others, and 2) making appropriate choices between things that are and are not valued. One is expected to organize likes and preferences into a value system and then to decide which ones will be dominant 5. Characterization by Value: All behavior displayed is consistent with one's value system. Values are integrated into a pervasive philosophy that never allows expressions that are out of character with those values. Evaluation at this level involves the extent to which one has developed a consistent philosophy of life (e.g., exhibits respect for the worth and dignity of human beings in all situations).
Psychomotor Domain	1. Imitation: The learner observes and then imitates an action. These behaviors may be crude and imperfect. The expectation that the individual is able to watch and then repeat an action. 2. Manipulation: Performance of an action with written or verbal directions but without a visual model or direct observation. The action may be performed crudely or without neuromuscular coordination at this stage. Notice that the action verbs are the same as those for the imitation stage. The difference is that these actions are performed with the aid of written and verbal instruction, not visual demonstration. 3. Precision: Requires performance of some action independent of either written instructions or a visual model. One is expected to reproduce an action with control and to reduce errors to a minimum. 4. Articulation: Requires the display of coordination of a series of related acts by establishing the appropriate sequence and performing the acts accurately, with control as well as with speed and timing. 5. Naturalization: High level of proficiency is necessary. The behavior is performed with the least expenditure of energy, becomes routine, automatic, and spontaneous.

12. Program Educational Objectives (PEOs)

PEO1	The graduates will be able to perform as skilled engineers and provide technical support to the industries and government in the field of electrical and electronic engineering.
PEO2	The graduates will utilize their acquired knowledge and innovative ideas to design and implement effective solutions to major engineering challengesand contribute to different sectors such asinformation and communication technology, cleanenergy, automation and digitalization of society etc.
PEO3	The graduateswill play a key role in shaping the society to ensure a better world for the next generations through sustainable development, and safe environment while emphasizing on ethical and moral values.
PEO4	The graduates will exhibit extraordinary leadership skills and charismatic characteristics in professional environment, or to become entrepreneurs in order to provide innovative and technical solutions to universal obstacles.

13. Program Learning Outcomes (PLOs)

PLO1	Engineering knowledge: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization respectively to the solution of complex engineering problems.
PLO2	Problem analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PLO3	Design/development of solutions: 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.
PLO4	Investigation: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PLO5	Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.
PLO6	The engineer and society: 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 solutions to complex engineering problems.
PLO7	Environment and sustainability: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.
PLO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PLO9	Individual work and teamwork: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PLO10	Communication: Communicate effectively 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.
PLO11	Project management and finance: Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PLO12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

14. Mapping Mission of the University with PEOs

Mission Code	PEO1	PEO2	PEO3	PEO4
UM1	✓			
UM2		✓	✓	
UM3				✓
UM4		✓		✓
UM5	✓		✓	

15. Mapping PLOs with the PEOs

PEO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
PEO1	✓	✓	✓			✓						
PEO2	✓	✓	✓	✓	✓	✓						✓
PEO3							✓	✓		✓		
PEO4		✓	✓	✓					✓	✓	✓	✓

16. Mapping Courses with the PLOs

BNQF Code	**Course No.**	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
1st Year 1st Semester													
0713	EEE 1101	C1	C4	C3									
0713	EEE 1102				P1	P2							
0611 0612	CSE 1111	C1	C4						A1				
0611 0612	CSE 1112				C4	P2							
0541	Math 1101	C1	C2	C3									
0533	Phy 1111	C2	C4	C3									
0533	Phy 1112				C2	P2							
0232	Ban 1111	C2			C3				A5		A5		A2
1st Year 2ndSemester													
0713	EEE 1201	C2	C4				C5						
0713	EEE 1202		C4		P2								

0714	EEE 1203	C2	C2				C3						
0714	EEE 1204				C4	P4							
0541	Math 1201	C3	C2	C3	C2								
0531	Chem 1211	C2	C2				A2						
0531	Chem 1212					P2		A5					
0232	Eng 1211	C2	C4	C6							A2		A1
2nd Year 1stSemester													
0714	EEE 2103	C1	C4										A1
0714	EEE 2104					P4				A5			
0713	EEE 2105	C2	C4				A1						
0713	EEE 2106					P3	A4						
0713	EEE 2119	C2	C4	C3									
0541	Math 2101	C2	C3	C4									
0222	Hum 2111	C1			C1	C1	C4				A1		
2nd Year 2ndSemester													
0713	EEE 2205	C2					C4	C5					
0713	EEE 2206					P3				A2			
0714	EEE 2213		C1	C2			C6						
0714	EEE 2214					P2					A2		
0715	ME 2251	C2					C2	C4					
0541 0542	Math 2201	C1	C2	C3									
0411	Hum 2211		C2	C3								C3	
3rd Year 1stSemester													
0713 0714	EEE 3101		C2		C4	C3							
0714 0715 0716	EEE 3105		C2		C4	C3							
0714 0715 0716	EEE 3106				P2			A1					
0533	EEE 3107	C2	C3		C4								

0713 0714													
0541	Math 3101	C2	C3	C4									
0541	Math 3102				C3	P4							
0223	Hum 3111						C2		C2	A3	A1		A2
3rd Year 2ndSemester													
0031 0417 0611	EEE 3200			C6	C2	P4							A4
0311 0713	EEE 3205	C2						A1	C4			C6	
0714	EEE 3209	C2		C4		C6							
0714	EEE 3210					P4				A1			
0713	EEE 3211		C2				C4	C3					
0713	EEE 3212					P3	A2						
0713 0714	EEE 3221		C1	C6	C4								
0713 0714	EEE 3222					P3	A5						
0421	Law 3211						C4		C3	C2			A3
4th Year 1stSemester													
0311 0417 0611	EEE 4000		C2	C3	C4	P2	A2	A5	A4	A2	A5	C5	A1
0311 0417 0611	EEE 4100						A1	C6	C2				
0714	EEE 4113		C2	C6	C4								
0714	EEE 4117						C1	C4					A1
0714	EEE 4118				P3	P1					A2		
0714	EEE 4129	C1					A2	C6					
0714	EEE 4130				P2					A2			
0714	EEE 4111	Elective I			C2			A2				C6	
0714 0914	EEE 4115							C1	C2	A1			
0533 0714	EEE 4147		C1	C2	C4								
0713	EEE	Elect		C2				C4	C3				

	4*21	ive												
0713	EEE 4*22	II					P3	A2						
0713	EEE 4*23		C2	C5	C6									
0713	EEE 4*24								A5	A2				
0712 0713	EEE 4*25							C5	A2					A3
0712 0713	EEE 4*26								C6			A1		
4^{th} Year 2^{nd}Semester														
0311 0417 0611	EEE 4000			C2	C3	C4	P2	A2	A5	A4	A2	A5	C5	A1
0311 0611 0713	EEE 4200			C2			P2		A2					
0712 0713	EEE 4213					C4		C3					C6	
0712 0713	EEE 4214						P2					A2		
0713 0714	EEE 4233					C2			C3				C4	
0413	Hum 4211					C3	P4	C2				A1		
0713	EEE 4*21			C2				C4	C3					
0713	EEE 4*22						P3	A2						
0713	EEE 4*23	Elect ive II	C2	C5	C6									
0713	EEE 4*24								A5	A2				
0712 0713	EEE 4*25							C5	C2					A3
0712 0713	EEE 4*26								C6			A1		
0714	EEE 4209			C2				C6						A1
0714	EEE 4210						P4					A1		
0712 0714	EEE 4231	Elect ive III			C2			C4	C2					
0712 0714	EEE 4232					C4	P2							
0712 0714	EEE 4243			C3			C4	C2						
0712	EEE							C5						A2

0714	4244													
*Level of Bloom's Cognitive Domain (C): Level 1 - Remember, Level 2 - Understand, Level 3 – Apply, Level 4 - Analyze, Level 5 - Evaluate, Level 6 - Create.														
*Level of Bloom's Psychomotor Domain (P): Level 1 - Imitation, Level 2 - Manipulation, Level 3 - Precision, Level 4 - Articulation, Level 5 - Naturalization.														
* Level of Bloom's Affective Domain (A): Level 1 - Receive, Level 2 - Respond, Level 3 - Value, Level 4 - Organization, Level 5 - Characterization by value.														

BACHELOR OF SCIENCE IN
ELECTRICAL & ELECTRONIC ENGINEERING (EEE)

Part-B

Faculty of Science and Engineering

Department of Electrical & Electronic Engineering (EEE)

North Bengal International University

17. Structure of the Curriculum

a) Duration of the Program: 4 years (8 semesters)

b) Admission Requirements: The minimum qualifications for admission into the undergraduate program are:

i) Higher Secondary Certificate (H.S.C) or its equivalent in Science with Mathematics, Physics, and Chemistry. Minimum GPA of 2.50 in both SSC and HSC / an aggregate GPA of 6.00 in SSC and HSC.

ii) O Level in 5 subjects with a minimum GPA 3.00 and A Level in 2 subjects with a minimum GPA 2.50.

iii) Candidates must pass an admission test held by the university authority before enrolling in Bachelor of Science in Electrical & Electronic Engineering program.

c) Total minimum credit requirement to complete the program: According to BNQF (Part B) for Higher Education, minimum credit requirement for the fulfillment of Bachelor Degree is 160.00 credits which is recommended by the respective Academic Committee to the Academic Council.

d) Total class weeks in a Semester:

Semester	**Duration**
Classes	14 weeks
For Midterm exam break	1 weeks
For Midterm Exam	2 weeks
For Final Exam Break	2 weeks
For Final Exam	3 weeks
Semester Break	2 weeks
Total Weeks for 6 months/bi-semester (14+1+2+2+3+2) = 24	

e) Minimum CGPA requirements for graduation:
The minimum CGPA requirements for obtaining a Bachelor Degree is 2.20.

f) Maximum Academic Years of Completion:
A student must complete his/her studies within a maximum period of seven years for 4-year bachelor degree.

g) Category of Courses:

i. General Education Courses: General education courses refer to interdisciplinary courses, beyond B.Sc. in EEE program that provides well-rounded learning experience to the students of an academic program. Mathematics, physics, chemistry and humanities courses such as economics, government, society, industrial management, accountancy and English belong to this type.

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
Basic Science Courses					
0533	Phy 1111	Electricity, Optics, Waves & Modern Physics	3.00		3.00
0533	Phy 1112	Electricity, Optics, Waves & Modern Physics Sessional		2.00	1.00
0531	Chem 1211	Physical & Inorganic Chemistry	3.00		3.00
0531	Chem 1212	Physical & Inorganic Chemistry Sessional		2.00	1.00
0541	Math 1101	Calculus & Complex Variable	3.00		3.00
0541	Math 1201	Algebra, Co-ordinate Geometry & Vector Analysis	3.00		3.00
0541	Math 2101	Linear Algebra, Matrices & Differential Equations	3.00		3.00
0541 0542	Math 2201	Transform Methods & Statistical Analysis	3.00		3.00
0541	Math 3101	Numerical Analysis	3.00		3.00
0541	Math 3102	Numerical Analysis Sessional		2.00	1.00
					24.00
Arts, Humanities & Social Science Courses					
0232	Ban 1111	Introduction to Bengali Language & Literature	4.00		4.00
0232	Eng 1211	Introduction to English Language & Literature	4.00		4.00
0222	Hum 2111	Bangladesh Studies	4.00		4.00
0411	Hum 2211	Financial Accounting & Economics	4.00		4.00
0223	Hum 3111	Normative & Meta Ethics	4.00		4.00
0421	Law 3211	Introduction to Law	4.00		4.00
0413	Hum 4211	Project Planning & Management	4.00		4.00
					28.00
Total Credits					**52.00**

ii. Related Engineering Courses:

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0611 0612	CSE 1111	Computer Programming	3.00		3.00
0611 0612	CSE 1112	Computer Programming Sessional		2.00	1.00
0715	ME 2251	Basic Mechanical Engineering	3.00		3.00
Total Credits					**7.00**

iii. Core Courses: Core courses refer to the courses that characterize the discipline, EEE. All the EEE courses belong to this category.

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0713	EEE 1101	Electrical Circuit I	3.00		3.00
0713	EEE 1102	Electrical Circuit I Sessional		2.00	1.00
0713	EEE 1201	Electrical Circuit II	3.00		3.00
0713	EEE 1202	Electrical Circuit II Sessional		2.00	1.00
0714	EEE 1203	Electronics I	3.00		3.00
0714	EEE 1204	Electronics I Sessional		2.00	1.00
0714	EEE 2103	Electronics II	3.00		3.00
0714	EEE 2104	Electronics II Sessional		2.00	1.00
0713	EEE 2105	Electrical Machines I	3.00		3.00
0713	EEE 2106	Electrical Machines I Sessional		2.00	1.00
0713	EEE 2119	Electrical Properties of Materials	3.00		3.00
0713	EEE 2205	Electrical Machines II	3.00		3.00
0713	EEE 2206	Electrical Machines II Sessional		2.00	1.00
0714	EEE 2213	Digital Electronics	3.00		3.00
0714	EEE 2214	Digital Electronics Sessional		2.00	1.00
0713 0714	EEE 3101	Signals & Linear Systems	3.00		3.00
0714 0715 0716	EEE 3105	Control Systems	3.00		3.00

0714 0715 0716	EEE 3106	Control Systems Sessional		2.00	1.00
0533 0713 0714	EEE 3107	Electromagnetic Fields & Waves	3.00		3.00
0311 0713	EEE 3205	Power Plant Engineering & Economy	3.00		3.00
0714	EEE 3209	Microprocessor, Interfacing & System Design	3.00		3.00
0714	EEE 3210	Microprocessor, Interfacing & System Design Sessional		2.00	1.00
0713	EEE 3211	Power System I	3.00		3.00
0713	EEE 3212	Power System I Sessional		2.00	1.00
0713 0714	EEE 3221	Measurement & Instrumentation	3.00		3.00
0713 0714	EEE 3222	Measurement &Instrumentation Sessional		2.00	1.00
0714	EEE 4113	Digital Signal Processing	3.00		3.00
0714	EEE 4117	Communication Engineering	3.00		3.00
0714	EEE 4118	Communication Engineering Sessional		2.00	1.00
0714	EEE 4129	Power Electronics	3.00		3.00
0714	EEE 4130	Power Electronics Sessional		2.00	1.00
0311 0511 0713	EEE 4200	Electrical Services Design		2.00	1.00
0712 0713	EEE 4213	Power System Protection	3.00		3.00
0712 0713	EEE 4214	Power System Protection Sessional		2.00	1.00
0713 0714	EEE 4233	Cellular Communication	3.00		3.00
Total Credits					**75.00**

iv. Elective Courses: Elective courses refer to the courses that characterize the discipline, EEE. At least a single course must be included in the course plan from this category.

Elective I

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0714	EEE 4111	Advanced Digital Electronics	3.00		3.00
0714 0914	EEE 4115	Biomedical Engineering	3.00		3.00
0533 0714	EEE 4147	Antennas & Propagation	3.00		3.00

Elective II

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0713	EEE 4*21	Power System II	3.00		3.00
0713	EEE 4*22	Power System II Sessional		2.00	1.00
0713	EEE 4*23	High Voltage Engineering	3.00		3.00
0713	EEE 4*24	High Voltage Engineering Sessional		2.00	1.00
0712 0713	EEE 4*25	Renewable Energy	3.00		3.00
0712 0713	EEE 4*26	Renewable Energy Sessional		2.00	1.00

Elective III

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0714	EEE 4209	Embedded System Design	3.00		3.00
0714	EEE 4210	Embedded System Design Sessional		2.00	1.00
0712 0714	EEE 4231	VLSI Design	3.00		3.00
0712 0714	EEE 4232	VLSI Design Sessional		2.00	1.00
0712 0714	EEE 4243	Microwave Engineering	3.00		
0712 0714	EEE 4244	Microwave Engineering Sessional		2.00	1.00

v. Capstone course/Internship/Thesis/Projects/Portfolio:

BNQF Code	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credits
0031 0417 0611	EEE 3200	Seminar		2.00	1.00
0311 0417 0611	EEE 4000	Project & Thesis		14.00	7.00
0311 0417 0611	EEE 4100	Industrial Training			3.00
Total Credits					**11.00**

17. Year/Level/Semester/Term wise distribution of courses

a. Summary of Undergraduate Course Plan

Sl.	Year/Semester	Theory		Sessional		Total Credits
		No. of Course	Credits	No. of Course	Credits	
1	1st/1st	5	16.00	3	3.00	19.00
2	1st/2nd	5	16.00	3	3.00	19.00
3	2nd/1st	5	16.00	2	2.00	18.00
4	2nd/2nd	5	16.00	2	2.00	18.00
5	3rd/1st	5	16.00	2	2.00	18.00
6	3rd/2nd	5	16.00	4	4.00	20.00
7	4th/1st	5	15.00	5	9.00	24.00
8	4th/2nd	5	16.00	5	8.00	24.00
Total		**40**	**127.00**	**26**	**33.00**	**160.00**

b. 1st YEAR 1stSEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0713	EEE 1101	Electrical Circuit I	3	3			3.00
0713	EEE 1102	Electrical Circuit I Sessional			2	1	1.00
0611 0612	CSE 1111	Computer Programming	3	3			3.00
0611 0612	CSE 1112	Computer Programming Sessional			2	1	1.00
0541	Math 1101	Calculus & Complex Variable	3	3			3.00
0533	Phy 1111	Electricity, Optics, Waves & Modern Physics	3	3			3.00
0533	Phy 1112	Electricity, Optics, Waves & Modern Physics Sessional			2	1	1.00
0232	Ban 1111	Introduction to Bengali Language & Literature	4	4			4.00
Total			**16**	**16**	**6**	**3**	**19.00**

c. 1st YEAR 2ndSEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0713	EEE 1201	Electrical Circuit II	3	3			3.00
0713	EEE 1202	Electrical Circuit II Sessional			2	1	1.00
0714	EEE 1203	Electronics I	3	3			3.00
0714	EEE 1204	Electronics I Sessional			2	1	1.00
0541	Math 1201	Algebra, Co-ordinate Geometry & Vector Analysis	3	3			3.00
0531	Chem 1211	Physical & Inorganic Chemistry	3	3			3.00
0531	Chem 1212	Physical & Inorganic Chemistry Sessional			2	1	1.00
0232	Eng 1211	Introduction to English Language & Literature	4	4			4.00
Total			**16**	**16**	**6**	**3**	**19.00**

d. 2nd YEAR 1stSEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0714	EEE 2103	Electronics II	3	3			3.00
0714	EEE 2104	Electronics II Sessional			2	1	1.00
0713	EEE 2105	Electrical Machines I	3	3			3.00
0713	EEE 2106	Electrical Machines I Sessional			2	1	1.00
0713	EEE 2119	Electrical Properties of Materials	3	3			3.00

0541	Math 2101	Linear Algebra,Matrices & Differential Equations	3	3			3.00
0222	Hum 2111	Bangladesh Studies	4	4			4.00
Total			**16**	**16**	**4**	**2**	**18.00**

e. 2nd YEAR 2ndSEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0713	EEE 2205	Electrical Machines II	3	3			3.00
0713	EEE 2206	Electrical Machines II Sessional			2	1	1.00
0714	EEE 2213	Digital Electronics	3	3			3.00
0714	EEE 2214	Digital Electronics Sessional			2	1	1.00
0715	ME 2251	Basic Mechanical Engineering	**3**	**3**			3.00
0541 0542	Math 2201	Transform Methods & Statistical Analysis	3	3			3.00
0411	Hum 2211	Financial Accounting & Economics	4	4			4.00
Total			**16**	**16**	**4**	**2**	**18.00**

f. 3rd YEAR 1st SEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0713 0714	EEE 3101	Signals & Linear Systems	3	3			3.00
0714 0715 0716	EEE 3105	Control Systems	3	3			3.00
0714 0715 0716	EEE 3106	Control Systems Sessional			2	1	1.00
0533 0713 0714	EEE 3107	Electromagnetic Fields & Waves	3	3			3.00
0541	Math 3101	Numerical Analysis	3	3			3.00
0541	Math 3102	Numerical Analysis Sessional			2	1	1.00
0223	Hum 3111	Normative & Meta Ethics	4	4			4.00
Total			**16**	**16**	**4**	**2**	**18.00**

g. 3rd YEAR 2nd SEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0031 0417 0611	EEE 3200	Seminar			2	1	1.00
0311 0713	EEE 3205	Power Plant Engineering & Economy	3	3			3.00
0714	EEE 3209	Microprocessor, Interfacing& System Design	3	3			3.00
0714	EEE 3210	Microprocessor, Interfacing & System Design Sessional			2	1	1.00

0713	EEE 3211	Power System I	3	3			3.00
0713	EEE 3212	Power System I Sessional			2	1	1.00
0713 0714	EEE 3221	Measurement & Instrumentation	3	3			3.00
0713 0714	EEE 3222	Measurement & Instrumentation Sessional			2	1	1.00
0421	Law 3211	Introduction to Law	4	4			4.00
Total			**16**	**16**	**8**	**4**	**20.00**

h. 4th YEAR 1stSEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0311 0417 0611	EEE 4000	Project & Thesis			6	3	3.00
0311 0417 0611	EEE 4100	Industrial Training			6	3	3.00
0714	EEE 4113	Digital Signal Processing	3	3			3.00
0714	EEE 4117	Communication Engineering	3	3			3.00
0714	EEE 4118	Communication Engineering Sessional			2	1	1.00
0714	EEE 4129	Power Electronics	3	3			3.00
0714	EEE 4130	Power Electronics Sessional			2	1	1.00
0714 0914	EEE 41**	Elective I	3	3			3.00
0713	EEE 4***	Elective II	3	3			3.00
0713	EEE 4***	Elective II Sessional			2	1	1.00
Total			**15**	**15**	**18**	**9**	**24.00**

i. 4th YEAR 2nd SEMESTER

BNQF Code	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
0311 0417 0611	EEE 4000	Project & Thesis			8	4	4.00
0311 0611 0713	EEE 4200	Electrical Services Design			2	1	1.00
0712 0713	EEE 4213	Power System Protection	3	3			3.00
0712 0713	EEE 4214	Power System Protection Sessional			2	1	1.00
0713 0714	EEE 4233	Cellular Communication	3	3			3.00
0413	Hum 4211	Project Planning &Management	4	4			4.00
0712 0713	EEE 4***	Elective II	3	3			3.00
0712 0713	EEE 4***	Elective II Sessional			2	1	1.00
0712 0714	EEE 42**	Elective III	3	3			3.00
0712 0714	EEE 42**	Elective III Sessional			2	1	1.00
Total			**16**	**16**	**16**	**8**	**24.00**

Theory Course Policy:

Assessment & Marks Distribution:

SL No.	Name of Assessment		Marks	Date
1.	Continuous Assessment	Class Participation and Attendance	10	As Per Class Routine
2.		Class Test	10	As Per Class Test Routine
3.		Assignment/Project/Viva-voce/Presentation/Others	10	Mentioned by the Instructor
4.	Summative	Mid Term Examination	20	As Per Examination Routine
		Final Examination	50	As Per Examination Routine
Total Marks:			**100**	

Sessional Course Policy:

Assessment & Marks Distribution:

SL No.	Name of Assessment	Marks	Date
1.	Class Attendance	10	As Per Class Routine
2.	Quiz/Lab Test/Project Demonstration	15	As Per Examination Date
3.	Presentation/Lab Viva	25	As Per Examination Date
4.	Lab Report and Lab Performance	50	On Lab Days
Total Marks:		**100**	

BACHELOR OF SCIENCE IN
ELECTRICAL & ELECTRONIC ENGINEERING (EEE)

Part-C

Faculty of Science and Engineering

Department of Electrical & Electronic Engineering (EEE)

North Bengal International University

19.1. Core Courses

Electrical Circuit I

Course Code: EEE 1101	**Contact Hours/Week:** 3 Hours
Course Title: Electrical Circuit I	**Credits:** 3.00

Pre-requisite: None

Rationale: This course is important to know the fundamental knowledge, solutions techniques and different practical applications of electrical circuit both DC and AC. However, it can evaluate the performance of circuits or networks. After studying this course, students will be able to analyze various electrical circuits which are the fundamentals for an electrical and electronic engineer.

Course Contents: Fundamental concepts and units, Variables and parameters: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws, Joule's law. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including super node and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, Mill man's theorem, Compensation theorem, Maximum power transfer theorem and Reciprocity theorem. Source Concept: Sources of E.M.F, primary and secondary cells. Energy storage elements: Inductors and capacitors, series & parallel combination of inductors and capacitors. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws of magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits. Introduction to measuring instruments: Ammeter, voltmeter, galvanometer and wattmeter. Alternating Current circuits: Introduction to alternating current circuits, instantaneous, average and R.M.S values, complex impedance and phasor algebra, Power relations in A/C circuits: real, reactive and apparent power, power factor, power factor improvement.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe different circuit elements and basic laws of circuits.	C1											

CLO2	Apply circuit theorems to solve different DC circuits and networks.			C3									
CLO3	Analyze DC electrical circuits consisting of different circuit elements.		C4										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Introductory Circuit Analysis : Bobert L. Boylestad
2. Fundamentals of Electric Circuit : Charles K Alexander
3. Introduction to Electric Circuit : Richard C Dorf
4. Online Resources suggested by the respective Course Teacher

Electrical Circuit I Sessional

Course Code: EEE 1102	**Contact Hours/Week:** 2 Hours
Course Title: Electrical Circuit I Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about practical experiments on fundamental concepts, theorems, and different circuit problems.

Course Contents: Sessional based on the theory of course EEE 1101. Course content of EEE 1101 is as follows:
Fundamental concepts and units, Variables and parameters: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws, Joule's law. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including super node and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, Mill man's theorem, Compensation theorem, Maximum power transfer theorem and Reciprocity theorem. Source Concept: Sources of E.M.F, primary and secondary cells. Energy storage elements: Inductors and capacitors, series & parallel combination of inductors and capacitors. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws of magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits. Introduction to measuring instruments: Ammeter, voltmeter, galvanometer and wattmeter. Alternating Current circuits: Introduction to alternating current circuits, instantaneous, average and R.M.S values, complex impedance and phasor algebra, Power relations in A/C circuits: real, reactive and apparent power, power factor, power factor improvement.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Build various electrical circuits and networks.					P2							
CLO2	Replicate the performance of different basic electrical networks.				P1								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Psychomotor (Imitation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☑ Lab test

Electrical Circuit II

Course Code: EEE 1201	**Contact Hours/Week:** 3Hours
Course Title: Electrical Circuit II	**Credits:** 3.00

Pre-requisite: EEE 1101-Electrical Circuit I

Rationale: This course is designed to teach about the characteristics of alternating-current circuits with mathematical explanations, analyze the alternating-current circuits and design of alternating-current circuits for various applications.

Course Contents: Polyphase system, balanced and unbalanced three phase circuit analysis. Two-port network analysis. Coupled circuit. Introduction to filter.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Explain poly-phase circuit properties and AC	C2											

	characteristics.												
CLO2	Relate the physical application of AC power and networks in poly-phase system.						C5						
CLO3	Analyze different AC networks, magnetically coupled circuits and their applications.		C4										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Evaluate)	☑ Lecture ☐ Tutorial ☑ Discussion ☑Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Introductory Circuit Analysis : Bobert L. Boylestad
2. Fundamentals of Electric Circuit : Charles K Alexander
3. Introduction to Electric Circuit : Richard C Dorf
4. Alternating Current Circuits : Rusel M Corcoran
5. Online Resources suggested by the respective Course Teacher

Electrical Circuit II Sessional

Course Code: EEE 1202	**Contact Hours/Week:** 2 Hours
Course Title: Electrical Circuit II Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about practical experiments on fundamental concepts, theorems, and different problems related to AC systems.

Course Contents: Sessional based on the theory of course EEE 1201. Course content of EEE 1201 is as follows:Polyphase system, balanced and unbalanced three phase circuit analysis. Two-port network analysis. Coupled circuit. Introduction to filter.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Build various three phase electrical circuits and networks.				P2								
CLO2	Analyze the performance of different electrical networks in three phase domain.		C4										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

CLO2	Cognitive (Analyze)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☐ Lab test

Electronics I

Course Code: EEE 1203	**Contact Hours/Week:** 3 Hours
Course Title: Electronics I	**Credits**: 3.00

Pre-requisite: None

Rationale: This course is important to know the fundamental knowledge of electronics and evaluate the performance of electronic circuits or networks. After studying this course, the students will be able to analyze semiconductor devices which are the fundamentals for an electronics engineer.

Course Contents: Semiconductor diode characteristics: Qualitative and Quantitative theory of the p-n junction as a diode; ideal p-n junction, p-n junction band diagram, current components in p-n diode, volt-ampere characteristics, transition and diffusion capacitance, dynamic resistance, reverse breakdown, avalanche and zener breakdown, zener diode.Rectifier Diode: controlled & uncontrolled rectification, Special-Purpose Diodes: Tunnel diode, varactor diode, and breakdown diode, metal oxide semi-conductor diode, optical diode, PIN diode, schottky diode, current regulator diode.
Introduction to BJT, SCR, TRIAC, DIAC, BJT, FET, MOSFET.
Introduction to operational amplifiers: Basic linear and nonlinear applications. Frequency response, bandwidth and other practical limitation of op-amps, compensation techniques. Feedback concept, Improvement of amplifier characteristics by negative feedback. Classification, analysis of feedback amplifier. Sinusoidal oscillators: Concept and its classification. Active filters. Negative impedance converters.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the basic knowledge of diodes, transistors and	C2											

	amplifiers.												
CLO2	Explainthe operation of semiconductor devices.		C2										
CLO3	Apply the knowledge of different types of semiconductor and electronic devices in real life.						C3						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Electronic Devices and Circuit Theory : Bobert L. Boylestad
2. Principle of Electronics : V. K Mehta
3. Microelectronic Circuit : Sedra and Smith
4. Online Resources suggested by the respective Course Teacher

Electronics I Sessional

Course Code: EEE 1204	**Contact Hours/Week:** 2 Hours
Course Title: Electronics I Sessional	**Credit:** 1.00

Pre-requisite None

Rationale: This course is important to make the students familiar with the electronic circuits and give them experimental skills. The purpose of the laboratory experiments is to verify the performance of electronics components diode, BJT, SCR etc. It enables the students to gain sufficient knowledge on the use of computer for simulation of electronic circuits through different circuit simulation tools. The students will also be able to design a hardware project based on the acquired knowledge of this course.

Course Contents: Sessional based on the theory of course EEE 2103. Course content of EEE 2103 is as follows:Semiconductor diode characteristics: Qualitative and Quantitative theory of the p-n junction as a diode; ideal pn junction, pn junction band diagram, current components in p-n diode, volt-ampere characteristics, transition and diffusion capacitance, dynamic resistance, reverse breakdown, avalanche and zener breakdown, zener diode. Rectifier Diode: controlled& uncontrolled rectification, Special-Purpose Diodes: Tunnel diode, varactor diode, and breakdown diode, metal oxide semi-conductor diode, optical diode, PIN diode, schottky diode, current regulator diode.
Introduction to BJT, SCR, TRIAC, DIAC,BJT, FET, MOSFET.
Introduction to operational amplifiers: Basic linear and nonlinear applications. Frequency response, bandwidth and other practical limitation of op-amps, compensation techniques. Feedback concept, Improvement of amplifier characteristics by negative feedback. Classification, analysis of feedback amplifier. Sinusoidal oscillators: Concept and its classification. Active filters. Negative impedance converters.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Construct various circuits and networks using different electronic elements.					P4							
CLO2	Analyze the performance of different electronic networks.				C4								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Articulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☐ Lab Viva ☑ Lab Report ☑ Presentation ☑ Project Demonstration ☐ Lab test
CLO2	Cognitive (Analyze)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Electronics II

Course Code: EEE 2103	**Contact Hours/Week:** 3 Hours
Course Title: Electronics II	**Credits:** 3.00

Pre-requisite: EEE 1203-Electronics I

Rationale: This course has been designed to know about different types of circuits and their applications. This will help the students to know about the different wave-shapes of electronic circuits.

Course Contents: Wave shaping: Linear and non-linear wave shaping, Clipping and Clamping circuits, Non Linear function circuits. Negative resistance switching circuits. Timing circuits: Bi-stable, Mono-stable and Astablemultivibrators, Sweep and staircase generator, IC 555 and its application. Application of op-amp in timing circuits, Comparators, Schimtt's Trigger. Pulse generator, VCO, PLL, Blocking oscillators.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe different timing circuits,	C1											

	comparators and oscillators with their applications.												
CLO2	Analyzedifferent types of wave-shaping and the characteristics of electronic circuits.		C4										
CLO3	Develop effective circuits using proper electronic elements.												A1

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐Final Exam ☑ Presentation ☐Mid-Term

Reference Books:

1. Electronic Devices and Circuit Theory : Bobert L. Boylestad
2. Microelectronic Circuit: Sedra and Smith
3. Online Resources suggested by the respective Course Teacher

Electronics II Sessional

Course Code: EEE 2104	**Contact Hours/Week:** 2 Hours
Course Title: Electronics II Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the different types of electronic circuits and give them experimental skills. The purpose of this sessional course is to understand the operation of electronic circuits and to be able to observe their outputs. The students will be able to design a complete circuit based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 2203. Course content of EEE 2203 is as follows:Wave shaping: Linear and non-linear wave shaping, Clipping and Clamping circuits, Non Linear function circuits. Negative resistance switching circuits.
Timing circuits: Bi-stable, Mono-stable and Astablemultivibrators, Sweep and staircase generator, IC 555 and its application. Application of op-amp in timing circuits, Comparators, Schimtt's Trigger. Pulse generator, VCO, PLL, Blocking oscillators.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Verify the performance of different types of electronic circuits by working in groups or as individuals in laboratory.									A5			
CLO2	Construct timing circuit, oscillators & wave-shape generatorsusing active elements.					P4							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Characterization by value)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Manipulation)	☐ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☐ Lab Viva ☑ Lab Report ☑ Presentation ☑ Project Demonstration ☐ Lab test

Electrical Machines I

Course Code: EEE 2105	**Contact Hours/Week:** 3 Hours
Course Title: Electrical Machines I	**Credits:** 3.00

Pre-requisite:EEE 1201-Electrical Circuit II

Rationale: The purpose of this course is to introduce to students with electrical machines especially induction motor and transformer: types, constructions, working principles, advantages, limitations, practical applications, different types of mathematical manipulations etc.

Course Contents: Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers; Phase conversion.
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.
Single Phase Induction Motor: Theory of operation, equivalent circuit and starting.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the operating principle of different electrical machines.	C2											
CLO2	Analyze the construction, performance and testing of different transformers & induction motors.		C4										
CLO3	Develop knowledge for practical problem solving through numerical examples.						A1						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO3	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☑Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Direct and Alternating Current Machinery: Rosenblatt
2. Electrical Technology : B L Thereja
3. Principles of Electronics : V K Mehta
4. Online Resources suggested by the respective Course Teacher

Electrical Machines I Sessional

Course Code: EEE 2106	**Contact Hours/Week:** 2 Hours
Course Title: Electrical Machines I Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about practical experiments on different concepts and theorems on transformer and induction motor.

Course Contents: Sessional based on the theory of course EEE 2105. Course content of EEE 2105 is as follows:Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers; Phase conversion.
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.
Single Phase Induction Motor: Theory of operation, equivalent circuit and starting.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Demonstrate the connections of					P3							

	induction motors and transformer.												
CLO2	Discriminate between theoretical knowledge and practical observations.						A4						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Precision)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Affective (Organization)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

Electrical Machines II

Course Code: EEE 2205	**Contact Hours/Week:** 3 Hours
Course Title: Electrical Machines II	**Credits:** 3.00

Pre-requisite: EEE 2105-Electrical Machines I

Rationale: This course is designed to deliver clear concepts about DC (generator, motor) and AC (synchronous generator, synchronous motor) machines: types, constructions, working principles, advantages, disadvantages, practical applications, different types of mathematical manipulations etc.

Course Contents: DC Generators: Types, no-load voltage characteristics, buildup of a self-excited shunt generator, load-voltage characteristic and effect of speed on no-load and load characteristics and voltage regulation, armature reaction. DC Motor: Operating principle,

counter emf, torque, speed, torque-speed characteristics, starting, braking, and speed control. 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.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the fundamentals and basic concepts of DC machines, synchronous generator and synchronous motor	C2											
CLO2	Analyze the factors for choosing an electrical machine for practical applications.						C4						
CLO3	Evaluate the performances (losses, efficiency, power ratings, speed, torque, curves, voltage/ current ratings etc.) of electrical machines for sustainable development.							C5					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Evaluate)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Direct and Alternating Current Machinery: Rosenblatt
2. Electrical Technology : B L Thereja
3. Principles of Electronics : V K Mehta
4. Electric Machinery Fundamentals : Chapman
5. Online Resources suggested by the respective Course Teacher

Electrical Machines II Sessional

Course Code: EEE 2206	**Contact Hours/Week:** 2 Hours
Course Title: Electrical Machines II Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about fundamental concepts of DC generator, DC motor, synchronous generator and synchronous motor through experimental work in the laboratory.

Course Contents: Sessional based on the theory of course EEE 2205. Course content of EEE 2205 is as follows:DC Generators: Types, no-load voltage characteristics, buildup of a self-excited shunt generator, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation, armature reaction. DC Motor: Operating principle, counter emf, torque, speed, torque-speed characteristics, starting, braking, and speed control. 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.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Demonstrate different types of experiments with electrical machines in laboratory.					P3							
CLO2	Examine the efficiency and voltage regulation of electrical machines by working in groups or as individual.									A2			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Precision)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

CLO2	Affective (Respond)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

Electrical Properties of Materials

Course Code: EEE 2119 **Course Title:** Electrical Properties of Materials	**Contact Hours/Week:** 3 Hours **Credits:** 3.00

Pre-requisite: None

Rationale: This course is designed to deliver basic ideas of quantum mechanics, statistical mechanics, electrical and magnetic properties of materials and superconductivity. For device application engineers must know electrical and magnetic properties of materials. Thus this course will help to develop device application.

Course Contents: Crystal Structure: Types of crystals, lattice and basis, Bravais lattice and Miller indices.
Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity.
Introduction to quantum mechanics: Wave nature of electrons, Schrodinger's equation, one-dimensional quantum problems- infinite quantum well, potential step and potential barrier; Heisenbergs's uncertainty principle and quantum box.
Band theory of solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density-of-states.
Carrier statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy.
Modern theory of metals: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.
Dielectric properties of materials: Dielectric constant, polarization- electronic, ionic and orientational; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss and piezoelectricity.
Magnetic properties of materials: Magnetic moment, magnetization and relative permitivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.
Introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO 1	Explain different types of properties and relations based on quantum mechanics, statistical mechanics, superconductivity	C2											
CLO 2	Derive different equations using quantum mechanics, statistical mechanics and superconductivity concepts.		C4										
CLO 3	Solve different types of problems related to quantum mechanics, statistical mechanics and superconductivity			C3									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Electrical Properties of Materials : FulvinoFrisone
2. Materials Engineering : John Martin
3. Electronic Properties of Materials : Rolf E. Hummel
4. Online Resources suggested by the respective Course Teacher

Digital Electronics

Course Code: EEE 2213	**Contact Hours/Week:** 3 Hours
Course Title: Digital Electronics	**Credits:** 3.00

Pre-requisite: EEE 1203-Electronics I

Rationale: This course is important to know the fundamental knowledge, solutions techniques and different practical applications of digital logic circuits and programmable logic devices.However, it can evaluate the performance of logic devices and also analysis the sequential circuit. After studying this course, students will be able to analyze various digital logic circuits which are the fundamentals for an electronic engineer.

Course Contents: Analysis and Synthesis of Digital Logic Circuits: Number system, codes, and conversion. Boolean algebra, De Morgan's law, logic gates and truth tables, combinational logic design, minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and combinational circuit design.
Programmable Logic Devices: Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.
Sequential Circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: Shift registers, counters and their applications.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Recognize different numbering system, codes, logics gates and logic circuit to solve digital logic circuit problems		C1										
CLO2	Understand various programmable logic devices and their applications.			C2									
CLO3	Design different types of latches and flip-flops for development of society.						C6						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☑ Final Exam ☑ Presentation ☑ Mid-Term

Reference Books:

1. Digital System: Principles and Application: Ronald J Tocci
2. Digital Design : M Morris Mano
3. Integrated Electronics: Analog and Digital Circuits and Systems (McGraw-Hill electrical and electronic engineering series) [Jacob Millman, Christos C. Halkias]
4. Online Resources suggested by the respective Course Teacher

Digital Electronics Sessional

Course Code: EEE 2214	**Contact Hours/Week:** 2 Hours
Course Title: Digital Electronics Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about practical experiments on fundamental concepts of digital logic circuits, logic device, and different sequential circuits.

Course Contents: Sessional based on the theory of course EEE 2313. Course content of EEE 2313 is as follows:Analysis and Synthesis of Digital Logic Circuits: Number system, codes, and conversion. Boolean algebra, De Morgan's law, logic gates and truth tables, combinational logic design, minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and combinational circuit design.

Programmable Logic Devices: Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.
Sequential Circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: Shift registers, counters and their applications.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Perform different types of experiments withlogic circuits in laboratory.					P2							
CLO2	Examine logic devices using logic gates and flip flops by taking help from group members.										A2		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Affective (Respond)	☐ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☑ Project Demonstration ☐ Lab test

Signals & Linear Systems

Course Code: EEE 3101	**Contact Hours/Week:** 3 Hours
Course Title: Signals & Linear Systems	**Credits:** 3.00

Pre-requisite: EEE 1101-Electrical Circuit I

Rationale: This course is designed to teach about fundamental concepts, solution techniques and different practical applications of electrical circuits, and different types of signals as well as systems with their basic operations and applications.

Course Contents: Analogous system, Response to non-sinusoidal voltage, L-system. Transform methods, Purpose and nature of transform, Fourier and Laplace transforms. Impulse function. Convolution integral and their application to network and system analysis. Filter equations, modern filters.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the basic signals and systems.		C2										
CLO2	Apply different transform methods to solve mathematical problems.					C3							
CLO3	Analyze the response of various electrical systems for different signals and conditions.				C4								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Signals and Systems: Simon Haykin
2. Signal Processing and Linear System: B P Lathi
3. Online Resources suggested by the respective Course Teacher

Control Systems

Course Code: EEE 3105	**Contact Hours/Week:** 3 Hours
Course Title: Control Systems	**Credits:** 3.00

Pre-requisite: None

Rationale: The course deals with fundamental concepts of control system terminology, performance analysis in time & frequency domain and various graphical methods for stability analysis. At the end of the course the students will be able to model electrical, mechanical and electro- mechanical systems, design controllers for various inter-disciplinary applications.

Course Contents: Introductory Concepts: Open loop versus closed loop feedback system, Input output relationship, Transfer function, DC machine dynamics, performance criteria, sensitivity and accuracy, Analysis of control systems time and frequency domain error constants.
Stability of Control System: Routh-Hurwitz criterion, bode plot, polar plot. Nyquist method, Root locus techniques, Frequency response analysis, Nicholes chart, compensation, Introduction to non-linear control system, State variable characterization of systems, transition matrix, canonical forms, Controllability and observability.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the classification of systems, transfer functions, representation of systems using block diagram, signal flow graphetc.		C2										
CLO2	Apply the knowledge of different time domain specification parameters to design various controller to analyze dynamic performance of a system.					C3							
CLO3	Analyze system's absolute and relative stability using different time and frequency domain methods.				C4								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Modern Control Engineering: Katsuhiko Ogata
2. Automatic Control Systems: Benjamin Kou
3. Online Resources suggested by the respective Course Teacher

Control Systems Sessional

Course Code: EEE 3106	**Contact Hours/Week:** 2 Hours
Course Title: Control Systems Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course aims to familiarize with the modeling of dynamical systems, to simulate and analyze the stability of the system using MATLAB SIMULINK platform. At the end of the course the participants will be able to model of dynamical systems, to simulate and analyze the stability of the system using MATLAB SIMULINK platform which will them to apply the knowledge in the other sector of industrial applications.

Course Contents: Sessional based on the theory of course EEE 3105. Course content of EEE 3105 is as follows:Introductory Concepts: Open loop versus closed loop feedback system, Input output relationship, Transfer function, DC machine dynamics, performance criteria,

sensitivity and accuracy, Analysis of control systems time and frequency domain error constants.
Stability of Control System: Routh-Hurwitz criterion, bode plot, polar plot. Nyquist method, Root locus techniques, Frequency response analysis, Nicholes chart, compensation, Introduction to non-linear control system, State variable characterization of systems, transition matrix, canonical forms, Controllability and observability.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Develop different controllers to improve stability of various systems in frequency and time domain.							A1					
CLO2	Perform comparison between the theoretical concepts and practical systems.				P2								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Receive)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Manipulation)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Electromagnetic Fields & Waves

Course Code: EEE 3107	**Contact Hours/Week:** 3 Hours
Course Title: Electromagnetic Fields & Waves	**Credits:** 3.00

Pre-requisite: None

Rationale: This course is designed to teach about fundamental concepts, solution techniques and different practical applications of basic laws of Electromagnetic field and wave such as Coulomb's law, Gauss's law, Ampere's law, Biot-Savart's law and basic concept of waveguides. At the end of the course the participants will be able to know the principles of Electromagnetic properties and be able to apply them in other fields.

Course Contents: Electrostatics and magneto-statics using vector methods. Fields in dielectrics and conductors. Boundary conditions of Electric and Magnetic fields. Time Varying Fields; Maxwell's equation and Poynting vector. Uniform plane wave and its transmission and reflection. Skin effect and Surface resistance. Wave guides. Introduction to radiation system: Antenna, Antenna classification, Antenna properties (gain, directivity, polarization, etc.).

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand Basic Laws of Electromagnetic field and wave.	C2											
CLO2	Apply Coulomb's law, Gauss's law, Ampere's law, and Biot-Savart's law in different charge distribution.		C3										
CLO3	Analyze the behavior of waveguide in different medium.				C4								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Field and Wave Electromagnetics: David K Chang
2. Introduction to Electromagnetic Fields: Clayton R. Paul
3. Online Resources suggested by the respective Course Teacher

Seminar

Course Code: EEE 3200	**Contact Hours/Week:** 2 Hours
Course Title: Seminar	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to help students to develop their skills in seminars and workshops which encourage active engagement, passionate dialogue, enhancing students' skills and knowledge. Seminars improve the confidence among the individual students. A seminar allows for small groups of students to meet and discuss academic topics or required reading, as well as set goals for research and continuing investigation.

Course Contents: Students will work in groups or individually to prepare review articles on the corresponding topic for their thesis/project and will present before audience.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statement	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Review various type of literature to accumulate the knowledge of numerous research topic.				C2								
CLO2	Compose the gathered knowledge from literature survey for writing thesis paper.			C6									
CLO3	Develop the presentation skill using modern tools.					P4							
CLO4	Respond to social, technical and environmental problem through literature review and research.												A4

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☑ Audio/Video	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report

		☐ Others	
CLO2	Cognitive (Create)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report
CLO3	Psychomotor (Articulation)	☑ Survey ☑Simulation/Emulation ☑Lab work ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report
CLO4	Affective (Organization)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report

Power Plant Engineering & Economy

Course Code: EEE 3205	**Contact Hours/Week:** 3 Hours
Course Title: Power Plant Engineering & Economy	**Credits:** 3.00

Pre-requisite: EEE 2105- Electrical Machines I, EEE 2205-Electrical Machines II

Rationale: This course has been designed to know about the basic's knowledge of different types of power plants and their operation. It also provides the knowledge about load curve, load factor, capacity factor, demand factor, utilization factor, diversity factor, load

forecasting, base load and peak load. It will also help to know how to operate a power plant economically.

Course Contents: Introduction to thermal, hydro and nuclear power stations. Nuclear reactor, reactor construction and control. Power reactors. Central station reactors. Nuclear hazards.Variable load problems, plotting and analysis of load curves, chronological load curves and load duration curve. Energy load curve and its use. Load factor, capacity factor, demand factor, utilization factor, diversity factor etc., and their impact over the cost analysis of power generation and utilization. Load forecasting, selection of units and plant location.Load sharing: Base load and peak load plants. Use of chronological load curves to distribute load among units. Power plant Economics: Economic operation of power plants. Input output curve, heat rate curve, incrementalrate curve. Use of incremental rate curve for optimum load scheduling. Transmission line loss, determination of loss co-efficient. Economic conductor selection, Kelvin's law. Graphical method for location of distribution systems. Tariff and tariff design. Bus system. Importance of power control. Current limiting reactors. Different types of bus system layout. Forces on bus section in case of short circuit.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe different types of power plants and their economic operation.	C2											
CLO2	Analyze load curves, billing methods, energy requirements etc. for economic purposes.								C4				
CLO3	Design a power plant by selecting proper size of generating units.											C6	
CLO4	Develop environment friendlypower plants for							A1					

	sustainable development.												

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO4	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Principles of Power Systems: V K Mehta
2. Power System Analysis: Stevenson Jr.
3. Power System Analysis: Hadi Sadat
4. Electrical Power System: D Das
5. Online Resources suggested by the respective Course Teacher

Microprocessor, Interfacing & System Design

Course Code: EEE 3209	**Contact Hours/Week:** 3 Hours
Course Title: Microprocessor, Interfacing & System Design	**Credits:** 3.00

Pre-requisite: EEE 2213-Digital Electronics

Rationale: The motive for this course is to show students the essentials of microprocessor and microcontroller frameworks. Microprocessor is the course used to give a comprehension of microchip equipment and programming. The students will be able to incorporate these concepts into their electronic plans for other courses where control can be accomplished through a microprocessor/controller implementation. Students finishing these tasks will work with microprocessor-based hardware, what's more, be equipped for recognizing equipment from programming flaws. The prevalent student will likewise be equipped for taking part in product improvement endeavors, including backing and advancement of assembly language code.

Course Contents: Fundamental Concepts:Microprocessor: A programmable device; microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM, microprocessor instructions. 16-bit Architecture:Pin diagram and functions, memory organization, bus activities, register layout, internal processing blocks. Instruction Set:Classifications of instructions, addressing modes, address computing chart.I/O Controller Programming:Port definition and read/write instructions, parallel I/O programming using 8255, serial I/O programming using 8251, display programming using8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter. Interrupt Structure:Interrupt terminologies, hardware and software interrupt, multipleinterrupt management, 8259 interrupt controller. Data Conversion Algorithm:BCD2BIN conversion, BIN2BCD conversion, binary multiplication, binary division. System Design (8086 based digital weighing machine: DWM)Top-down/ Bottom-up design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display, cost computation and processing and display.
Advanced Microprocessors and Microcontrollers:History of the evolution of MPU/MCU, multitasking systems, PVAM operation of Intel high performance architecture, overview of 80286 architecture, instruction and programming; overview of 80386 architecture, instruction and programming; CISC and RISC microcontrollers, instruction and programming.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the programming model of Microprocessors and Microcontrollers	C2											
CLO2	Compare accepted standards and guidelines to select appropriate Microprocessor and Microcontroller to meet specified performance requirements.			C4									
CLO3	Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.					C6							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Introduction to Microprocessor: B.B Bray
2. Microprocessor and Interfacing: Douglas Hall
3. Online Resources suggested by the respective Course Teacher

Microprocessor, Interfacing & System Design Sessional

Course Code: EEE 3210 **Course Title:** Microprocessor, Interfacing & System Design Sessional	**Contact Hours/Week:** 2 Hours **Credit:** 1.00

Pre-requisite: None

Rationale: This course introduces basics of assembly language, microprocessor architecture, and discusses different interfaces and the design of systems based on microprocessors.

Course Contents: Sessional based on the theory of course EEE 3209. Course content of EEE 3209 is as follows: Fundamental Concepts:Microprocessor: A programmable device; microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM, microprocessor instructions. 16-bit Architecture:Pin diagram and functions, memory organization, bus activities, register layout, internal processing blocks. Instruction Set:Classifications of instructions, addressing modes, address computing chart.I/O Controller Programming:Port definition and read/write instructions, parallel I/O programming using 8255, serial I/O programming using 8251, display programming using8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter. Interrupt Structure:Interrupt terminologies, hardware and software interrupt, multipleinterrupt management, 8259 interrupt controller. Data Conversion Algorithm:BCD2BIN conversion,

BIN2BCD conversion, binary multiplication, binary division. System Design (8086 based digital weighing machine: DWM)Top-down/ Bottom-up design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display, cost computation and processing and display.
Advanced Microprocessors and Microcontrollers:History of the evolution of MPU/MCU, multitasking systems, PVAM operation of Intel high performance architecture, overview of 80286 architecture, instruction and programming; overview of 80386 architecture, instruction and programming; CISC and RISC microcontrollers, instruction and programming.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Formulate appropriate computing solution for Microprocessor or Microcontroller-based applications.					P4							
CLO2	Develop an assembly language program as a team for specified application.									A1			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Articulation)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑Presentation ☑ Project Demonstration ☐ Lab test
CLO2	Affective (Receive)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

Power System I

Course Code: EEE 3211	**Contact Hours/Week:** 3 Hours
Course Title: Power System I	**Credits:** 3.00

Pre-requisite:EEE 2105-Electrical Machines I, EEE 2205-Electrical Machines II

Rationale: This course has been designed to know about basics knowledge of power system. Students will learn how to draw the equivalent circuit of a power system. From this course, students will also learn how to analysis the complex power system problems.

Course Contents: Inductance and Capacitance of overhead power line. Line representation: equivalent circuit of short, medium and long line. Network representation: single line and reactance diagram of power system and per unit representation. Load flow studies: Gauss – seidel and Newton-Raphson method. Control of voltage, real power and reactive power. Reactive power compensation. Fault analysis: Symmetrical fault calculation, symmetrical components, sequence impedance and sequence networks, different unsymmetrical fault calculation. Introduction to different kinds of relays and circuit breakers. Typical layout of substation equipment.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Explain the basics of power system (single line diagrams, load flow studies, transmission lines etc.).		C2										
CLO2	Manipulate different parameters for efficient power system.							C3					

CLO3	Inspect different types of faults in power system for safety purposes.						C4						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Principles of Power Systems: V K Mehta
2. Power System Analysis: Stevenson Jr.
3. Power System Analysis: Hadi Sadat
4. Electrical Power System: D Das
5. Online Resources suggested by the respective Course Teacher

Power System I Sessional

Course Code: EEE 3212	**Contact Hours/Week:** 2 Hours
Course Title: Power System I Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the power system. The purpose of this sessional course is to analyze the different types of faults in power system. The students will be able to draw the equivalent circuit of a power system based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 3211. Course content of EEE 3211 is as follows: Inductance and Capacitance of overhead power line. Line representation: equivalent circuit of short, medium and long line. Network representation: single line and reactance diagram of power system and per unit representation. Load flow studies: Gauss – Seidel and Newton-Raphson method. Control of voltage, real power and reactive power. Reactive power compensation. Fault analysis: Symmetrical fault calculation, symmetrical components, sequenceimpedance and sequence networks, different unsymmetrical fault calculation. Introduction to different kinds of relays and circuit breakers. Typical layout of substation equipment.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Examine different types of faults in power system.						A2						
CLO2	Demonstrate the response of a power system by changing different parameters in computer aided platform.					P3							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Affective (Respond)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Precision)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Measurement & Instrumentation

Course Code: EEE 3221	**Contact Hours/Week:** 3 Hours
Course Title: Measurement & Instrumentation	**Credits:** 3.00

Pre-requisite: EEE 1101-Electrical Circuit I, EEE 1203-Electronics I

Rationale: This course has been designed to know about different types of measuring devices and their operation & application. From this course the students will also learn how to use and classify different types of measuring instruments.

Course Contents: Introduction: Methods of measurement. Statistical method applied to field of measurement and error analysis and calibration. Resistance, Inductance and Capacitance measurements: Different methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance measurement. A.C. and DC bridge methods, Measurement of insulation and earth resistances. Localization of cable fault. Magnetic measurement: Flux meter, Flux and Flux density measurement. Determination of iron losses and their separation.Measuring instruments: Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities. Speed, frequency and phase difference measurements. Illumination measurement. Electronic measuring instruments: Digital instruments, VTVM, Q-meter and CRO. Instrumentation: Extension of instrument range. Use of C.T. and P.T and calculation of their burden, Instrumentation of substation. Measurement of non-electrical quantities: Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe mathematically and physically the designed measuring instruments and their use for measurements.		C1										
CLO2	Illustrate the construction of measuring instruments.				C4								
CLO3	Design variety of electronic instruments and measuring systems used in different sectors.			C6									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO3	Cognitive (Evaluate)	☑ Lecture ☑Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. A course in Electrical and Electronic measurements: A K Swahney
2. Introduction to Instrumentation and Measurements: Robert B Northrop
3. Online Resources suggested by the respective Course Teacher

Measurement & Instrumentation Sessional

Course Code: EEE 3222	**Contact Hours/Week:** 2 Hours
Course Title: Measurement & Instrumentation Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the different types of measuring instruments and give them experimental skills. The purpose of this course is to understand the operation of measuring devices. The students will also be able to classify different types of measuring devices based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 3221. Course content of EEE 3221 is as follows:Introduction: Methods of measurement. Statistical method applied to field of measurement and error analysis and calibration. Resistance, Inductance and Capacitance measurements: Different methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance measurement. A.C. and DC bridge methods, Measurement of insulation and earth resistances. Localization of cable fault. Magnetic measurement: Flux meter, Flux and Flux density measurement. Determination of iron losses and their separation. Measuring instruments: Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities. Speed, frequency and phase difference measurements. Illumination measurement. Electronic measuring instruments: Digital instruments, VTVM, Q-meter and CRO. Instrumentation: Extension of instrument range. Use of C.T. and P.T and calculation of their burden, Instrumentation of substation. Measurement of non-electrical quantities: Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Verify the performances of different types of measuring devices used in professional environment.						A5						
CLO2	Calibrate the measuring instruments.					P3							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Characterization by value)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Precision)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Project & Thesis

Course Code: EEE 4000	**Contact Hours/Week:** 14 Hours
Course Title: Project & Thesis	**Credits:** 7.00

Pre-requisite: EEE 3200-Seminar

Rationale: This course is important to enables the students to develop an inquisitive mind and helps always to want to find out why things happen. The usefulness of project and thesis work is that it allows the student to organize his approach to solving the research problem. The significance of the project and thesis highlights the value that the project and thesis outcomes may provide in the field or real-world practice. It enables the students to gain sufficient knowledge on research era through different ways.

Course Contents: A project/thesis course will be assigned to the students in 4th year 1stsemester class and it will continue till 4th year 2ndsemester. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references etc. Final assessment on this course will be done in 4th year 2ndsemester.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statement	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the research strategy to carry out this research to achieve the goal.		C2										
CLO2	Discover the problems from research literatures to concern the societal and environmental need.			C3									
CLO3	Analyze various type of literature paper to explore the research field.				C4								
CLO4	Execute various design of research and project work using modern tools.					P2							
CLO5	Improve the communication skill with engineering										A5		

	community and society to complete the thesis survey effectively.												
CLO6	Verify a real-life complex problem that attains by thesis & project materials for sustainable development.							A5					
CLO7	Discuss about the best solution using all the ideas of the group.									A2			
CLO8	Respond to social, technical and environmental problem through research.						A2						
CLO9	Organize a thesis & project considering the social, cultural, global, ethical, legal, health, environmental responsibilities along with cost effeteness.								A4				
CLO10	Summarize the earned skills to execute the new plan and budget.											C5	
CLO11	Develop effective knowledge to solve a problem in real world situations.												A1

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of	Teaching-Learning	Assessment Strategy

	Learning Taxonomy	**Strategy**	
CLO1	Cognitive (Understand)	☑ Survey ☐Simulation/Emulation ☐Lab work ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report
CLO2	Cognitive (Apply)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report
CLO3	Cognitive (Analyze)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report
CLO4	Psychomotor (Manipulation)	☐ Survey ☑Simulation/Emulation ☑Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☑ Project ☑ Audio/Video ☐ Others	☐ Quiz ☐ Viva ☑ Dissertation ☑ Presentation ☑ Project Demonstration ☐ Report
CLO5	Affective (Characterization by value)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report

		☐ Others	
CLO6	Affective (Characterization by value)	☑ Survey ☑Simulation/Emulation ☑Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☑ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☑ Project Demonstration ☐ Report
CLO7	Affective (Respond)	☑ Survey ☐Simulation/Emulation ☑Lab work ☐ Tutorial ☑ Discussion ☑ Interaction ☑ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☑ Project Demonstration ☐ Report
CLO8	Affective (Respond)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report
CLO9	Affective (Organization)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☐ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report
CLO10	Cognitive (Evaluate)	☑ Survey ☑Simulation/Emulation ☑Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☑ Project	☐ Quiz ☐ Viva ☑ Dissertation ☑ Presentation ☑ Project Demonstration ☐ Report

		☑ Audio/Video ☐ Others	
CLO11	Affective (Receive)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☐ Viva ☑ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report

Industrial Training

Course Code: EEE 4100	**Contact Hours/Week:** 6.00
Course Title: Industrial Training	**Credits:** 3.00

Pre-requisite: None

Rationale: This course is important to help students to develop their skills in the application of theory to practical knowledge. Industrial training helps to develop the skills and techniques which are directly relevant to their desired goals. Industrial Training also increases students' responsibility and good work habits. It enables the students to gain sufficient knowledge in real and practical world.

Course Contents: Student will be attached with the industries/service agencies for two weeks after completing their Third year first semester (before starting Third year second semester/during any vacation in Third year second semester) to gain practical knowledge. It is a 3-credit course and without completion of this course the student will not fulfill the requirements of B. Sc. Engineering Degree.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statement	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Develop the knowledge about actual working environment.						A1						
CLO2	Combine the knowledge of professional engineering solutions for sustainable development.							C6					
CLO3	Understand the ethical knowledge through discussion and case study.								C2				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Receive)	☑ Survey ☐Simulation/Emulation ☐Lab work ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☑ Audio/Video ☑ Practical Demonstration	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report
CLO2	Cognitive (Create)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☑ Practical	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☑ Report

		Demonstration	
CLO3	Cognitive (Understand)	☑ Survey ☐Simulation/Emulation ☐Lab work ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Viva ☐ Dissertation ☑ Presentation ☐ Project Demonstration ☐ Report

Digital Signal Processing

Course Code: EEE 4113	**Contact Hours/Week:** 3 Hours
Course Title: Digital Signal Processing	**Credits:** 3.00

Pre-requisite: EEE 2213-Digital Electronics

Rationale: The aim of this course is to introduce the students with the basic principles, techniques and applications of digital signal processing. It will also make the students aware of the meanings and implications of the properties of system and signal.

Course Contents: Introduction to Digital Signal Processing (DSP): Discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete time systems, difference equation, convolution, transient and steady state response. Discrete Transformations: Discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform, Z-transformation properties, transfer function, poles and zeroes and inverse Z-transform. Correlation: Circular convolution, auto correlation and cross correlation. Digital Filters: FIR filters- linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters-specifications, design using impulse variant, bilinear z-transformation, least square methods and finite precision effects.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Explain the operations on signals and acquire knowledge about systems.		C2										
CLO2	Analyze various signal processing techniques.				C4								
CLO3	Design IIR and FIR digital filters using various techniques.			C6									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Digital Signal Processing: John G. Proakis and Dimitris G. Manolakis
2. Digital Signal Processing: A. Vallavaraj, C. Gnanapriya, and S. Salivahanan
3. Digital Signal Processing: Barrie W. Jervis
4. Online Resources suggested by the respective Course Teacher

Communication Engineering

Course Code: EEE 4117	**Contact Hours/Week:** 3 Hours
Course Title: Communication Engineering	**Credits:** 3.00

Pre-requisite: EEE 3107-Electromagnetic Fields & Waves, EEE 1203-Electronics I

Rationale: This is a fundamental course for the basic knowledge of communication. The students will be able to understand the different communication techniques and analyze the existing communication networks. This course is very important for the students willing pursue a future carrier in the telecom sector or in network engineering. The knowledge on different digital modulation techniques & multiplexing will make the students competent for a competitive job in the communication sector. The recent technologies implemented in existing communication systems are thoroughly discussed in this course. It will play a vital role if a student wishes to conduct further research in the communication field.

Course Contents: Introduction: Principles, evolution of communication system, networks, exchange, international regulatory bodies. Telephone apparatus, Switching system, Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Modern telephone services and network: Internet telephony, facsimile, integrated services digital network. Overview of communication system: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth, and transmission capacity. Optical Communication, fiber optics. Noise: Source, characteristics of various types of noise and signal to noise ratio. Communication systems: Analog and digital.
Continuous wave modulation: Transmission types- base-band transmission, carrier transmission; Antenna & Antenna heights; Amplitude and Angle Modulations & Demodulations. Transmitter & Receiver; Encoder & Decoder. Delta Modulation, Sampling, Nyquist Theorem, Pulse Modulations; line coding- formats and bandwidths. Binary Modulated Bandpass Signaling: OOK, BPSK, DPSK, FSK, MSK bandwidth requirements, detection and noise performance, Multilevel Modulated Bandpass Signaling, Shanon's Capacity. Multiplexing: TDM- principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; FDM- principle, de-multiplexing; wavelength-division multiplexing; Multiple-access network- time-division multiple-access, frequency-division multiple access, code-division multiple-access - spread spectrum multiplexing, coding techniques and constraints of CDMA. Communication system design: design parameters, channel selection criteria and performance simulation.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe the evolution of communication technology in modern society.						C1						
CLO2	Compare different communication methods and modulation techniques.							C4					
CLO3	Develop various multiplexing techniques & multiple access networks for desirable communication system.												A1

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Modern Digital and Analog Communication Systems: B P Lathi
2. Electronic Communication Systems: G. Kenedy
3. Theory and Problems of Analog and Digital Communication: Hwei HSU
4. GSM System Survey: Erricson
5. Online Resources suggested by the respective Course Teacher

Communication Engineering Sessional

Course Code: EEE 4118	**Contact Hours/Week:** 2 Hours
Course Title: Communication Engineering Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to provide the knowledge of different equipment for a communication system. The students will be able to observe the different communication techniques and analyze the existing communication networks in the facilitated laboratories. This course is very important for the students to understand the theoretical course.

Course Contents: Sessional based on the theory of course EEE 4117. Course content of EEE 4117 is as follows: Introduction: Principles, evolution of communication system, networks, exchange, international regulatory bodies. Telephone apparatus, Switching system, Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Modern telephone services and network: Internet telephony, facsimile, integrated services digital network. Overview of communication system: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth, and transmission capacity. Optical Communication, fiber optics. Noise: Source, characteristics of various types of noise and signal to noise ratio.

Communication systems: Analog and digital.Continuous wave modulation: Transmission types- base-band transmission, carrier transmission; Antenna & Antenna heights; Amplitude and Angle Modulations & Demodulations. Transmitter & Receiver; Encoder & Decoder. Delta Modulation, Sampling, Nyquist Theorem, Pulse Modulations; line coding- formats and bandwidths. Binary Modulated Bandpass Signaling: OOK, BPSK, DPSK, FSK, MSK bandwidth requirements, detection and noise performance, Multilevel Modulated Bandpass Signaling, Shanon's Capacity. Multiplexing: TDM- principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; FDM- principle, de-multiplexing; wavelength-division multiplexing; Multiple-access network- time-division multiple-access, frequency-division multiple access, code-division multiple-access - spread spectrum multiplexing, coding techniques and constraints of CDMA. Communication system design: design parameters, channel selection criteria and performance simulation.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Replicate a full duplex telephony system.					P1							
CLO2	Control the noise level in different communication system.				P3								
CLO3	Examine the different continuous wave modulation techniques by working in group or as an individual.										A2		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Psychomotor (Imitation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Psychomotor (Precision)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO3	Affective (Respond)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

Power Electronics

Course Code: EEE 4129	**Contact Hours/Week:** 3 Hours
Course Title: Power Electronics	**Credits:** 3.00

Pre-requisite: EEE 1203-Electronics I, EEE 2103-Electronics II

Rationale: This course has been designed so that the students can be familiar with basic power electronics devices and get practical experience of the circuit design to solve engineering problems. It starts with basic switching components such as power diodes, transistors, GTO, MOSFET and their applications. It is important for the students to learn, analyze and design different power electronics devices, which are the foundation of the advanced courses.

Course Contents: Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buck-boost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: single phase and three phase current and voltage source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe fundamental concepts and techniques used in power electronics.	C1											
CLO2	Discuss about power electronics components and techniques for practical implementation.						A2						
CLO3	Design budget friendly and power efficient devices (rectifiers, inverters, filters etc.) for industrial use leading to sustainable development.							C6					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Affective (Respond)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Power Electronics: Circuits, Devices & Application: Muhammad H Rashid
2. Electronic Devices and Circuit Theory: Robert L Boylestad
3. Online Resources suggested by the respective Course Teacher

Power Electronics Sessional

Course Code: EEE 4130	**Contact Hours/Week:** 2 Hours
Course Title: Power Electronics Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the power switches and give them experimental skills. The purpose of the laboratory experiment is to understand the operation of switching components. It enables the students to gain sufficient knowledge on the use of switching components in power circuit. The students will also be able to design power electronics devices based on the acquired knowledge of this course.

Course Contents: Sessional based on the theory of course EEE 4129. Course content of EEE 4129 is as follows: Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buck-boost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: single phase and three phase current and voltage source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Examine the performance of different power electronic devices by working in group or as an individual.									A2			
CLO2	Build various power electronics based on the operation of switching components.				P2								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Respond)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Electrical Services Design

Course Code: EEE 4200	**Contact Hours/Week:** 2 Hours
Course Title: Electrical Services Design	**Credit:** 1.00

Pre-requisite: EEE 1101-Electrical Circuit I, EEE 1203-Electronics I, EEE-2105 Electrical Machines I, EEE-2205 Electrical Machines II, EEE 3211-Power System I.

Rationale: From this course the students will be introduced to basics rules, codes, and standards of electrical services design. This course will provide the knowledge of installing protective devices for the safety regulations. Students will also learn how to design and prepare budget for residential, commercial, and industrial wiring with proper load calculation.

Course Contents: Electrician's tools, splices, soldering, code practices. Electrical and electronic symbols, Safety rules, electricity rules and electricity codes. Terminology and definitions: fuses, circuit breakers, distribution boxes, cables, bus-bars and conduits. Wattage rating of common electrical equipment.Introduction to CAD tools for building services design. Familiarization with building regulations, codes and standards: BNBC, NFPA etc.Electrical wiring system design, drawing and estimation for residential, commercial house wiring and Industrial installation wiring. Use of meggers, Insulation test, Grounding earth resistance measurement using earth resistance tester. Prepaid Energy Meter, Smart Metering System. Electrical installations system design: substation, BusbarTrunking (BBT) System and protection, air-conditioning, heating and lifts. Design for intercom, public address systems, telephone system and LAN. Design of security systems including CCTV, fire alarm, smoke detector, burglar alarm, and sprinkler system.A design problem on a multistoried building.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand basic circuit laws, codes, methods and the challenges of electrical services design.		C2										
CLO2	Examine electrical wiring layouts forresidential or commercial buildings, and industries for social safety and clean environment.							A2					
CLO3	Implement different protective equipment					P2							

	to ensure safety issues.												

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Affective (Respond)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO3	Psychomotor (Manipulation)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Reference Books:

1. Power system Analysis and design: B.R. Gupta
2. Electrical Wiring, Estimating and Costing: S.L. Uppal & G.C. Garg
3. Electrical Design; Estimation and costing: K.B. Raina and S.K. Bhattacharya
4. BNBC, NFPA standards
5. Online Resources suggested by the respective Course Teacher

Power System Protection

Course Code: EEE 4213	**Contact Hours/Week:** 3 Hours
Course Title: Power System Protection	**Credits:** 3.00

Pre-requisite: EEE 3211-Power System I

Rationale: Power system protection is important in order to be able to identify and to isolate a faulty section of electrical power system from rest of the live system so that the rest portion can function satisfactorily without any severe damage due to fault current. When students study this course, they will be able to know about different protection schemes of power system which is very important for the continuity of power system.

Course Contents: Philosophy of switchgear and protection: Circuit breakers, principle of arc extinction in DC and AC circuit breakers. Recovery voltage, rate of rise of recovery voltage and other transient phenomena. Switching surges. Disconnection of unloaded transformer and transmission line. Speed of circuit breaker. Construction, operation, rating and testing of bulk oil and minimum oil breaker, SF6 circuit breaker, ABCB, ACB, and VCB. Selection of circuit breaker. Travelling wave in transmission line. Surge absorber, lightning arrester, horn gap, its rating and testing.Protective relaying: Relay voltage rating, high, medium and low. Basic protective zone. Relaying Scheme. Electromechanical Relays: Principal, general equation. Overcurrent, balanced current, overvoltage, distance, directional, positive sequence, negative sequence and differential relays and their applications. Static relays: Introduction to solid state device in the construction of static relays. Different type of static relays. Generator protection. Transformer protection, Bucholz‟s relay. Protection of bus bar, transmission line, feeder etc. Relay testing.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discriminate among different types of protective equipment for power system.				C4								
CLO2	Apply the protective equipment in power system protection.						C3						
CLO3	Design a cost effective and efficient protective scheme for a											C6	

	power system.												

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Principles of Power Systems: V K Mehta
2. Power System Analysis: Stevenson Jr.
3. Power System Analysis: Hadi Sadat
4. Electrical Power System: D Das
5. Online Resources suggested by the respective Course Teacher

Power System Protection Sessional

Course Code: EEE 4214	**Contact Hours/Week:** 2 Hours
Course Title: Power System Protection Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the protective equipment and give them experimental skills. The purpose of the laboratory experiment is to understand the operation of protective components. It enables the students to gain sufficient knowledge on the use of protective components in power system protection. The students will also be able to design a complete protection scheme of power system based on the acquired knowledge of this course.

Course Contents: Sessional based on the theory of course EEE 4213. Course content of EEE 4213 is as follows: Philosophy of switchgear and protection: Circuit breakers, principle of arc extinction in DC and AC circuit breakers. Recovery voltage, rate of rise of recovery voltage and other transient phenomena. Switching surges. Disconnection of unloaded transformer and transmission line. Speed of circuit breaker. Construction, operation, rating and testing of bulk oil and minimum oil breaker, SF6 circuit breaker, ABCB, ACB, and VCB. Selection of circuit breaker. Travelling wave in transmission line. Surge absorber, lightning arrester, horn gap, its rating and testing.
Protective relaying: Relay voltage rating, high, medium and low. Basic protective zone. Relaying Scheme. Electromechanical Relays: Principal, general equation. Overcurrent, balanced current, overvoltage, distance, directional, positive sequence, negative sequence and differential relays and their applications. Static relays: Introduction to solid state device in the construction of static relays. Different type of static relays. Generator protection. Transformer protection, Bucholz's relay. Protection of bus bar, transmission line, feeder etc. Relay testing.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Examine the performance of different protective components by working in group or as an individual.										A2		
CLO2	Build various protection scheme based on the operation of protective equipment.					P2							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Affective (Respond)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Cellular Communication

Course Code: EEE 4233	**Contact Hours/Week:** 3 Hours
Course Title: Cellular Communication	**Credit Hour:** 3.00

Pre-requisite: EEE 4117-Communication Engineering

Rationale: This course is important to make the students familiar with cellular communication. The purpose of this course is to make the students able to learn about analog and digital communications. The students will be able to know about advantages and characteristics of digital communication systems from this course.

Course Contents: Introduction: Concept, evolution and fundamentals, analog and digital cellular systems.Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile Radio Propagation: Characteristics of propagation, models for radio propagation, antenna at cell site and mobile antenna.Frequency Management and Channel Assignment: Fundamentals of frequency management, spectrum utilization, fundamentals of channel assignment, traffic and channel assignment.Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate. Diversity Techniques: Concept of diversity branch and signal paths, types of diversity, carrier to noise and carrier to interference ratio performance.Digital Cellular Systems: GSM, GPRS, EDGE, WCDMA, UMTS, HSDPA, LTE, generation of mobile communication, packet switching and data communication.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss about basics of analog and digital cellular systems.				C2								
CLO2	Construct an environment friendly and highly efficient cellular communication system.							C3					
CLO3	Analyze the performance of cellular communication of different generationsfor better economy.											C4	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Wireless Communications: Theodore S. Rappaport
2. Introduction to Analog and Digital Communication: S. Haykin
3. Modern Digital and Analog Communication Systems: B P Lathi
4. Electronic Communication Systems: G. Kenedy
5. Advanced Electronic Communication Systems: W. Tomasi
6. Online Resources suggested by the respective Course Teacher

19.2. Elective Courses

19.2.1. Elective I

Advanced Digital Electronics

Course Code: EEE 4111	**Contact Hours/Week:** 3 Hours
Course Title: Advanced Digital Electronics	**Credits:** 3.00

Pre-requisite: EEE 2213-Digital Electronics

Rationale: This course is important to know the fundamental knowledge, solutions techniques and different practical applications of digital logic families like TTL, ECL, and CMOS and different CMOS inverter. However, in this course different converter are analysis for interfacing purpose of analog and digital circuit. After studying this course, students will be able to analyze various digital logic circuits and interfacing circuit which are the fundamentals for an electronic engineer.

Course Contents: TTL: TTL NAND gate operation, current-sourcing and current-sinking action, totem pole output circuit, TTL NOR gate, standard TTL characteristics, supply voltage and temperature range, voltage levels, power dissipation, propagation delay, fan out, introduction to improved TTL series, TTL loading and fan out, other TTL characteristics, connecting TTL outputs together, open collector output, Tri-state, TTL driving CMOS, problem with TTL. ECL: Basic ECL circuit, CL OR/NOR gate, ECL characteristics, fan out, speed of operation. CMOS Logic Families: Introduction to the working principle of enhancement type NMOS, PMOS and depletion MOS. Comparison of NMOS and PMOS with respect to speed. Design of NOMS inverter with resistive load, with NMOS enhancement load and with NMOS depletion load. Edge time and speed calculation for NMOS inverter with depletion load.CMOS inverter: Circuit diagram, operation, transfer characteristic and noise margin. Design of basic CMOS gates (NAND gate and NOR gate) with specified parameters (rise time and fall time). Circuit implementation from logic equations. NMOS pass transistors and CMPS pass gate. Implementation of multiplexer by NMOS and CMOS pass gate. Buffer circuit. CMOS gates driving TTL gates and comparison of CMOS logics with TTL logics. Design of basic logic gates using CMOS and BiCMOS.Interfacing Data Converters: Digital to Analog Converters (D/A): The binary weighted resistor D/A converter. The R/2R ladder D/A converter. The inverted ladder D/A converter. Specification for D/A converters (resolution, linearity, settling time and accuracy). Analog to Digital Converters (A/D): Flash converters, Successive approximation converter and Dual slope converter. A/D converter specifications (analog input voltage, input impedance, accuracy, conversion time etc.). A comparison of converter types. Sample and hold circuit (S/H), interconnecting the S/H circuit and the A/D converter.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss about TTL, ECL, and CMOS logic families with their applications.						A2						
CLO2	Understand basic CMOS inverter including basic CMOS logic design with NAND gate NOR gate, TTL logic and buffer circuit.			C2									
CLO3	Design different types of cost effective interfacing circuit including AD converter and DA converter consisting of different application.											C6	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Respond)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Digital System: Principles and Application: Ronald J Tocci
2. Digital Design: M Morris Mano
3. Microprocessor 8085: Ramesh Gaonkar
4. Online Resources suggested by the respective Course Teacher

Biomedical Engineering

Course Code: EEE 4115	**Contact Hours/Week:** 3 Hours
Course Title: Biomedical Engineering	**Credits:** 3.00

Pre-requisite: EEE 3221-Measurement & Instrumentation

Rationale: This course provides the knowledge about different medical terminology, cell physiology and different excitation of heart. However, this course provides the knowledge about different transducer that is used in medical diagnostics. After studying this course, students will be able gather knowledge about different biomedical instrumentation that have application in medical system.

Course Contents: Medical terminology, cell physiology, membrane potential, action potential, excitation and rhythmically. Rhythmic excitation of heart. Transducers used in medical diagnostics. Biomedical Instrumentation: Normal Electrocardiograph, ECG simulator, Watch filter, ECG amplifier, pulse beat monitor, pace maker, galvanic skin resistance detector, respiratory and suction apparatus. Electronic stethoscope. Electronic clinical thermometer, blood flow and pressure monitoring recorders, metabolic rate measurement. Special topics: Bio-telemetry, application of ultrasonic and laser in biology and medicine. Clinical X- ray equipment. Fluoroscopy. Infrared heating.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe medical terminology, cell physiology, and excitation of heart.						C1						
CLO2	Understand about basic concept of transducer and biomedical instrumentation that used in medical system.							C2					
CLO3	Develop biotelemetry, X-ray, fluoroscopy and other medical instruments for the betterment of human kind.								A1				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Medical Instrumentation Application and Design: John G. Webster
2. ECG in Medical Practice: A. B. M. Abdullah
3. Introduction to biomedical equipment technology: J. J. Carr & J. M. Brown
4. Online Resources suggested by the respective Course Teacher

Antennas &Propagation

Course Code: EEE 4147	**Contact Hours/Week:** 3 Hours
Course Title: Antennas & Propagation	**Credits:** 3.00

Pre-requisite: EEE 3107-Electromagnetic Fields & Waves

Rationale: The study of antennas and propagation is essential to a complete understanding of radio communications, radar, cell phones, and other electronic communication systems. This course handles the basics of antennas and wave propagation. However, it can evaluate different types of antennas and fundamentals of antennas. After studying this course, students will be able to analyze the performance of antennas that is fundamentals for communication engineer.

Course Contents: Fundamental of Antennas: Vector Potential Functions, Electric and Magnetic Fields for Electric and Magnetic Current Sources, Solution of Vector Potential Wave Equation.Antenna Arrays: Two-Element Array. N-element Linear Arrays: Broad-side, End-fire, Phased, Binomial, Dolph- Tchebyschef and Super-directive Arrays, Determination of Array Factor and Patterns, Planar and Circular Arrays. Travelling-Wave and Broad-band Antennas: Long wire, V, Rhombic and Helical Antennas, Yagi, Uda array, Frequency Independent and Log-periodic Antennas. Aperture, Reflector and Lens Antennas: Huygens's Principle, Rectangular and Circular Apertures, Microstrip Antennas. Babinet's Principle, Sectoral, Pyramidal and Conical Horns, Parabolic and Cassegrain Reflector Antennas, Lens

Antennas. Antenna Measurement: Antenna ranges, Radiation Pattern, Gain and Directivity, Polarization. Radio wave propagation: Ground wave propagation, Ionospheric propagation, Propagation losses.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe the fundamentals of antennas with electric and magnetic current source to solve wave equation.	C1											
CLO2	Understand the basic of antenna arrays with different classification.		C2										
CLO3	Analyze about antenna measurement and radio wave propagation with different application.			C4									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Antenna and Wave Propagation: K. D. Prasad
2. Antenna Theory: C. A. Balanis
3. Online Resources suggested by the respective Course Teacher

19.2.2. Elective II

Power System II

Course Code: EEE 4*21	**Contact Hours/Week:** 3 Hours
Course Title: Power System II	**Credits:** 3.00

Pre-requisite: EEE 3211-Power System I

Rationale: This course has been designed to know about the knowledge of AC & DC transmission and distribution system. Students will also learn about the stability analysis in power system.

Course Contents: Design and Constructional Features of Overhead Power transmission Lines and Underground Cables, DC and AC Power Distribution. Stability: Swing Equation, Power Angle Equation, Equal Area Criterion, Multi-machine System, Step-by-step solution of Swing Equation, Factors Affecting Transients Stability. Flexible AC Transmission System. High Voltage AC Transmission System. Power System Harmonics.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Explain different parameters of transmission lines and distribution system.		C2										
CLO2	Manipulate different parameters to reduce losses & risks of a power system.							C3					
CLO3	Inspect different types of methods and devices for stability in						C4						

	power system for safety purposes.												

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Principles of Power Systems: V K Mehta
2. Power System Analysis: Stevenson Jr.
3. Power System Analysis: Hadi Sadat
4. Electrical Power System: D Das
5. Online Resources suggested by the respective Course Teacher

Power System II Sessional

Course Code: EEE 4*22	**Contact Hours/Week:** 2 Hours
Course Title: Power System II Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the power system. The purpose of this sessional course is to analyze the AC & DC transmission and distribution system. The students will learn about the stability analysis in power system based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 4*21. Course content of EEE 4*21 is as follows: Design and Constructional Features of Overhead Power transmission Lines and Underground Cables, DC and AC Power Distribution. Stability: Swing Equation, Power Angle Equation, Equal Area Criterion, Multi-machine System, Step-by-step solution of Swing Equation, Factors Affecting Transients Stability. Flexible AC Transmission System. High Voltage AC Transmission System. Power System Harmonics.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Examine different types of FACTS devices for power system in computer aided platform.						A2						
CLO2	Demonstrate the stability of a power system by changing different parameters in computer aided platform,					P3							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Affective (Respond)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Psychomotor (Precision)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

High Voltage Engineering

Course Code: EEE 4*23	**Contact Hours/Week:** 3 Hours
Course Title: High Voltage Engineering	**Credits:** 3.00

Pre-requisite: EEE 3101-Signals & Linear Systems, EEE 3211-Power System I, EEE 3221-Measurement & Instrumentation.

Rationale: High voltage Engineering is very important to know about high voltage power transmission. The course provides students with knowledge on the fundamentals governing generation and control in high voltage power systems.

Course Contents: Ionization and decay process: Townsend's first and second ionization coefficient. Electric breakdown in gases. Townsend's criterion for spark breakdown. Sparking potential. Penning effect. Corona discharges, power loss calculation. Breakdown of solid and liquid dielectrics. Generation of high voltage: Alternating voltage, transformer cascade. Series resonant circuit for high voltage ac testing. Test of dc and ac cable. Transient Voltage: Impulse wave shape. Impulse voltage generator and its mathematical analysis. Design consideration of impulse generators. Triggering of impulse generators. DC voltage doubler and cascade circuits. Electrostatic generator, voltage stabilization. Measurement of high voltage: Electrostatic voltmeter, sphere gap. Potential divider. High Voltage testing of power system equipment: Oil testing. Design consideration of transmission line based on direct stroke. High voltage transient in transmission line. High voltage lightning arrester. Insulation co-ordination.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand breakdown mechanisms of solids, liquids and gases.	C2											
CLO2	Justify partial discharges and their measurement techniques.		C5										
CLO3	Generate impulse, AC and DC high voltages.			C6									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Evaluate)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Create)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation

		☐ Audio/Video ☐ Others	☑ Mid-Term

Reference Books:

1. High Voltage Engineering: C.L. Wadhwa
2. High Voltage Engineering: M S Naidu
3. Online Resources suggested by the respective Course Teacher

High Voltage Engineering Sessional

Course Code: EEE 4*24	**Contact Hours/Week:** 2 Hours
Course Title: High Voltage Engineering Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: The purpose of the laboratory experiment is to understand the breakdown mechanism of solid, liquid and gas, and testing of high voltage equipment. It enables the students to gain sufficient knowledge on the use of high voltage components in power system.

Course Contents: Sessional based on the theory of course EEE 4*23. Course content of EEE 4*23 is as follows:Ionization and decay process: Townsend's first and second ionization coefficient. Electric breakdown in gases. Townsend's criterion for spark breakdown. Sparking potential. Penning effect. Corona discharges, power loss calculation. Breakdown of solid and liquid dielectrics. Generation of high voltage: Alternating voltage, transformer cascade. Series resonant circuit for high voltage ac testing. Test of dc and ac cable. Transient Voltage: Impulse wave shape. Impulse voltage generator and its mathematical analysis. Design consideration of impulse generators. Triggering of impulse generators. DC voltage doubler and cascade circuits. Electrostatic generator, voltage stabilization. Measurement of high voltage: Electrostatic voltmeter, sphere gap. Potential divider. High Voltage testing of power system equipment: Oil testing. Design consideration of transmission line based on direct stroke. High voltage transient in transmission line. High voltage lightning arrester. Insulation co-ordination.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Examinethe performance of high voltage components to design cost effective system.								A2				
CLO2	Verifythe most suitable method for high voltage generation.							A5					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Respond)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test
CLO2	Affective (Characterization by value)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☑ Lab test

Renewable Energy

Course Code: EEE 4*25	**Contact Hours/Week:** 3 Hours
Course Title: Renewable Energy	**Credits:** 3.00

Pre-requisite: None

Rationale: Renewable energy is currently one of the most important topics to both scientists and engineers. This course will prepare a student with necessary knowledge about the sources

of renewable energy, associated technology for energy conversion, and most suitable conditions for different geographical locations. Power electronic devices, different controllers and different communication schemes are integral part of this course. So students will know more about the real life application of different devices & technologies during the process of energy conversion. For higher studies or even in the job field renewable energy is becoming a matter of great importance with great possibilities.

Course Contents: Importance of renewable energy, sources. Statistics regarding solar radiation and wind speed. Insulation: geographical distribution, atmospheric factors, measurements. Solar cell: principle of operation, spectral response, factors affecting conversion efficiency, I-V characteristics, maximum power output. PV modules and arrays: stationary and tracking. PV systems: stand alone, battery storage, inverter interfaces with grid. Wind turbine generators: types, operational characteristics, cut-in and cut-out speed, control, grid interfacings, AC-DC-AC link. Wind and Tidal energy conversion.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss the necessity of renewable energy.							C2					
CLO2	Seek futuristic solutions of energy problem through green/ alternative energy.												A3
CLO3	Evaluate existing models for energy conversion from renewable sources.						C5						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Affective (Value)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO3	Cognitive (Evaluate)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Stabilization of a Grid Connected Wind Form by Using SMES: Md. Rafiqul Islam Sheikh
2. Power Converters for Medium Voltage Networks: Md. Rabiul Islam et. al
3. Renewable and Efficient Electric Power System: Gilbert M. Masters
4. Online Resources suggested by the respective Course Teacher

Renewable Energy Sessional

Course Code: EEE 4*26	**Contact Hours/Week:** 2 Hours
Course Title: Renewable Energy Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course will introduce the students to small scale projects implementing devices for renewable energy. Simulations of different energy sources will be conducted in order to provide guidelines for future research possibilities. This course will combine power electronic devices such as dc-dc converters with different energy conversion technologies and controllers. It will develop a more practical and implementation related skills which will guide the students to pursue their career in industries or in the research areas of power electronics, control engineering or any of the renewable energy sources.

Course Contents: Sessional based on the theory of course EEE 4*25. Course content of EEE 4*25 is as follows:Importance of renewable energy, sources. Statistics regarding solar

radiation and wind speed. Insulation: geographical distribution, atmospheric factors, measurements. Solar cell: principle of operation, spectral response, factors affecting conversion efficiency, I-V characteristics, maximum power output. PV modules and arrays: stationary and tracking. PV systems: stand alone, battery storage, inverter interfaces with grid. Wind turbine generators: types, operational characteristics, cut-in and cut-out speed, control, grid interfacings, AC-DC-AC link. Wind and Tidal energy conversion.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Develop mini projects (prepare data, budget estimation of projects, seek aid from others) using renewable energy sources.										A1		
CLO2	Propose models for power generation using renewable energy sources for the development of mankind.							C6					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Receive)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☑ Project Demonstration ☐ Lab test

CLO2	Cognitive (Create)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

19.2.3. Elective III

Embedded System Design

Course Code: EEE 4209	**Contact Hours/Week:** 3 Hours
Course Title: Embedded System Design	**Credits:** 3.00

Pre-requisite: EEE 3209- Microprocessor, Interfacing & System Design

Rationale: The motive for this course is to show students the essentials of embedded systems and its real time applications. The students will be able to know about the evolution, architecture and addressing of different processors. The students will also learn about the difference between ADC and DAC, how to perform embedded software development and how to examine embedded systems using Microcontrollers, PLC, and FPGA.

Course Contents: Embedded Processing – Evolution, Issues and Challenges: System and Processor Architecture: von Neumann, Harvard and their variants; Memory Architecture and Devices: Input-Output Devices and Mechanisms; Instruction Set and Addressing Modes: Interfacing of Memory and Peripherals Devices – Functional and Timing Issues; Application Specific Logic Design using Field Programmable Devices and ASICs; Analog to Digital (ADC) Converters and Digital to Analog (DAC) Converters; Bus I/O and Networking Considerations; Bus and Wireless Protocols; Embedded Systems Software: Constraints and Performance Targets; Real-time Operating Systems: Introduction, Scheduling in Real-time Operating Systems; Memory I/O Management: Device Drivers; Embedded Software Development: Flow, Environments and Tools, System Specification and Modelling, Programming Paradigms, System Verification; Performance Analysis and Optimization: Speed, Power and Area Optimization; Testing of Embedded Systems System Design Examples using Microcontrollers, PLC, and FPGA.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the basics of processor architecture, peripheral devices, buses and converters.		C2										
CLO2	Design programs to run embedded						C6						

	systems according to necessity.												
CLO3	Develop the performance of fully functional embedded systems (software & hardware).												A1

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Create)	☑ Lecture ☑ Tutorial ☐ Discussion ☑ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Embedded Systems Design: Steve Heath
2. Embedded Systems Architecture, Programming & Design: Raj Kamal
3. Online Resources suggested by the respective Course Teacher

Embedded System Design Sessional

Course Code: EEE 4210	**Contact Hours/Week:** 2 Hours
Course Title: Embedded System Design Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the embedded system. The purpose of this sessional course is to analyze different processors using computer aided tools. The students will learn about the real time applications of embedded systems based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 4209. Course content of EEE 4209 is as follows: Embedded Processing – Evolution, Issues and Challenges: System and Processor Architecture: von Neumann, Harvard and their variants; Memory Architecture and Devices: Input-Output Devices and Mechanisms; Instruction Set and Addressing Modes: Interfacing of Memory and Peripherals Devices – Functional and Timing Issues; Application Specific Logic Design using Field Programmable Devices and ASICs; Analog to Digital (ADC) Converters and Digital to Analog (DAC) Converters; Bus I/O and Networking Considerations; Bus and Wireless Protocols; Embedded Systems Software: Constraints and Performance Targets; Real-time Operating Systems: Introduction, Scheduling in Real-time Operating Systems; Memory I/O Management: Device Drivers; Embedded Software Development: Flow, Environments and Tools, System Specification and Modelling, Programming Paradigms, System Verification; Performance Analysis and Optimization: Speed, Power and Area Optimization; Testing of Embedded Systems System Design Examples using Microcontrollers, PLC, and FPGA.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Formulate appropriate computing solution for Embedded system applications.					P4							
CLO2	Develop a mini project for a specified application by working in groups.										A1		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Articulation)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Affective (Receive)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☑ Project Demonstration ☐ Lab test

VLSI Design

Course Code: EEE 4231	**Contact Hours/Week:** 3 Hours
Course Title: VLSI Design	**Credits:** 3.00

Pre-requisite: EEE 1203-Electronics I, EEE 2103-Electronics II

Rationale: The purpose of this course is to know the fundamental knowledge about microelectronics and MOS technology, scaling of MOS circuit with different practical applications. After studying this course, students will be able to analyze various design on ALU system, CMOS technology, VHDL concept, etc.

Course Contents: Introduction to Microelectronics and MOS Technology, Basic Electrical Properties and Circuit Design Processes of MOS and Bi CMOS Circuits, Inverter Circuits, Sub-System Design Processes and Layout, Scaling of MOS Circuits: Scaling Models and Scaling Factors, Limitation of Scaling. Computational Elements: Design of an ALU Sub-System, Adder, Multipliers, Memory Registers, Dynamic & Static Flip-Flops, Bus Arbitration and Aspects of System Timing. CMOS Fabrication, Practical Aspects of Design Tools and Test-Ability CMOS Design, Behavioral Description, Structural Description, Physical Description and Design Verification. Introduction to Ga-As Technology: Ultra-Fast Circuits and Systems. VHDL background and basic concepts, structural specifications of hardware design organization and parameterization.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss about microelectronics and MOS technology with basic electrical properties and circuit design procedure.							C2					
CLO2	Understand basic design of ALU system, flip-flops and application			C2									
CLO3	Analyze CMOS design, CMOS fabrication, and VHDL that consisting of d concept with different application.						C4						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation

		☐ Audio/Video ☐ Others	☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Basic VLSI Design: Douglas A. Pucknell
2. Principles of CMOS VLSI Design: Neil H. E. Weste& Kamran Eshraghian
3. Digital Integrated Circuit Design: Hubert Kaeslin
4. CMOS Circuit Design, Layout, and Simulation: R. Jacob Baker
5. Online Resources suggested by the respective Course Teacher

VLSI Design Sessional

Course Code: EEE 4232	**Contact Hours/Week:** 2 Hours
Course Title: VLSI Design Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to teach about fundamental concepts of MOS technology, various CMOS design, through software experimental work in the laboratory.

Course Contents: Sessional based on the theory of course EEE 4231. Course content of EEE 4231 is as follows:Introduction to Microelectronics and MOS Technology, Basic Electrical Properties and Circuit Design Processes of MOS and Bi CMOS Circuits, Inverter Circuits, Sub-System Design Processes and Layout, Scaling of MOS Circuits: Scaling Models and Scaling Factors, Limitation of Scaling. Computational Elements: Design of an ALU Sub-System, Adder, Multipliers, Memory Registers, Dynamic & Static Flip-Flops, Bus Arbitration and Aspects of System Timing. CMOS Fabrication, Practical Aspects of Design Tools and Test-Ability CMOS Design, Behavioral Description, Structural Description, Physical Description and Design Verification. Introduction to Ga-As Technology: Ultra-Fast Circuits and Systems. VHDL background and basic concepts, structural specifications of hardware design organization and parameterization.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Inspect different types of CMOS design through laboratory software experimental work.				C4								
CLO2	Build different CMOS circuit in software simulation					P2							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Analyze)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Psychomotor (Manipulation)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Microwave Engineering

Course Code: EEE 4243	**Contact Hours/Week:** 3 Hours
Course Title: Microwave Engineering	**Credits:** 3.00

Pre-requisite: EEE 3107-Electromagnetic Fields & Waves

Rationale: The aim of this course is to provide the foundation for microwave theory and techniques. Passive and active devices commonly utilized in microwave subsystems are analyzed and studied. Scattering parameters are defined and used to characterize devices and

system behavior. Learning microwave theory and techniques will open up for better understanding of interesting phenomena, such as resonances, coupling effects, and electromagnetic wave propagation. Design procedures are presented along with methods to evaluate device performance.

Course Contents: UHF Transmission Lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, smith chart, impedance matching and lossy transmission lines.Microwave Components: Cavities, Slow wave structures, Waveguide Tees, Directional Couplers, Circulators and Isolators, S-parameter.Microwave Tubes: Klystron amplifier, Multicavity klystron amplifier, Reflex Klystron oscillator, Magnetron, TWT amplifier, BWO.Semiconductor Microwave Devices: Tunnel diodes, Gunn-Effect diodes, IMPATT diodes. Microwave measurements.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss the fundamental concept about the use of microwave in transmission lines.						C2						
CLO2	Apply different methods to determine circuit properties for passive/active microwave devices.		C3										
CLO3	Analyze the performance characteristics of a microwave circuit or system using Computer-Aided Design (CAD) methods.					C4							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Microwave Devices and Circuits: Samuel Y Liao
2. Microwave Engineering: Nasar
3. Online Resources suggested by the respective Course Teacher

Microwave Engineering Sessional

Course Code: EEE 4244	**Contact Hours/Week:** 2 Hours
Course Title: Microwave Engineering Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: The motive of the course is to help participants gain practical experience in designing a basic passive microwave circuit, using modern CAD tools, and experimentally verify the design with modern microwave vector network analyzers. Microwave Computer-Aided Design (CAD) methods are introduced by means of laboratory exercises. Project work serves to develop student engineering design and report writing skills.

Course Contents: Sessional based on the theory of course EEE 4243. Course content of EEE 4243 is as follows: UHF Transmission Lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, smith chart, impedance matching and lossy transmission lines.Microwave Components: Cavities, Slow wave structures, Waveguide Tees, Directional Couplers, Circulators and Isolators, S-parameter.Microwave Tubes: Klystron amplifier, Multicavity klystron amplifier, Reflex Klystron oscillator, Magnetron, TWT amplifier, BWO.Semiconductor Microwave Devices: Tunnel diodes, Gunn-Effect diodes, IMPATT diodes. Microwave measurements.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Justify the properties of microwave signal along with their application with appropriate microwave bench setup.						C5						
CLO2	Examinedifferent microwave system models and their characteristics using hardware and computer aided design methods to find the scopes for future development.												A2

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ Level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Evaluate)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

CLO2	Affective (Respond)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☑Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

19.3 Related Engineering Courses:

Computer Programming

Course Code: CSE 1111	**Contact Hours/Week:** 3 Hours
Course Title: Computer Programming	**Credits:** 3.00

Pre-requisite: None

Rationale: The programming course covers a comprehensive introduction to a structured programming language, emphasizing transportability and clear the pathway towards the problem-solving skills. To introduce the fundamental principles, mechanism of programming skills and develop basic programming knowledge to program design and development. This course assists students in developing abilities to address real-world community issues.

Course Content: Introduction to digital computers. Programming languages, algorithms and flow charts. Structured programming using C: Variables and constants, operators, expressions, control statements, functions, array, pointer, structure union, user defined data types, input-output files. Object oriented programming using C++: Introduction, classes and objects; polymorphism; function and operator overloading; inheritance.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Recognize the Fundamentals of computer programming with C.	C1											
CLO2	Illustrate the concept of various tokens and different data types operators, conditional and iterative statements and their applications.		C4										

CL03	Develop programming skills in order to design system for ethical application.								A1				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Analyze)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Programming in ANSI C: E Balagurusamy
2. Teach Yourself: HarbertSchield
3. Online Resources suggested by the respective Course Teacher

Computer Programming Sessional

Course Code: CSE 1112	**Contact Hours/Week:** 2 Hours
Course Title: Computer Programming Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: Computer programming has evolved into one of the most efficient and effective methods of solving mathematical and engineering problems. Students majoring in Computer Science & Engineering must improve their skills in designing efficient algorithms as well as developing and evaluating computer programs. This course is essential for enhancing problem-solving and problem-analysis skills.

Course Content: Sessional based on the theory of course CSE 1111. Course content of CSE 1111 is as follows: Introduction to digital computers. Programming languages, algorithms and flow charts. Structured programming using C: Variables and constants, operators, expressions, control statements, functions, array, pointer, structure union, user defined data types, input-output files. Object oriented programming using C++: Introduction, classes and objects; polymorphism; function and operator overloading; inheritance.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Analyze the fundamental principles, typical characteristics and mechanisms of a structured programming language.				C4								
CLO2	Implement practical knowledge of basic programming to develop useful applications.					P2							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Analyze)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

CLO2	Psychomotor (Manipulation)	☐ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☑ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☑ Project Demonstration ☑ Lab test

Basic Mechanical Engineering

Course Code: ME 2251	**Contact Hours/Week:** 3 Hours
Course Title: Basic Mechanical Engineering	**Credits:** 3.00

Pre-requisite: None

Rationale: This course is important to know the fundamental knowledge of Mechanical Engineering and explain the performance of mechanical accessories. After studying this course, the students will be able to explain the operation of mechanical devices such as turbine which are the fundamentals for a mechanical engineer.

Course Contents: Study of fuels. Steam generation units with accessories and mountings. Study of steam generation and steam turbines. Introduction to internal combustion engines and their cycles. Study of SI and CI engines and gas turbines with their accessories. Refrigeration and air conditioning with their application. Refrigeration equipment: compressors, condensers and evaporators.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.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO1	PLO1	PLO1
CLO1	Explain the operation of refrigerator, air conditioner, and various types of turbine.	C2											
CLO2	Understand about the fundamental knowledge of						C2						

	Mechanical Engineering needed for electrical engineers.												
CLO3	Inspect different types of fuel and engine for green environment & sustainable development.							C4					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Thermal Engineering: R. S. Khurmi
2. Online Resources suggested by the respective Course Teacher

19.4. General Education (GED) Courses:

19.4.1. Basic Science Courses:

Electricity, Optics, Waves & Modern Physics

Course Code: Phy 1111 **Course Title:** Electricity, Optics, Waves & Modern Physics	**Contact Hours/Week:** 3 Hours **Credits:** 3.00

Pre-requisite: None

Rationale: The importance of studying Physics is very profound in every engineering subject because physics strengthens quantitative reasoning and problem-solving skills. This course is designed to understand core concepts of electromagnetism, waves and oscillations, and modern physics. This basic physics course will help the students to learn how to analyze complex problems.

Course Contents: Electrostatics: Electric dipole, field due to a dipole, Gauss's law and its application. Electromagnetic Induction: Faraday's law, Ampere's law, Biot-Savart's law, motional e.m.f.; self and mutual inductance, galvanometers- moving coil, ballistic and deadbeat types. Waves and Oscillations: Oscillations: Simple Harmonic Motion, Transverse and Longitudinal nature of waves: Travelling and Standing waves. Intensity of a wave. Sound waves: Propagation and speed of sound in fluid and solid media, Doppler's effect; Infrasonic and Ultrasonic.Thermodynamics: Zeroth law of Thermodynamics, First law of thermodynamics, work done during adiabatic and isothermal processes, Second law of thermodynamics, Carnot's cycle, Carnot's engine, thermionic emission, entropy changes in reversible and an irreversible process. Optics: Theories of light: Huygens's principle and construction. Interference of light. Young's double slit experiment, Fresnel bi-prism, Newton's ring, Interferometers. Diffraction of light: Fresnel and fraunhofer diffraction, Diffraction by single and double slit, diffraction gratings. Polarization: Production and analysis of polarized light, Optical activity, Optics of crystalsAtom models: Rutherford atom model, Bohr atom model, Particle properties of waves: Photoelectric effect, Einstein's photoelectric equation, Laws of photoelectric emission, Compton Effect, Quantum effect: de Broglie wavesRadioactivity: introduction to radioactivity, characteristics of alpha, beta particles and gamma rays, Laws of radioactive disintegration, Half-life, mean life, practical application of radioactivity. Nuclear energy: Fission and fusion process, mass distribution, energy distribution, chain reaction, binding energy, nuclear force, nuclear reactor. Semiconducting physics: Band theory, Semiconducting materials, p-type and n-type materials, semiconductor devices.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Explain different types of laws and phenomenon based on electromagnetism, waves and vibration, optics and modern physics.	C2											
CLO2	Derive different types of equations of electromagnetism, waves and vibration, optics and modern physics.		C4										
CLO3	Solve different types of problems related to electromagnetism, waves and vibration, optics and modern physics.			C3									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☐ Discussion ☐ Interaction ☐ Audio/Video	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

		☐ Others	
CLO2	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☐ Discussion ☑ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Electricity and Magnetism: R. Murugeshan
2. Vibrations and Waves: S.P. Puri
3. Concepts of Modern Physics: AurtherBeiser
4. Nuclear Physics: Irving Kaplan
5. Basic Electronics and Linear Circuits: Bhargava, K. Gupta
6. Online Resources suggested by the respective Course Teacher

Electricity, Optics, Waves & Modern PhysicsSessional

Course Code: Phy 1112	**Contact Hours/Week:** 2 Hours
Course Title: Electricity, Optics, Waves & Modern Physics Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is designed to provide students with fundamental concepts of measuring the value of galvanometer constant, the value of g by compound pendulum, mutual inductance of two coils, characteristics of different basic semiconductor devices.

Course Contents: Sessional based on the theory of course Phy 1111. Course content of Phy 1111 is as follows: Electrostatics: Electric dipole, field due to a dipole, Gauss's law and its application. Electromagnetic Induction: Faraday's law, Ampere's law, Biot-Savart's law, motional e.m.f.; self and mutual inductance, galvanometers- moving coil, ballistic and deadbeat types. Waves and Oscillations: Oscillations: Simple Harmonic Motion, Transverse and Longitudinal nature of waves: Travelling and Standing waves. Intensity of a wave. Sound waves: Propagation and speed of sound in fluid and solid media, Doppler's effect; Infrasonic and Ultrasonic.Thermodynamics: Zeroth law of Thermodynamics, First law of thermodynamics, work done during adiabatic and isothermal processes, Second law of

thermodynamics, Carnot's cycle, Carnot's engine, thermionic emission, entropy changes in reversible and an irreversible process. Optics: Theories of light: Huygens's principle and construction. Interference of light. Young's double slit experiment, Fresnel bi-prism, Newton's ring, Interferometers. Diffraction of light: Fresnel and fraunhofer diffraction, Diffraction by single and double slit, diffraction gratings. Polarization: Production and analysis of polarized light, Optical activity, Optics of crystalsAtom models: Rutherford atom model, Bohr atom model, Particle properties of waves: Photoelectric effect, Einstein's photoelectric equation, Laws of photoelectric emission, Compton Effect, Quantum effect: de Broglie wavesRadioactivity: introduction to radioactivity, characteristics of alpha, beta particles and gamma rays, Laws of radioactive disintegration, Half-life, mean life, practical application of radioactivity. Nuclear energy: Fission and fusion process, mass distribution, energy distribution, chain reaction, binding energy, nuclear force, nuclear reactor. Semiconducting physics: Band theory, Semiconducting materials, p-type and n-type materials, semiconductor devices.

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Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the working mechanism of different devices like galvanometer, diode, transistor and use them in experiments.				C2								
CLO2	Perform different experiments to determine the value of g, galvanometer constant, mutual inductance and characteristics of diode, transistor etc.					P2							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

Physical & Inorganic Chemistry

Course Code: Chem 1211	**Contact Hours/Week:** 3 Hours
Course Title: Physical & Inorganic Chemistry	**Credits:** 3.00

Pre-requisite: None

Rationale: This course is important to know the fundamental knowledge of chemical bonds and evaluate the performance of acid-base titration. After studying this course, the students will be able to analyze different theorems and solutions which are the fundamentals for a chemical engineer.

Course Contents: Different types of chemical bonds and their properties. Modern concepts of acids and bases. Problems involving acid base titration. Properties and uses of noble gases. Electrochemistry, Mechanism of electrolytic conduction, Transport number, Kohl-Rausch's law. Ionization of water and concept of pH. Different types of cells, Cell e.m.f. Single electrode potentials, their determination and application. Secondary Cells or Accumulators, lead accumulator and alkaline accumulator. Different types of solutions. Factors influencing the solubility of a substance, solution of gas in liquids. Colligative properties of dilute solution. Le-chatelier's theorem and some of its important industrial applications. Thermochemistry, chemical kinetics.Inorganic Thermodynamics and Energetic**:** Bond energy terms, enthalpy, entropy, and thermodynamics of the formation of ionic and covalent compounds. The driving force of a reaction, lattice energy, Born-Haber cycle, energy of hydration, energy change of the solution process, ionization energies, electronegativity, electron affinity. Nuclear Chemistry:Radioactivity, patterns of nuclear stability, nuclear transmutations, rates of radioactive decay, detection of radioactivity, energy changes in nuclear reactions, nuclear fission, nuclear fusion, isotopes, isobar, isomers, methods of separation of isotopes, applications of radioisotopes, biological effects of radiation.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the basic knowledge of chemical bonds and their properties	C2											
CLO2	Discuss about different types of law, titration, and ionization process ensure human safety.						A2						
CLO3	Explain the operation of different types of cells and solution		C2										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Affective (Respond)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

CLO3	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Modern Inorganic Chemistry: R. D. Madan
2. Principles of Physical Chemistry: M. M. Haque and M. A. Nawab
3. Fundamental Concepts in Inorganic Chemistry: Esmarch S. Gilreath
4. Physical Chemistry: G. M. Barrow
5. Online Resources suggested by the respective Course Teacher

Physical & Inorganic Chemistry Sessional

Course Code: Chem 1212 **Course Title:** Physical & Inorganic Chemistry Sessional	**Contact Hours/Week:** 2 Hours **Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with different types of solution and cells and give them experimental skills. The purpose of the laboratory experiments is to verify the performance of titration and solution. It enables the students to gain sufficient knowledge on the use of laboratory equipment for different experiment.

Course Contents:

Sessional based on the theory of course Chem 1211. Course content of Chem 1211 is as follows:

Different types of chemical bonds and their properties. Modern concepts of acids and bases. Problems involving acid base titration. Properties and uses of noble gases. Electrochemistry, Mechanism of electrolytic conduction, Transport number, Kohl-Rausch's law. Ionization of water and concept of pH. Different types of cells, Cell e.m.f. Single electrode potentials, their determination and application. Secondary Cells or Accumulators, lead accumulator and alkaline accumulator. Different types of solutions. Factors influencing the solubility of a substance, solution of gas in liquids. Colligative properties of dilute solution. Le-chatelier's theorem and some of its important industrial applications. Thermochemistry, chemical kinetics.Inorganic Thermodynamics and Energetic**:** Bond energy terms, enthalpy, entropy, and thermodynamics of the formation of ionic and covalent compounds. The driving force of a reaction, lattice energy, Born-Haber cycle, energy of hydration, energy change of the solution process, ionization energies, electronegativity, electron affinity. Nuclear Chemistry:Radioactivity, patterns of nuclear stability, nuclear transmutations, rates of

radioactive decay, detection of radioactivity, energy changes in nuclear reactions, nuclear fission, nuclear fusion, isotopes, isobar, isomers, methods of separation of isotopes, applications of radioisotopes, biological effects of radiation.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Build different types of solution including liquid and gases.					P2							
CLO2	Verify the performance of different acid-base titration and cells for various environment friendly applications.							A5					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Psychomotor (Manipulation)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Affective (Characterization by value)	☑ Lab Experiments ☐ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☑ Presentation ☐ Project Demonstration ☐ Lab test

Calculus & Complex Variable

Course Code: Math 1101	**Contact Hours/Week:** 3 Hours
Course Title: Calculus & Complex Variable	**Credits:** 3.00

Pre-requisite: None

Rationale: To provide the basic concepts of differential and integral calculus and complex variable.

Course Contents: Functions: Domain, Range, Inverse function and graphs of functions, Composition of function, Limits, Continuity, Indeterminate form.Ordinary Differentiation: Differentiability, Differentiation, Successive differentiation and Leibnitz theorem. Expansions of Functions: Rolle's Theorem, Mean value theorem, Taylor's and Maclaurin's formulae. Maximum and minimum of functions of one variable. Partial Differentiation: Euler's theorem, Tangents and normal, Asymptotes.Indefinite Integrals: Method of substitution, Integration by parts, Special trigonometric functions and rational fractions.Definite Integrals: Fundamental theorem, General properties, Evaluations of definite integrals and reduction formulas. Multiple Integrals: Determination of lengths, Areas and Volumes.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**.**

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Define the basic terms of calculus and complex variable.	C1											
CLO2	Understand the basic concept of calculus and complex variable.		C2										
CLO3	Apply the concepts of calculus and complex variable to real world phenomena.			C3									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy

CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☐ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑Tutorial ☐ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Functions of One Complex Variable: J. B. Conway
2. Complex Analysis: L. V. Ahlfors
3. Differential Calculus and Integral Calculus: Das and Mukherji
4. Differential Calculus: J. Edwards
5. Online Resources suggested by the respective Course Teacher

Algebra, Co-ordinate Geometry & Vector Analysis

Course Code: Math 1201	**Contact Hours/Week:** 3 Hours
Course Title: Algebra, Co-ordinate Geometry & Vector Analysis	**Credits:** 3.00

Pre-requisite: None

Rationale: This course will introduce the fundamentals of algebra, vector analysis and co-ordinate geometry for engineering fields.

Course Contents: Algebra: Algebra of sets, De Morgan's rule, relation & function. Determinants: Properties and Cramer's rule, Theory of Equations: Theorem, Relation between roots and coefficients. Solution of cubic equations, De Moiver's theorem: Deduction from De Moiver's theorem, Functions of complex arguments. Gregory's series. Summation of series. Hyperbolic functions. Vector Analysis: Addition and subtraction of vectors, scalar and vector product of two vectors, Differentiation and integration of vectors, line, surface and volume

integrals. Gradient of a scalar function, divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Conservative systems. Gauss's divergence theorem, Stoke's theorem and Green's theorem, and their applications in engineering problems. Co-ordinate Geometry: Co-ordinate Geometry of two dimension-Change of axis, Transformation of co-ordinates, simplification of equations of curves. Co-ordinate Geometry of three-dimension System of co-ordinates, distance between two points, section formula, projection, direction cosines, equations of planes and lines.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Describe the physical explanation of different algebraic and vector notation.		C2										
CLO2	Apply differentiation and integration on vector valued functions.	C3											
CLO3	Calculate length, volume and area of objects related to engineering study by using vector.			C3									
CLO4	Understand the basic concept of two-dimensional and three-dimensional geometry.				C2								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO4	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Vector Analysis: Dr. Muhammad AbdusSattar
2. Vector Analysis: Murray R Spiegel
3. A text Book on Co-ordinate Geometry (Two and Three Dimensions) with vector analysis: Rahman &Bhattacharjee
4. Higher Algebra: Abdur Rahman
5. Online Resources suggested by the respective Course Teacher

Linear Algebra, Matrices & Differential Equations

Course Code: Math 2101	**Contact Hours/Week:** 3 Hours
Course Title: Linear Algebra, Matrices & Differential Equations	**Credits:** 3.00

Pre-requisite: None

Rationale: To provide knowledge of formation, classification, order and application of Linear Algebra, Differential Equation and also give the fundamental knowledge of matrices.

Course Contents: Linear Algebra: Vector space, subspace, sum and direct sum. Linear dependence and independence, basis and dimension. Range, kernel, nullity, rank, singular and non-singular transformations. Matrix representation of a linear operator. Change of basis, similarity. Matrices and linear mappings.Matrices: Definition, equality, addition, subtraction, multiplication, transposition, inversion, rank. Vector space and linear transformations. Eigen

values and eigen vectors. Application of eigen values to systems of differential equations.Differential Equation: Degree and order of ordinary differential equations. Solution of first order differential equations by various methods. Solutions of linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations. Solution of higher order differential equations in absence of dependent/independent variables. Series solutions of differential equations, the Frobenius method.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss different types of differential equations,linear algebraic expression and the concept of matrices	C2											
CLO2	Solve different types of algebraic problem and differential equations		C3										
CLO3	Analyze the engineering problems by differential equation methods			C4									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

		☐ Others	
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Differential Equations: S. L. Ross
2. Differential Equations: H. T. H. Piaggio
3. Ordinary and Partial Differential Equations: RaiSinghania
4. Theory of Matrices: C. C. Mcduffe
5. Linear Algebra: S. Lipschutz
6. Online Resources suggested by the respective Course Teacher

Transform Methods & Statistical Analysis

Course Code: Math 2201	**Contact Hours/Week:** 3 Hours
Course Title: Transform Methods & Statistical Analysis	**Credits:** 3.00

Pre-requisite: None

Rationale: The course will introduce the fundamentals of Fourier analysis; Laplace transform and complex variables for engineering and applied science streams.

Course Contents: 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. Harmonics:

Solutions of Laplace's equation, Rectangular, Cylindrical and Spherical harmonics.Statistical Analysis: Frequency and relative frequency. Probability, sample space, probability of finite space. Random variable. Measure of central tendency. Mean, Media, Mode, Quartile deviation, Mean Absolute Deviation. Measures of dispersion; Variance, Covariance; Standard deviation. Probability density function. Continuous and discrete distribution. Ensemble and Exsemble average of stochastic process. Equivalent distribution. Correlation and regression analysis. Normal probability distribution. probability equation and its derivatives. Normal curve and its properties. Probability integral and it's evaluation by ascending and descending power series. Different discrete distribution; control limit. Laplace De Moiver's theorem. Law of large number, Poisson's law. Theory of errors and Gaussian law of errors; Arithmetic mean, weighted mean. Most probable value, measures of precision. Mean square error, probable error and average error. Rejection of observation, confidence limit.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Define the basic knowledge of Fourier Series, Laplace Transform and statistical analysis.	C1											
CLO2	Understand the basic concept of Fourier Series, Laplace Transformation and complex variable.		C2										
CLO3	Apply the concepts of Fourier Series, Laplace Transformation and statistical analysis to real world phenomena.			C3									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. An Introduction to Laplace Transforms and Fourier Series: P. P. G. Dyke
2. The Laplace Transform: Theory and Applications: Joel L. Schiff
3. An Introduction to the Theory of Statistics: RaiSinghania
4. Online Resources suggested by the respective Course Teacher

Numerical Analysis

Course Code: Math 3101	**Contact Hours/Week:** 3 Hours
Course Title: Numerical Analysis	**Credits:** 3.00

Pre-requisite: None

Rationale: The course will introduce the fundamentals of Fourier analysis and Laplace transform for engineering and applied science streams.

Course Contents: Floating-point arithmetic: Floating-point representations, General properties, IEEE-754, 32-bit and 64-bit formats, Denormalized numbers, NaNs and other special values, Floating-point exception handling, CRAY, Rounding methods, Floating-point

operations (+, -, X, /), Catastrophic cancellation due to subtraction; introduction to the concept of condition number

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors. Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.

Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss –Seidel, The Matrix Inverse, Error Analysis and System Condition.Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Curve Fitting with sinusoidal Functions. Numerical Differentiation and Integration: The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data. Finite-difference methods for ordinary differential equations: Solution of linear, homogeneous difference equations with constant coefficients, Survey of methods for deriving finite-difference algorithms, Stability analysis of finite-difference methods: Euler, backward Euler, Midpoint, Trapezoidal, Midpoint-trapezoidal predictor-corrector, Runge-Kutta methods, Adams-Moulton methods, Adams-Bashforth methods. Methods for stiff equations: Backward Euler, Gear's methods. Methods for linear systems of ODEs in which the coefficient matrix has purely imaginary eigenvalues, Finite-difference methods as digital filters: Transfer-function analysis, Boundary-value problems for ODEs. Numerical Solutions of Ordinary Differential Equations: Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods, Adaptive Runge-Kutta Methods. Pseudorandom-number generators, the FFT.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the basic knowledge of Numerical Analysis.	C2											
CLO2	Apply numerical Analysis in electrical circuits and communication system.		C3										

CLO3	Analyze engineering problems with fundamental engineering transformation techniques like Numerical Analysis.			C4									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Numerical Analysis: S. S. Shastry
2. The Laplace Transform: Theory and Applications: Chapman
3. Online Resources suggested by the respective Course Teacher

Numerical Analysis Sessional

Course Code: Math 3102	**Contact Hours/Week:** 2 Hours
Course Title: Numerical Analysis Sessional	**Credit:** 1.00

Pre-requisite: None

Rationale: This course is important to make the students familiar with the numerical analysis. The purpose of this sessional course is to analyze different types of complex problems. The students will be able to solve the complex system by computational method based on the acquired knowledge in this course.

Course Contents: Sessional based on the theory of course EEE 3101. Course content of EEE 3101 is as follows:Floating-point arithmetic: Floating-point representations, General properties, IEEE-754, 32-bit and 64-bit formats, Denormalized numbers, NaNs and other special values, Floating-point exception handling, CRAY, Rounding methods, Floating-point operations (+, -, X, /), Catastrophic cancellation due to subtraction; introduction to the concept of condition number.Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors.Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss –Seidel, The Matrix Inverse, Error Analysis and System Condition.Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Curve Fitting with sinusoidal Functions.Numerical Differentiation and Integration: The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data.Finite-difference methods for ordinary differential equations: Solution of linear, homogeneous difference equations with constant coefficients, Survey of methods for deriving finite-difference algorithms, Stability analysis of finite-difference methods: Euler, backward Euler, Midpoint, Trapezoidal, Midpoint-trapezoidal predictor-corrector, Runge-Kutta methods, Adams-Moulton methods, Adams-Bashforth methods. Methods for stiff equations: Backward Euler, Gear's methods. Methods for linear systems of ODEs in which the coefficient matrix has purely imaginary eigenvalues, Finite-difference methods as digital filters: Transfer-function analysis, Boundary-value problems for ODEs**.** Numerical Solutions of Ordinary Differential Equations: Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods, Adaptive Runge-Kutta Methods. Pseudorandom-number generators, the FFT.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Analyze different types of complex problems.				C3								

CLO2	Solve numerical problems by computational method.					P4							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Analyze)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☑ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test
CLO2	Psychomotor (Articulation)	☑ Lab Experiments ☑ Simulation/Emulation ☑ Lab Demonstration ☐ Mini-Project ☐ Audio/Video ☐ Others	☐ Quiz ☑ Lab Viva ☑ Lab Report ☐ Presentation ☐ Project Demonstration ☑ Lab test

19.4.2. Arts, Humanities & Social Science Courses:

বাংলাভাষা ও সাহিত্য

Course Code: Ban 1111 **(**BAN 0232)	**Contact Hours/Week:** 4 Hours
Course Title: Introduction to Bengali Language & Literature (বাংলাভাষা ও সাহিত্য)	**Credits:** 4.00

Pre-requisite: None

Rationale:সাহিত্য হলোমানবমনেরবহুবর্ণিলপ্রকাশ। আমরাবাঙালি, আমাদেররাষ্ট্রভাষাবাংলা। অসংখ্য তাজাপ্রাণ ও রক্তের বিনিময়েএকমাত্রবাঙালিকেইরক্ষাকরতেহয়েছেতাদেরনিজভাষার সম্মান। আজ এ ভাষাঅর্জনকরেছেআন্তর্জাতিকমাতৃভাষার স্বীকৃতি। ধ্বনিপরিচয় থেকে শুরুকরেব্যবহারিকবাংলাসহসাহিত্যেরনানাবিধপঠনপাঠনেরবিষয়েআলোকপাতেরমাধ্যমে
শিক্ষার্থীকেমানবজীবনেরসামাজিক, রাজনৈতিক, মানবিকজ্ঞান দানকরা সম্ভব। বাংলাভাষা ও সাহিত্যেরজ্ঞান অর্জনের মধ্য দিয়েবাঙালিরআদি থেকে শুরুকরেবর্তমানকালপর্যন্তটিকে থাকারজন্য নানা আন্দোলন-সংগ্রাম ও গৌরবগাথা যেমনরাষ্ট্রভাষা আন্দোলন, শিক্ষা আন্দোলন, ছয় দফা আন্দোলন, গণ-আন্দোলন ও মুক্তিযুদ্ধেরমাধ্যমে অর্জিত স্বাধীনতাসম্পর্কে ধারণালাভকরতেপারবে। সর্বোপরি, এ কোর্স অধ্যয়নেরমাধ্যমে শিক্ষার্থী একজন যোগ্য ও সুদক্ষনাগরিকহিসেবেনিজেকেসমাজেপ্রতিষ্ঠিতকরারসুযোগপাবে।

Course Contents: প্রথম খণ্ড: ভাষা ও নির্মিতি
ভাষা: বাংলাধ্বনি ও বর্ণ, স্বর ও ব্যঞ্জন, বাংলা স্বরধনি ও স্বরবর্ণ, বাংলাব্যঞ্জনধ্বনি ও ব্যঞ্জনবর্ণেরউচ্চারণ, সংযুক্ত ব্যঞ্জনবর্ণ, সাধু ও চলিত (প্রমিত) ভাষা, বাংলাবানানেরনিয়ম, যতিচিহ্ন, বঙ্গানুবাদ।
নির্মিতি: প্রতিবেদনবারিপোর্ট: নিবন্ধ: ক. একুশে ফেব্রুয়ারি; খ. মুক্তিযুদ্ধ; গ. বাংলানববর্ষ; ঘ. বাংলারলোকসংস্কৃতি।
দ্বিতীয় খণ্ড: সাহিত্য
কবিতা: আবদুল হাকিম-বঙ্গবাণী; মাইকেলমধুসূদন দত্ত- বঙ্গভাষা; রবীন্দ্রনাথ ঠাকুর- নির্ঝরের স্বপ্নভঙ্গ; কাজীনজরুলইসলাম- আজসৃষ্টিসুখেরউল্লাসে; জীবনানন্দ দাশ- বাংলারমুখআমি; হাসানহাফিজুররহমান- অমরএকুশে; শামসুররাহমান- তোমাকেপাওয়ারজন্য হে স্বাধীনতা; ছোটগল্প ও অন্যান্য রচনা: রবীন্দ্রনাথ ঠাকুর- পোস্টমাস্টার; বিভূতিভূষণ বন্দ্যোপাধ্যায়- পুঁইমাচা; আখতারুজ্জামান ইলিয়াস- অপঘাত।প্রবন্ধ: বঙ্কিমচন্দ্র চট্টোপাধ্যায়- বাঙ্গালা ভাষা; রবীন্দ্রনাথ ঠাকুর- সভ্যতারসংকট।

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	বাংলাভাষা ও সাহিত্যেরজ্ঞানলাভকরেতার সঠিকব্যবহার ও বিকাশঘটাবে।	C2											
CLO2	নৈতিক ও								A5				

	মানবিকমূল্যবোধেরমাধ্যমে চেতনারবিকাশঘটিয়েসমাজ ও দেশেরউন্নয়নেসহায়কভূমিকা রাখবে।												
CLO3	সাহিত্য পাঠেরমাধ্যমে সাহিত্যিকের মননশীলও সৃজনশীল দৃষ্টিভঙ্গি অনুধাবনেরমাধ্যমে বাস্তবতাসম্পর্কে ধারণাঅর্জনকরবে।												A2
CLO4	বাংলাসাহিত্যেরচর্চাকরেচিত্তে রইতিবাচকপ্রকাশেরমাধ্যমে মানসিকবিকাশঘটাবে।										A5		
CLO5	বাংলাভাষার শুদ্ধ প্রয়োগেরমাধ্যমে প্রমিতউচ্চারণ ও শুদ্ধ বানানেরযথাযথ ব্যবহারকরেব্যবহারিক ও কর্মমূখী দক্ষতাঅর্জনকরবে।				C3								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Affective (Characterization by value)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO3	Affective (Respond)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

		☐ Others	
CLO4	Affective (Characterization by value)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO5	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. বাংলাভাষা ও সাহিত্য: রফিকুলইসলাম, সৌমিত্র শেখর
2. বাংলা লেখারনিয়মকানুন : হায়াৎমামুদ
3. বাংলাবানানেরনিয়ম : মাহবুবুলহক
4. বাংলাবানান ও উচ্চারণশিক্ষা : আবদুলআলীম
5. বাংলাউচ্চারণঅভিধান : নরেনবিশ্বাস
6. বাংলাসাহিত্যেরকথা (১ম ও ২য় খণ্ড): মুহম্মদ শহীদুল্লাহ
7. বাংলাসাহিত্যেরসম্পূর্ণ ইতিবৃত্ত: অসিতকুমার বন্দ্যোপাধ্যায়
8. বাংলাসাহিত্যেররূপরেখা (১ম ও ২য় খণ্ড): গোপালহালদার

Introduction to English Language & Literature

Course Code: Eng 1211 (ENG 0232)	**Contact Hours/Week:** 4 Hours
Course Title: Introduction to English Language & Literature	**Credits:** 4.00

Pre-requisite: None

Rationale: This course aims at providing practice in reading, writing, speaking, and listening skills of English. Reading skill will focus on guessing word meaning, understanding sentence meaning, scanning, skimming, general comprehension, and summarizing, writing skills will cover writing correct sentences, generating ideas, planning, and writing with good organization. Focus will be on techniques of paragraph and essay development. The course will also provide practice in listening and speaking skills. There will be some literary texts for reading also.

Course Contents:

Language:

Speaking:	Introducing self, describe a place, person etc. Formal & informal conversation
Listening:	Sound recognition, word recognition, listening for specific meaning and general comprehension.
Reading:	Reading for details or general comprehension, summarizing, predicting, guessing word meaning, understanding sentence meaning.
Writing:	Formal and informal letter writing, paragraph, and essay writing.

Literature:

P.B. Shelley	: Ozymandias
Robert Browning	: My Last Duchess
Alfred Tennyson	: The Lotos Eaters
Robert Frost	: Stopping by Woods on a Snowy Evening.
Katherine Mansfield	: The Garden Party
Earnest Hemingway	: Old Man at the Bridge
Jonathan Swift	: Gulliver's Travels: Voyage to Lilliput
George Orwell	: Animal Farm

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Discuss with others in English.										A2		
CLO2	Understand literary & nonliterary English texts.	C2											
CLO3	Develop their listening skill.												A1
CLO4	Composedifferent sorts of writings like paragraph & essays.			C6									
CLO5	Analyze literary texts.		C4										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Respond)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO4	Cognitive (Create)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO5	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Introduction to English Grammar: R Murphy
2. English Grammar, part iv: J. C. Nasefield
3. Communicative Grammar of English: Leech and Svartvick
4. From Paragraph to Essay, 7, Illustrated: Imhoof and Hudson
5. College Writing Skills and Reading: John Langan
6. Notions in English: Leo Jones
7. Functions in English: John, Blundel
8. A Glossary of Literary Terms: M. H. Abram

9. Literature: An Introduction to Fiction, Poetry and Drama: X. J. Kennedy
10. Mastering English Literature: R. Gill
11. Anatomy of Fiction: M. Boulton
12. Introduction to Literature: X. J. Kennedy

Bangladesh Studies

Course Code: Hum 2111 (HUM 0222)	**Contact Hours/Week:** 4 Hours
Course Title: Bangladesh Studies	**Credits:** 4.00

Pre-requisite: None

Rationale: The rationale of the course is to give an outline to the students about the sources of the history of ancient, medieval, and modern Bengal. This course also provides knowledge about the social, cultural, and political aspects of Bangladesh.

Course Contents: Unit 1: Topography of Ancient Bengal, Townships of Ancient Bengal, Shashanka, Pala, and Sena Dynasties. Unit 2: Turkish Conquests, IlyasShahi Dynasty, HussainShahi Dynasty, Akbar's Conquest of Bengal, Bara Bhuiyas and Nawabi Periods, War of Palashi and East India Company, Civil Procedure, Battle of Buxar. Unit 3: British Foundation of Government, Lord Warren Hastings, Lord Cornwallis and Permanent Settlement, Social and Administrative Reforms, Lord Ripon, William Bentinck, Sepoy Mutiny and Rise of Nationalism, Indian Congress and Muslim League, People of Bengal,Ram Mohan Roy, Abdul Latif, Syed Amir Ali, Causes and Reactions to the Partition of Bengal, Non-Cooperation and Khilafat Movement, Lahore Proposal and India Division. Unit 4: Awami League, Language Movement, Cultural Movement, United Front Elections, Six-Part Movement, People's Uprising, 1970 Elections, Bangladesh's Freedom Struggle. Unit 5: Liberation war and literary and cultural development after 1971, politics after liberation war.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO NO.	CLO Statements	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO1	Recognize the inner significance of the emergence of Bangladesh as a nation and make them patriotic nationals.										A1		

CLO2	Identify the glorious history of Bengali civilization and communal harmony among the people in comparison to the other parts of the globe.				C1								
CLO3	Analyze the important aspects of social, political, religious, and economic themes of the ancient, medieval and modern Bengal.						C4						
CLO4	Identify the major sources of history, the religious and other movement of medieval Bengal, Muslim rule, British rule, western education, and factors behind the growth of Hindu and Muslim middle class.					C1							
CLO5	Remember various development and the heroic efforts of the political parties, leaders, and student leaders to become an independence in 1971.	C1											

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑ Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO2	Cognitive (Remember)	☑ Lecture ☐ Tutorial	☑ Class Test ☐ Assignment

		☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO4	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐ Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO5	Cognitive (Remember)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. স্বাধীনবাংলাদেশেরঅভ্যুদয়ের ইতিহাস: মুনতাসীরমামুন ও মো. মাহবুবররহমান
2. বাঙ্গালী, বাংলাদেশ ও বঙ্গবন্ধু:মোস্তফাকামাল
3. বাঙালীরইতিহাস :আদি পর্ব: নীহাররঞ্জনরায়
4. বাংলারইতিহাসের দু'শোবছর: স্বাধীনসুলতানদেরআমল:সুখময়মুখোপাধ্যায়
5. বাংলাদেশের মুক্তিযুদ্ধেরইতিহাস:মোহাম্মদ হান্নান
6. PurbaBanglarBhashaAndolon and TatkaleenRajniti: মুহম্মদ শহীদুল্লাহ
7. 1st, 2nd, 3rd, 4th, and 5th Five-Year Plans of Bangladesh
8. Bangla-Desh Economy: Problems and Prospects:Rao BKRV (ed.)
9. Bangladesh Studies: M. Wazed Ali

Financial Accounting & Economics

Course Code: Hum 2211 (Hum 0411)	**Contact Hours/Week:** 4 Hours
Course Title: Financial Accounting & Economics	**Credits:** 4.00

Pre-requisite: None

Rationale: The rationale of this course is to provide the basic concepts and standards underlying financial accounting systems and economics. The course emphasizes the assembly

of the basic financial accounting statements, the income statement, owner's equity statement and balance sheet as well as their interpretation and the basic principles of economics and an exposure to a range of applications of the theory in real world problems.

Course Contents: Basic Concepts of Economics: Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering. Theory of Demand, Supply and Consumer Behavior: Law of Demand; Demand schedule and demand curve; Supply law, Supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply Production and Costs and Theory of the Firm: Meaning of production; Factors of production; Concepts of total, average and marginal costs, fixed and variable costs. Theory of the Firm: Perfect competition and monopoly; Total, average and marginal revenue of a firm; Average and marginal revenue under perfect competition and monopoly; Firm's Equilibrium; Equilibrium of firm under perfect competition and monopoly. The Input-Output Analysis: Meaning of input-output analysis; Input-output analysis model; balance equation; coefficient matrix; Determination of final demand vector. Basic Concepts of Macroeconomics: Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics. National Income accounting and determination: Concepts of GNP, GDP and national income; Methods of national income accounting; Problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model. Budgets of Bangladesh: The revenue at the capital budget; Income, expenditure of the government; direct and indirect taxes. Development Planning in Bangladesh: Need for planning in Bangladesh; Various five year plans in Bangladesh; Development strategies in the five year plans of Bangladesh.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the key ideas that define the economic and accounting method of thinking as an engineer.		C2										
CLO2	Analyze familiarity with a range of micro as well as macroeconomic and financial statements issues.											C3	

CLO3	Demonstrate substantial knowledge on fundamental economic question of allocating scarce resources, principles of demand, supply, market price and cost accounting evolution, meaning, objectives, scope concepts of costs.			C3									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☑Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Modern Economic Theory: K. K. Dewett
2. Advanced Economic Theory: H.L Ahuja
3. Business Organization and Management: M. C. Shukla
4. Management: Harold Koontz and Heinz Weihrich

Normative & Meta Ethics

Course Code: Hum 3111 (ETHICS 0223)	**Contact Hours/Week:** 4 Hours
Course Title: Normative & Meta Ethics	**Credits:** 4.00

Pre-requisite: None

Rationale: Ethics is a branch of philosophy which study human conducts and evaluate them in terms of ethical standard and moral values. The question of what is right', 'what is wrong', 'what is good', 'what is bad', are the core concern of ethics. This course is concerned with the fundamental ethical questions related to human life and it is designed to provide students basic knowledge on morality, values, and ethical behavior.

Course Contents: Unit 1 (Definition, scope, and kinds of normative ethics; and relation with other disciplines): Definition and scope of Ethics; Normative ethics, Meta-ethics, and Practical ethics. Origin of ethics, Relation of ethics to metaphysics, religion, and psychology.
Unit 2 (Various actions, psychological basis, and postulates): Moral, immoral and non-moral actions, psychological basis of morality, desire, universe of desires and conflict of desires, motive and intention, postulates of morality; nature and object of moral judgment.
Unit 3 (Moral standards, various stages of moral standard and various perspectives of moral standard): Various perspectives of moral standard; the external versus internal moral standards: the law of the Tribe, Society. State and God; Hedonism and its classification, Intuitionism, Rationalism Perfectionism.
Unit 4 (Moral pathology): Moral pathology: Concept of moral evil, vice, sin, crime; Various theories of punishment.
Unit 5 (Various perspectives of virtues): Virtue: The meaning of virtue, Socrates: virtue is knowledge; Plato's treatment of the virtue, Aristotle's concept of virtue.
Unit 6 (Moral progress): Moral progress: different stages or conditions in the evolution of moral life; conditions of moral progress in individual; possibility of moral progress.
Unit 7 (Meta-ethics and main theories of meta ethics): Definition of meta-ethics, Non-naturalism, Emotivism, Prescriptivism, Multi-functionalism, Descriptivism.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the definition, scope and kinds of normative ethics and relation with other						C2						

	disciplines												
CLO2	Explain various actions, psychological basis, and postulates								C2				
CLO3	Discuss the moral standards, various stages of moral standard and various perspectives of moral standard												A2
CLO4	Develop moral pathology and moral progress										A1		
CLO5	Seek various perspectives of virtues and meta-ethics and main theories of meta ethics									A3			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO3	Affective (Respond)	☑ Lecture ☐ Tutorial ☑ Discussion ☑ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO4	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☐Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO5	Affective (Value)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Application of Ethics morals Manners and Laws Bangladesh Institute of Islamic Thought: ABM Mahbubul Islam & Md. Sahadat Hossain
2. Principia Ethica: G. E. Moore
3. Fundamental Principles of the Metaphysic of Morals Trans Thomas Kingsmill Abbott: Immanuel Kant
4. Critique of Practical Reason Trans: Immanuel Kant
5. A Manual of Ethics: Jadunath Sinha
6. A Manual of Ethics: John S. Mackenzie
7. Utilitarianism: John Stuart Mill
8. An Introduction to Ethics: William Lillie

Introduction to Law

Course Code: Law 3211 (LAW 0421)	**Contact Hours/Week:** 4 Hours
Course Title: Introduction to Law	**Credits:** 4.00

Pre-requisite: None

Rationale: This course reflects on the nature of legal rules and the underlying meaning of legal concept. It comprises philosophy of law and to reflect on the known rules of law, what it is for a rule to be a legal rule, and what distinguishes law from morality, etiquette, and other related phenomena. This course also comprises some legal theories of law which serve

to emphasis the different facets of law and build up a complete picture of legal concepts. There will be an attempt to describe the function and operation of law in society.

Course Contents: Historical Development of Law, Nature and Classification of Laws, Law, and MoralsSources of Law, Theories of Punishment, Forms of Punishment, Law and Society, Role of Law in the Development of the SocietyTraffic Rules of Bangladesh & Fine, Muslim succession,the Consumer Rights Protection Act- 2009,Digital Security Act- 2018, Muslim family law ordinance, ICT Act-2006.Legal Awareness, Social Value of Law, Public Interest Litigation, Alternative Dispute ResolutionEmergence of Bangladesh, Framing of the Constitution of Bangladesh, Proclamation of Independence Order, Supremacy of the Constitution, Features of Bangladesh Constitution, Preamble, Supremacy of the Constitution, Fundamental Principles of State Policy and Fundamental Rights their Enforcement, Emergency Provisions, Amendment Procedure; The President- Modes of Election and Terms of Office, Power and Functions, Legislative Power, Ordinance Making Power, Immunities and Prerogative of Mercy, Impeachment and Removal of the President, Non-Party Care-Taker Government: Composition, Functions and Debates; Local Government, Defense Services;Terms and Tenure of office, Power and Functions of the Prime Minister and different Ministers, Ministerial Responsibility and Accountability; Parliament, Its Composition, Powers and Functions, Privileges and Immunities, Qualification and Disqualification for Election to Parliament, Legislative and Financial or Fiscal Powers and Procedures, Delegated Legislation, Powers and Functions of the Speaker and Deputy Speaker, Sovereignty of the Parliament, Vacation of Seat of the Members of Parliament; Composition, Structure, Jurisdiction and Powers of the Supreme Court, Appointment of the Judges, Superintendence of Subordinate Courts, Separation of Powers, Administrative Tribunals, Supreme Judicial Council, Attorney General, Constitutional Remedies, Ombudsman, Writ, Judicial Review; Establishment and Functions of the Election Commission; RPO 1972, Code of Conduct 2013.

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Understand the relation of State and law and be able to use the legal mechanism for enforcing legal rights.									C2			
CLO2	Demonstrate skills to determine right								C3				

	and wrong, breach of rights and duties along with the knowledge of prescribing proper punishment.												
CLO3	Differentiate among different types of sources of law and the hierarchy of the sources in different legal systems.						C4						
CLO4	Conscious about the constitution of Bangladesh												A3

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO2	Cognitive(Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Cognitive (Analyze)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

CLO4	Affective (Value)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term

Reference Books:

1. Constitution, Constitutional Law and Politics: Bangladesh Perspective: Halim and Abdul Bangladesh Constitution: Trends and Issues: Kamal and Mustafa
2. Jurisprudence & Legal Theory: Mahajan, V. D.
3. Salmon on Jurisprudence: Salmond and W. Jhon
4. Ministry of Law, Justice and Parliamentary Affairs, the Constitution of the People's Republic Bangladesh

Project Planning &Management

Course Code: Hum 4211 (HUM 0413)	**Contact Hours/Week:** 4 Hours
Course Title: Project Planning & Management	**Credits:** 4.00

Pre-requisite: None

Rationale: This course aims to provide the opportunity to the students to develop an understanding to Manage the scope, cost, timing, and quality of the project at all times focused on project success. With the help of this course the students also can implement general business concepts, practices, and tools to facilitate project success in future. They can also appraise the role of project management in organization change.

Course Contents: Introduction: Concept of Project, Feature and types of Projects, Project Cycle, Concept of Project Management, Elements and functions of Project Management, Importance and Challenges of Project Management Qualities, Functions, and responsibilities of a project manager

Project Formulation and Appraisal: Concept of Project Formulation, Stages of Project Formulation, Problem of Project Formulation, Problem of Project formulation, Financial Feasibility Study-PBP, NPV, IRR, Project appraisal, Cost Benefit Analysis (SCBA)

Project Plan: Concept, Steps, Importance, Failure of Project Plan

Project Schedule: Concept, Steps to successful schedules, Objectives of scheduling, Scheduling Tools, Gantt Charts, Network Techniques- Critical Path Method (CPM), PERT

Project Cost Estimation: Concept, Tools, and Techniques for Cost Estimation Financial Analysis: Pricing Project Costs and Benefits.

Project Risk Analysis: Definition of Risks, Types of project risks, Techniques of measuring risks, Managing Project risks

Project Implementation: Concept, Steps in Project Implementation, Impediment to Project Implementation, Guideline to effective Project Implementation
Monitoring, evaluation, and termination of Project: Techniques of monitoring, precondition of effective monitoring, Methods of Evaluation, different status of project termination
Project Management in Bangladesh: Procedures of preparation and approval of development projects in Bangladesh, Organization, and functions of planning commission, ECNEC and IMED, Problems of Project implementation in Bangladesh

Mapping Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs):

CLO No.	CLO Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	Recognize project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.										A1		
CLO2	Apply project management knowledge, processes, lifecycle and the embodied concepts, tools, and techniques in order to achieve project success.				C3								
CLO3	Adapt technology tools for communication, collaboration, information					P4							

	management, and decision support.												
CLO4	Understand general business concepts, practices, and tools to facilitate project success.						C2						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLO No.	Domain/ level of Learning Taxonomy	Teaching-Learning Strategy	Assessment Strategy
CLO1	Affective (Receive)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☐ Class Test ☑Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO2	Cognitive (Apply)	☑ Lecture ☑ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term
CLO3	Psychomotor (Articulation)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☑ Audio/Video ☐ Others	☐ Class Test ☑Assignment ☐ Final Exam ☑ Presentation ☐ Mid-Term
CLO4	Cognitive (Understand)	☑ Lecture ☐ Tutorial ☑ Discussion ☐ Interaction ☐ Audio/Video ☐ Others	☑ Class Test ☐Assignment ☑ Final Exam ☐ Presentation ☑ Mid-Term

Reference Books:

1. Project Management: M. Serajuddin
2. Project Management: B.B. Goel
3. Project Management: Jack R. Meredith and Samuel J. Mantel Jr.
4. Managing Project in Bangladesh: Sky lark Chandha
5. Projects Planning, Selection and Implementation: Prasanna