United International **University**

Department of Electrical and Electronic Engineering

Bachelor of Science in Electrical and Electronic Engineering (BSEEE)
Curriculum

(Effective for the Students Admitted from Fall 2018 Trimester)

September 2018

Contents

1. Introduction

Bachelor of Science in Electrical and Electronic Engineering involves primarily the study of a number of core courses which every electrical engineer should know and some courses from a number of specialized areas. Core courses build the foundation of Electrical and Electronic Engineering. UIU has set forth four areas of specialization. Students should take at least three courses from a specializing area in order to make that area his/her major concentration. Students should also take courses from areas other than their chosen major area of concentration to ensure that their knowledge is not confined to a particular major area of concentration. To understand the underpinning theory of the courses of Electrical and Electronic Engineering, a number of courses on Mathematics and Basic Science, e.g., Physics, Chemistry etc. have been felt mandatory to include in the syllabus. In addition, some social science, management, accounting, economics and communication-skills development related courses have been incorporated to make the syllabus a balanced one and reasonably complete. The objective of the undergraduate program in Electrical and Electronic Engineering is to develop broadly educated and competent graduates to meet the current and future needs of home and abroad.

Admission Requirements

Every applicant, without any exception, must fulfill the admission requirements as laid down by UIU. Admission test and interview for admission into the first semester will be held thrice a year as decided by UIU. No interim or supplementary admission test or interview will be arranged.

A higher secondary certificate or its equivalent in science with mathematics and physics or other fields of study is the basic educational requirement. However, students passing H.S.C from Arts or Commerce group may also apply provided they complete courses equivalent to 6 credit hours in Mathematics and Physics before they start their regular courses at UIU.

Admission Test

Applicants will be required to sit for an admission test designed to judge their abilities and aptitude for the program. The test will be held in Dhaka as arranged by UIU. The admission test will be held on the following three areas:

i. Language and Communication
ii. Mathematics and Physics
iii. Analytical ability

To qualify in a written test an applicant is required to obtain a minimum mark in all the three sections separately.

Degree Requirements

The B.Sc. in EEE degree requirements will be as follows:

(a) Completion of 142.0 credit hours
(b) Successful completion of the “Capstone Project”
(c) Passing of all courses individually and maintaining a minimum CGPA of 2.00

2. List of Courses

The following methodology is adopted for course number assignment of only EEE courses:

For a course numbered as EEE XYZZ, X is the year, Y is the type and ZZ is the serial. The type of courses are:

0 - Fundamental	4 - Computer
1 - Electronics	5 - Embedded system
2 - Power	9 - Projects, internship, training etc.
3 - Communication	

Also odd number at the end denotes theory course, while even denotes laboratory course (with the exception of type 9 courses).

Hence, EEE 3205, for example, is a course for 3rd year, is from power group, has a serial number of 05 and is a theory course.

(A) General Education Courses (22.0 Credits)

Compulsory (19.0 Credits)

1.	ENG 1105	Intensive English I	4.5
2.	ENG 1207	Intensive English II	4.5
3.	URC 1101	Life Skills for Success	3.0
4.	SOC 3101	Society, Environment and Engineering Ethics	3.0
5.	GED 4000	Entrepreneurship and Career Laboratory	1.0
6.	ACT 3101	Financial and Managerial Accounting	3.0

Optional (Any One: 3.0 Credits)

7.	BDS 2201	Bangladesh Studies	3.0
8.	BAN 2501	Bangla	3.0
9.	ECO 2101	Economics	3.0

(B) Basic Science Courses (26.0 Credits)

1.	PHY 1101	Physics I	3.0
2.	PHY 1103	Physics II	3.0
3.	PHY 1104	Physics Laboratory	1.0
4.	CHE 2101	Chemistry	3.0
5.	CHE 2102	Chemistry Laboratory	1.0
6.	MAT 1101	Calculus I	3.0

7.	MAT 1103	Calculus II	3.0
8.	MAT 2105	Linear Algebra and Differential Equations	3.0
9.	MAT 2107	Complex Variables, Fourier and Laplace Transforms	3.0
10.	MAT 2109	Coordinate Geometry and Vector Analysis	3.0

(C) Other Engineering Courses (7.0 Credits)

1.	EEE 2401	Structured Programming Language	3.0
2.	EEE 2402	Structured Programming Language Laboratory	1.0
3.	IPE 4101	Industrial Production Engineering	3.0

(D) Core Courses (64.0 Credits)

Fundamental (8.0 Credits)

1.	EEE 1001	Electrical Circuits I	3.0
2.	EEE 1003	Electrical Circuits II	3.0
3.	EEE 1004	Electrical Circuits Laboratory	1.0
4.	EEE 2000	Simulation Laboratory	1.0

Electronics (18.0 Credits)

5.	EEE 2101	Electronics I	3.0
6.	EEE 2103	Electronics II	3.0
7.	EEE 2104	Electronics Laboratory	1.0
8.	EEE 2105	Digital Electronics	3.0
9.	EEE 2106	Digital Electronics Laboratory	1.0
10.	EEE 3107	Electrical Properties of Materials	3.0
11.	EEE 4109	Control System	3.0
12.	EEE 4110	Control System Laboratory	1.0

Power (16.0 Credits)

13.	EEE 2200	Electrical Wiring and Drafting	1.0
14.	EEE 2201	Energy Conversion I	3.0
15.	EEE 2203	Energy Conversion II	3.0
16.	EEE 2204	Energy Conversion Laboratory	1.0

17.	EEE 3205	Power System	3.0
18.	EEE 3206	Power System Laboratory	1.0
19.	EEE 3207	Power Electronics	3.0
20.	EEE 3208	Power Electronics Laboratory	1.0
		Communication (17.0 Credits)	
21.	EEE 2301	Signals and Linear Systems	3.0
22.	EEE 3303	Probability, Statistics and Random Variables	3.0
23.	EEE 3305	Engineering Electromagnetics	3.0
24.	EEE 3307	Communication Theory	3.0
25.	EEE 3308	Communication Laboratory	1.0
26.	EEE 3309	Digital Signal Processing	3.0
27.	EEE 3310	Digital Signal Processing Laboratory	1.0
		Computer (5.0 Credits)	
28.	EEE 3400	Numerical Techniques Laboratory	1.0
29.	EEE 3403	Microprocessor and Interfacing	3.0
30.	EEE 3404	Microprocessor and Interfacing Laboratory	1.0

(E) Elective Courses (17.0 Credits)

Elective courses are divided into two categories: Elective I and Elective II. Elective I courses are offered to build up the foundation on the respective specialized fields. Elective II courses are offered with their companion laboratory courses so that the students get balanced education both on theory and practice. Elective (Elective I and Elective II) subjects are distributed into the five groups, namely, Electronics, Power, Communication, Computer, and Embedded System and Robotics. Out of five elective courses at least three (two from Elective I and one from Elective II) must be taken from one group as major and two courses (one from Elective I and one from Elective II) from at least two other groups as minor.

Group 1: Electronics Group

Elective I

1.	EEE 4111	Solid State Devices	3.0
2.	EEE 4113	Semiconductor Processing and Fabrication Technology	3.0
3.	EEE 4115	Optoelectronics	3.0
4.	EEE 4117	Analog Integrated Circuits	3.0
5.	EEE 4119	Compound Semiconductor Devices	3.0

Elective II

6.	EEE 4121	VLSI Design	3.0
7.	EEE 4122	VLSI Design Laboratory	1.0
8.	EEE 4123	Biomedical Electronics	3.0
9.	EEE 4124	Biomedical Electronics Laboratory	1.0
10.	EEE 4225	Electrical Measurements	3.0
11.	EEE 4226	Electrical Measurements Laboratory	1.0

Group 2: Power Group

Elective I

1.	EEE 4211	Transmission and Distribution Systems	3.0
2.	EEE 4213	Power Plant Engineering	3.0
3.	EEE 4219	High Voltage Engineering	3.0
4.	EEE 4221	Advanced Electrical Machines	3.0
5.	EEE 4223	Renewable Energy	3.0

Elective II

6.	EEE 4215	Operation and Control of Power System	3.0
7.	EEE 4216	Operation and Control of Power System Laboratory	1.0
8.	EEE 4217	Power System Protection	3.0
9.	EEE 4218	Power System Protection Laboratory	1.0
10.	EEE 4225	Electrical Measurements	3.0
11.	EEE 4226	Electrical Measurements Laboratory	1.0

Group 3: Communication Group

Elective I

1.	EEE 4313	Optical Fiber Communication	3.0
2.	EEE 4317	Mobile Cellular Communication	3.0
3.	EEE 4319	Telecommunication Engineering	3.0
4.	EEE 4321	Antenna and Propagation	3.0
5.	EEE 4323	Satellite Communication	3.0

6.	EEE 4325	Multimedia Communication	3.0
7.	EEE 4327	Advanced DSP and Filter Design	3.0
8.	EEE 4329	Telecommunication Policy and Management	3.0
9.	EEE 4331	Biomedical Engineering	3.0
10.	EEE 4333	Special Topics on Telecommunication Engineering	3.0
11.	EEE 4335	Information Theory and Coding	3.0
12.	EEE 4339	Introduction to Software Radios	3.0
		Elective II	
13.	EEE 4311	Microwave Engineering	3.0
14.	EEE 4312	Microwave Engineering Laboratory	1.0
15.	EEE 4315	Digital Communication	3.0
16.	EEE 4316	Digital Communication Laboratory	1.0
17.	EEE 4337	RF Engineering	3.0
18.	EEE 4338	RF Engineering Laboratory	1.0

Group 4: Computer Group

		Elective I	
1.	EEE 4411	Computer Architecture	3.0
2.	EEE 4415	Advanced Logic Design	3.0
3.	EEE 4419	Multimedia System Design	3.0
		Elective II	
4.	EEE 4413	Computer Networks	3.0
5.	EEE 4414	Computer Networks Laboratory	1.0
6.	EEE 4417	Microprocessor Based System Design	3.0
7.	EEE 4418	Microprocessor Based System Design Laboratory	1.0

Group 5: Embedded System and Robotics Group

		Elective I	
1.	EEE 4513	Real Time Embedded System Design	3.0
2.	EEE 4515	Industrial Automation and Robotics	3.0

3.	EEE 4517	Real Time Embedded Digital Signal Processing	3.0

Elective II

4.	EEE 4511	Embedded System Design and Architecture	3.0
5.	EEE 4512	Embedded System Design and Architecture Laboratory	1.0

(F) Project (6.0 Credits)

Compulsory Project (6.0 Credits)

1.	EEE 4901	Capstone Project I	1.0
2.	EEE 4902	Capstone Project II	2.0
3.	EEE 4903	Capstone Project III	3.0

(G) Internship / Industrial Training (optional courses)

1.	EEE 4904	Internship	2.0
2.	EEE 4905	Industrial Training	2.0

Summary of Courses

Serial	Group	Theory Credit	Laboratory / Project / Internship / Industrial Training Credit	Total Credit
1.	General Education	21.0	1.0	22.0
2.	Basic Science	24.0	2.0	26.0
3.	Other Engineering	6.0	1.0	7.0
4.	Core	51.0	13.0	64.0
5.	Electives	15.0	2.0	17.0
6.	Project	0.0	6.0	6.0
	Total	**117.0**	**25.0**	**142.0**

3. Course Equivalence

New Course			Old Course		
Course Code	**Course Title**	**Cr**	**Course Code**	**Course Title**	**Cr**
SOC 3101	Society, Environment and Engineering Ethics	3.0	SOC 101	Society, Technology and Engineering Ethics	3.0
ACT 3101	Financial and Managerial Accounting	3.0	ACT 111	Financial and Managerial Accounting	3.0
ECO 2101	Economics	3.0	EC0 213	Economics	3.0
PHY 1101	Physics I	3.0	PHY 101	Physics I	3.0
PHY 1103	Physics II	3.0	PHY 103	Physics II	3.0
PHY 1104	Physics Laboratory	1.0	PHY 104	Physics Lab	1.0
CHE 2101	Chemistry	3.0	CHEM 101	Chemistry	3.0
CHE 2102	Chemistry Laboratory	1.0	CHEM 102	Chemistry Lab	1.0
MAT 1101	Calculus I	3.0	MATH 003	Elementary Calculus	3.0
MAT 1103	Calculus II	3.0	MATH 151	Differential and Integral Calculus	3.0
MAT 2107	Complex Variables, Fourier and Laplace Transforms	3.0	MATH 187	Fourier & Laplace Transform and Complex Variables	3.0
MAT 2109	Coordinate Geometry and Vector Analysis	3.0	MATH 201	Coordinate Geometry and Vector Analysis	3.0
EEE 2401	Structured Programming Language	3.0	EEE 121	Structured Programming Language	3.0
EEE 2402	Structured Programming Language Laboratory	1.0	EEE 122	Structured Programming Language Lab	1.0
IPE 4101	Industrial Production Engineering	3.0	IPE 401	Industrial Management	3.0
EEE 1001	Electrical Circuits I	3.0	EEE 101	Electrical Circuits I	3.0
EEE 1003	Electrical Circuits II	3.0	EEE 103	Electrical Circuits II	3.0
EEE 1004	Electrical Circuits Laboratory	1.0	EEE 104	Electrical Circuits Lab	1.0
EEE 2000	Simulation Laboratory	1.0	EEE 110	Simulation Lab	1.0
EEE 2101	Electronics I	3.0	EEE 105	Electronics I	3.0
EEE 2103	Electronics II	3.0	EEE 207	Electronics II	3.0
EEE 2104	Electronics Laboratory	1.0	EEE 208	Electronics Lab	1.0
EEE 2105	Digital Electronics	3.0	EEE 223	Digital Electronics	3.0

New Course			Old Course		
Course Code	**Course Title**	**Cr**	**Course Code**	**Course Title**	**Cr**
EEE 2106	Digital Electronics Laboratory	1.0	EEE 224	Digital Electronics Lab	1.0
EEE 3107	Electrical Properties of Materials	3.0	EEE 301	Electrical Properties of Materials	3.0
EEE 4109	Control System	3.0	EEE 401	Control System	3.0
EEE 4110	Control System Laboratory	1.0	EEE 402	Control System Lab	1.0
EEE 2200	Electrical Wiring and Drafting	1.0	EEE 220	Electrical Wiring and Drafting	1.0
EEE 2201	Energy Conversion I	3.0	EEE 203	Energy Conversion I	3.0
EEE 2203	Energy Conversion II	3.0	EEE 205	Energy Conversion II	3.0
EEE 2204	Energy Conversion Laboratory	1.0	EEE 206	Energy Conversion Lab	1.0
EEE 3205	Power System	3.0	EEE 305	Power System	3.0
EEE 3206	Power System Laboratory	1.0	EEE 306	Power System Lab	1.0
EEE 3207	Power Electronics	3.0	EEE 307	Power Electronics	3.0
EEE 3208	Power Electronics Laboratory	1.0	EEE 308	Power Electronics Lab	1.0
EEE 2301	Signals and Linear Systems	3.0	EEE 211	Signals and Linear Systems	3.0
EEE 3303	Probability, Statistics and Random Variables	3.0	EEE 255	Probability and Random Signal Analysis	3.0
EEE 3305	Engineering Electromagnetics	3.0	EEE 303	Engineering Electromagnetics	3.0
EEE 3307	Communication Theory	3.0	EEE 309	Communication Theory	3.0
EEE 3308	Communication Laboratory	1.0	EEE 310	Communication Lab	1.0
EEE 3309	Digital Signal Processing	3.0	EEE 311	Digital Signal Processing	3.0
EEE 3310	Digital Signal Processing Laboratory	1.0	EEE 312	Digital Signal Processing Lab	1.0
EEE 3403	Microprocessor and Interfacing	3.0	EEE 423	Microprocessor and Interfacing	3.0
EEE 3404	Microprocessor and Interfacing Laboratory	1.0	EEE 424	Microprocessor and Interfacing Lab	1.0
EEE 4111	Solid State Devices	3.0	EEE 313	Solid State Devices	3.0
EEE 4113	Semiconductor Processing and Fabrication Technology	3.0	EEE 431	Semiconductor Processing and Fabrication Technology	3.0
EEE 4115	Optoelectronics	3.0	EEE 433	Optoelectronics	3.0

New Course			Old Course		
Course Code	**Course Title**	**Cr**	**Course Code**	**Course Title**	**Cr**
EEE 4117	Analog Integrated Circuits	3.0	EEE 435	Analog Integrated Circuits	3.0
EEE 4121	VLSI Design	3.0	EEE 441	VLSI Design	3.0
EEE 4122	VLSI Design Laboratory	1.0	EEE 442	VLSI Design Lab	1.0
EEE 4211	Transmission and Distribution Systems	3.0	EEE 471	Transmission and Distribution Systems	3.0
EEE 4213	Power Plant Engineering	3.0	EEE 473	Power Plant Engineering	3.0
EEE 4219	High Voltage Engineering	3.0	EEE 479	High Voltage Engineering	3.0
EEE 4221	Advanced Electrical Machines	3.0	EEE 481	Advanced Electrical Machines	3.0
EEE 4223	Renewable Energy	3.0	EEE 483	Renewable Energy	3.0
EEE 4215	Operation and Control of Power System	3.0	EEE 475	Operation and Control of Power System	3.0
EEE 4216	Operation and Control of Power System Laboratory	1.0	EEE 476	Operation and Control of Power System Lab	1.0
EEE 4217	Power System Protection	3.0	EEE 477	Power System Protection	3.0
EEE 4218	Power System Protection Laboratory	1.0	EEE 478	Power System Protection Lab	1.0
EEE 4225	Electrical Measurements	3.0	EEE 421	Electrical Measurements	3.0
EEE 4226	Electrical Measurements Laboratory	1.0	EEE 422	Electrical Measurements Lab	1.0
EEE 4313	Optical Fiber Communication	3.0	EEE 453	Optical Fiber Communication	3.0
EEE 4317	Mobile Cellular Communication	3.0	EEE 457	Mobile Cellular Communication	3.0
EEE 4319	Telecommunication Engineering	3.0	EEE 459	Telecommunication Engineering	3.0
EEE 4321	Antenna and Propagation	3.0	EEE 461	Antenna and Propagation	3.0
EEE 4323	Satellite Communication	3.0	EEE 463	Satellite Communication	3.0
EEE 4325	Multimedia Communication	3.0	EEE 465	Multimedia Communication	3.0
EEE 4327	Advanced DSP and Filter Design	3.0	EEE 467	Advanced DSP and Filter Design	3.0
EEE 4329	Telecommunication Policy and Management	3.0	EEE 469	Telecommunication Policy and Management	3.0
EEE 4331	Biomedical Engineering	3.0	EEE 491	Biomedical Engineering	3.0

New Course			Old Course		
Course Code	**Course Title**	**Cr**	**Course Code**	**Course Title**	**Cr**
EEE 4333	Special Topics on Telecommunication Engineering	3.0	EEE 493	Special Topics on Telecommunication Management	3.0
EEE 4335	Information Theory and Coding	3.0	EEE 495	Information Theory and Coding	3.0
EEE 4339	Introduction to Software Radios	3.0	EEE 499	Introduction to Software Radios	3.0
EEE 4311	Microwave Engineering	3.0	EEE 451	Microwave Engineering	3.0
EEE 4312	Microwave Engineering Laboratory	1.0	EEE 452	Microwave Engineering Lab	1.0
EEE 4315	Digital Communication	3.0	EEE 455	Digital Communication	3.0
EEE 4316	Digital Communication Laboratory	1.0	EEE 456	Digital Communication Lab	1.0
EEE 4337	RF Engineering	3.0	EEE 497	RF Engineering	3.0
EEE 4338	RF Engineering Laboratory	1.0	EEE 498	RF Engineering Lab	1.0
EEE 4411	Computer Architecture	3.0	CSE 313	Computer Architecture	3.0
EEE 4415	Advanced Logic Design	3.0	CSE 417	Advanced Logic Design	3.0
EEE 4419	Multimedia System Design	3.0	CSE 447	Multimedia System Design	3.0
EEE 4413	Computer Networks	3.0	CSE 323	Computer Networks	3.0
EEE 4414	Computer Networks Laboratory	1.0	CSE 324	Computer Networks Lab	1.0
EEE 4417	Microprocessor Based System Design	3.0	CSE 421	Microprocessor Based System Design	3.0
EEE 4418	Microprocessor Based System Design Laboratory	1.0	CSE 422	Microprocessor Based System Design Lab	1.0
EEE 4513	Real Time Embedded System Design	3.0	EEE 445	Real Time Embedded System Design	3.0
EEE 4515	Industrial Automation and Robotics	3.0	EEE 447	Industrial Automation and Robotics	3.0
EEE 4517	Real Time Embedded Digital Signal Processing	3.0	EEE 449	Real Time Embedded Digital Signal Processing	3.0
EEE 4511	Embedded System Design and Architecture	3.0	EEE 439	Introduction to Embedded System Design and Architecture	3.0
EEE 4512	Embedded System Design and Architecture Laboratory	1.0	EEE 440	Embedded System Design and Architecture Lab	1.0

4. Sequence of Course Offerings in Twelve Trimesters

Trimester 1

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
1.	ENG 1105	Intensive English I	4.5	6.0
2.	MAT 1101	Calculus I	3.0	3.0
3.	URC 1101	Life Skills for Success	3.0	3.0
		Subtotal	**10.5**	**12.0**

Trimester 2

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
4.	ENG 1207	Intensive English II	4.5	6.0
5.	MAT 1103	Calculus II	3.0	3.0
6.	EEE 1001	Electrical Circuits I	3.0	3.0
7.	PHY 1101	Physics I	3.0	3.0
		Subtotal	**13.5**	**15.0**

Trimester 3

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
8.	EEE 1003	Electrical Circuits II	3.0	3.0
9.	EEE 1004	Electrical Circuits Laboratory	1.0	3.0
10.	PHY 1103	Physics II	3.0	3.0
11.	PHY 1104	Physics Laboratory	1.0	3.0
12.	MAT 2105	Linear Algebra and Differential Equations	3.0	3.0
		Subtotal	**11.0**	**15.0**

Trimester 4

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
13.	EEE 2000	Simulation Laboratory	1.0	3.0
14.	EEE 2101	Electronics I	3.0	3.0

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
15.	CHE 2101	Chemistry	3.0	3.0
16.	CHE 2102	Chemistry Laboratory	1.0	3.0
17.	MAT 2107	Complex Variables, Fourier and Laplace Transforms	3.0	3.0
		Subtotal	**11.0**	**15.0**

Trimester 5

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
18.	MAT 2109	Coordinate Geometry and Vector Analysis	3.0	3.0
19.	EEE 2401	Structured Programming Language	3.0	3.0
20.	EEE 2402	Structured Programming Language Laboratory	1.0	3.0
21.	EEE 2103	Electronics II	3.0	3.0
22.	EEE 2104	Electronics Laboratory	1.0	3.0
		Subtotal	**11.0**	**15.0**

Trimester 6

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
23.	EEE 2200	Electrical Wiring and Drafting	1.0	3.0
24.	GED …..	GED Optional	3.0	3.0
25.	EEE 2201	Energy Conversion I	3.0	3.0
26.	EEE 2105	Digital Electronics	3.0	3.0
27.	EEE 2106	Digital Electronics Laboratory	1.0	3.0
28.	EEE 2301	Signals and Linear Systems	3.0	3.0
		Subtotal	**14.0**	**18.0**

Trimester 7

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
29.	ACT 3101	Financial and Managerial Accounting	3.0	3.0
30.	EEE 3303	Probability, Statistics and Random Variables	3.0	3.0

31.	EEE 2203	Energy Conversion II	3.0	3.0
32.	EEE 2204	Energy Conversion Laboratory	1.0	3.0
33.	EEE 3107	Electrical Properties of Materials	3.0	3.0
		Subtotal	**13.0**	**15.0**

Trimester 8

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
34.	SOC 3101	Society, Environment and Engineering Ethics	3.0	3.0
35.	EEE 3305	Engineering Electromagnetics	3.0	3.0
36.	EEE 3309	Digital Signal Processing	3.0	3.0
37.	EEE 3310	Digital Signal Processing Laboratory	1.0	3.0
38.	EEE 3400	Numerical Techniques Laboratory	1.0	3.0
		Subtotal	**11.0**	**15.0**

Trimester 9

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
39.	EEE 3205	Power System	3.0	3.0
40.	EEE 3206	Power System Laboratory	1.0	3.0
41.	EEE 3403	Microprocessor and Interfacing	3.0	3.0
42.	EEE 3404	Microprocessor and Interfacing Laboratory	1.0	3.0
43.	EEE 3307	Communication Theory	3.0	3.0
44.	EEE 3308	Communication Laboratory	1.0	3.0
		Subtotal	**12.0**	**18.0**

Trimester 10

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
45.	IPE 4101	Industrial Production Engineering	3.0	3.0
46.	EEE 3207	Power Electronics	3.0	3.0
47.	EEE 3208	Power Electronics Laboratory	1.0	3.0
48.	EEE …..	Elective I (Major)	3.0	3.0

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
49.	EEE 4901	Capstone Project I	1.0	3.0
		Subtotal	**11.0**	**15.0**

Trimester 11

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
50.	EEE 4109	Control System	3.0	3.0
51.	EEE 4110	Control System Laboratory	1.0	3.0
52.	EEE …..	Elective I (Major)	3.0	3.0
53.	EEE …..	Elective II (Major)	3.0	3.0
54.	EEE …..	Elective II (Major) Laboratory	1.0	3.0
55.	EEE 4902	Capstone Project II	2.0	3.0
		Subtotal	**13.0**	**18.0**

Trimester 12

Sl. No.	Course Code	Course Title	Credit Hr.	Contact Hr.
56.	EEE …..	Elective I (Minor)	3.0	3.0
57.	EEE …..	Elective II (Minor)	3.0	3.0
58.	EEE …..	Elective II (Minor) Laboratory	1.0	3.0
59.	GED 4000	Entrepreneurship and Career Laboratory	1.0	3.0
60.	EEE 4903	Capstone Project III	3.0	3.0
	** EEE 4904 / EEE 4905	Internship / Industrial Training (Optional)		
		Subtotal	**11.0**	**15.0**

** Internship / Industrial Training course will be taken after completion of all courses.

Distribution of Credit Hours in Twelve Trimesters

Trimester	Theory Credit	Laboratory / Project / Internship / Industrial Training Credit	Total Credit
Trimester 1	10.5	0.0	10.5
Trimester 2	13.5	0.0	13.5
Trimester 3	9.0	2.0	11.0
Trimester 4	9.0	2.0	11.0
Trimester 5	9.0	2.0	11.0
Trimester 6	12.0	2.0	14.0
Trimester 7	12.0	1.0	13.0
Trimester 8	9.0	2.0	11.0
Trimester 9	9.0	3.0	12.0
Trimester 10	9.0	2.0	11.0
Trimester 11	9.0	4.0	13.0
Trimester 12	6.0	5.0	11.0
Total	**117.0**	**25.0**	**142.0**

5. Course Contents

General Education Courses (Compulsory):

Course Code & Title	**ENG 1105 Intensive English I**
Credits	**4.5**
Prerequisite	None
Contents	Reading and Writing: Cohesion, Skimming, Coherence, Scanning; Reading and Annotation; Main ideas, Brainstorming and Taking notes; Comprehensions; Linking and Transitional words; Grammatical Knowledge: Parts of Speech, Punctuation, Subject Verb Agreement, Tense; WH Questions; Paraphrasing; Summarizing; News Report Writing; Creative Writing; Presentation. Speaking and Listening: Speaking and Listening strategies; Pronunciation and Intonation; Vocabulary, Educated guess from content; Linking words and Fillers; Introduction to Drama; Performing Play; Art of Questioning; Famous Speeches; Listening Activities; How to make and present a brochure; News Reporting; Impromptu Speaking; Group Presentation.

Course Code & Title	**ENG 1207 Intensive English II**
Credits	**4.5**
Prerequisite	**ENG 1105**
Contents	Reading and Writing: Writing process: Outlining, Drafting, Editing, Revising, Final Draft, Publishing; Prewriting Techniques: Free writing, Scratching out, Clustering, Questioning; Differences between a paragraph and an essay; Format of a paragraph; Adding details/ Body paragraphs: Ordering paragraphs, Time order, Emphatic order, Use of transitional words; Structure of a traditional essay; Types of Essays: Descriptive, Narrative, Cause-Effect, Argumentative, Compare and Contrast, Persuasive essay; Writing a good conclusion; Academic reading: Using index, choosing a book; Narrator's point of view; Preventing regression; Critical thinking; Expanding fixations; Return sweep. Speaking and Listening: Greetings and Expressions; Practice speaking; Role play (using modals and phrases); Handling situations; Listening tracks and speeches; Developing public speaking: Increasing confidents; Critical thinking and Vocabulary list; Newspaper project; Human rights discussion; Special occasion speech; Impromptu; Developing presentation skills; Developing argumentative skill: Argumentative presentation. Grammar Contents: Overview of verb tenses; Present and Past, Simple and Progressive; Perfect progressive tenses and Future time.

Course Code & Title	**URC 1101 Life Skills for Success**
Credits	**3.0**
Prerequisite	None
Contents	Introduction: Why this course, Distribution and Evaluation rubric, how to use elms for contents, quizzes, and assignments; Course policy: Anti-plagiarism policy, Student involvement, Importance of character, Deviation from right path & consequences,

understanding right path, Lives of famous persons. Parents and Life: Why are parents so important in life, can we ignore the contribution of parents in our lives? Mother and father-degree of importance, should we respect our parents, how to respect of parents, should we send our parents to old-age home, Living with parents, Weight of parents in religion, Success of lives on parent's care. Legal Compliance & UIU Life: Why law, why should we obey Rules and Regulations, UIU Core Values, Rules & Regulations, Effective dressing, Wearing ID Card, Classroom Discipline, Life at UIU: DSA and CCC activities, Experience sharing from alumni and current students, UIU IT Services & Library Facilities. Essence of Life: Who am I, Self-esteem, Vigil, Essence of creation, Animal Vs. Human Being, Human values, Ethical Living, Professional ethics, Mind Mapping, Goal Setting, Transforming Failure into Success, Integration of soft skills, Human qualities/habits for success in life Time Management: Defining self-purpose; Benefits of time management; Tools of Time Management; Audit your time; Exercises on time management; Tracking down the daily activities; Pareto's Principle, The 80/20 Rule Tips for developing a schedule Focusing: The Promo-doro Method Demonstration; Killing Procrastination; Strategies To Evaluate Urgent/Important Matrix; Tips To Avoid Multitasking, Real life Examples. Study Skills: What are study skills? Why is it important? 10 habits of successful students, Types of study skills, Fine tuning your study room, Organization and scheduling tasks, how to take lecture notes, How to read textbooks, Memorization techniques, Exam preparation techniques; Critical thinking and Problem solving. Etiquette and Manner: Types of etiquette, Etiquette and manners, Importance of etiquette, Social etiquette, Respect to elders, Morality & ethics, Learning of etiquette, Etiquette rules, Corporate culture & etiquette, Best examples of etiquettes and manners. Personality Trait Analysis: Personality traits concept, Personality traits test, Personality theory, Personality test score interpretation, Personality traits chart, Personality traits in the workplace, what is MBTI? Four dichotomies of MBTI, 16 types of personalities under MBTI, Advantage of MBTI. Effective Communication: Concept of effective communication, Essence of effective communication, Effective communication in the workplace, Examples of effective communication skills, Effective communication techniques, Communication through effective presentation, Types of presentation, Importance of fluency, Body language, Presentation skills, Development of effective PP slides. Social Responsibility: Meaning of social responsibility, Responsibilities to stakeholders, responsibilities to neighbors, child, women, co-workers, senior citizens, Personal Social Responsibility (PSR) Vs. Corporate Social Responsibility, Importance of social media connectivity, Positive mind set in social media connectivity, How to post in Facebook and other social media. Health & Happiness: Introduction to mental health, Stigma and fear related to mental health, How can mental health assistance boost a student's performance? How to increase attention and concentration in the class? Common mental health problems and their self-treatment. When to refer to a mental health professional? Change your thoughts, change your world. How taking care of your physical health can improve productivity? Practical benefits of exercise. How to sleep well and proper sleep hygiene? Common signs for a physical problem and how to treat them? Happiness advantage. What is stress? Strategies for stress management.

Course Code & Title	**SOC 3101 Society, Environment and Engineering Ethics**
Credits	**3.0**
Prerequisite	None
Contents	Society: emergence of Sociology as moral lessons for society; Basic institutions in society, organization and institutions in society, Types of Society; Culture: basics of culture, elements of culture, cultural change, socialization, and social issues around us; Technology and society: interaction between technology and society; Engineering ethics: understanding ethics, engineering ethics; Moral reasoning and engineering as social experimentation; The engineers' concern for safety, professional responsibility; Employer authority; Rights of engineers; Global issues; Career choice and professional outlook; Ethical problems are like design problems; Genetically modified

objects (GMO); Environment: environment and environmental issues environmental degradation, waste management and renewable energy; Basic understanding of sustainable development, SDGs, climate change adaptation; Disability and Accessibility.

Course Code & Title	**GED 4000 Entrepreneurship and Career Laboratory**
Credits	**1.0**
Prerequisite	None
Contents	This course is based on weekly 3-hour long seminars on open topics relevant to the career, employment, entrepreneurship, and life challenges that the students may face after the completion of their undergraduate studies. The seminars can be conducted by the professionals from the industries, motivators, career counselors, and successful alumni. The topics of the seminar may include but not limited to the following topics. Motivation: Goal settings, core motivation behind goals, creating long-term motivation, skills, habits and behaviors behind goals, motivating others Thought and Visionary leadership: vision of life, goal settings, emotional intelligence, self-confidence, building a consistent routine towards success; Team Building: Team and teamwork, empathy and sense of belonging, team growth, winning team, team building golden rule; Career and Innovation: Skill assessment, networking, career building in an ethical way, interview techniques, volunteer works, career guide, developing creative and innovative potential, opportunities and innovation, inspiration from leading entrepreneurs; Entrepreneurship: Entrepreneurial Finance, Law for the Entrepreneur and Manager, Entrepreneurial Marketing, Operations Management Strategic Management Problem solving: Techniques of problem solving: Inductive vs. deductive approaches to problem solving, Problem solving tools and frameworks e.g. issues tree analysis, fishbone diagram analysis, Pareto analysis, barriers to efficient problem-solving; Topics related to critical thinking, CV writings and communications skills.

Course Code & Title	**ACT 3101 Financial and Managerial Accounting**
Credits	**3.0**
Prerequisite	None
Contents	Financial Accounting: Definition of Accounting, Basic activities of Accounting, Users of Accounting, the need for Basic Accounting for non-business students, Basic and Expanded Accounting Equation, Identifying a transaction, the impact of every transaction on Accounting Equation, Definition of Accounts, Debits and Credits, Steps in a recording process, Preparation of Journal, Ledger and Trial Balance, Accrual and Cash basis Accounting, Different types of Adjusting Entries, Preparation of Adjusting Entries, Different types of Financial Statements, Preparation and interpretation of Income Statement, Owners' Equity Statement and Classified Balance Sheet. Managerial Accounting: The difference between Financial and Managerial Accounting, Importance and purpose of Managerial Accounting, Classification of Costs from five different perspectives using real life cases, Application of High-Low Method in segregating fixed and variable costs, Concept of Cost-Volume-Profit Analysis, Calculation and Interpretation of Break-even and Target Profit Analysis under two different methods, Calculation and Interpretation of Margin of Safety and Degree of Operating Leverage, Concept of Relevant Costs, Characteristics of Relevant Costs, Different types of Decision making: Retain or drop the segment, Make or Buy, Special Order and Sell or Process further.

General Education Courses (Optional):

Course Code & Title	BDS 2201 Bangladesh Studies
Credits	**3.0**
Prerequisite	None
Contents	Ancient Bengal: Sasanka, Rise of the Palas, the Senas; Early Medieval Bengal; Coming of the Muslims; The Independent sultanate of Bengal: Ilyas Shahi and Hossein Shahi Bengal; Late medieval Bengal: The Establishment of Mughal Rule in Bengal; Bara Bhuiyans: Subedars and Nawabs; The European Style in Bengal Architecture;British rule in Bengal; Battles of Plassey and Buzas; The Dual government; permanent settlement (1793); Nineteenth century Bengali renaissance: social and religious reforms, Raja Rammohan Roy, Ishwar Chandra Vidyasagar, Titu Meer; Partition of Bengal (1905); Language Movement (1952); Movement for Autonomy; 6-point and 11-Point Programs; The 1970 Election-Military Action, Genocide in the East Pakistan; The Liberation War; The Emergence of Bangladesh as a Sovereign Independent State in 1971; Culture: Cultural dilution and change, Bengali culture and problems of society; social problems of Bangladesh; Social change: theories of social change; social change in Bangladesh; urbanization process and its impact on Bangladesh society.

Course Code & Title	BAN 2501 Bangla
Credits	**3.0**
Prerequisite	None
Contents	(অ) বাংলা সাহিত্য ক) নির্বাচিত প্রবন্ধ (যে কোন ৩ টি): (১) হরপ্রসাদ শাস্ত্রী: তৈল, (২) বঙ্কিমচন্দ্র চট্টোপাধ্যায়: বাঙালা ভাষা, (৩) রবীন্দ্রনাথ ঠাকুর: সভ্যতার সংকট, (৪) প্রমথ চৌধুরী: বীরবলের হালখাতা, (৫) মোতাহের হোসেন চৌধুরী: শিক্ষা ও মনুষ্যত্ব, (৬) অন্যান্য প্রবন্ধ (সহায়ক গ্রন্থ হতে নির্বাচিত)। খ) নির্বাচিত গল্প, যে কোন ৩ টি: (১) রবীন্দ্রনাথ ঠাকুর: পোস্টমাস্টার / স্ত্রীর পত্র / একরাত্রি, (২) বনফুল: নিমগাছ, (৩) বিভূতিভূষণ বন্দ্যোপাধ্যায়: পুঁই মাচা, (৪) বেগম রোকেয়া সাখাওয়াত হোসেন: অবোরোধবাসিনী, (৫) সৈয়দ ওয়ালীউল্লাহ: নয়নচারা, (৬) অন্যান্য গল্প (সহায়ক গ্রন্থ হতে নির্বাচিত)। গ) নির্বাচিত কবিতা (যে কোন ৩ টি): (১) রবীন্দ্রনাথ ঠাকুর: নির্ঝরের স্বপ্নভঙ্গ, (২) কাজী নজরুল ইসলাম: আজ সৃষ্টি সুখের উল্লাসে, (৩) জীবনানন্দ দাশ: বনলতা সেন, (৪) শামসুর রাহমান: তোমাকে পাওয়ার জন্য হে স্বাধীনতা, (৫) নির্মলেন্দু গুণ: হুলিয়া (প্রেমাংশুর রক্ত চাই), (৬) অন্যান্য কবিতা (সহায়ক গ্রন্থ হতে নির্বাচিত)। ঘ) উপন্যাস (যে কোন ১ টি): বিভূতিভূষণ বন্দ্যোপাধ্যায়: আরণ্যক, অদ্বৈত মল্লবর্মণ: তিতাস একটি নদীর নাম, মানিক বন্দ্যোপাধ্যায়: দিবারাত্রির কাব্য। (আ) প্রায়োগিক বাংলা (ক) বাংলা ভাষার লিখন দক্ষতা: (১) বাংলা ধ্বনিতত্ত্ব (ধ্বনি, বর্ণ, ধ্বনি পরিবর্তন, যুক্তবর্ণ), (২) বাংলা বানান: বাংলা একাডেমির বাংলা বানানের নিয়ম, শব্দের অপপ্রয়োগ, শব্দের বানান ও অশুদ্ধি, (৩) বাক্যের শুদ্ধি-অশুদ্ধি: বাক্যের গঠনগত শুদ্ধি-অশুদ্ধি, বিরাম চিহ্ন, (৪) বাংলা

লিখন কৌশল: রেজুলেশন লিখন, অনুষ্ঠান সঞ্চালন পাণ্ডলিপি প্রস্তুত, বিজ্ঞাপন লিখন, প্রুফ সংশোধন।

(খ) বাংলা ভাষার শ্রবণ ও কথন-দক্ষতা: (১) বাংলা উচ্চারণের নিয়ম: স্বরবর্ণ ও ব্যাঞ্জনবর্ণের উচ্চারণের স্থান, উচ্চারণরীতি, (২) বাংলা উচ্চারণ-সূত্র ও তার প্রয়োগ

Course Code & Title	**ECO 2101 Economics**
Credits	**3.0**
Prerequisite	None
Contents	Definition of Economics; Economics and engineering; Principles of economics; Micro Economics: Introduction to various economic systems – capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of firm. Consumer behavior analysis – Theory of demand and their elasticities, Cardinal and ordinal approaches of utility analysis; Price determination; Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Producer behavior analysis: Theory of supply and their elasticities, Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts. Macro-economics: Savings; investment, employment; national income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh. Economics of development and planning—Models for growth and development in the context of Bangladesh. Necessity and Prerequisites for successful planning in Bangladesh.

Basic Science Courses:

Course Code & Title	PHY 1101 Physics I
Credits	**3.0**
Prerequisite	None
Contents	Mechanics: Vectors and vector algebra; Review on particle dynamics; Work, energy, power and momentum; Conservation of linear and angular momentum; Conservation of energy, Elastic and inelastic collisions; Rotational dynamics, Fluid dynamics and applications. Waves & Oscillations: Different types oscillations; Simple harmonic motion, damped harmonic motion, forced harmonic motion and their applications in circuits, energy calculation, Lissajou's figure, Traveling and Stationary waves, Resonance; Sound waves; Application of acoustic phenomena; Wave speed; Power and intensity of wave motion. Physical Optics: Propagation of light, Reflection and refraction, Theories of light, Interference of light, Superposition principle, Young's double slit, Newton's ring, Fresnel and Fraunhofer diffractions, Diffraction in different slits and grating, Polarization of light and applications, Brewster's Law, Optical activity, Normal and anomalous dispersion, Dispersive power, transmission and reflection coefficient.

Course Code & Title	PHY 1103 Physics II
Credits	**3.0**
Prerequisite	**PHY 1101**
Contents	Electricity magnetism: Concept of charge, Coulomb's law, Electric field, Dipole in an electric field, electric flux, Gauss' law, electric potential, field potential relation, Capacitance and capacitors with dielectric, energy storage in an electric field, current density, Ohm's law, EMF, Resistance in series and parallel, Kirchhoff's Rules, magnetic field, Biot-Savart law, Ampere's law, Gauss's law for magnetism, magnetic force on a current, magnetic lines of induction, Faraday's law, Lenz's Law, Lorentz Force, Hall effect, Magnetization, Hysteresis, Inductance in series- parallel, DC and AC properties, RMS value, R-L-C resonance, EM waves, Maxwell equations. Heat & Thermodynamics: Review of temperature and heat; Different scales and their relations, Postulates of kinetic theory of gas, Degrees of freedom, Mean free path, laws of thermodynamics, Application of first law in different processes: isothermal and adiabatic changes; Reversible and irreversible processes; Refrigerator, Heat engine and Carnot's cycle, Efficiency and Coefficient of performance, concept of entropy, thermodynamic relation. Quantum and Modern Physics: Quantum Theory of Radiation, Energy of photons, Photo-electric Effect, Compton Effect, De Broglie wave length, Heisenberg' s Uncertainty Principle, Phase velocity & Group velocity, Correspondence principle, Pair production, Pair annihilation; Wave function, Quantum numbers, Schrodinger equation-Time dependent and time independent form, Expectation value, Quantum Operator, Eigen functions and Eigen values, Tunneling effect, Energy of trapped electron, Application of Schrodinger's equation in Hydrogen atom, finite and infinite square well, Quantum dots and corrals, Atomic structures and models, Nuclear physics and radioactivity, Special and general Theory of Relativity and Its Consequences.

Course Code & Title	PHY 1104 Physics Laboratory
Credits	**1.0**
Prerequisite	**PHY 1101**
Contents	Experiments based on Propagation of light, Applications of Interference of light, Applications of Stationary waves, Applications of Simple harmonic motion, Applications of Electricity and magnetism.

Course Code & Title	CHE 2101 Chemistry
Credits	**3.0**
Prerequisite	None
Contents	Atomic structure, quantum numbers, electronic configuration, periodic properties of elements and uses of noble gases; Different chemical bonds and geometry of molecules, Selective organic reactions; Solutions and theory of dilute solution, Phase rule and phase diagram; Thermochemistry, Solid state; photochemistry, Theory of acid-base, buffer solution, pH and indicator concept; Electrochemistry.

Course Code & Title	CHE 2102 Chemistry Laboratory
Credits	**1.0**
Prerequisite	None
Contents	Experiments based on inorganic quantitative analysis.

Course Code & Title	MAT 1101 Calculus I
Credits	**3.0**
Prerequisite	None
Contents	Function, Domain and Range of a Function, Translation, reflection, compression and stretches of a function. Even and Odd functions, Inverse functions, one to one and many to one function, Family of Exponential, logarithmic, sine and cosine function, Limit, continuity and differentiability, Tangent line, Derivative and Chain rule, An overview of area problem, Newton's anti-derivative method in finding area, Indefinite integral, fundamental theorem of calculus, Definite integral, Area between two curves, arc length of plane curves.

Course Code & Title	MAT 1103 Calculus II
Credits	**3.0**
Prerequisite	**MAT 1101**
Contents	Differentiations, L'Hopital Rule, Analysis of functions (increasing, decreasing, Concavity and relative Extrema) and Polynomials, Rolle's theorem, Mean Value Theorem, Taylor's series &Maclaurin series, Partial Derivatives, The Chain Rule, Different types of Integration (Principles of Integral evaluation, Integration by parts, Trigonometric Substitution, Integrating rational functions by partial fractions), Improper Integral, Gamma & Beta functions, Multiple integrals and their applications (area, volume problems).

Course Code & Title	MAT 2105 Linear Algebra and Differential Equations
Credits	**3.0**
Prerequisite	**MAT 1103**
Contents	Linear Algebra & Matrices: Introduction to the system of linear equations, solutions and their applications. Matrices, Matrix Algebra and Determinants. Solution of equations by matrix inversions. Eigen values and Eigen vectors. Linear combinations, independence of vectors and linear transformations. Differential Equations: Classification of differential equations. Solutions and applications of first order and second order differential equations by various methods. Wave equation and Heat equation. Solutions with boundary and initial conditions of partial differential equations.

Course Code & Title	MAT 2107 Complex Variables, Fourier and Laplace Transformations
Credits	**3.0**
Prerequisite	**MAT 1103**
Contents	Complex Variable: Complex number system. General functions of a complex variable, Limits and continuity of a function of a complex variable and related theorems, Complex differentiation and the Cauchy-Riemann equations. Singularities, Infinite series, Taylor's and Laurent's series, Cauchy integral formulae, Cauchy's residue theorem. Fourier Analysis: Real and complex forms of Fourier series. Finite transform, Fourier integral, Fourier transforms and their uses in solving boundary value problems. Laplace Transforms: Laplace and inverse Laplace transforms of functions and their applications (Solution of differential equations).

Course Code & Title	MAT 2109 Coordinate Geometry and Vector Analysis
Credits	**3.0**
Prerequisite	**MAT 1103**
Contents	Conic sections and their properties, Rectangular co-ordinate in 3-space, cross and dot product of vectors, parametric equation of straight lines, Plane in 3-space. Differentiation and integration of vector valued function, tangent and normal vectors, directional derivative and gradient of scalar fields, Tangent planes and normal vectors, vector fields, line integrals, conservative vector field, Green's theorem. Triple integral in cylindrical and spherical coordinate systems, Surface integral, flux, divergence theorem, Stokes' theorem.

Other Engineering Courses:

Course Code & Title	EEE 2401 Structured Programming Language
Credits	**3.0**
Prerequisite	None
Contents	Overview, Structure of C program, Data Types and Data Type Qualifier, I/O Functions-Character I/O, Formatted I/O, Character Set, Identifiers, Keywords and Contents, Variables, Expressions, Statement and Symbolic Constants, Arithmetic operators, Relational Operators and Logical Operators, Assignment Operators, Increment/Decrement Operators, Unary Operator and Conditional Operator., Bit-wise Operators, Comma Operator, Precedence and Associativity, Branching: The IF statement (break and continue statement), Branching: SWITCH statement, GOTO statement and operator, Looping: FOR statement (break and continue), Looping: WHILE and DO WHILE statement, Storage class: Automatic, Static, Register and Extern, Functions: Access, Prototype, Argument Passing and Value Receiving, Functions: Pass-by-value, Pass-by-reference and Value Receiving , Functions: Command Line Parameter and Library Functions, Arrays: Initialization, Access, Passing and Receiving, Arrays: 2D handling, Arrays: Sorting and Searching, String Handling, Structure: Initialization, Access, Passing and Receiving, Structure: Embedded Structure, Union and Bit-fields, File: Types of File, Text File Handling, File: Binary File Handling , File: Data File Management Program, Pointer: Concept, Passing and Receiving, Memory Allocation and Release, Pointer: List or Tree Management by Self-Referential Structure, Pointer: Pointer and Multi-Dimensional Arrays, Enumeration, Macros, Pre-Processor and Compiler , Directives, Library, Compiler and Linker, Segment and Memory Model, Video Adapter, Modes and Graphics Initialization, Graphics Functions.

Course Code & Title	EEE 2402 Structured Programming Language Laboratory
Credits	**1.0**
Prerequisite	None
Contents	Laboratory work based on EEE 2401.

Course Code & Title	IPE 4101 Industrial Production Engineering
Credits	**3.0**
Prerequisite	None
Contents	Introduction, evolution, need hierarchy, managers, managerial skills, management functions, management challenges, corporate strategy. Organization: Theory and structure; Coordination; Span of control, Authority delegation; Groups; Manpower planning, Leadership, Wages and incentives. Quality Management & Control : Quality aspects, quality costs, , Evaluation of quality concepts, Quality control, Quality assurance, Basic tools of TQM (Total Quality Management), quality loss functions, TPM (Total productivity management), Lean Manufacturing, 6 sigma productions and Reliability theory. Project Management: Definition, Life cycle, Project selections, Time value of money. Marketing Management: Marketing, Market, Marketing mix, Macro and Micro marketing strategies, Brand, Brand equity, Brand elements, Modern strategy, Laws and regulations. Operation Management: Inventory , ABC analysis, EOQ (Economic order quantity), POQ (Production order quantity), Quantity discount model, Scheduling , sequencing , Priority rules, Demand forecasting, Quantitative models, Qualitative models, technology life cycles, Case studies.

Operation Research: Introduction, Evaluation, Optimization, Problem formulation, Linear programming.

Core Courses (Fundamental):

Course Code & Title	EEE 1001 Electrical Circuits I
Credits	**3.0**
Prerequisite	None
Contents	Circuit variables: voltage, current, power and energy, Voltage and current independent and depended sources, Circuit elements resistance, inductance and capacitance. Modeling of practical circuits, Ohm's law and Kirchhoff's laws, Solution of simple circuits with both dependent and independent sources, Series-parallel resistance circuits and their equivalents, Voltage and current divider circuits, Delta-Wye equivalent circuits, Techniques of general DC circuit analysis (containing both independent and dependent sources): Node-voltage method, Mesh-current method, Source transformations. Thevenin and Norton equivalents, Maximum power transfer. Superposition technique. Properties of Inductances and capacitances. Series-parallel combinations of inductances and capacitances; Concepts of transient and steady state response with dc source. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits.

Course Code & Title	EEE 1003 Electrical Circuits II
Credits	**3.0**
Prerequisite	**EEE 1001**
Contents	Definitions of ac voltage, current, power, volt-ampere and various factors (including power, peak, form factors etc.); Introduction to sinusoidal steady state analysis: Sinusoidal sources, phasor, impedance, admittance, reactance, susceptance; voltage, current, power of R, L, C. R-L, R-C, R-L-C circuits with sinusoidal source; Series-parallel and Delta-Wye simplifications of circuits with R, L and C. Techniques of general ac circuit analysis (containing both independent and dependent sources): Node-voltage method, Mesh-current method, Source transformations, Thevenin and Norton Equivalents, Phasor diagrams. Sinusoidal steady state power calculations, RMS values, Real and reactive power. Maximum power transfer, impedance matching. Steady state voltage, current. Circuits with non-sinusoidal excitations, power and power factor of ac circuits with multiple sources of different frequencies; Transients in AC circuits, Resonance in AC circuits: Series and parallel resonance and Q factors. Magnetically coupled circuits. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation and measurements, Power factor improvement.

Course Code & Title	EEE 1004 Electrical Circuits Laboratory
Credits	**1.0**
Prerequisite	**EEE 1001**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and coElencepts learned in EEE 1001 and EEE 1003. In the second part, students will design simple systems using the principles learned in EEE 1001 and EEE 1003.

Course Code & Title	EEE 2000 Simulation Laboratory
Credits	**1.0**
Prerequisite	**EEE 1003**
Contents	Introductory simulation laboratory based on using modern simulation software and applying them to basic electrical engineering problems.

Core Courses (Electronics):

Course Code & Title	EEE 2101 Electronics I
Credits	**3.0**
Prerequisite	**EEE 1003**
Contents	Introduction to semiconductors: intrinsic, p-type and n-type. PN junction: formation, and operating principles. PN junction diode: current-voltage characteristics, simplified models, dynamic resistance and capacitance. Zener diode: current-voltage characteristics and its applications. Diode circuits: Half-wave and full wave rectifiers with filter capacitors, Clippers and clampers, Zener shunt regulator. Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET): structure, physical operation, current-voltage characteristics and regions of operations, small signal equivalent circuit models; Secondary effects: body effect, channel length modulation, Early effect and short channel effects; MOS amplifiers-biasing discrete and integrated MOS amplifier circuits, Single stage amplifier circuits, their configurations and DC analysis; AC analysis of single stage MOS amplifiers- Voltage and current gain, input and output resistances. MOSFET as active loads, MOSFET as a switch. Bipolar junction transistor (BJT): Basic structure, physical operation, BJT characteristics and regions of operation, DC analysis, biasing the BJT for discrete circuits, small signal equivalent circuit models, AC analysis of Single stage BJT amplifier circuits and their configurations.

Course Code & Title	EEE 2103 Electronics II
Credits	**3.0**
Prerequisite	**EEE 2101**
Contents	Single-stage MOS amplifiers with passive loads; Single-stage, Cascaded and Cascaded MOS amplifiers with active loads. Frequency response of MOS Amplifiers: Bode plots; Current mirrors, differential amplifiers and Operational Trans conductance Amplifiers (OTA), Single and two stage Operational amplifiers in IC. General-purpose OPAMPs: basics, inverting, non-inverting and adder amplifiers, integrators and differentiators, comparator circuits and other applications. Feedback: basic concept of negative feedback, types of feedback, analysis of voltage-series, current-series, current-shunt and voltage-shunt feedback. Active filters: types and specifications, Bode plots, realization of first, second and higher order low, high, band pass and band reject filters using Opamps. Signal generators: structure and working principle of square-wave, triangular wave and saw-tooth wave generators. Oscillators: structure and working principle of phase-shift oscillators, Wien-Bridge oscillator, LC and crystal oscillators. Output stages and power amplifiers: classification of output stages, class A, B and AB output stages.

Course Code & Title	EEE 2104 Electronics Laboratory
Credits	**1.0**
Prerequisite	**EEE 2101**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 2101 and EEE 2103. In the second part, students will design simple projects using the principles learned in EEE 2101 and EEE 2103.

Course Code & Title	EEE 2105 Digital Electronics
Credits	**3.0**
Prerequisite	**EEE 2101**
Contents	Number systems and codes. Analysis and synthesis of logic circuits: Boolean algebra, switching functions, switching circuits and combinational logic circuits. Implementation of basic static logic gates in CMOS, noise margin and power dissipation. Modular combinational circuit design: pass transistor, pass gates, multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, binary arithmetic elements of ALU 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 FSM approach, timing analysis of sequential circuits. Modular sequential logic circuit design: shift registers, counters and their applications. Design of combinational and sequential circuit using HDL.

Course Code & Title	EEE 2106 Digital Electronics Laboratory
Credits	**1.0**
Prerequisite	**EEE 2101**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 2105. In the second part, students will design simple systems using the principles learned in EEE 2105.

Course Code & Title	EEE 3107 Electrical Properties of Materials
Credits	**3.0**
Prerequisite	**PHY 1103 and MAT 2107**
Contents	Crystal structures: 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, quantum wire and quantum dot. Heisenberg's uncertainty principle. Band theory of solids: Band theory from molecular orbital, effective mass, density-of-states. Carrier statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy. Optical properties of materials: Snell's law, wave-particle duality of light, total internal reflection, absorption coefficient of materials, complex refractive index, transmission coefficient and reflection coefficient of materials, Optical transfer matrix method. Dielectric properties of materials: Dielectric constant, polarization; Clausius-Mosotti equation, frequency dependence of dielectric constant, dielectric loss and piezoelectricity. Magnetic properties of materials: Magnetic moment, magnetization and relative permittivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains. Introduction to superconductivity: Type I and Type II superconductors. Introduction to meta-materials.

Course Code & Title	EEE 4109 Control System
Credits	**3.0**
Prerequisite	**EEE 2103 and EEE 2301**

Contents	Introduction to control system: open & closed loop system. Analysis using transfer function: Routh stability criterion, transient characteristics, effect of additional pole/zero, steady state error, parameter sensitivity. Root locus of closed loop system. Design of controller using root locus method. Transfer function of electrical, mechanical & electro-mechanical system. Equivalent system: different types of representations & conversion using block diagram & signal flow graph both in frequency and time domain. State-space representation of system, controller design using state variable. Analysis using frequency response. Introduction to Digital control system, stability analysis in Z-domain.

Course Code & Title	**EEE 4110 Control System Laboratory**
Credits	**1.0**
Prerequisite	**EEE 2103 and EEE 2301**
Contents	Simulation of system using MATLAB for transient analysis. Hardware realization & analysis of control aspects in both open & closed-loop, uncompensated & compensated system. Design of controllers. Design-based project demonstrating effect of controller.

Core Courses (Power):

Course Code & Title	EEE 2200 Electrical Wiring and Drafting
Credits	**1.0**
Prerequisite	**EEE 1003**
Contents	Introduction to the importance of designing the electrical building services for residential buildings, industrial buildings, multistoried office buildings, multistoried multipurpose buildings, Bangladesh Building Codes and Wiring regulations, IEE Wiring regulations and safety regulations. Basic Symbols and Notations for the creation of Electrical Drawings consistent with BNBC standards and codes, Current Ratings, Legends of conduits, Mounting locations, Demonstration on a simple Architectural Structure. Demonstration on complete drawing of an architectural structure. Fitting and Fixtures layout, Conduit layout (Light loads wiring, Heavy loads wiring) Switchboard connection diagram, Sub-Distribution board connection diagram, Switchboard grouping, Switchboard to SDB connection diagram, Cable TV, Telephone, Internet and Calling Bell wiring. Demonstration on complete drawing for an average sized (2000Sft to 2200Sft) apartment, Load calculation, Selection of wire size, Selection of suitable circuit breakers, Selection of conduit size, Load Sharing method, Main Distribution Board connection diagram, Check Meter to LT panel design, Main system earthing design, Current calculation for Air Conditioner, Motor and Pump. Electricity bill calculation for a residential building, Lightening arrestor selection. Introduction to AutoCAD Software and its applications. Basic working principle and troubleshooting process of household appliances. Earthing system design. PFI design. Practical Solar PV system Design. Introduction to LAN for a building, Network Device, Network Topologies LAN Components and Technologies, Fire Alarm System, CCTV with layout, Burglar Alarm System, Fire Sprinklers, Working Principle of Elevators(Lift) and Intercom. Fire protection system. Design a Single line diagram of a typical 11KV/415V 500KVA Substation and Bus-bar trucking system for various applications.

Course Code & Title	EEE 2201 Energy Conversion I
Credits	**3.0**
Prerequisite	**EEE 1003**
Contents	Electromechanical energy conversion fundamentals: Faraday's law of electromagnetic induction, Fleming’s rule and Lenz’s law. Elementary generator: Commutation, electromagnetic force, left hand rule, counter emf and comparison between generator and motor action. Transformer: Ideal transformer - transformation ratio, no-load and load vector diagrams; actual transformer - construction, equivalent circuit, regulation, short circuit and open circuit tests, parallel operation, autotransformer, instrument transformer. 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. Single phase induction motor: Theory of operation, equivalent circuit and starting.

Course Code & Title	EEE 2203 Energy Conversion II
Credits	**3.0**
Prerequisite	**EEE 2201**
Contents	Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves, Permanent Magnet Synchronous Motor. DC generator: Types, no-load voltage characteristics, build-up of a self-excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation. DC motor: Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation.

Course Code & Title	EEE 2204 Energy Conversion Laboratory
Credits	**1.0**
Prerequisite	**EEE 2201**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 2201 and EEE 2203. In the second part, students will design, implement and verify simple systems using the principles learned in EEE 2201 and EEE 2203.

Course Code & Title	EEE 3205 Power System
Credits	**3.0**
Prerequisite	**EEE 2203**
Contents	Line representation: Equivalent circuit of short, medium and long transmission line. Network representation: Single line and reactance diagram of power system and per unit representation. Load flow: Gauss-Seidel method, Newton Raphson method. Power flow control: Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor. Fault analysis: Short circuit current and reactance of a synchronous machine. Symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation. Protection: Introduction to relays, differential protection and distance protection. Introduction to circuit breakers. Load curves: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor and plant factor.

Course Code & Title	EEE 3206 Power System Laboratory
Credits	**1.0**
Prerequisite	**EEE 2203**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3205. In the second part, students will design simple systems using the principles learned in EEE 3205.

Course Code & Title	EEE 3207 Power Electronics
Credits	**3.0**
Prerequisite	**EEE 2103 and EEE 2203**
Contents	Power semiconductor switches & triggering devices: BJT, MOSFET, IGBT, SCR, TRIAC, DIAC, Cool MOS. Rectifiers: AC-DC converter, Uncontrolled & controlled, Single phase & three phase, Full and semi converter. Dual Converter, DC-DC converter, Chopper circuit, SMPS, voltage controllers, DC motor (control) drive, practical drive circuits (i.e. LED driver and others) Inverter: DC-AC converter, Single phase & three phase, voltage & current source, their applications. PWM, AC motor (control) drive, Stepper motor and its drive (control). Application of power electronic devices in industries, power system & automation. HVDC system.

Course Code & Title	EEE 3208 Power Electronics Laboratory
Credits	**1.0**
Prerequisite	**EEE 2103 and EEE 2203**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3207. In the second part, students will design and implement simple systems using the principles learned in EEE 3207.

Core Courses (Communication):

Course Code & Title	EEE 2301 Signals and Linear Systems
Credits	**3.0**
Prerequisite	**MAT 2107 and EEE 1003**
Contents	Classifications of Signals, Useful Signal Operations, Useful Signal Models, Size of a Signal, Even and Odd Functions, Systems, Classification of systems, System Model. System Response, The Unit Impulse Response, System Response to External Input, System Stability Intuitive Insights into system behavior. Periodic Signal representation by Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Exponential Fourier Series, LTIC System Response to periodic Inputs Generalized Fourier Series. Aperiodic Signal Representation of Fourier Transform, Fourier Transform for some useful functions. Properties of Fourier Transform, Signal Transmission through LTIC system, Signal Energy. Applications of Fourier Transform. Laplace Transform and Inverse Laplace Transform. Properties of the Laplace Transform Solution to Differential and Integro-Differential Equations Analysis of Electrical Network, System Realization, Frequency Response of LTIC System, Stability of systems.

Course Code & Title	EEE 3303 Probability, Statistics and Random Variables
Credits	**3.0**
Prerequisite	**EEE 2301**
Contents	Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis, correlation and regression analysis. Elementary probability theory. Continuous and discrete Random Variables & their moments, Special Probability Distributions. Multiple Random Variables: Joint CDF, Conditional PMF/PDF, Mean & Variance. Functions of Random variables. Introduction to Random Process. Elementary sampling theory & Estimation of parameter: Curve fitting & linear regression.

Course Code & Title	EEE 3305 Engineering Electromagnetics
Credits	**3.0**
Prerequisite	**PHY 1103 and MAT 2109**
Contents	Basic Laws of Vector Analysis; Orthogonal Coordinate Systems; Transformation between Coordinate Systems, Differential Length, Area and Volume; Line, Surface and Volume Integrals; Gradient, Divergence and Curl of Fields; Laplacian Operator. Coulomb's law and Field intensity, Electric Field due to continuous Charge distributions, Electric Flux Density, Gauss's Law-Maxwell's Equation, Application of Gauss's Law, Electric Potential, Relation between E and V- Maxwell's Equations, Electric Dipole, Energy Density in Electrostatic Fields. Continuity Equation and Relaxation Time, Electrostatic Boundary Conditions. Poisson's and Laplace's equations, Capacitance, Method of Images. Biot-Savart's Law, Ampere's Circuit Law, Applications of Amperes Circuital Law, Magnetic Flux Density, Maxwell's equation for Static Fields, Magnetic Scalar and Vector Potentials. Forces due to Magnetic Fields, Magnetic Boundary Conditions, Magnetic Energy. Faraday's Law, Displacement Currents, Time Varying Potentials, Time Harmonic Fields. Wave Propagation in Lossy Dielectrics, Plane Wave in Lossless Dielectrics, Plane Waves in Free Space, Plane Wave in Good Conductors. Power and Pointing Vectors, Reflection of a plane Wave at normal incidence.

Course Code & Title	EEE 3307 Communication Theory
Credits	**3.0**
Prerequisite	**EEE 2301 and EEE 3303**
Contents	Review of communication systems and signal distortions and SNR. Amplitude Modulation: DSB-SC, DSB, SSB and Demodulation, FDM. Frequency Modulation and Phase Modulation: Basic equations, NBFM and NBPM, Wideband FM, Armstrong's method, Demodulation. Sampling of Continuous time signals and applications including PCM, DPCM and Delta Modulation and TDM. Basic Digital Modulation including ASK, BPSK and Line Coding techniques. Spread spectrum communications.

Course Code & Title	EEE 3308 Communication Laboratory
Credits	**1.0**
Prerequisite	**EEE 2301 and EEE 3303**
Contents	Selected concepts learned in EEE 3307 will be demonstrated using software tools e.g., Matlab. This course will also include a design project based on the experiments.

Course Code & Title	EEE 3309 Digital Signal Processing
Credits	**3.0**
Prerequisite	**EEE 2301**
Contents	Conversion from CT to DT signals, 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 zeros and inverse Z transform. Digital Filters: FIR filters – linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters – specifications, design using impulse invariant, bi-linear Z transformation.

Course Code & Title	EEE 3310 Digital Signal Processing Laboratory
Credits	**1.0**
Prerequisite	**EEE 2301**
Contents	Selected concepts learned in EEE 3309 will be demonstrated using software tools e.g., Matlab. This course will also include a design project based on the experiments.

Core Courses (Computer):

Course Code & Title	EEE 3400 Numerical Techniques Laboratory
Credits	**1.0**
Prerequisite	**MAT 2105 and EEE 2000**
Contents	Laboratory on numerical techniques using computer solution of differentiation and integration problems, transcendental equations, linear and non-linear differential equations and partial differential equations.

Course Code & Title	EEE 3403 Microprocessor and Interfacing
Credits	**3.0**
Prerequisite	**EEE 2401 and EEE 2105**
Contents	Basic components of a computer system. Simple-As-Possible (SAP) computer: SAP-1, selected concepts from SAP-2 and SAP-3 (jump, call, return, stack, push and pop). Evolution of microprocessors. Introduction to Intel 8086 microprocessor: features, architecture, Minimum mode operation of 8086 microprocessor: system timing diagrams of read and write cycles, memory banks, design of decoders for RAM, ROM and PORT. Introduction to Intel 8086 Assembly Language Programming: basic instructions, logic, shift and rotate instructions, addressing modes, stack management and procedures, advanced arithmetic instructions for multiplication and division, instructions for BCD and double precision numbers, introduction to 8086 programming with C language. Hardware Interfacing with Intel 8086 microprocessor: programmable peripheral interface, programmable interrupt controller, programmable timer, serial communication interface, keyboard and display interface (LED, 7 segment, dot matrix and LCD). MCU introduction- architecture, memory and registers management, built-in peripheral, 8-bit single–core general purpose MCU, small to medium scale problem using MCUs and 8-bit microcontroller using embedded-C.

Course Code & Title	EEE 3404 Microprocessor and Interfacing Laboratory
Credits	**1.0**
Prerequisite	**EEE 2401 and EEE 2105**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts of microprocessor, Architecture, addressing modes, interfacing, instruction sets using assembly language. In the second part, students will perform experiments to verify practically the theories and concepts of micro-controller, interfacing, instruction sets using C programing language to design simple systems.

Project, Internship / Industrial Training:

Capstone Project is a senior design project work that takes place around the final year of 4 years engineering curriculum of B.Sc. in Electrical and Electronic Engineering.

Course Code & Title	**Capstone Project I, II and III**
	EEE 4901 Capstone Project I for 1st trimester
	EEE 4902 Capstone Project II for 2nd trimester
	EEE 4903 Capstone Project III for 3rd trimester
Credits	**1.0, 2.0 & 3.0 (for 1st, 2nd and 3rd consecutive trimesters)**
Prerequisite	**Major declaration**
Contents	Capstone Project must reflect culminating activities of the student where s/he would showcase knowledge, skills and attitudes learned in the earlier courses. Capstone project represents a culminating demonstration of the program outcomes at the level of solving complex engineering problems. The capstone project involves teams of students who build and test custom designed systems, components or engineering processes. Design projects selected from problems submitted by the students, faculty and local industry; Industry projects are given preference as they are best suited for meeting the course objectives; Instructional phase includes (not limited to): communications, report writing, visual aids, design process (requirements/specifications/objections, synthesis/analysis, design evaluation, implementation, maintainability, manufacturability, economic and social influences etc.), proposal preparation, estimating, project management and scheduling, contracts etc.; Performance phase includes (not limited to): design team formation and organization, design proposals, implementation of design process, project scheduling and management, design reviews, design simulation and testing, preparation of documentation, drawings, specifications, etc., written and oral presentation of completed projects.

Course Code & Title	**EEE 4904 Internship**
Credits	**2.0**
Prerequisite	**Completion of all credits except EEE 4905**
Contents	Students undertake a significant experiential learning opportunity, typically with an industrial company that provides electrical services or manufactures electrical products. The internship represents an educational strategy that links classroom learning and student interest with the acquisition of knowledge in an applied work setting. Through direct observation, reflection and evaluation, students gain an understanding of the internship site's work, mission, and audience, how these potentially relate to their academic study, as well as the organization's position in the broader industry or field. Students will produce a critical reflection on their internship experience demonstrating how they have addressed specific learning goals. A student must complete all their academic credits and requirements before they embankment into internship program. Students are responsible for securing their own internships but should contact the Career Services Office / the Department Office for assistance and resources to identify and apply for opportunities of interest. Students will participate in an internship for at least three weeks and no less than 120 hours of supervised work. The students work at the industry will be evaluated through the daily journal and a standard rubric marked by the industry supervisor. This evaluation will be complemented by the evaluation of the students' work presented to the internship coordinator in the department.

Course Code & Title	EEE 4905 Industrial Training
Credits	**2.0**
Prerequisite	**Completion of all credits except EEE 4904**
Contents	The training aims to exposed students to real electrical engineering practices in an industry. Students will gain knowledge and working experience as well as improving their interpersonal skills through working with professionals from the industries. Depending on the nature of work in the training, the students will have opportunity to apply theories learnt in the lecture room into real electrical engineering practices. The total duration of the training is at least three weeks and no less than 120 hours of direct training contact hours.

Technical Electives (Electronics Group):

Course Code & Title	EEE 4111 Solid State Devices
Credits	**3.0**
Prerequisite	**EEE 3107**
Contents	Semiconductor Fundamentals: General introduction of semiconductors, Energy band model of semiconductors, Carrier properties: charge, effective mass, density of states, The Fermi Function, Equilibrium distribution of carriers, equilibrium carrier concentrations, Carrier Action: Drift, diffusion, recombination-generation, Equations of states – Continuity equations and diffusion equations, diffusion lengths, quasi-Fermi Levels. pn-Junction Diodes: pn junction electrostatics, IV-characteristics, energy-band diagrams for homo and hetero-junctions, transient response. Metal-semiconductor junction: fundamentals, energy band diagrams, Schottky junction and ohmic contacts, Metal-Insulator-Semiconductor junction. Tunnel diodes: fundamentals, energy band diagrams. Bipolar junction transistor: Basic principles of pnp and npn transistors, static characteristics, energy band diagrams for homo and hetero-junction BJTs. Field-effect transistors: Junction FET fundamentals, MOS fundamentals: electrostatics, energy-band diagrams, capacitor-voltage characteristics, effects of non-ideal conditions. Qualitative theory of MOSFET operation, current-voltage characteristics of MOSFETs- output characteristics and transfer characteristics, body effect and channel-length modulation, concept of various performance parameters: output resistance, transconductance, On-off ratio, subthreshold swing, inverse subthreshold slope, drain-induced barrier lowering, Gate Induced Drain Leakage. Short-channel effects and their effects on the MOS performance parameters. Multi-gate MOSFETs: dual-gate, triple gate, FinFET and Gate-all-around structures. Sub-60 mV/dec MOSFETs: negative-capacitance FETs and Tunnel FETs.

Course Code & Title	EEE 4113 Semiconductor Processing and Fabrication Technology
Credits	**3.0**
Prerequisite	**CHE 2101 and EEE 2103**
Contents	Substrate materials: Crystal growth and wafer preparation, epitaxial growth technique, molecular beam epitaxy, chemical vapor phase epitaxy and chemical vapor deposition (CVD). Doping techniques: Diffusion and ion implantation. Growth and deposition of dielectric layers: Thermal oxidation, CVD, plasma CVD, sputtering and silicon-nitride growth. Etching: Wet chemical etching, silicon and GaAs etching, anisotropic etching, selective etching, dry physical etching, ion beam etching, sputtering etching and reactive ion etching. Cleaning: Surface cleaning, organic cleaning and RCA cleaning. Lithography: Photo-reactive materials, pattern generation, pattern transfer and metalization. Discrete device fabrication: Diode, transistor, resistor and capacitor. Integrated circuit fabrication: Isolation - pn junction isolation, mesa isolation and oxide isolation. BJT based microcircuits, p-channel and n-channel MOSFETs, complimentary MOSFETs and silicon on insulator devices. Testing, bonding and packaging.

Course Code & Title	EEE 4115 Optoelectronics
Credits	**3.0**
Prerequisite	**EEE 3107**
Contents	Optical properties of semiconductors, Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, solar

	irradiance. Solar cells: basic structure, operating principle and energy band diagrams of pn homo-junction, pn hetero-junction, Schottky junction and Metal-Insulator-Semiconductor junction solar cells. Design considerations of Thin film solar cells. Structure, working principle and energy band diagrams of Quantum-well solar cells and organic solar cells. Photo-detectors: junction photo-detectors, PIN detectors, hetero junction detectors, avalanche photodiodes, performance parameters of photo detectors. Photoconductors, and phototransistors. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers, hetero junction and quantum well LED. Laser Theory: Spontaneous and Stimulated emission, Einstein relations, light amplification, population inversion, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, optical and electrical confinement, Hetero junction lasers, Introduction to quantum well lasers.
Course Code & Title	**EEE 4117 Analog Integrated Circuits**
Credits	**3.0**
Prerequisite	**EEE 2103**
Contents	MOS single stage amplifiers in integrated circuits: common-source, common-drain, and common-gate amplifiers, active loads, biasing (resistor-MOSFET divider, MOSFET-only voltage divider, self-biased voltage reference), cascode and cascade stages, noise (flicker noise, thermal noise, input-referred noise), small signal analysis, frequency response- Bode plots, DC gain, AC gain, concept of poles and zeroes, their calculation and significance. Current mirrors (basic, cascode), Differential amplifiers: common mode analysis (input and output common mode range), differential amplifier with active load, slew rate. Design of single-stage and two-stage operational amplifiers based on custom specifications. Frequency compensation techniques (feedback), stability, low-frequency open loop gain, output swing, power dissipation, offsets, slew rate, common mode feedback Operational transconductance amplifiers- telescopic, cascoded, folded-cascoded and cascaded structures, unity gain frequency. Noise: Introduction, types, representation in circuits, noise in single stage and differential amplifiers. Band-gap references: Supply voltage independent biasing, temperature independent biasing and constant transconductance biasing. Oscillators: ring type and LC type, Colpitis and Hartley oscillator, Design of LC oscillators. Voltage Controlled Oscillators. Phase Locked Loops (PLL): Introduction, basic PLL (Type I) and charge pumped PLL (Type II).
Course Code & Title	**EEE 4119 Compound Semiconductor Devices**
Credits	**3.0**
Prerequisite	**EEE 3107**
Contents	Reviews of compound semiconductor: Zinc-blend crystal structures, growth techniques, alloys, band gap, basic opto-electronic properties, density of carriers in intrinsic and doped compound semiconductors. Introduction to Physics of Hetero-Junctions: Band alignment, band offset, Anderson's rule, single and double sided hetero-junctions, quantum wells and quantization effects, lattice mismatch and strain and common hetero-structure material systems. Hetero-Junction diode: Band banding, carrier transport and I-V characteristics. Hetero-junction field effect transistor: Structure and principle, band structure, carrier transport and I-V characteristics. Nonideal effects, frequency response, high electron mobility transistor. Hetero-structure bipolar transistor (HBT): Structure and operating principle, quasi-static analysis, extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT. Resonant Tunneling

diodes: physics and operation. Resonant Tunneling Transistors: device physics, operation and characteristics.

Course Code & Title	EEE 4121 VLSI Design
Credits	**3.0**
Prerequisite	**EEE 2401 and EEE 2105**
Contents	VLSI technology: Top down design approach, technology trends. Review of MOS transistor theory: Threshold voltage, body effect, I-V equations and characteristics, latch-up problems, NMOS inverter, CMOS inverter, pass-transistor and transmission gates. Ratioed circuits: Pseudo NMOS inverter. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption. Buffer chain design to drive large capacitive load. Electro-migration. Noise margin. Crosstalk. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. IC fabrication: photolithography, CMOS process flow. Estimation of resistance and capacitance from layout. Layout matching (LVS) Stick diagram and area estimation from stick diagram. CMOS subsystem design: Adders, multiplier, PLA, FSM design. Basic logic gates in CMOS. Synthesis of arbitrary combinational logic in CMOS, pseudo-NMOS, dynamic CMOS and CMOS domino logic. CMOS latches and flip flops. Memory elements design: 6 transistor static CMOS memory cell, 4 transistor dynamic memory cell. 3 transistor and 1 transistor dynamic memory cell. ROM, PROM. Contents Addressable Memory cell. Static CMOS memory array. I/O systems: IO PADs. VLSI Testing: procedure, stuck-at fault, fault coverage, test pattern generation. Scan chain.

Course Code & Title	EEE 4122 VLSI Design Laboratory
Credits	**1.0**
Prerequisite	**EEE 2401 and EEE 2105**
Contents	Circuit Design: Schematic, layout, DRC/LVS/RCX. Verification: Functional simulation of Structural/Behavioral/RTL design using Verilog. Synthesis: RTL Verilog to gate-level netlist. Physical Design: gate level netlist to GDSII.

Course Code & Title	EEE 4123 Biomedical Electronics
Credits	**3.0**
Prerequisite	**EEE 2103**
Contents	Elements of physiology: central and peripheral nervous system, types of nerves, neuronal conduction, biopotentials. Electrodes and sensors: electrical models, materials, electrode networks, types of sensors. Interface circuits: bio-amplifiers, practical considerations of implementation. Biophysical principles of electrical and magnetic neuromuscular stimulation. Electronic stimulator circuits: neural stimulators for the central nervous system (cochlear, visual, Parkinson's, tumors, dystonia, epilepsy, sleep apnea, pain) and the peripheral nervous system (limb movements, urinary system, paralysis, epilepsy and depression, pain) Biotelemetry: Introduction**,** power and data management telemetry, inductive-link based approach, capacitive-link based approach, optical approach, discrete and integrated circuitries, batteries.

Course Code & Title	EEE 4124 Biomedical Electronics Laboratory
Credits	**1.0**
Prerequisite	**EEE 2103**
Contents	Laboratory experiments based on EEE 4123.

Technical Electives (Power Group):

Course Code & Title	EEE 4211 Transmission and Distribution Systems
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	An overview on transmission & distribution system of Bangladesh. Transmission Line: Inductance, Capacitance for single phase & three phase lines. Underground cables: Types, electrostatic stress, grading of cables, Capacitance of single phase and three phase cables. High voltage AC & DC transmission: Advantages & disadvantages of each type of transmission, kinds of dc link. Mechanical design of transmission line: Types of insulators, voltage distribution along string of insulators, string efficiency, methods of equalizing potential; Sag: Sag calculation, effect of ice & wind on sag. Stability: Swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation, factors affecting stability, transient stability of synchronous generators, steady-state stability (frequency stability, voltage stability). Flexible AC transmission system (FACTS): Objective of FACTS, basic types of FACTS controllers and devices, Series compensation, Parallel compensation, Distribution automation & control (DAC), sources, effects and mitigation of harmonics in power system. Distribution System: Effect of voltage on transmission efficiency, comparison of various transmission and distribution systems, Kelvin's law, method of feeding distribution.

Course Code & Title	EEE 4213 Power Plant Engineering
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	Sources of energy: Fuels, nuclear energy, wind power, solar energy, tidal power. Power plant cycles: Routine cycle, regenerative cycles, gas power cycle, gas turbine cycles and others. Power plants: General layout and principles, Turbines: Steam turbine, gas turbine, combined cycle gas turbine, IC engines, hydro, nuclear and thermal power plant. Power plant instrumentation: Measurement of pressure, temperature, fuel and speed; electrical measurements, instrumentation and controls in steam power stations. Selection of location: Technical, economic and environmental factors, Load forecasting. General scheduling: Deterministic and probabilistic, Electricity tariff: formulation and types. Nuclear power station: Basic components, chain reactions, reactor types (PWR, BWR), shielding, nuclear safety. Nuclear power plant project in Bangladesh.

Course Code & Title	EEE 4219 High Voltage Engineering
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	High voltage DC: Rectifier circuits, voltage multipliers, Van-de-Graf, and electrostatic generators. High voltage AC: Cascaded transformers and Tesla coils. Impulse voltage: shapes, mathematical analysis, codes and standards, single and multi-stage impulse generators, tripping and control of impulse generators. Breakdown in gas, liquid and solid dielectric materials. Corona. High voltage measurements and testing. Over-voltage phenomenon and insulation, lightning and switching surges, basic insulation level, surge diverters and arresters.

Course Code & Title	EEE 4221 Advanced Electrical Machines
Credits	**3.0**
Prerequisite	**EEE 2203**
Contents	Special machines: Universal series motor, permanent magnet DC motor, unipolar and bipolar brushless DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drive circuits, switched reluctance motor, electro static motor, repulsion motor, synchronous and control transformers. Permanent magnet synchronous motors. Acyclic machines: Generators, conduction pump and induction pump. Magneto hydrodynamic generators. Fuel Cells, thermoelectric generators, flywheels. Vector control, linear motors and traction. Photovoltaic systems: stand alone and grid interfaced. Wind turbine generators: induction generator, AC-DC-AC conversion.

Course Code & Title	EEE 4223 Renewable Energy
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	Fundamentals of Energy Systems: reserve and resources, primary and secondary energy, Green House Gases and their effects. Energy Meteorology: The fundamental physics of solar radiation, solar geometry, interaction of solar radiation with the atmosphere, Reasons for wind flow, the coriolis force, the vertical wind profile, solar radiation and wind velocity measurements. Solar Energy: Solar PV: physical processes in solar cells, Modeling of solar cell, solar cell materials, properties of solar cells, influences of different parameters, Formation of PV arrays and modules, components of solar home systems and grid connected PV systems, Maximum power point tracking (MPPT), Modern solar energy applications (residential, electric vehicle, naval, and space, minigrid, nanogrid, net metering). Solar Thermal: The selective surfaces, the working principle of flat plate solar collectors, its important components and its usage. Wind Energy: The power content of flowing wind, wind flow profile, Bernoulli's equation, air foil, drag and lift force, wind turbine, power curve, Bets Optimum, Different types of generator for wind turbine, Different types of converters for wind energy conversion system. Biomass Energy: Biomass gasifier, biogas digester, bio methenation process, parameters influencing bio methenation process. Different types of biofuels. Hydro Power: The principle of hydro energy conversion, different types of water turbine based upon water head difference. Hydrogen and Fuel Cell: Properties of hydrogen, hydrogen production and storage, wind hydrogen system, working principles of fuel cells. loses, advantages and application of fuel cells, fuel cell types, stacking principles of fuel cells. Other Renewables: Geothermal energy, tidal, wave and sea current energies, the energy content and technologies to extract energy from other renewables. Energy Storage: Properties of energy storage media, types of energy storage technologies, different type of batteries, working principle of Lead-Acid batteries, factors that affect the performance of Lead-Acid batteries. Energy Economics for Renewable Energy. Home Energy Storage System, Grid connected PV system with storage, Grid Connected Hybrid system, Stand-alone Hybrid system, Vehicle to grid, Vehicle to Home.

Course Code & Title	EEE 4215 Operation and Control of Power System
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	Principles of power system operation: The economic load dispatch (ELD), SCADA: Communication system, remote terminal unit (RTU). Unit commitment, static security analysis, state estimation, optimal power flow, automatic generation control and dynamic

security analysis. Frequency regulation and load side management. Need based energy management (NEBM).

Course Code & Title	EEE 4216 Operation and Control of Power System Laboratory
Credits	**1.0**
Prerequisite	**EEE 3205**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4215. In the second part, students will design sample systems using the principles learned in EEE 4215.

Course Code & Title	EEE 4217 Power System Protection
Credits	**3.0**
Prerequisite	**EEE 3205**
Contents	Purpose of power system protection. Instrument transformers: CTs, PTs, accuracy class of CTs & PTs. Criteria for detecting faults: Over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Harmonics in power system and power quality. Electromechanical, electronic and digital Relays: Basic modules, over current, differential, distance and directional. Trip circuits. Unit protection schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Miniature circuit breakers and fuses. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF6 and vacuum.

Course Code & Title	EEE 4218 Power System Protection Laboratory
Credits	**1.0**
Prerequisite	**EEE 3205**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4217. In the second part, students will design sample systems using the principles learned in EEE 4217.

Course Code & Title	EEE 4225 Electrical Measurements
Credits	**3.0**
Prerequisite	**EEE 2203 and EEE 2103**
Contents	Measuring instruments: Permanent magnet moving coil, moving iron, electrodynamometer and electrostatic type. Ammeter and voltmeter, extension of instrument range. Current and potential transformers. Measurement of power and energy: induction and electrodynamometer type, maximum demand and power factor meter. Electronic measuring equipments. Measurement of resistance, capacitance and inductance. Measurement of conductivity, localization of cable faults. Transducers: strain gauges, thermocouple, resistive Capacitive and inductive transducers, linear variable differential transformer, piezoelectric and optical transducers and their applications. Signal conditioning and data acquisition systems. Error in measurement and their statistical analysis.

Course Code & Title	EEE 4226 Electrical Measurements Laboratory
Credits	**1.0**
Prerequisite	**EEE 2203 and EEE 2103**
Contents	Laboratory experiments based on EEE 4225.

Technical Electives (Communication Group):

Course Code & Title	EEE 4313 Optical Fiber Communication
Credits	**3.0**
Prerequisite	**EEE 3305 and EEE 3307**
Contents	Introduction. Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

Course Code & Title	EEE 4317 Mobile Cellular Communication
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	Introduction: Evolution of mobile cellular communication (History of wireless communication from pre 1G to 4G). Basic Network architecture (UMTS 3G and 4G), basic call flow diagrams. Cellular communication fundamentals: Hexagonal structure, frequency reuse, channel assignment, interference, Blocking probability, handoff, cell splitting, small cell concept, repeaters and distributed antenna system (DAS). Large scale and small scale propagation models: Free space, ground reflection models, path-loss models (Log-normal model, UMTS models for indoor and outdoor propagation), delay spread, coherence time and bandwidth, Rayleigh fading, level crossing rate and average fade duration. Diversity: Fundamentals of spatial diversity, selection and maximal ration combining received diversity, SNR improvement, transmit diversity, antenna spacing requirement. Modulation and pulse shaping for mobile cellular communication: PSK, FSK and QAM, spectral efficiency and BER performance, adaptive modulation, RC waveforms. CDMA: Fundamentals of spreading and multiple access through spreading codes, Walsh codes, PN codes, transmit power control, basic 3G transmitter and receiver structure, layered architecture and PHY layer channels, HSDPA basics. OFDM: Basic transmitter and receiver structure, LTE basics.

Course Code & Title	EEE 4319 Telecommunication Engineering
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	Introduction: Principle, evolution, networks, exchange and international regulatory bodies. Telephone apparatus. Switching system: Introduction to analog system, digital switching systems - space division switching, blocking probability and multistage switching, time division switching and two dimensional switching. Signaling Techniques, In Channel, Common Channel, SS7 signaling unit, STP, SCP. Call set up procedure. Data communication Architecture, OSI Reference Model, TCP/IP architecture, IP routing. Transmission media for Telecommunication. Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Telephone services and network: Internet telephony and VOIP, integrated services digital network

(ISDN), asynchronous transfer mode. Introduction to cellular telephony and satellite communication.

Course Code & Title	EEE 4321 Antenna and Propagation
Credits	**3.0**
Prerequisite	**EEE 3305**
Contents	Basics of antenna: Introduction, Radiation pattern, Radiation Power density, Radiation Intensity, Beam width, Directivity, Antenna efficiency, Gain. Friis Transmission equation and Radar Range Equation. Aperture Antennas (Rectangular and Circular). Horn Antennas. Printed and Microstrip Antenna, Antenna Arrays. Propagation of radio waves – broadcast and line of sight, transmission and reception of radio waves, effect of earth's curvature; long, medium and short wave propagation, ionospheric propagation, scattering in radio links, effect of rain and dust.

Course Code & Title	EEE 4323 Satellite Communication
Credits	**3.0**
Prerequisite	**EEE 3305 and EEE 3307**
Contents	Brief history and overview of satellite communications, regulatory bodies, communication systems. Satellite frequency bands, Satellite orbits and launching procedures and look angles. Spacecraft: power, communications, TT&C, antenna systems. Frequency allocations. Fundamental orbital laws. GEO, MEO, LEO satellites, subsystems of a communication satellite, earth station, Link budget analysis, C/N calculation. Modulation and multiplexing techniques for satellite link. Multiple access techniques: FDMA, TDMA, CDMA, advantage of spectral spreading, satellite jamming. Propagation effects-attenuation, effect of rain on propagation. Satellite Error Control and Coding. Case Studies: Global Positioning System (GPS), VSAT networks, LEO, DBS-TV.

Course Code & Title	EEE 4325 Multimedia Communication
Credits	**3.0**
Prerequisite	**EEE 3307 and EEE 3309**
Contents	Some basics on television systems, multidimensional signals and Fourier transform, multidimensional (space-time) sampling, interlaced and non-interlaced scanning: Information theory: conditional and joint entropy and redundancy, source coding theorem, statistical source models, mutual information rate distortion theory: Predictive coding: linear prediction, quantization, optimum predictor; Discrete two-dimensional transforms: DFT, DCT, wavelet and Hadamard transforms; Transform Coding with motion estimation, principles of MPEG coding; Modern audiovisual terminals and communication systems.

Course Code & Title	EEE 4327 Advanced DSP and Filter Design
Credits	**3.0**
Prerequisite	**EEE 3309**
Contents	Sampling, interpolation, and decimation; Fast Fourier Transform (FFT), fast convolution by FFT using the overlap-save or overlap-add methods; Bandpass sampling; IIR and FIR filter design and implementation issues: filter structures, coefficient quantization and

sensitivity, finite wordlength arithmetic or signal quantization, limit cycles, noise shaping; Spectral estimation methods, Basic adaptive filtering.

Course Code & Title	**EEE 4329 Telecommunication Policy and Management**
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	International telecommunication organizations, trans-border data flow, barriers to trade in information equipment and services, development of competition, and World Trade Organization telecommunication agreement. Policy problems created by the vulnerability of telecommunication and computer networks to accidental or intentional attacks, dependence of economic and military security on telecommunication networks, information warfare, privacy and surveillance, international trade and information security. Fundamentals of daily telecommunication operations, including human factors in organization, acquisition and procurement, research and development, logistical planning, and relations with carriers and manufacturers.

Course Code & Title	**EEE 4331 Biomedical Engineering**
Credits	**3.0**
Prerequisite	**EEE 3309**
Contents	Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics, structural level of the human body, muscular, skeletal, nervous, cardio-vascular, respiratory systems; Measurement of bio-signals: Measurement systems, transducers, amplifiers and filters, biopotentials (ECG, EEG, EMG and neurostimulation methods), cardiovascular instrumentation (pacemakers, blood pressure, defibrillator, dissolved gas measurement, blood flow measurements, plethysmography, cardiogrpahy & cardioverter), Imaging technology: X-Ray, gamma camera, nuclear magnetic resonance imaging, cerebral angiography, tomography, ultrasound imaging, including doppler ultrasound.

Course Code & Title	**EEE 4333 Special Topics on Telecommunication Engineering**
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	This course is aimed at covering topics of current interest and new technology of Telecommunication Engineering.

Course Code & Title	**EEE 4335 Information Theory and Coding**
Credits	**3.0**
Prerequisite	**EEE 3303 and EEE 3307**
Contents	Background of Information Theory, Probability, Joint and Marginal Probability, Baye's Theorem, DMS, Information Contents, Entropy, Mutual Information, Source Coding, Huffman coding, Noisy Channels: Binary Symmetric Channel, Binary Erasure Channel. Noisy Channel Coding theorem and Capacity. Coding: Linear block codes, Convolutional codes, Maximum Likelihood decoding and basics of Turbo coding.

Course Code & Title	EEE 4339 Introduction to Software Radios
Credits	3.0
Prerequisite	**EEE 3307**
Contents	Introduction & Foundational Principles, RF Design for DSP Engineers, Digital Generation of Signals, Analog to Digital Conversion, Equalization and Interference Rejection, Synchronization, Demodulation and Decoding, Real-Time Programming Issues, Case Studies in Software Radio Design.

Course Code & Title	EEE 4311 Microwave Engineering
Credits	**3.0**
Prerequisite	**EEE 3305**
Contents	Transmission lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart and impedance matching. Waveguides: general formulation, modes of propagation and losses in parallel plate, rectangular and circular waveguides. Micro strips: Structures and characteristics. Resonators: Waveguide Cavity Resonators, Microstrip Resonators. S-parameters and characterization of RF two-port devices. Power Divider and Coupler, Mixer, Oscillator. Linearity, sensitivity, and dynamic range. Radiation and Antennas: Radiation Resistance, Radiation Pattern- Isotropic, Directional and Omni Directional Patterns, Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency and Gain, Polarization, Hertzian and halfwave dipoles. Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

Course Code & Title	EEE 4312 Microwave Engineering Laboratory
Credits	**1.0**
Prerequisite	**EEE 3305**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4311. In the second part, students will design simple systems using the principles learned in EEE 4311.

Course Code & Title	EEE 4315 Digital Communication
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	Information Theory fundamentals: Mathematical models of information, entropy, Source coding, Huffman coding and decoding. Digital transmission system: Baseband and bandpass signal representation in terms of basis functions, geometric representation and waveforms of 1D, 2D and multidimensional signals: (PAM, PSK, QAM, FSK), Receiver design in AWGN: (Correlation and matched filter demodulators, maximum likelihood estimation, bit error performance). Digital signal transmission in bandlimited channels: Inter-symbol interference (ISI), Pulse shaping: (Nyquist and Raised Cosine pulse shapes), Linear equalization. Channel coding and capacity: Channel models and capacity, capacity curves, Linear block coding and decoding, Convolutional coding and decoding, Interleaving. Fundamentals of OFDM: Transmitter and receiver, practical parameters in commercial implementation (LTE).

Course Code & Title	EEE 4316 Digital Communication Laboratory
Credits	**1.0**
Prerequisite	**EEE 3307**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4315. In the second part, students will design simple systems using the principles learned in EEE 4315.

Course Code & Title	EEE 4337 RF Engineering
Credits	**3.0**
Prerequisite	**EEE 3307**
Contents	Introduction to Wireless Components: Antenna, Amplifier, Mixer, Oscillator, Resonant Circuits. Noise: Thermal Noise, Shot Noise, Noise Voltage and Power, Mixing of Noise, Noise Temperature and Noise Figure (NF), NF of Cascaded Components, NF of passive networks. Effects of Nonlinearity: Harmonics, Sensitivity and Dynamic Range, Gain Compression (P1dB), Intermodulation Distortion, Third Order Intercept Point (IP3), IP2, Intercept points of cascaded components. Impedance matching: Smith chart, L-Network, Pi Network Impedance matching. Impedance matching using smith chart. Filter: Filter Design: Maximally Flat, Equal ripple, Linear Phase Filter, Filter Scaling and Transformation. Butterworth, Chebyshev response. Amplifiers and Oscillators: S-Parameter, Power Gain, Stability, Stability Circles, Low Noise Amplifier (LNA) design, Characteristics of Power Amplifier (PA) and amplifier classes. Oscillator Tuning Range, Frequency Stability, Voltage Controlled Oscillator (VCO), Oscillator Phase Noise. Amplifier and Oscillator Design using S-parameters. Mixer: Frequency Conversion, Image Frequency, Conversion Loss, Isolation, Diode Mixer, Image Reject Mixer.

Course Code & Title	EEE 4338 RF Engineering Laboratory
Credits	**1.0**
Prerequisite	**EEE 3307**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4337. In the second part, students will design sample systems using the principles learned in EEE 4337.

Technical Electives (Computer Group):

Course Code & Title	EEE 4411 Computer Architecture
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	Information representation; Measuring performance; Limitations of Power consumptions; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths with single cycle and multi cycle implementations; Control Unit design; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels; DMA and Interrupts; Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

Course Code & Title	EEE 4415 Advanced Logic Design
Credits	**3.0**
Prerequisite	**EEE 2105**
Contents	Introduction. Combinational circuit design with programmable logic devices, implementation of high speed multipliers. Design of modular sequential logic circuits, implementation of digital fractional rate multipliers. State machine design, Mealy and Moore machines. Asynchronous circuit design. Design, modeling and verification of complex digital systems. Modem design methodologies for logic design: Data path and control design, algorithmic state machines integration of data and control. Logic circuit testing and testable design. Modern tools for the design and testing of digital systems. Digital design case studies.

Course Code & Title	EEE 4419 Multimedia Systems Design
Credits	**3.0**
Prerequisite	**EEE 3307 and EEE 3403**
Contents	Overview to multimedia systems, multimedia storage. Data compression techniques for audio and video. Synchronization. Multimedia networking and protocols, QOS principles. Video streams on ATM. Mobile multimedia computations. Operating system support for multimedia. Hypermedia system. Standard for multimedia. Multimedia database and multimedia applications.

Course Code & Title	EEE 4413 Computer Networks
Credits	**3.0**
Prerequisite	**EEE 2401 and EEE 3307**
Contents	TCP/IP and OSI Reference Models, Internet Protocol Stack, Circuit Switching vs. Packet Switching, FDMA, TDMA Physical Media, Encoding and Decoding, Delay and Packet Loss. Application Layer: Service requirements, WWW, HTTP, Electronic Mail (SMTP), Domain Name System (DNS). Transport Layer: Service Models, Multiplexing/

	Demultiplexing, Connectionless Transport (UDP), Connection-oriented Transport (TCP). TCP Flow & Congestion Control. Network Layer: Routing and forwarding, NAT, Fragmentation, Routing algorithms, Routing in the Internet. Link Layer and Local Area Networks: Link layer services, MAC Protocols, Link layer addressing Ethernet, CSMA/CD, ARP. Wireless and Mobile Networks: Wireless links and network characteristics, Wi-Fi: IEEE 802.11 Wireless LANs, CSMA/CA.

Course Code & Title	**EEE 4414 Computer Networks Laboratory**
Credits	**1.0**
Prerequisite	**EEE 2401 and EEE 3307**
Contents	Laboratory works based on EEE 4413.

Course Code & Title	**EEE 4417 Microprocessor Based System Design**
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	Limitations of 16 bit processors. 32 bit microprocessors (Intel 80386/80486, Motorola 68000) internal architecture, addressing modes, instructions, memory and I/O interfaces, system design, programming, applications to industrial process control. Embedded processors architecture, advanced port, programming, controller design for adjustable speed motor devices.

Course Code & Title	**EEE 4418 Microprocessor Based System Design Laboratory**
Credits	**1.0**
Prerequisite	**EEE 3403**
Contents	This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4417. In the second part, students will design simple systems using the principles learned in EEE 4417.

Technical Electives (Embedded System and Robotics Group):

Course Code & Title	EEE 4513 Real Time Embedded System Design
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	Embedded system courses are divided into two main-streams one is manly SW-oriented and the other is HW oriented. This course is planed focusing the SW part of high level embedded system design. Students who are interested in mainly embedded SW, intelligence, algorithm and real-time system design can take this course as an intro. For the HW part we will have another intro course. After learning this course student will be able to understand real-time operation and control algorithm, embedded OS, how to develop device driver for embedded system based on embedded OS. Can understand and will be able to continue higher studies in application specific embedded system design like communication, signal-processing, power optimization etc. 32-bit MCU intro- ARM architecture, feature, Advanced Programming- real-time system control, multitasking, real-time algorithm, Advanced embedded communications- USB, Ethernet, wireless, CAN, Mod-bus, Embedded OS- Various Tiny-OS, Embedded Linux, Windows CE, and OS for hand-held devices (Android, Symbian etc.)

Course Code & Title	EEE 4515 Industrial Automation and Robotics
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	Embedded system courses are divided into two main-streams one is manly SW-oriented and the other is HW oriented. This course is planed focusing the HW part of high level embedded system design. Students who are interested in mainly embedded HW, industrial automation, robotics and machine drives can take this course as an intro. For the SW part we will have another intro course. After learning this course students will be able to understand and work with various industrial drive and actuators, sensors and transducers. Will be able to understand work with robotic components, hydraulic, pneumatic devices, closed-loop control scheme and can continue higher studies in this field. Industrial drives- DC/AC motor, servo drives, power-electronics interfacing, Sensors and transducers- motion, position, velocity, force, strain etc., Robot as machine-robotic components, kinematical structure and mechanical components, end-efforts (tools and grips), Mechanical drive- Hydraulic and pneumatic system.

Course Code & Title	EEE 4517 Real Time Embedded Digital Signal Processing
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	Embedded system design also involves communication and signal processing application. DSP and FPGA based system design are mainly used in these fields. Students who are interested in other than industrial (machine) control and robotics can take this course to get an exposure in DSP and FPGA based system design. In this course application specific system design will be focused, such as telecommunication, protocol implementation, image-voice-video processing, bio-medical-signal processing etc. This course will use mainly 32-bit DSP-processor to develop system based on RTOS (need course 3) and/or Linux. MPU-Core design using FPGA will also be introduced besides ASIC design. DSP-Processor intro and system development, FPGA based MPU core design, ASIC design.

Course Code & Title	EEE 4511 Embedded System Design and Architecture
Credits	**3.0**
Prerequisite	**EEE 3403**
Contents	This course will teach the new powerful programming technique used for embedded system development. Student will learn to program 8-bit microcontroller using embedded-C. They will be able to solve small to medium scale problem using MCUs. Can input data from the system, process them and can show or use them to control the system. This course will cover 8-bit single–core general purpose MCU, which will make the course easy, interesting and finally drive them to be interested to learn high level MCUs thus to be aligned with the present trends of embedded system development. MCU introduction- architecture, memory and registers management, built-in peripheral, Introduction to embedded-C and development environment- IDE, variable types, I/O operation, Array and string, Functions, Pointers, IDE, Peripheral programming- I/O port, timer/counter and interrupt programming, Device interfacing- various display devices (LCD, Matrix etc.), input devices, analog sensors interfacing, analog device drive designing and interfacing, High level system introduction- 16/32 bit application specific MCU, advanced feature of embedded-C.

Course Code & Title	EEE 4512 Embedded System Design and Architecture Laboratory
Credits	**1.0**
Prerequisite	**EEE 3403**
Contents	Lab experiments will be based on different applications based on the MCU internal peripherals like ports, timer/counter and interrupt module. Display devices interfacing, Digital input device interfacing, Analog sensor interfacing, Analog device control (motor, light etc.).