Student Handbook

GREEN UNIVERSITY OF BANGLADESH

Department of
Electrical and Electronic Engineering

Preface

The Department of Electrical and Electronic Engineering (EEE) is a prominent department within the Green University of Bangladesh, boasting a distinguished history of excellence in undergraduate education and research for over fifteen years. Our mission is to cultivate the generation of highly qualified engineers prepared to contribute on both national and international stages.

The EEE department actively adapts its curriculum to the evolving nature of the engineering field. Regular updates to course content, expansion of laboratory facilities, and revisions to teaching and research materials are core departmental practices. Despite inherent resource limitations, the department is steadfastly committed to revising, renewing, and introducing new courses. This dedication ensures our students remain competitive with their peers at other leading universities throughout Bangladesh.

The syllabus presented in this handbook reflects this ongoing commitment to meeting the contemporary needs of EEE students, empowering them to fulfill career aspirations in national and international environments. This syllabus, along with the course offerings listed in this handbook, is the culmination of the department's faculty's efforts, informed by valuable cooperation and feedback from esteemed engineering universities and seasoned professionals. Curriculum development has benefited from a comprehensive review of course catalogs from universities across Bangladesh, Asia, Europe, and North America.

The EEE department syllabus was initially approved by the UGC on 27.07.2008. In subsequent meetings, several changes were made to the curriculum. These meetings aimed to update the EEE department's curriculum based on evolving educational needs and standards.

In the 1st Meeting of the EEE Curriculum Committee on 2nd May 2015, EEE 451 (Green Communication) and EEE 459 (Green Computing) were added to the syllabus. The 2nd Meeting on 13th August 2015 incorporated Green Power and Energy, Green Computing, Green Communications, and Green Electronics as elective courses. The 3rd meeting on 9th June 2016 reduced total credits from 147 to 144, adjusting elective course requirements. The 4th Meeting on 11th April 2017 modified the mission and vision of the department and updated syllabi for various courses. The 5th meeting on 10th November 2017 included new courses like HUM 211, HUM 213, EAP 204, HUM 205, and HUM 403 to meet UGC requirements.

The 6th curriculum committee meeting was held on 7th November, 2019. As per the requirements of OBE, 3 credits are allocated to 8 weeks of industrial training. As per the requirements of OBE, the final year project (minimum 6 credits) should be carried out in a period of 1 year. For this, Project/Thesis is conducted in 3 consecutive semesters, and the course codes will be EEE 400 A, EEE 400 B, and EEE 400 C, and the credit for each is 2 credits. In the 7th curriculum meeting, the title of some core and elective courses are changed after reviewing the course structure of Bangladesh University of Engineering and Technology (BUET) and some esteemed foreign universities.

Chairperson's Message

Welcome to the Department of Electrical and Electronic Engineering (EEE) at Green University of Bangladesh (GUB)!

Since its inception, the EEE Department has evolved into one of the most dynamic and leading departments at GUB, proudly hosting over 1000 students and 35+ dedicated faculty members. From the very beginning, our mission has been to deliver quality education and foster a vibrant learning environment that nurtures innovation, technical excellence, and ethical responsibility.

We are equipped with modern infrastructure, state-of-the-art laboratories, and a thoughtfully designed OBE-based curriculum that aligns with the latest industry trends and global technological advancements. Our curriculum emphasizes four core areas: Power and Energy, Electronics, Telecommunications, and Computer Engineering. To bridge the gap between theory and practice, our students are also engaged in industry attachment programs, gaining hands-on experience and real-world exposure.

Our faculty members are at the heart of this growth. They are not only passionate educators but also renowned researchers whose work is recognized globally through publications in prestigious international journals and conferences. They are continuously trained in modern teaching methodologies, ensuring our students receive the best possible guidance and mentorship.

Beyond academics, we take pride in cultivating a holistic educational experience. The EEE Club plays a vital role in organizing a wide range of extra and co-curricular activities, including seminars, workshops, competitions, industrial tours, and more-encouraging creativity, teamwork, and leadership among our students.

Whether you're a prospective student, a parent, a fellow academic, or simply an interested member of society, I warmly invite you to explore our department through our official website and social media platforms. We are always open to your questions, thoughts, and collaboration.

Come, be a part of the EEE family, and experience the journey of transformation, innovation, and excellence.

Dr. Md. Hasan Maruf
Chairperson,
Department of Electrical and Electronic Engineering,
Green University of Bangladesh

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Chapter 1: Introduction

1.1 Vision of GUB

Green University of Bangladesh envisions to be a top-ranking university in the world for transformative impact on the society through continuous innovation in education, research, creativity, and entrepreneurship.

1.2 Mission of GUB

The mission of GUB is to prepare competent, compassionate, ethically driven and socially responsive professionals, to educate students through research for intellectual as well as social transformation, and to enhance their lifelong learning capacity for creativity and adaptability to face the challenges of 21st century.

The Green University of Bangladesh will strive for:

UM1	Preparing competent, compassionate, ethically driven and socially responsible professionals in the areas of science, engineering, business, law, liberal arts and social sciences.
UM2	Educating students and imparting research knowledge for intellectual as well as social transformation enabled sustainable development.
UM3	Enhancing the self-learning capacity of students through outcome-based participatory activities.

1.3 Vision of the Department of EEE

The vision of the Department of Electrical and Electronic Engineering (EEE), Green University of Bangladesh is to ensure the transformational qualities of the graduates in acquiring and creating new knowledge and thus serving the country as well as the humanity to develop human capital and to yield knowledge base economy and peaceful society.

Table 1: Mapping of the Vision of the Department of EEE with that of the GUB

Vision of the EEE Department	**Vision of GUB**			
	Education	Research	Creativity	Entrepreneurship
Acquiring and Creating Knowledge	✓			
Knowledge-base Economy and Peaceful Society		✓	✓	✓

1.4 Mission of the Department of EEE

The mission statements of the EEE Department of GUB are:

i. **Mission Statement 1:** The department is committed to generating, disseminating and preserving knowledge and to working with others to bring this knowledge to bear on the world's greatest challenges.

ii. **Mission Statement 2:** The research and education of EEE will make a difference to human life and will benefit humanity.

iii. **Mission Statement 3:** By melding rigorous analytical thinking within a liberal context, the department will prepare the next generation of ethical, engaged, visionary and innovative leaders.

iv. **Mission Statement 4:** The department will catalyze new opportunities to enable an expanded campus, growing enrollment and increased array of partnership and program.

v. **Mission Statement 5:** The department will be a point of intersection for many disciplines inside and outside the country.

Table 2: Mapping of the Mission of the Department of EEE with that of the GUB

	UM1	UM2	UM3
EEE Mission 1		✓	
EEE Mission 2		✓	
EEE Mission 3	✓		
EEE Mission 4			✓
EEE Mission 5			✓

1.5 Description of the Program

Name of the Degree: B.Sc. in EEE
Name of the Faculty: Faculty of Science and Engineering (FSE)
Name of the Department: Department of Electrical and Electronic Engineering

1.6 Core Values

We believe, we practice, and we promote

- Academic Excellence
- Innovation and Lifelong Learning
- Integrity and Professional Ethics
- Social Responsibility and Leadership

- Inclusiveness
- Freedom of Thoughts and Expression
- Green Thinking and Living

1.7 Tagline

Leading by Innovation and Research

1.8 Goals/Objectives of the Department

The goals of the Department of Electrical and Electronic Engineering are:

- To prepare graduates for employment in various electrical engineering-related areas and for the pursuit of advanced degrees in EEE or allied fields by educating them in the fundamental concepts, knowledge, and laboratory/field techniques and skills of Electrical Engineering.
- To generate competencies of graduates in generating, disseminating, and preserving knowledge and to working with others to bring this knowledge to bear on the world's greatest challenges.
- By melding rigorous analytical thinking among graduates within a liberal context, the department will prepare the next generation of ethical, engaged, visionary, and innovative leaders.
- The department will catalyze new opportunities to enable an expanded campus, growing enrollment, and an increasing array of local and international partnerships and programs.

1.9 Features of OBE-based Curriculum

1.9.1 Course Outcomes (COs)

Course outcomes in outcome-based education are specific, measurable statements that outline what students are expected to learn and be able to do by the end of a course. These outcomes help guide the design of curriculum, assessments, and instruction and provide a clear framework for students to understand their own learning goals. By focusing on outcomes, educators can ensure that courses are aligned with broader educational objectives and that students are achieving the desired levels of knowledge and skills. Ultimately, course outcomes in outcome-based education aim to promote student success and learning outcomes.

The courses offered by the Department of EEE are meticulously designed to align with the department's mission statements, ensuring that educational outcomes are both relevant and impactful.

1.9.2 Program Outcomes (POs)

Program Outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and attitudes that students acquire while progressing through the program. The students of the B.Sc. in EEE program are expected to achieve the following graduate attributes or program outcomes at the time of graduation. The POs of EEE department are given as follows:

- **PO1 - Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- **PO2 - Problem analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.
- **PO3 - Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.
- **PO4 - Investigation:** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusion.
- **PO5 - Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6 - The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- **PO7 - Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
- **PO8 - Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.
- **PO9 - Individual work and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
- **PO10 - Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
- **PO11 - Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

- **PO12 - Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

1.9.3 Program Educational Objectives (PEOs)

The program educational objectives (PEO) of the EEE department of Green University of Bangladesh have been set in such a way so that after graduation the students can demonstrate:

PEO 1	Technical competency and leadership excellence to become professional engineers leading to a successful career in industry or academia.
PEO 2	Commitment towards sustainable development and maintaining professional ethics for the betterment of society.
PEO 3	Lifelong learning in generating innovative engineering solutions through entrepreneurship and applying complex problem-solving skills.

1.9.4 Mapping between PEOs and POs

	UM1	UM2	UM3
PO 1	✓		
PO 2	✓		
PO 3	✓		
PO 4	✓		
PO 5	✓		
PO 6			✓
PO 7		✓	
PO 8		✓	
PO 9	✓		
PO 10			✓
PO 11			✓
PO 12	✓		✓

1.10 Competency/Graduate Profile of EEE Graduates

The target competencies for the Electrical and Electronic Engineering (EEE) program are divided into two groups: General and Technical competencies.

1.10.1 Part I: General Competencies

The general areas require students to gain advanced knowledge, skills and experience in the following areas:

a) Ethical

b) Socially responsive citizen and leader

c) Analytical skills and creative knowledge

d) Excellence in communication

e) Assertive and self-confidence

f) Entrepreneurial

g) Demonstrative

h) Motivated

i) Conceptual and diagnostic

j) Strategic thinker and decision makers

1.10.2 Part II: Technical Competencies

The technical areas require students to gain advanced knowledge, skills and experience in the following areas:

a) Problem solving skills

b) Creativity

c) Learning and adaptation

d) Software and hardware skills

e) System administration skills

f) Update of knowledge

1.11 BNQF Domain

1.11.1 BNQF Learning Outcome Domains and Level Descriptors

1. **Fundamental Skills**

   (a) Demonstrate knowledge and critical understanding of the well-established principles of his/her field of study and of the way in which those principles have developed;

   (b) Apply underlying concepts and principles outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context;

   (c) Apply knowledge and skills in addressing issues/solving problems with minimal supervision;

   (d) Evaluate critically the appropriateness of different approaches to solving problems in his/her field of study;

(e) Support supervision of junior staff via a mentor or a leader/manager; and

(f) Display advanced digital literacy which is adequate to perform complex tasks and bring about solutions.

2. **Social Skills**

(a) Communicate and interact effectively and clearly information, problems, and solutions as a team to peers' experts, and non-experts in Bangla and English;

(b) Express her, himself fluently and spontaneously in English and Bangla;

(c) Use language flexibly and effectively for social, academic, and professional purposes;

(d) Produce clear. well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors, and cohesive devices in advanced proficiency level of Bangla and English;

(e) Demonstrate the ability to incorporate entrepreneurial skills in planning daily activities; and

(f) Display advanced civic literacy and knowledge, exercising civic rights and obligations at all levels as well as participating in changes for the improvement of Bangladesh society.

3. **Thinking Skills**

(a) Exercise very substantial degree of autonomy and often significant responsibility in making judgments/ decisions towards the management of self, others, and for the allocation of substantial resources; and

(b) Demonstrate professional knowledge and practical skills in both technical and management to lead a team in an inexperienced environment.

4. **Personal Skills**

(a) Engage in self-direction and self-enterprise skills;

(b) Demonstrate social, professional, environmental, and ethical practices/values;

(c) Show-case global knowledge and competencies to fulfil employment, entrepreneurial, and lifelong learning skills; and

(d) Contribute significantly to the society

1.11.2 Mapping PO with BNQF learning indicators

POs	BNQF Learning Outcome Domains			
	Fundamental Skills	Social Skills	Thinking Skills	Personal Skills
PO 1	✓			
PO 2			✓	
PO 3			✓	

POs	BNQF Learning Outcome Domains			
	Fundamental Skills	Social Skills	Thinking Skills	Personal Skills
PO 4			✓	
PO 5	✓			
PO 6		✓		
PO 7				✓
PO 8				✓
PO 9				✓
PO 10		✓		
PO 11			✓	
PO 12				✓

1.12 Faculty Members and Laboratory Facilities

1.12.1 List of Faculty Members and their field of specialization

- **Head of the Department**
  Dr. Md. Hasan Maruf
  PhD (IUT), M.Sc. (Sweden)
  Specialization: Semiconductor Device Modelling, Low Power VLSI Circuit, Semiconductor Memory, Memristor, and Smart Grid

- **Professors**

  1. Dr. Md Quamrul Ahsan
     PhD (Canada), M.Sc. (BUET)
     Specialization: Power System Reliability, Power System Planning, Load Management, and Renewable Energy
  2. Dr Khawza Iftekhar Uddin Ahmed
     PhD (USA), M.Sc. (BUET)
     Specialization: Signal Processing for Biomedical Applications, Wireless Communication
  3. Dr. Md. Fayzur Rahman
     PhD (South Korea), M.Sc. (India)
     Specialization: Power Electronics, Solid-State Transformer, High-Voltage Discharge Application, and Image Processing

- **Associate Professors**

  1. Dr. Md. Ahsanul Alam
     PhD (Saudi Arabia), M.Sc. (Malaysia)
     Specialization: Power System Dynamic Analysis, Renewable Energy, and FACTS Devices

2. Dr. Mohammed Nazmus Shakib
   PhD (Malaysia), M.Sc. (Malaysia)
   Specialization: Antenna Technology
3. Dr. Md. Hasan Maruf
   PhD (IUT), M.Sc. (Sweden)
   Specialization: Semiconductor Device Modelling, Low Power VLSI Circuit, Semiconductor Memory, Memristor, and Smart Grid

■ **Assistant Professors**

1. Mr. Shahriar Mahmud Kabir
   PhD (BUET, Ongoing), M.Sc. (BUET),
   Specialization: Biomedical Signal and Image Processing and Breast Tumor Classification
2. Mr. Mohammad Asif Ul Haq
   PhD (RUET, Ongoing), M.Sc. (Malaysia)
   Specialization: Energy Efficiency, Sustainability, Smart Grid, and Renewable and Sustainable Energy Systems
3. Mr. M M Naushad Ali
   M.Sc. (South Korea)
   Specialization: Image Processing, Computer Vision, Machine Learning, and Renewable Energy
4. Ms. Meherun Nesa
   M.Sc. (BUET)
   Specialization: Material Science, Medical Physics, and Semiconducting Thin Films
5. Mr. Sourav Barua
   M.Sc. (AUST)
   Specialization: Plug-in Hybrid Electric Vehicles (PHEV), Charging Impact on the Grid, Smart Grid Technology, Renewable Energy Integration, Power Systems Stability, Digital Systems Design with VHDL, Verilog, and FPGA, Internet of Things (IoT), and Robotics.

■ **Lecturers**

1. Ms. Lusain Nima
   M.Sc. (BUET)
   Specialization: Renewable and Sustainable Energy Systems.
2. Ms. Umma Syda Akther
   M.Sc. (Physics, DU), B.Sc. (Physics, JU)
   Specialization: Electronics & VLSI
3. AKM Shahabuddin
   MS(Nuclear Engineering, Russia), M.Sc. (Physics,JU), B.Sc. (Physics. JU)
   Specialization: Nanomaterials, Nuclear Power Reactor
4. Mr. Md. Naiemur Rahman
   B.Sc. (RUET)
   Specialization: Power Electronics, Control Systems, & Renewable Energy

5. Ms. Shahela Akter
   B.Sc. (RUET)
   Specialization: Electronics & VLSI
6. Mr. Md Atiqul Islam
   B.Sc. (CUET)
   Specialization: Power System Analysis
7. Md. Istiac Ahmed
   B.Sc. (IUT)
   Specialization: Photonics, Optoelectronics & Plasmonics
8. Mahmudur Rahman
   B.Sc. (CUET)
   Specialization: Image Processing & Machine Learning
9. Mr. Kamran Ahmmed
   B.Sc. (IUT)
   Specialization: Power Electronics & Control System, Power System Analysis
10. Mr. Md Takvir Anam
    B.Sc. (RUET)
    Specialization: Power Electronics & Control System
11. Mst. Umme Habiba
    B.Sc. (CUET)
    Specialization: Image Processing & Machine Learning
12. Mr. Sourav Chandra Das
    B.Sc. (RUET)
    Specialization: Photonics, optoelectronics & Plasmonics
13. Mr. Syed Mahmudul Hasan Mehedi
    B.Sc. (BUET)
    Specialization: Power System Analysis.
14. Mr. Ridwan Abrar
    B.Sc. (BUET)
    Specialization: Power System Analysis
15. Mr. Satirtha Paul Shyam
    B.Sc. (MIST)
    Specialization: Image Processing & Machine Learning
16. Ms. Monjila Afrin Dorothi
    B.Sc. (CUET)
    Specialization: Power System Analysis, Photonics, optoelectronics & Plasmonics
17. Mr. Md. Shahnewaz
    B.Sc. (RUET)
    Specialization: Power System Analysis
18. Mr. Shaharior Anik
    B.Sc. (RUET)
    Specialization: Photonics, PCF

19. Md. Ashaduzzaman Niloy
    B.Sc.(IUT)
    Specialization: Power Electronics & Control System, Renewable and Sustainable Energy Systems, Photonics, optoelectronics & Plasmonics

■ **Lab Lecturers**

1. Mr. Md. Abdullah Al Oafi Himon
   B.Sc. (GUB)
   Specialization: Communication Engineering
2. Mr. Md. Abul Khair
   B.Sc. (GUB)
   Specialization: Power Systems
3. Mr. Sakib Abdul Ahad
   B.Sc. (GUB)
   Specialization: Image Processing & Machine Learning
4. Nayem Sharker
   B.Sc. (GUB)
   Specialization: Renewable and Sustainable Energy Systems

1.12.2 Laboratory Facilities

The Department of EEE offers extensive laboratory facilities, furnished with standard equipment. These laboratories provide students with practical experience in areas such as circuit design, microelectronics, power systems, and communications. Engaging in hands-on experiments and projects allows students to develop essential technical skills, enhance their problem-solving capabilities, and deepen their understanding of theoretical concepts. The existing laboratory facilities of the department are shown below.

SL	Name of the Laboratory	Location
1.	Electrical Circuits Laboratory-I	A-607
2.	Electrical Circuits Laboratory-II	G-109
3.	Electronics Laboratory-I	G-110
4.	Electronics Laboratory-II	G-101
5.	Computer Programming & Digital Signal Processing Laboratory	E-104
6.	Integrated Design Project Laboratory	E-101
7.	Microprocessor & Interfacing Laboratory	E-102
8.	Communication & Power Electronics Laboratory	E-109
9.	Energy Conversion Laboratory	E-202/B
10.	Power System Protection Laboratory	A-203
11.	Physics Laboratory-I	A-407
12.	Physics Laboratory-II	A-405

Chapter 2: Academic Rules & Regulations

2.1 Admission and Degree Completion

2.1.1 Duration of the Program

4 Years/8 Semesters

2.1.2 Undergraduate Admission

Green University of Bangladesh (GUB) is growing steadily, upholding the spirit of its oath, "A Global Higher Education Center of Excellence" in order to contribute to the development of the business and technological sectors of Bangladesh. GUB programs are updated continuously by an independent academic council consisting of some scholars from renowned academic institutions of the country and are based on curricula of North American universities. Our graduates are much sought after and employed by the corporate sectors of the country. There is a wide range of undergraduate programs that GUB offers so that prospective students can make their degrees as exclusive as they may desire. At GUB, we are committed to ensuring academic excellence and a dynamic learning environment in each of our undergraduate programs. Our superlative faculty is always ready to support students with the greatest assistance. The following information will help you to have an overview of the undergraduate programs, including all the instructions under GUB rules and regulations.

2.1.3 Undergraduate Admission Eligibility

1. A minimum GPA of 2.5/2nd division/equivalent grade in SSC and HSC or equivalent public examinations. However, students with GPA 2.00 in any examination either SSC or HSC must have a minimum GPA of 6.00 totaling the GPA of both the examinations.

2. Candidates must have passed University of London and Cambridge GCE 'O' Level in at least five subjects and 'A' Level in at least two subjects. Only the best five subjects in 'O' Level and best two subjects in 'A' Level will be considered. Out of these seven subjects, a candidate must have at least 4B's or GPA of 4.00 in the four subjects and 3 C's or GPA of 3.5 in the remaining three subjects. (in the scale of A=5, B=4, C=3, D=2 and E=1.

3. Diploma in Engineering under the Bangladesh Technical Education Board (BTEB) or equivalent, with at least a second division or a minimum GPA of 2.5.

4. For admission to BSc in CSE, BSc in EEE and BSc in Textile Engineering programs, students must have had Physics, Chemistry and Mathematics with satisfactory scores in HSC/A-Level or equivalent level. Candidates not having Mathematics or failed in Mathematics at HSC/A-levels must take a remedial course on Mathematics in addition to the courses required for the program.

5. The students, who are sons/daughters of freedom fighters, will be eligible for getting admission if they have a minimum GPA of 5.00 totaling the GPA of SSC and HSC Examinations. Such students are requested to submit attested photocopies of (i) "Provi-

sional Certificate" from Ministry of Liberation war affairs. (ii) Mukti Barta (iii) Gazette (iv) "National ID" of the freedom fighter. (v) Birth Certificate / Death Certificate of the Freedom Fighter. (vi) Database of Freedom Fighters Information (vii) Government allowance book.

6. Minimum requirements for admission in LLB (Hons) Program: Combined GPA of 8.00 or above in SSC and HSC or equivalent public examinations.

2.1.4 Break of Studies

Candidates with a break of study of not more than five years may apply for direct admission. Candidates with a break of study of more than five years will have to apply before admission.

2.1.5 Graduate Admission

The advantage of postgraduate study is that it allows students to enter employment with additional skills and knowledge. A Postgraduate degree offers the graduate students a continuous higher education with the preparations of scientific and professional skills. It prepares students for the future challenges and provides them with knowledge and skills that expose them to creativity and enable them to contribute to development. GUB strives to enhance the national development process through the creation of a center of excellence in higher education that is responsive to society's needs.

2.1.6 Graduate Admission Eligibility

1. The candidates applying for Master programs must have minimum GPA 2.00 or equivalent results at the Bachelor level and

2. Minimum GPA of 2.50 in both SSC and HSC Examinations or at least one GPA of 2.00 with an aggregate GPA of 6.00 in SSC and HSC or

3. Candidates must have passed University of London and Cambridge GCE 'O' Level in at least five subjects and 'A' Level in at least two subjects. Only the best five subjects in 'O' Level and best two subjects in 'A' Level will be considered. Out of these seven subjects, a candidate must have at least 4B's or GPA of 4.00 in the four subjects and 3 C's or GPA of 3.5 in the remaining three subjects. (in the scale of A=5, B=4, C=3, D=2 and E=1)

4. At least 3 years of job experience with Bachelor degree or 4-year Bachelor (Honors) degree required for EMBA.

5. Candidates seeking admission to LL.M should have at least LL.B (Hons) degree from any recognized university.

2.1.7 Total Minimum Credit Requirement to Complete the Program

144 credits.

2.1.8 Total Class Weeks in a Semester

16 weeks per semester.

2.1.9 Degree Requirements at a Glance

A student enrolling for Bachelor of Science (B.Sc.) in Electrical and Electronics Engineering (EEE) needs to complete a total of 38 theory courses and 18 sessional courses. In addition to that, all students need to complete a final year design project/thesis in order to be awarded the degree.

2.1.10 Minimum CGPA Requirements for Graduation

2.5 out of 4.00

2.1.11 Maximum Academic Year of Completion

8 years.

2.1.12 Academic Advising

The Electrical and Electronic Engineering (EEE) Department of Green University of Bangladesh (GUB) endeavours to ensure that all students receive sound academic advice and guidance by the academic advisors or faculty members during their undergraduate or graduate studies. At the time of course registration in a semester, each student must receive academic guidelines/advice regarding the number of courses, or the courses in different categories for the purpose of registration. The advisor also determines the credit requirements for a student for the program s/he studies.

2.2 Scholarships and Financial Aid for Students

Green University of Bangladesh (GUB) offers scholarship and financial aid under the provision of Private University Act 2010. This is a significant step forward for GUB to encourage academic excellence in Bangladesh. We are committed to persistent investment in the "Scholarship and Waiver Program" in the coming years too. We encourage dedicated students, aiming for a bright career to apply for admission at GUB.

2.2.1 Scholarship and Waiver Application

A student can apply for a scholarship or waiver during the admission by submitting a prescribed form after paying a prescribed amount to the admission office.

2.3 Tuition Fee Waiver

Following types of Scholarships and Waivers are offered by the Green University of Bangladesh:

2.3.1 Merit Based Scholarships (based on the Previous Academic Attainments)

A student can receive a merit based scholarship based on their academic results during SSC and HSC or equivalent examinations. Here, a certain percentage of credit fees are waived based on their combined GPA in SSC and HSC or equivalent examinations, which may vary from 10% to 50%, where a higher GPA ensures a higher waiver. The percentage of waivers are determined in the admission committee meeting and well-communicated during the admission.

2.3.2 Merit-based Scholarships (based on the performance in Admission Test)

Some additional waivers are provided based on the performance of the admission test as follows:

- Top 5 highest scorers among the selected students in GUB Admissions Test (all tests combined) will be given an additional 10% scholarship.
- A minimum benchmark score of 80% of total marks for rewarding in the admission test will be followed. Maximum 5 students in a semester will be selected based on their admission test results. GPA of HSC or equivalent examinations will be considered if there is a tie/same mark for a position.

2.3.3 Special Waivers

A considerable number of special waivers are also awarded to the students based on certain criteria. Note that in case of special waivers, one student can avail only one option from the following categories:

- Female Students
- Siblings & Spouse
- Students of Ethnic Groups
- Players of National Cricket Team (present national team)
- Skilled players for GUB Teams
- Group (Minimum 5 students) Admission

These waivers may vary within a range of 5% to 100%. The percentage of the waivers are determined in the admission committee meeting and are well-communicated during the admission.

2.3.4 Semester Result Based Scholarship

Undergraduate students can avail additional scholarships (in addition to their existing scholarships) through their high academic attainment in the previous semester at GUB. Generally, the students who have CGPAs between 3.8 to 4.0 avail these scholarships. Here, a student may receive a tuition fee waiver of 5% to 10% based on his/her CGPA. Again, the percentage of the waivers are determined in the admission committee meeting and are well-communicated via various sources.

2.3.5 Scholarship for the Second Major (One Degree with Two Majors)

In case of a second major, a student will be awarded with 5% scholarship.

2.3.6 Tuition Fee waiver for GUB and US-Bangla Group employees and their Children, Siblings & Spouse

The faculty members of GUB or staff/ ward (maximum two at a time) of US-Bangla Group along with their spouses or first blood relatives will get an extra tuition fee exemption of 25%. No restriction will be imposed in taking courses on the employees of GUB/ US-Bangla Group. The waiver will be effective only if the employee has at least one year of work experience; conversely, the waiver will not be enjoyable. Again, after the completion of their degrees, they must serve at GUB/ USBangla Group for at least two years. Otherwise, they have to return the half of the benefits that they have received during their study while quitting the service.
An employee of these organizations has to submit a confirmation letter regarding his/her service in each semester to continue the waiver in the next semester.

2.3.7 Full-free Tuition Fee Waiver to the Sons and Daughters of Freedom Fighters

The scholarship/waiver for sons/daughters of the Freedom Fighters may be provided as per the guidelines of the government.

2.3.8 Scholarships from the Self Contributory Welfare Fund

Every semester, a considerable number of students are awarded scholarships from the self contributory fund of the employees of GUB. They received an amount of financial aid for two years once selected for the scholarships. This amount of financial aid and the number of recipients are decided by the respective committee based on the availability of the fund.

2.3.9 Conditions to Retail Scholarships

i) All types of scholarships/waivers based on the previous academic results will continue for the first two semesters. From the third semester onward, the waiver will depend on the results of the previous semester.

ii) If a student fails to maintain a minimum GPA requirement for a particular level of waiver, s/he will be entitled to a lower level of waiver, taking his/her latest GPA into consideration. Again, the percentages of the waivers are determined in the admission committee meeting and are well communicated via various sources.

iii) If a student officially dropped any semester, s/he may enjoy scholarship in the next semester as before. However, this phenomenon can be repeated for a maximum of two semesters.

iv) It is noteworthy to mention that an eligible student can avail only one option of scholarship/tuition fee waiver at a time-whichever is higher.

v) To enjoy scholarship and tuition fee waivers (except for female, ethnic minority group, sibling, and spouse waivers), undergraduate program students must register for at least a minimum credit, i.e., seventeen (17) credits for the regular programs and fifteen (15) credits for the weekend programs in each semester. If any department offers lower credits than the aforementioned credits (not lower than 15 credits for undergraduate programs), the condition can be relaxed based on the approval of the management authority of GUB.

vi) If any student registers for the minimum credits, i.e., 17 (regular programs)/15 (weekend programs) or more in a semester, s/he has to pass all the registered credits and maintain the required GPA to enjoy or to continue his or her scholarship/tuition fee waiver in the next semester.

vii) Scholarship and tuition fee waiver benefits are applicable only for the tuition fee and are never applicable for the other fees, including the admission fee, semester fee, Library fee, laboratory fee, extra-curricular activities fee, internship/dissertation/project/thesis/research writing/monograph writing fee, course improvement fee, make-up or retake examination fee, and viva voce fee.

viii) Facilities, such as scholarships, tuition fee waivers, and others, will instantly be cancelled forever if any student is found taking part in any activity that goes against the rules and regulations of the university. This policy will be followed strictly.

ix) A student can enjoy a maximum of a 50% waiver from one or more categories except Word of Freedom Fighters and Players of the National Cricket Team.

2.4 Registration

2.4.1 Academic Load for Students

A student shall take a minimum of 17 credits per semester for undergraduate regular programs and a minimum of 15 credits per semester for undergraduate weekend programs. However, a minimum of 15 credits per semester for regular programs could be allowed in special cases with the permission of the concerned authority. Again, a student shall not take more than 22 credits per semester for undergraduate regular programs and 20 credits per semester for undergraduate weekend programs. If a student is willing to take more credits than the maximum limit for accelerating graduation or covering the lapses, s/he shall have a CGPA of 3.5 or above and shall have taken written permission from the Chairperson of the department as well as the Dean of the faculty. Note that the students under academic probation will be offered fewer credits considering their academic performances.

2.4.2 Academic Advising

It is a developmental process that assists students in the clarification of their life/career goals and in the development of educational plans for the realization of these goals. Hence, GUB practices this process and assigns students to the academic advisors (generally, faculty members of the respective departments) during their study periods. When an advisor is assigned to a student, s/he serves as a facilitator of communication, a coordinator of learning experiences through course and career planning, and an academic progress reviewer. Before a student registers for the next semester, s/he must consult with his/her advisor to select the suitable courses to enroll in. Note that the advisor determines the credit requirements for a student in a particular semester. It is desirable that an academic advisor for a student remain unaltered till the completion of his/her program. Under unavoidable circumstances, a chairperson of the respective department can assign a new advisor.

2.4.3 Mentorship

Alongside academic advising, mentoring is another effective way (which is practiced at GUB) to support students-especially freshers' (students of the 1st semester)-to improve their learning curve through gaining required academic, administrative, and other support from their student mentors and faculty moderators during study periods at GUB. A novice student receives initial guidance, required information for long-term success in their academic career, course enrollment-related suggestions, and others from his/her mentor and/or moderator. The students mentorship program shall be carried out according to the guidelines mentioned in the Policy on Green University Students Mentorship Program (GUSMP).

2.4.4 Pre-registration

Before the pre-registration starts, all the departments shall set up their routines and other course details, including section details, instructor names, and others in the system. All the students who would like to enroll in the next semester shall perform the pre-registration through the GUB's online software system. As per the academic calendar and the pre-announcements through the various media-preferably, immediately after the midterm examination the online system will be unlocked for pre-registration. After consulting with the academic advisor, students shall complete their pre-registrations by themselves through the system. Failing to do so will impose a fine. Moreover, a student may not get his/her desired courses and/or sections if pre-registration is not completed duly on time.

2.4.5 Registration for Newly Admitted Students

Being admitted to the University, each student shall attain his/her studentship of the University to an academic program as per the University rules. S/he shall be required to register with the university through the university registration process and on payment of the required fees as determined by the university authority from time to time. The offices of the concerned department follow the course registration process supervised by respective faculty advisors, program coordinators, and chairpersons.

2.4.6 Registration for Existing Students

As per the academic calendar and the pre-announcements through the various media-like the pre-registration process-the online system will be unlocked for the registration before the next semester begins. Herein, the students can add/drop the courses and can complete the registration process once their payments are cleared. Even after the scheduled registration period, the students can still register up to an extended period, paying a certain amount of fine. No registration will be allowed afterwards. In all cases, the academic advisors will confirm the registrations of the students after consulting with them.

2.4.7 Class Size

For maintaining an interactive and effective learning environment in a classroom, it is suggested to limit the number of students in a theory class to 40 and in a practical/sessional class to 25.

2.4.8 Adding/Dropping of Courses

Like the pre-registration and registration processes, adding/dropping of courses will also be performed through the online system. Here:

- A student may add/drop courses without a fee or with a fee as per the schedule of the academic calendar.
- A student must obtain permission from the respective academic advisor, program coordinator(s), and chairperson of the department and complete the formalities with the registrar's office to add or drop courses.

2.4.9 Retaking Courses

Retaking a course can be performed in two scenarios, which are detailed below:

i) **Failed Courses**
If a student failed in any course, s/he will have to retake that course afterwards by re-registering and paying the full course fees. A course may be retaken in a semester only if it is offered in that semester.

Improvement of Grade
If a student obtains a grade lower than B in a course, s/he will be allowed to retake that course only once for the purpose of grade improvement-subject to the offering of that course. A student will be permitted to repeat a maximum of four courses in a bachelor's program for grade improvement. No improvement shall be allowed for the practical/sessional courses, and they cannot be retaken as self-study courses. Under all circumstances, the higher grade will be taken into account in calculating the final CGPA. A student taking advantage of the retake policy will not be eligible for receiving a gold medal or any other awards. Note: The course retaken must carry the same course code, course title, and course contents or their equivalent. A student retaking a course must attend the classes and assessments as per the guidelines of a regular student.

2.4.10 Self-study Courses

A final semester student can take a maximum of two courses as self-study, fulfilling the following conditions:

i) If a final semester student requires a maximum of two courses (not offered by the department) apart from the regular offered courses to complete his/her graduation.

ii) The number of students shall not exceed 4 (four) in a particular self-study course.

iii) A faculty member can conduct a maximum of two self-study courses in a semester.

iv) A self-study course is not applicable for grade improvement.

v) Prior to registering a self-study course:

- Courses must be approved by the Dean of the faculty with a recommendation from the Chairperson of the department and forwarded to the registrar's office to complete the formalities.
- Pay the prescribed self-study fee of the University (if this circumstance arises due to negligence/ reluctance/ unawareness of the student).

vi) Minimum 15 classes of one-hour duration must be conducted in a semester for each course.

2.4.11 Semester Drop/Withdrawal

i) If a student is willing to withdraw/ Drop from all the courses/ semester, s/he must follow the official semester drop process of GUB. As per the academic calendar, the student shall fill up an online form in the system and submit it for the approval.

ii) The approval of the application is subject to the permission of the Program Coordinator and Chairperson of the department as well as the Registrar of the University.

iii) If any student drops for fewer than three semesters without prior permission shall have to pay a prescribed delay drop fee per semester to continue his/her further study at GUB.

iv) If any student drops for three or more consecutive semesters without prior permission, the student's admission will be cancelled. The student can resume his/her study by taking readmission after taking permission from the Chairperson of the respective department and the Registrar of the University after paying the readmission fee.

v) A student, who leaves the University without officially withdrawing a semester in the manner mentioned above, will get a failed grade (F) in each course registered in that semester.

2.5 Guidelines for Thesis/Project/Dissertation/Monograph/Capstone Project/Internship

2.5.1 Final Year Design Project

Durations (semesters)	Credits	Semester before last semester	Last Sem
2	6	2	4

Note: In case of Final Year Design Project that spans for three semesters, 'I' grade will be given at the end of the 1st semester and the final grade will be given after the successful completion of the course.

i) The preparation of a report and successful defense of a student should be completed within the last semester, and the result must be published within that semester along with other courses on the result publication day.

ii) In case a student fails to complete his/her defense within the time period stated above, he/she becomes an irregular student. Such an irregular student will be given at most two additional semesters for completing works and defending successfully, subject to the payment of Tk. 2000/= (two thousand) in each additional semester.

iii) If a student fails to complete the report and defend it in the aforementioned 3 chances, they must register again with full credit tuition fees.

2.5.2 Internship

This course is designed to provide practical/industrial experiences to the students through internships in the reputed public and private industries. In this course, students will work in the industries, prepare detailed reports, and present their activities in front of their respective departmental industrial examination committees. At the end of this course, a student should be able to improve their knowledge and skills relevant to their areas of internship; relate, apply, and adapt relevant knowledge, concepts, and theories within industrial organizational settings; and practice organizational ethics. With these experiences and exposures, a student should be able to acquire adequate knowledge and skills to compete in the job market.

i) **Finding a Company/Industry/Organization for an Internship**
This is ultimately a student's responsibility to find an engineering organization for internship. For that, s/he must search for a suitable company/industry/organization based on his/her field of interests. In this regard, a student may take assistance from:

- Centre for Career Development (CCD) of Green University of Bangladesh (GUB).
- GUB alumni of his/her respective Department.
- Several social media platforms outside GUB like LinkedIn, AngelList, Meetup, and others.
- Talk to the companies/Industries/Organizations directly.
- His/her respective academic supervisor/faculty members/staff of GUB.

- Departmental Coordination Office
- Other relevant sources.

ii) **Internship Registration**
A student can register for this course only during his/her last semester following the standard online registration process of GUB. S/he also has to submit a filled-out form to the coordination committee for completing the process.

iii) **Activities and Duration of the internship**
Since this is a semester-long course, several activities of this course are distributed throughout the entire semester, including involvement with the industries, report preparation, attending the presentation and viva session, and others. Among them:

- Students must work a minimum of 84 hours to complete the industrial involvement for the course of at least 8 weeks. The activities include fieldwork, data collection, problem-solving, and the scheduled tasks assigned by the involved organization.
- S/he must report to his/her academic supervisor once every four (4) weeks, according to the supervisor's schedule, and also will announce the details of the meeting schedule once the student registers for an internship under him/her. The rest of the duration will be spent in preparing the report and for the presentation and viva session in front of the internship examination committee.

2.6 Registration Process for Final Year Design Project

i) A student can register for Final Year Design Project if he/she has completed a minimum credit hour prescribed by the concerned department as listed in the table.

Required Credit for Degree	**Minimum Required Credit hours earned before Registration**	**Credits**	**Duration (Semesters)**
144	100	6	2

ii) In case of an internship for one semester (or more), a student may be allowed to register for at most two courses (theory and/or lab) in that semester following the recommendations of the concerned supervisor and chairperson of the department.

iii) A student needs to fill out a prescribed form within the regular registration time schedule of a semester for completing the registration process of Final Year Design Project. Considering the large number of students in each batch of all the academic departments of Faculty of Science and Engineering (FSE), two or three students are allowed to form a group for submitting a single Final Year Design Project.

The students of the Faculty of Science and Engineering will register Final Year Design Project in the last 3 consecutive semesters with 2 credits in each semester (totaling 6 credits).

2.7 Industrial Training

The course code of Industrial Training is EEE 450, and the number of credit hours is 3. The minimum credit hours required before registration is 122.

2.8 Academic Rules

2.8.1 Performance Evaluation

The performance of a student will be continually evaluated during a semester through midterm exams, class tests/quizzes, assignments, presentations, and final exams. The final grade and its numeral score on a particular course earned by a student will be based on the total marks obtained in the course. Total marks for each course are split into the following categories:

i) Theory Courses:

SL	Evaluation Method	Marks
1	Class Test	10
2	KSA 1*	10
3	KSA 2*	10
4	Midterm Exam	30
5	Final Exam	40
Total		**100**

*Herein, under the KSA test 1 and 2, several assessment techniques, namely presentation, viva voce and project shall not be selected as the evaluation methods for those theory courses that are accompanying practical/sessional courses, as they are already incorporated.

ii) Practical/Sessional Courses:

SL	Evaluation Method	Marks
1	Lab Report	15
2	Continuous Lab Performance	25
3	Project, Presentation and Viva	30
4	Midterm Exam	30
5	Lab Final Exam	30
Total		**100**

2.8.2 Grading System

The numerical scores that are earned by a student in a course for those evaluation methods are cumulated and converted to a letter grade as below:

Numerical Grade	Letter Grade	Grade Point
80% or Above	A+	4.00
75% to 80%	A	3.75
70% to 75%	A-	3.50
65% to 70%	B+	3.25
60% to 65%	B	3.00
55% to 60%	B-	2.75
50% to 55%	C+	2.50
45% to 50%	C	2.25
40% to 45%	D	2.00
Less than 40%	F	0.00
	I	Incomplete
	W	Withdrawn

where, **'I' Grade:** A student will be assigned 'I' grade, if:

- S/he has been absent either in the mid-term or midterm makeup examination but appeared in the final examination.
- a student appeared either in the midterm or mid-term makeup examination but failed to appear in the final examination. An 'I' grade will be automatically converted to an 'F' grade if s/he fails to improve it to a passing grade.

'W' grade: 'W' grade will be assigned to a student for a course if s/he has withdrawn the course. 'W' grade will not be considered for the Grade Point Average (GPA)/ Cumulative Grade Point Average (CGPA) calculation.

'WH' grade: A student will be assigned a 'WH' grade, if s/he is reported in any centrally arranged examination (e.g., midterm or final) or his/her result is withheld for some other reasons. Once the decision is made about the student assigned 'WH' grade, it will be revised to any other grade.

2.8.3 Calculation of CGPA

For calculating the Grade Point Average (GPA)/ Cumulative Grade Point Average (CGPA) of a student, 'D' or higher grades are only taken into consideration. As the names suggest, the GPA is calculated for the courses taken in a semester and the CGPA is calculated for all the courses taken up to the semester to which it refers by the student. Hence, the GPA can be calculated as below:

$$Term\ GPA = \frac{\sum_{i=0}^{n} C_i G_i}{\sum_{i=0}^{n} C_i}$$

$$CGPA = \frac{\sum_{i=0}^{N} C_i G_i}{\sum_{i=0}^{N} C_i}$$

where C_i stands for credits of the i-th course, G_i stands for grade points earned in the i-th course. n stands for the number of courses taken in the semester. N stands for the number of courses taken up to the semester to which it refers. Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

2.8.4 Re-examination of Answer Script

Re-examinations of answer scripts will not be generally allowed. However, only re-scrutiny of an answer script may be allowed on the approval of the Dean of the Faculty against a written application of a student after paying a fee for this purpose.

2.8.5 Special Examinations

In GUB, three special examinations are practiced, namely make-up, improvement, and overlap examinations, which are elaborated below along with other aspects.

i) **Make-up Mid-term Examination**
A student can apply for the make-up mid-term examination if s/he could not appear in one/ more courses of the mid-term examination for any valid reason, including sickness, accident, or any other emergencies.

ii) **Improvement Examination (Mid-term Only)**
Students securing lower than 12 marks in courses of the mid-term examination are eligible for attending the improvement examinations, subject to the approval of the course instructors and Chairperson.

iii) **Make-up Final Examination**
A student can sit for the make-up final examination, if s/he could not appear in one/ more courses of the final Examination for any valid reason, including sickness, accident or any other emergencies; but s/he has appeared in the midterm or makeup mid-term examination.

iv) **Overlap Examination for Midterm and Final**
Overlap happens when the examinations of two courses are scheduled at the same time for a student during the midterm or final examinations. In this case, a student shall attend one examination duly on time and can attend another examination later as per the date announced by the Controller of Examinations.

v) **Application Procedure for Special Examinations**
For these special examinations, students have to submit application forms with proper evidence through the online system of GUB. Only those students will be allowed to appear in these examinations and will receive admit cards whose:

- Applications are approved by the course instructors and Chairperson of the Department.
- Fees related to these examinations are paid (applicable for make-up/ improvement examinations only) except overlap examination

2.9 Disciplinary Rules

2.9.1 General Principles

Upon admission to Green University of Bangladesh, the students are expected to accept the mission and goal of the university and assume the responsibilities for maintaining an atmosphere conducive to education and scholarship by respecting the personal safety and individual rights of all in the university community, by conducting themselves in accordance

with accepted standards of social behavior, and abiding by the regulations of the University and the laws of the country, while in the University premises.

They also subject themselves to the following principles:

- All the people have certain human rights and no student of Green University of Bangladesh may violate, ignore or break the rights.
- A student of Green University of Bangladesh is a part of the university community. This community includes the students, faculty members and the administrative staffs. The relationship within the community should be based on mutual trust and respect, honesty and integrity. Every member of the community is expected to promote understanding and friendship.
- All efforts should be made by the students to maintain excellent academic environment within the University.
- The students should make the best use of their time to achieve the most within their limited time.

2.9.2 Rules of Conduct

- Disruption No person shall cause, by action, threat or otherwise, a disturbance that the member knows may obstruct any activity organized by the Green University of Bangladesh or by any of its divisions, or the right of another member or members to carry on their legitimate activities, to speak or to associate with others.
- Interfering with, obstructing or disrupting:
    a. The university activities. This includes all normal university activities, such as, teaching, research, recreation, meeting, public events and disciplinary proceedings.
    b. The freedom of expression and movement of students or other members of the university community and their guests.
- Interfering with, obstructing or disrupting police or fire responses. Tampering with, impairing, disabling or misusing fire protection systems, such as, fire or smoke detectors, fire extinguishers, sprinklers or alarms or exit signs. Failing to evacuate during a fire alarm.
- Failing to comply with the direction of university officials who are performing their duties. This includes, but is not limited to, requests to present identification.
- Unauthorized Entry or Presence No person should enter the University premises with intent to damage or destroy the premises of Green University of Bangladesh, or to enter the premises in order to damage, destroy or steal any property in the premises of the University that is not his or her own, or without just cause knowingly enter or remain in or on any such premises.
- Unauthorized use of any kind official facilities, equipment or any other services provided by the Green University of Bangladesh

- No person shall knowingly use any facility, equipment or service of Green University of Bangladesh contrary to the expressed instruction of a person or persons authorized to give such instruction, or without just cause.
- No person shall knowingly gain access to or use Green University of Bangladesh's any computing or internal or external communication facility to which legitimate authorization has not been granted. No person shall use any such facility for any commercial, disruptive or unauthorized purpose.
- Misuse of computer facilities and/or systems, including, but not limited to the following acts:
    a. Unauthorized use of a computer, file, password or account.
    b. Dismantling or try to dismantle the computer
    c. Disconnecting the peripherals from the computer
    d. Sending objectionable messages through email, SMS or by any other means, accessing websites containing objectionable materials or downloading such files.
    e. Attempt to degrade system performance or capacity.
    f. Breach of computer security.
    g. Abuse of communal resources (e.g. unauthorized batch programs).
    h. Misappropriation of intellectual property or licensed software.
    i. Invasion of privacy.
    j. Harassments or threats.
- No person shall willingly mutilate, misplace, or render inoperable any stored information, such as, books, documents, slides, film, data files or programs from a library, computer or other such information storage, processing or retrieval system.
- No person shall use the University property for any illegal purpose.
- Unauthorized Formation of Political Party
- No person shall willingly form any kind of political party or its front organization or any political forum in the campus.
- No person shall use the University premises for any kind of political demonstration or procession or movement.
- No person shall willingly threat any member of the University community to join any political party or to participate any of its activities.
- No person shall use the University premises for extortion in the name of any political party or its front organization.
- No person shall involve with any kind of religious extremist or terrorist organization or its front organization.
- No person shall use the University premises for the publicity or promotion of any kind of political party or forum or its front organization.

- Unauthorized Possessions or use of Firearms or Ammunition
- No person shall possess or use any firearm or ammunition on the premises of Green University of Bangladesh. Possessing or using firearms, explosives, fireworks, incendiary device or other dangerous or illegal weapons is an offence. Only police officers and individuals with written permission from the respective authorities can possess weapons on the campus.
- A harmless instrument designed to look like a firearm, explosive or dangerous weapon that is used by or is in the possession of a person with the intent to cause fear in or assault to another person is expressly included within the meaning of a firearm, explosive or dangerous weapon.
- Student who is found guilty via a due-process procedure to have intentionally or recklessly used or possessed such weapons(s) in a way that would intimidate, harass, injure or otherwise interfere with the learning and working environment of the University, the minimum disciplinary sanction shall be suspension.
- False Charges No person shall knowingly or maliciously bring a false charge against any member of Green University of Bangladesh under these regulations.
- Aiding in the Commission of an offence No person shall counsel, procure, conspire with or aid a person in the commission of an offence defined in these regulations.
- Refusal to Comply with Sanctions Any person found to have committed an offence under the Regulations of Students Code of Conduct or violated any laws of the state or the Government refuse to comply with a sanction or sanctions imposed under the procedures of this Regulations.
- Smoking Green University of Bangladesh will maintain its premises as close to become smoke free as possible, In order to achieve this goal, understanding and patience of all the members of the community are required. Following are the guidelines one should follow:

    i) Smoking is prohibited in all indoor locations of the University and in any other is declared as ”Non-smoking Zone” by the University authority.

    ii) Smoking will be allowed in only those areas, where there is a sign for ”Smoking Zone”.

- Drugs and Alcohol Possessing, using, manufacturing, distributing or selling drugs, drug paraphernalia or alcoholic beverages in the Campus is a violation of the University policies. Green University of Bangladesh will try to maintain clean, healthy zone. In order to achieve this goal, understanding, patience and cooperation of all the members of the community are required. In the case of a student who is found guilty via a due process on procedure to have endangered the health, safety or welfare of an individual through the provision of alcohol or other drugs in violation of the laws of the government, the minimum disciplinary sanction shall be suspension. Provided however, the disciplinary committee shall have the right to place in abeyance the disciplinary sanction of suspension against a guilty student, whenever deemed fit and

proper. In cases where the sanction is kept in abeyance, the guilty student will be allowed to continue his studies without any break of study but shall remain under strict monitoring of Green University of Bangladesh Administration. The sanctions against the students earlier passed by the GUB Authority may be put into action again, if and when the GUB Administration feels necessary.

- Following are the guidelines one should follow:

  a. The selling or use of drugs should be immediately reported to the Administration of the University.

  b. Any person trying to sell or purchase drugs within the University Campus should be handed over to the Administration of the University for further action.

2.10 Examination Rules

2.10.1 Examinees' Obligations

i) No examinee will be allowed to sit for the examination without clearing his/her required dues of the University.

ii) They must come to the examination hall wearing ID cards.

iii) They must bring an Admit Card in the examination halls. Without an admit card, no student shall be allowed to sit for the examinations.

iv) They will have to be sure that the answer scripts have been duly signed by the invigilators.

v) They must put their bags, books, notes, note books, smart watches, and others to a place away from the examinees but near to the invigilators.

vi) Mobile phones must be switched off and kept in the bags.

vii) They may use Scientific Calculators only for specific courses.

viii) They will have to maintain overall discipline and sanctity in the examination hall.

2.10.2 Offences and Punishments

The following unfair means attempted by the examinees in the examination hall will be treated as punishable offences under sections 11.1, 11.2, and 11.3 of the Disciplinary Code of Conduct and their degree of punishments are also mentioned below:

SN	Offences	Punishments
1	Communicating verbally or exchanging or supplying any relevant information with any fellow examinees relating to the answer of questions during the examinations	Cancellation of examination of the particular course after consulting with the Chief Invigilator.
2	Copying or attempting to copy from chits, papers, books, script of another examinee mobile phone or electronic machineries	
3	Writing and copying or attempting to copy from the writing on the wall, black board or white board, floor, body, hand or hands or limbs, palm, desk, bench, clothes, scale or from any other place available in the examination hall.	
4	Possessing incriminating chits, papers, books, electronic machineries, etc. during the examination period	
5	Collecting or attempting to collect from the outside any chit, papers, books or any materials relating to the answers of the questions	
6	Use of cell-phone or any other unauthorized electronic code, sign, symbol helping to solve the problem or answering the question.	
7	Copying from the writing on the Admit Card.	
8	Appearing at the examination with the Admit Card of others or fake Admit Card	
9	Writing on the question and copying or attempting to copy or exchanging the written question paper with another examinee.	
10	Having no signature of the invigilator on the answer script or manipulating the date of the signature used previously with intent to update the signature	
11	Having hand writing of more than one examinee in a single answer script.	
12	Taking a seat intentionally in a wrong place other than his normal place and refusing to move from that place.	
13	Changing or substituting the cover page or inside page of the answer script.	Expulsion for 01 to 02 semesters depending on the gravity of the offence.
14	Refusing to hand over any incriminating or objectionable papers or materials, or throwing away or washing out from any part of the body or removing or swallowing them.	
15	Arrogant behavior or use of insolent or indecent or abusive language to the invigilators, or any other person or person relating to the examination	
16	Appearing at the examination through impersonation	
17	Changing roll number for taking undue advantage.	
18	Influencing or attempting to influence any other examinee(s) or person(s) involved in the examination mechanism.	
19	Impeding or creating obstruction or disturbance in the smooth conduct of the examination, or preventing others from appearing at the examination or provocation examinees to leave the examination hall.	

SN	Offences	Punishments
20	Threatening or assaulting or attempting to assault the invigilators or any person concerned with the examination either inside or outside the examination hall.	Expulsion for more than two semesters or permanently from the University.
21	Damaging furniture/gadgets/vehicles etc. in the examination hall/premises or setting fire or attempting to set fire on the valuable settings in the examination hall/premises of the University.	

Note: If a student is expelled in a course during the mid-term examination, s/he will not be entitled to sit for the final examination of that course.

2.11 Disciplinary Committee

Any violation of Regulation of Students Conduct will initiate necessary disciplinary action. The juridical system is subject to the authorities of the Disciplinary Committee of Green University of Bangladesh. The Disciplinary Committee shall have the authority to make decisions on any disciplinary matter.

2.12 Disciplinary Procedure

i. In the event the university is of the opinion that a student has in any manner acted in breach of any of the Regulation of Students Code of Conduct and making himself/herself liable to the disciplinary action, the University shall issue him a notice to show cause as to why disciplinary action shall not be taken against him/her, setting down the charges against him and requiring him to reply to the show cause notice within five (5) days. The time of five (5) days to show cause may only be extended for exceptional circumstances upon the prayer of the student. Should the student fail to reply within the stipulated time, the University shall proceed against him ex parte (in absentia).

ii. Pending disciplinary proceeding, the university may suspend the student if it is so considered in the interest of the university and other students. Such suspension shall not continue for longer than four(4) months, within which time the disciplinary proceedings shall be concluded. If the disciplinary proceedings cannot be concluded without the four(4) months time as aforesaid due to dilatory tactics adopted by the student concerned, the suspension may be extended till such time as the conclusion of the disciplinary proceedings.

iii. If it appears to the university that the reply, if any, given by the student is not satisfactory, the University shall constitute an inquiry committee consisting of three (3) teachers of the University who shall take a personal hearing of the student. The inquiry committee so constituted by the University shall notify the student to appear before it for a hearing within three (3) days from the date of receipt of the notice by the student. In such a hearing, the student shall have the right to defend himself/herself and adduce evidence in his favor, examine the records, if any and cross examine the witness, if any produced by the University. The student shall be present throughout the proceedings, except for exceptional circumstances his/her presence is excused upon his prayer, and in such an event the student concerned shall not have the right to raise any objection about the hearing on the ground of his/her absence at his/her request.

iv. The inquiry committee shall submit its report, giving its findings and recommendations to the University as soon as possible upon conclusion of the hearing. Provided, however that the recommendations of the inquiry committee shall not be the bindings on the University

who shall be free to take any decision against the student based on the findings of the inquiry committee.

v. The University shall communicate its decision to the student concerned by registered post to his/her address as recorded with the University, which shall be the conclusive evidence of the communication of the decision. The University shall also put a copy of the decision in the notice board of the university. Thereupon, the student shall have no right to raise any objection against the decision on the ground of non-communication.

vi. The student shall have the right of appeal against the decision of the University to the Vice-Chancellor of Green University of Bangladesh. Such an appeal shall be filed within fifteen (15) days from the date of the receipt of the decision of the University by the concerned student.

2.13 Appeals

The student has the right to appeal for a review of the penalties to the Vice-Chancellor of Green University of Bangladesh. The vice-chancellor, after being satisfied that a due process of investigation has been carried out, may decide to review the penalties or may refer the matter to the Board of Trustees (BoT), where a final decision on the review shall be reached.

Chapter 3: Structure of the Curriculum

3.1 Types of Courses

Three types of courses are included in the undergraduate curriculum. These are

i) Core Course

ii) Elective Course

iii) Pre-requisite Course

A number of courses are identified as core courses, which form the nucleus of the bachelor's degree program in Electrical and Electronics Engineering. A student has to complete all these core courses.

Apart from the core courses, the students can choose from a set of optional courses following their area of interest. The rules for selecting the number of elective courses are given in Section 3.6.5.

Prerequisite Course:
Some of the core courses are identified as prerequisite courses for some other courses. A prerequisite course is the one that is required to be completed before taking a particular course or more. A prerequisite course may require someone to complete one or more courses before its registration.

3.2 Course Categories

The letter prefix in any course number indicates the discipline/subject offering the course. Letter symbols for course categories are

EAP - English for Academic Purpose
EEE - Electrical and Electronic Engineering
CSE - Computer Science and Engineering
ME - Mechanical Engineering
HUM - Humanities
MATH - Mathematics
PHY - Physics
CHEM - Chemistry
PSD - Professional Life Skill Development

3.3 Course Designation and Numbering

To provide a common classification system for subjects and occupational sectors, a guideline regarding this matter is provided by the Bangladesh National Qualifications Framework (BNQF)-published on March 04, 2021. All the programs of GUB follow this guideline while designating and numbering their courses. Accordingly, each course must be designated and numbered with a seven-digit sequence, where,

- the initial four digits represent the detailed field of its subjects and occupational sectors as per the BNQF guideline

- the fifth digit represents the year/level of the course
- the last two digits represent whether the course is a theoretical course (when it is odd) or a practical/sessional course (when it is even).

The following example demonstrates the course designation and numbering of a course in detail: EEE 0713-101 where,

- EEE represents the department identification code, e.g., EEE for Electrical and Electronic Engineering
- 0713 represents the subject and occupational sector of this course as per the BNQF guideline, which represents the specific field, named Electricity and Energy under the broad field of Engineering, Manufacturing and Construction.
- Dash (-) separates the detailed field (0713) of a course from its unique identification number (101).
- 1 represents the year/level of the course, e.g., this course is for the 1st-year students
- 01 represents that this is a theoretical course, as it is an odd number.

3.4 Credit-Hour

Three credit hours are assigned to a theory course, and it requires three hours of lecture in a week. The duration of a lecture is usually 1 hour and 30 minutes. One credit lab course will have a minimum of 24 hours of classes per semester, and each laboratory class will have a duration of 3 hours if it is a 1.5 credit.

3.5 Summary of Course Structure

The Bachelor of Science in Electrical and Electronic Engineering (B.Sc. in EEE) program offers different types of courses. The offered types of courses and their total credit hours are presented in the following table.

The Department of EEE of Green University of Bangladesh offers the following types of courses for the award of a BSc. in EEE degree:

1. General Engineering Course
    i) Language and General Education Course
    ii) Basic Science and Mathematics Course
    iii) Other Engineering Course
2. Core Course
3. Elective Course
4. Final Year Design Project

Category	No. of Theory Courses	No. of Sessional Courses	Total Credit (in % of total credits)	
Language and General Education	7 (18 Cr)	3 (4.5 Cr)	22.5 (15.62%)	
Basic Science and Mathematics	9 (27 Cr)	2 (3 Cr)	30 (20.83%)	
Other Engineering	2 (6 Cr)	1 (1.5 Cr)	7.5 (5.21%)	
Core (EEE)	16 (48 Cr)	10 (15 Cr)	63 (43.75%)	**(58.34%)**
Elective	4 (12 Cr)	2 (3 Cr)	15 (10.42%)	
Final Year Design Project			6 (4.17%)	
Total	**38 (111 Cr)**	**18 (27 Cr)**	**144 (100%)**	
Total Program Credit: 144 Credits				

3.6 Course Structure with Course title and Course Code

3.6.1 Language and General Education

Sl	Course Code	Course Title	Credit
1	EAP 0231-009	English for Academic Purposes	0
2	PEL 0231-102	Professional English Lab I	1.5
3	PEL 0231-202	Professional English Lab II	1.5
4	HUM 0232-211	Functional Bengali Language	3
5	PLS 0031-400	Professional Life Skills Development	1.5
6	HUM0314-213	History of the Emergence of Bangladesh	3
7	HUM 0413-407	Engineers in Society	2
8	HUM 0411-409	Entrepreneurship and Innovation in Engineering	2
9	HUM 0223-411	Industrial Management and Finance	2
10	HUM 0314-2XX	HUM Elective I	3
11	HUM 0314-3XX	HUM Elective II	3

3.6.2 Basic Science and Mathematics

Sl	Course Code	Course Title	Credit
1	MATH 0541-101	Differential and Integral Calculus	3
2	MATH 0541-103	Ordinary and Partial Differential Equations	3
3	MATH 0541-205	Linear Algebra and Complex Variable	3
4	MATH 0541-207	Coordinate Geometry and Vector Analysis	3
5	MATH 0541-209	Probability and Statistics	3
6	MATH 0541-301	Numerical Methods	3
7	PHY 0533-101	Physics I	3
8	PHY 0533-103	Physics II	3

Sl	Course Code	Course Title	Credit
9	PHY 0533-104	Physics Lab	1.5
10	CHEM 0531-101	Chemistry	3
11	CHEM 0531-102	Chemistry Lab	1.5

3.6.3 Other Engineering

Sl	Course Code	Course Title	Credit
1	CSE 0613-101	Computer Programming	3
2	CSE 0613-102	Computer Programming Lab	1.5
3	ME 0715-201	Mechanical Engineering Fundamentals	3

3.6.4 Program Courses

Sl	Course Code	Course Title	Credit
1	EEE 0713-101	Electrical Circuits I	3
2	EEE 0713-103	Electrical Circuits II	3
3	EEE 0713-104	Electrical Circuits Lab	1.5
4	EEE 0714-201	Electronics I	3
5	EEE 0713-203	Energy Conversion I	3
6	EEE 0713-205	Engineering Electromagnetics	3
7	EEE 0713-207	Energy Conversion II	3
8	EEE 0713-208	Energy Conversion Lab	1.5
9	EEE 0714-209	Electronics II	3
10	EEE 0714-214	Electronics Lab	1.5
11	EEE 0714-301	Continuous Signals and Linear Systems	3
12	EEE 0714-303	Digital Electronics	3
13	EEE 0714-304	Digital Electronics Lab	1.5
14	EEE 0713-305	Power System	3
15	EEE 0714-307	Communication Systems	3
16	EEE 0714-308	Communication Systems Lab	1.5
17	EEE 0714-309	Solid State Devices	3
18	EEE 0714-317	Microprocessor and Embedded Systems	3
19	EEE 0714-318	Microprocessor and Embedded Systems Lab	1.5
20	EEE 0714-335	Introduction to Digital Signal Processing	3
21	EEE 0714-336	Introduction to Digital Signal Processing Lab	1.5
22	EEE 0714-401	Control Systems	3
23	EEE 0714-402	Control Systems Lab	1.5
24	EEE 0714-422	Integrated Design Project	1.5
25	EEE 0714-406	Electrical Services Design	1.5
26	EEE 0713-450	Industrial Training	3
27	EEE 0713-400	Final Year Design Project	6

3.6.5 Elective Course

The students have to choose a major and a minor group and earn a total of 15 credits from both. The selection should be such that 10.5 credits are from the major group and 4.5 credits is from the minor group.

SL	Course Code	Course Title	Credit
1	EEE 07XX-3XX	Elective I	3
2	EEE 07XX-3XX	Elective II	3
3	EEE 07XX-3XX	Elective II Lab	1.5
4	EEE 07XX-4XX	Elective III	3
5	EEE 07XX-4XX	Elective III Lab	1.5
6	EEE 07XX-4XX	Elective IV	3

3.6.6 Elective Groups

Group A: Communication and Signal Processing

Sl	Course Code	Course Title	Credit
1	EEE 0714-319	Random Signals and Processes	3
2	EEE 0714-325	Microwave Engineering	3
3	EEE 0714-326	Microwave Engineering Lab	1.5
4	EEE 0714-407	Optical Fiber Communications	3
5	EEE 0714-415	Digital Signal Processing	3
6	EEE 0714-423	Digital Communication	3
7	EEE 0714-424	Digital Communication Lab	1.5
8	EEE 0714-433	Mobile Cellular Communication	3
9	EEE 0714-441	Telecommunication Engineering	3
10	EEE 0714-451	Wireless Communication	3
11	EEE 0714-449	Machine Learning	3
12	EEE 0714-459	Digital Image Processing	3
13	EEE 0714-467	Medical Imaging	3

Group B: Electronics

Sl	Course Code	Course Title	Credit
1	EEE 0714-321	Analog Integrated Circuits	3
2	EEE 0714-329	VLSI I	3
3	EEE 0714-330	VLSI I Lab	1.5
4	EEE 0714-409	Compound Semiconductor and Hetero Junction Device	3
5	EEE 0714-417	Semiconductor Processing and Fabrication Technology	3
6	EEE 0714-425	VLSI II	3
7	EEE 0714-426	VLSI II Lab	1.5
8	EEE 0714-435	Optoelectronics	3
9	EEE 0714-443	Semiconductor Device Theory	3
10	EEE 0714-453	Nanotechnology and Nano electronics	3

Sl	Course Code	Course Title	Credit
11	EEE 0714-455	Medical Electronics	3
12	EEE 0714-463	FPGA Based System Design	3
13	EEE 0714-465	Mechatronics and Industrial Automation	3

Group C: Power

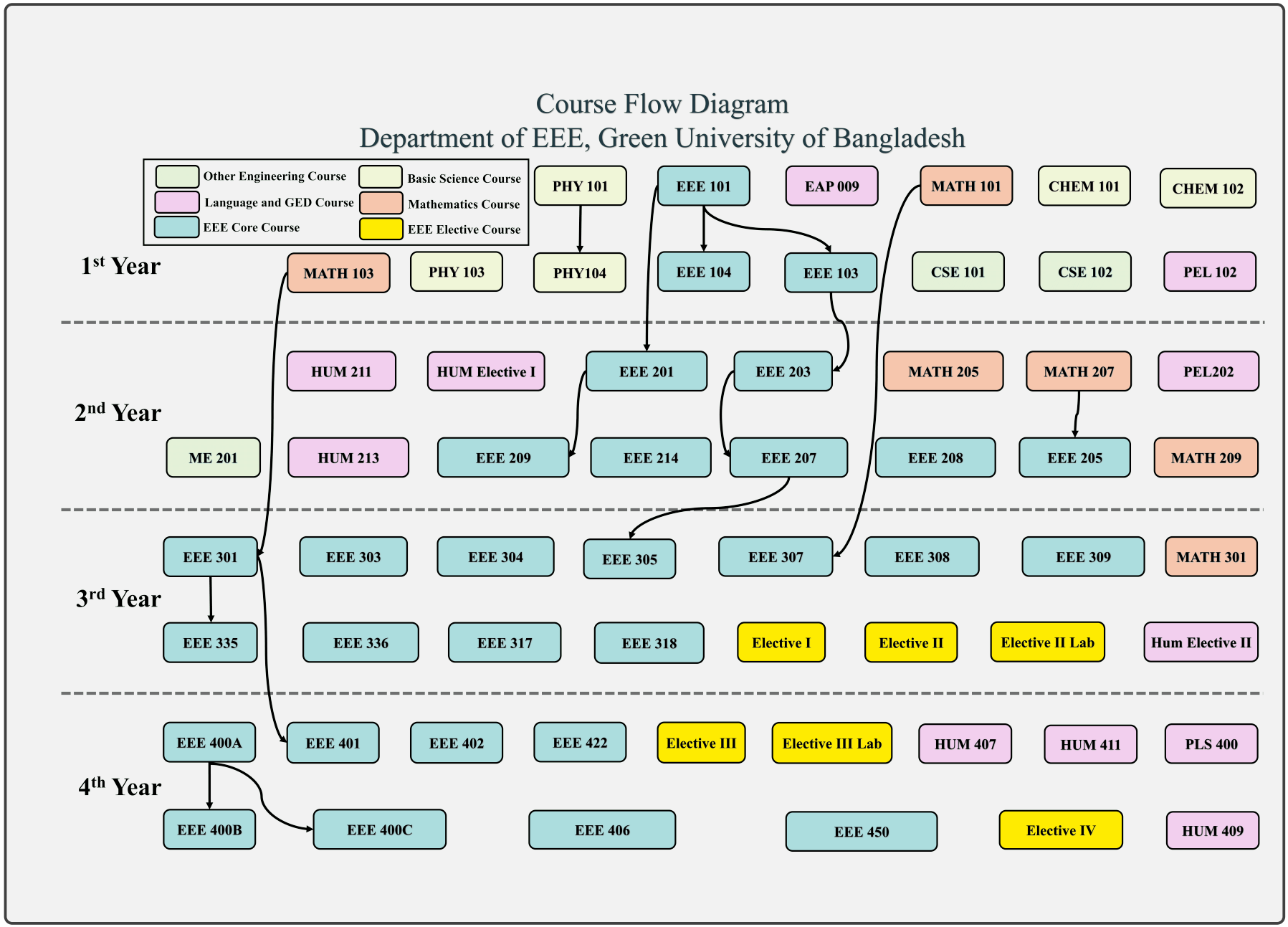
Sl	Course Code	Course Title	Credit
1	EEE 0713-323	Economic Operation and Stability Analysis of Power System	3
2	EEE 0713-327	Transmission and Distribution of Electrical Power	3
3	EEE 0713-333	Power Electronics	3
4	EEE 0713-334	Power Electronics Lab	1.5
5	EEE 0713-411	Power Plant Engineering	3
6	EEE 0713-419	Energy Conversion-III	3
7	EEE 0713-427	Power System Protection and Automation	3
8	EEE 0713-428	Power System Protection and Automation Lab	1.5
9	EEE 0713-429	High Voltage Engineering	3
10	EEE 0713-430	High Voltage Engineering Lab	1.5
11	EEE 0713-437	Power System Reliability	3
12	EEE 0713-445	Power System Operation and Control	3
13	EEE 0713-457	Renewable Energy System	3
14	EEE 0713-461	E-waste and Carbon Footprint	3
15	EEE 0713-469	Smart Grid	3

Group D: Computer

Sl	Course Code	Course Title	Credit
1	EEE 0714-331	Microprocessor System Design	3
2	EEE 0714-332	Microprocessor System Design Lab	1.5
3	EEE 0714-413	Real Time Computer System	3
4	EEE 0714-421	Multimedia Communications	3
5	EEE 0714-431	Computer Networks	3
6	EEE 0714-432	Computer Networks Lab	1.5
7	EEE 0714-439	Computer Architecture	3
8	EEE 0714-471	Cryptography and Network Security	3
9	EEE 0714-473	Cyber Security	3

HUM Electives

Group	Course Code	Course Title	Credit
HUM Elective I	HUM 0314-201	Sociology	3
	HUM 0314-207	Engineering Economics	3
HUM Elective II	HUM 0314-303	Financial and Managerial Accounting	3
	HUM 0314-307	Bangladesh Studies	3



3.7 Semester-wise course distribution

The courses of the Bachelor of Science in Electrical and Electronic Engineering are arranged and distributed among eight semesters based on the hierarchical needs of the courses. In the following, semester-wise courses are listed along with relevant information.

Year-I, Semester-I

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0713-101	Electrical Circuits I	Nil	3	
MATH 0541-101	Differential and Integral Calculus	Nil	3	
PHY 0533-101	Physics I	Nil	3	
EAP 0231-009	English for Academic Purposes	Nil	0	
CHEM 0531-101	Chemistry	Nil	3	
CHEM 0531-102	Chemistry Lab	Nil		1.5
Total	**(5+1) Courses**		**12**	**1.5**

Year-I, Semester-II

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0713-103	Electrical Circuits II	EEE 0713-101	3	
EEE 0713-104	Electrical Circuits Lab	EEE 0713-101		1.5
MATH 0541-103	Ordinary and Partial Differential Equations	Nil	3	
PHY 0533-103	Physics II	Nil	3	
PHY 0533-104	Physics Lab	PHY 0533-101		1.5
PEL 0231-102	Professional English Lab I	Nil		1.5
CSE 0613-101	Computer Programming	Nil	3	
CSE 0613-102	Computer Programming Lab	Nil		1.5
Total	**(4+4) Courses**		**12**	**6**

Year-II, Semester-I

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0714-201	Electronics I	EEE 0713-101	3	
EEE 0713-203	Energy Conversion I	EEE 0713-103		1.5
PEL 0231-202	Professional English Lab II	Nil	3	
MATH 0541-205	Linear Algebra and Complex Variable	Nil	3	
MATH 0541-207	Co-ordinate Geometry and Vector Analysis	Nil	3	
HUM 0314-2XX	HUM Elective I	Nil	3	
HUM 0232-211	Functional Bengali Language	Nil	3	
Total	**(6+1) Courses**		**18**	**1.5**

Year-II, Semester-II

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0713-205	Engineering Electromagnetics	MATH 0541-207	3	
EEE 0713-207	Energy Conversion II	EEE 0713-203	3	
EEE 0713-208	Energy Conversion Lab	Nil		1.5
EEE 0714-209	Electronics II	EEE 0714-201	3	
EEE 0714-214	Electronics Lab	Nil		1.5
MATH 0541-209	Probability and Statistics	Nil	3	
HUM 0314-213	History of the Emergence of Bangladesh	Nil	3	
ME 0715-201	Mechanical Engineering Fundamentals	Nil	3	
Total	**(6+2) Courses**		**18**	**3**

Year-III, Semester-I

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0714-301	Continuous Signals and Linear Systems	MATH 0541-103	3	
EEE 0714-303	Digital Electronics	Nil	3	
EEE 0714-304	Digital Electronics Lab	Nil		1.5
EEE 0713-305	Power System	EEE 0713-207	3	
EEE 0714-307	Communication Systems	MATH 0541-101	3	
EEE 0714-308	Communication Systems Lab	Nil		1.5
EEE 0714-309	Solid State Devices	Nil	3	
MATH 0541-301	Numerical Methods	Nil	3	
Total	**(6+2) Courses**		**18**	**3**

Year-III, Semester-II

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 07XX-3XX	Elective I	Nil	3	
EEE 0714-335	Introduction to Digital Signal Processing	EEE 0714-301	3	
EEE 0714-336	Introduction to Digital Signal Processing Lab	Nil		1.5
EEE 07XX-3XX	Elective II		3	
EEE 07XX-3XX	Elective II Lab			1.5
EEE 0714-317	Microprocessor and Embedded Systems	Nil	3	
EEE 0714-318	Microprocessor and Embedded Systems Lab	Nil		1.5
HUM 0314-3XX	HUM Elective II		3	
Total	**(5+3) Courses**		**15**	**4.5**

Year-IV, Semester-I

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0713-400A	Final Year Design Project	Nil	2	
HUM 0413-407	Engineers in Society	Nil	2	
EEE 0714-401	Control Systems	EEE 0714-301	3	
EEE 0714-402	Control Systems Lab	Nil		1.5
EEE 0714-422	Integrated Design Project	Nil		1.5
HUM 0223-411	Industrial Management and Finance	Nil	2	
EEE 07XX-4XX	Elective III	Nil	3	
EEE 07XX-4XX	Elective III Lab	Nil		1.5
PLS 0031-400	Professional Life Skills Development	Nil		1.5
Total	**(5+4) Courses**		**12**	**6**

Year-IV, Semester-II

Course Code	Course Name	Prerequisite	Credit	
			Theory	Sessional
EEE 0713-400B	Final Year Design Project	EEE 0713-400A	2	
EEE 0713-450	Industrial Training	Nil	3	
HUM 0411-409	Entrepreneurship and Innovation in Engineering	Nil	2	
EEE 07XX-4XX	Elective IV		3	
EEE 0714-406	Electrical Services Design			1.5
EEE 0713-400C	Final Year Design Project	EEE 0713-400A	2	
Total	**(4+2) Courses**		**9**	**4.5**

Note that

1. The total number of theory courses is 39, with 117 credits.
2. The total number of laboratory courses is 18, with 27 credits.
3. Project/Thesis is one course with 6 (3+3) credits.

3.8 Description of All Courses

3.8.1 Core Courses

Course Code: EEE 0713-101	**Course Title:** Electrical Circuits I	**Credit:** 3

Prerequisite: Nil
Content: Circuit variables and elements: voltage, current, power, energy, independent and dependent sources, resistance; basic laws: Ohm's law, Kirchhoff's current and voltage laws; simple resistive circuits: series and parallel circuits, voltage and current division, wye-delta transformation; techniques of circuit analysis: nodal and mesh analysis including super node and super mesh; network theorems: source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem.
Energy storage elements: inductors and capacitors, series parallel combination of inductors and capacitors; transient responses of RL, RC circuits and R-L-C circuits: natural and step responses; 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: EEE 0713-103	**Course Title:** Electrical Circuits II	**Credit:** 3

Prerequisite: EEE 0713-101
Content: Sinusoidal functions: instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor.
Analysis of single phase AC circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits, circuits with non-sinusoidal excitations, transients in AC circuits, passive filters.
Resonance in AC circuits: series and parallel resonance and Q factor, magnetically coupled circuits; analysis of three phase circuits: three phase supply, balanced and unbalanced circuits, power calculation.

Course Code: EEE 0713-104	**Course Title:** Electrical Circuits Lab	**Credit:** 1.5

Prerequisite: EEE 0713-101
Content: In this course, students will perform practical experiments to verify the theories and concepts learned in EEE 0713-101 and EEE 0713-103.

Course Code: EEE 0714-201	**Course Title:** Electronics I	**Credit:** 3

Prerequisite: EEE 0713-101, EEE 0713-103
Content: Diode circuits: half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits.
Bipolar junction transistor (BJT) as a circuit element: BJT configurations, current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch, single stage mid-band frequency BJT; amplifier circuits: voltage and current gain, input and output impedance of a common base, common emitter and common collector amplifier circuits, Darlington pair.

Field effect transistors: structure and physical operation of JFET, depletion and enhancement MOSFET, threshold voltage, body effect, current-voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter.

Course Code: EEE 0713-203	**Course Title:** Energy Conversion I	**Credit:** 3

Prerequisite: Nil
Content: Transformer: construction, principle of operation, transformation ratio, equivalent circuit, regulation and efficiency, transformer phasor diagram, short circuit and open circuit tests, polarity of transformer windings, auto transformers, harmonics in excitation current, transformer inrush current, three phase transformers connections, vector group, harmonics suppression of three phase transformer, parallel operation of transformers.
Three phase induction motor: rotating magnetic field, construction, types of induction motors, squirrel cage and wound rotor, slip and its effect on frequency and voltage, equivalent circuit, vector diagram, starting and running torques, effect of changing rotor resistance and reactance on torque, torque-speed characteristics, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control, losses, efficiency and power factor.
Single phase induction motor: theory of operation, double-field revolving theory, quadrature field theory, equivalent circuit and starting, torque-speed characteristics and performance calculation.

Course Code: EEE 0713-205	**Course Title:** Engineering Electromagnetics	**Credit:** 3

Prerequisite: MATH 0541-202
Content: Static electric field: coordinate systems, divergence and Stoke's Theorem, postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, Gauss's law and its application, electric potential due to charge distribution, conductors and dielectrics in static electric field, flux density, boundary conditions, capacitance, electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries, boundary value problems, Poisson's and Laplace's equations in different coordinate systems.
Steady electric current: Ohm's law, continuity equation, Joule's law, resistance calculation.
Static magnetic field: postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity, relative permeability, boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries.
Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction; Maxwell's equations: differential and integral forms, boundary conditions, potential functions, Time harmonic fields, Poynting theorem.
Plane electromagnetic wave, plane wave in lossless media, Doppler effect, transverse electromagnetic wave, polarization of plane wave; plane wave in lossy media: low-loss dielectrics, good conductors, group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

Course Code: EEE 0713-207	**Course Title:** Energy Conversion II	**Credit:** 3

Prerequisite: EEE 0713-203
Content: Synchronous generator: construction, excitation systems with brushes and brushless ex-

citation system, equivalent circuit, armature winding connections, harmonic cancellation in distributed short pitched winding, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance test, phasor diagram, salient pole generator, generator equations, equation of developed power and torque of synchronous machine, synchronous impedance method of predicting voltage regulation and its limitations; parallel operation: necessary conditions, synchronizing, circulating current and vector diagram, load distribution of alternators in parallel, droop setting, frequency control, voltage control and house diagram, introduction to DC generator.
Synchronous motor: operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting, synchronous capacitor and power factor correction.
DC motor: torque, counter emf, speed, armature reaction and its effect on motor performance, torque-speed characteristics, starting and speed regulation.
Introduction to wind turbine generations, construction and basic characteristics of solar cells.

Course Code: EEE 0713-208	**Course Title:** Energy Conversion Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0713-203 and EEE 0713-207. In the second part, students will design simple systems using the principles learned in EEE 0713-203 and EEE 0713-207.

Course Code: EEE 0714-209	**Course Title:** Electronics II	**Credit:** 3

Prerequisite: EEE 0714-201
Content: Operational amplifiers (Op-Amp): properties of ideal op-amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of op-amp circuits, low pass, high, band-pass and band-stop active filters, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of op-amp, DC imperfections.
Frequency response of amplifiers: poles, zeros and bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers; general purpose op-amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741 op-amp.
Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation; active filters: different types of filters and specifications, transfer functions, realization of first and second order low, high and band pass filters using op-amps; signal generators: basic principle of sinusoidal oscillation, op-Amp RC oscillators, LC and crystal oscillators.
Power amplifiers: basic principle, power transistors, classification of output stages, class A, B and AB complementary output stages.

Course Code: EEE 0714-214	**Course Title:** Electronics Lab	**Credit:** 1.5

Prerequisite: Nil
Content: In this course students will perform experiments to verify practically the theories and concepts learned in EEE 0714-201 and EEE 0714-209.

Course Code: EEE 0714-301	**Course Title:** Continuous Signals and Linear Systems	**Credit:** 3

Prerequisite: MATH 0541-103
Content: Classification of signals and systems: signals and their classification, basic operation on signals, elementary signals, representation of signals using impulse function, classification of systems; properties of linear time invariant (LTI) systems: linearity, causality, time invariance, memory, stability, invertibility.
Time domain analysis of LTI systems: differential equations, system representation, order of the system, solution techniques, zero state and zero input response, system properties, impulse response, convolution integral, determination of system properties; state variable: basic concept, state equation and time domain solution.
Frequency domain analysis of LTI systems: Fourier series: properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation: properties, system transfer function, system response and distortion-less systems; applications of time and frequency domain analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing; Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

Course Code: EEE 0714-303	**Course Title:** Digital Electronics	**Credit:** 3

Prerequisite: Nil
Content: Introduction to number systems and codes; analysis and synthesis of digital logic circuits: basic logic functions, Boolean algebra, combinational logic design, minimization of combinational logic; implementation of basic static logic gates in CMOS and BiCMOS: DC characteristics, noise margin and power dissipation, power optimization of basic gates and combinational logic circuits, modular combinational circuit design: pass transistor, pass gates, multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, binary arithmetic elements and ALU design.
Programmable logic devices: logic arrays, field programmable logic arrays and programmable read only memory, RAM, CPLD, FPGA, data converters and digital logic family; sequential circuits: different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits; modular sequential logic circuit design: shift registers, counters and their applications.

Course Code: EEE 0714-304	**Course Title:** Digital Electronics Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-303. In the second part, students will design simple systems using the principles learned in EEE 0714-303.

Course Code: EEE 0713-305	**Course Title:** Power System	**Credit:** 3

Prerequisite: EEE 0713-207
Content: Network representation: single line and reactance diagram of power system and per unit

system.
Line representation: equivalent circuits of short, medium and long lines, reactive compensation of lines.
Load flow solution: Gauss Seidel and Newton Raphson methods.
Fault analysis: short circuit current and reactance of a synchronous machine; symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation.
Power flow control: tap changing transformer, phase shifting, booster and regulating transformer, shunt capacitor.
Protection: introduction to relays, differential protection and distance protection, introduction to circuit breakers, typical layout of a substation. Power plants: types, general layout of a thermal power plant and major components of gas turbine, steam turbine and combined cycle power plants.

Course Code: EEE 0714-307	**Course Title:** Communication Systems	**Credit:** 3

Prerequisite: MATH 0541-101
Content: Overview of communication systems: basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity; noise: source, characteristics of various types of noise and signal to noise ratio.
Information theory: measure of information, source encoding, error free communication over a noisy channel, channel capacity of a continuous system and channel capacity of a discrete memory less system; communication systems: analog and digital; continuous wave modulation; transmission types: base-band transmission, carrier transmission; amplitude modulation: introduction, double side band, single side band, vestigial side band, quadrature, spectral analysis of each type, envelope and synchronous detection, angle modulation, instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM.
Pulse modulation: sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; pulse amplitude modulation: principle, bandwidth requirements; pulse code modulation (PCM): quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, differential PCM, demodulation of PCM; delta modulation (DM): principle, adaptive DM; line coding: formats and bandwidths; digital modulation: amplitude-shift keying: principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK): principle, bandwidth requirements, detection, differential PSK, quadrature PSK, noise performance; frequency-shift keying (FSK): principle, continuous and discontinuous phase FSK, minimum-shift keying, bandwidth requirements, detection of FSK; multiplexing: time-division multiplexing (TDM): principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; frequency-division multiplexing (FDM): principle, de-multiplexing; wavelength-division multiplexing; multiple-access network: time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA): spread spectrum multiplexing, coding techniques and constraints of CDMA; communication system design: design parameters, channel selection criteria and performance simulation.

Course Code: EEE 0714-308	**Course Title:** Communication Systems Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-307. In the second part, students

will design simple systems using the principles learned in EEE 0714-307.

Course Code: EEE 0714-309	**Course Title:** Solid State Devices	**Credit:** 3

Prerequisite: Nil
Content: Semiconductors in equilibrium: energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level; carrier transport processes and excess carriers: drift and diffusion, generation and recombination of excess carriers, built-in-field, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level.
PN junction: basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance.
Bipolar junction transistor: basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll equations and circuit synthesis.
Metal-semiconductor junction: energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts; MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET; junction field effect transistor: introduction, qualitative theory of operation, pinch-off voltage and current-voltage relationship.

Course Code: EEE 0714-317	**Course Title:** Microprocessor and Embedded Systems	**Credit:** 3

Prerequisite: Nil
Content: 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, addressing modes, instruction sets, assembly language programming, system design and interrupt; minimum mode operation of 8086 microprocessor: system timing diagrams of read and write cycles, memory banks, design of decoders for RAM, ROM and PORT.
Interfacing: programmable peripheral interface, programmable timer, serial communication interface, programmable interrupt controller, direct memory access, keyboard and display interface ((LED, 7 segment, dot matrix and LCD).

Course Code: EEE 0714-318	**Course Title:** Microprocessor and Embedded Systems Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-317. In the second part, students will design simple systems using the principles learned in EEE 0714-317.

Course Code: EEE 0714-335	**Course Title:** Introduction to Digital Signal Processing	**Credit:** 3

Prerequisite: EEE 0714-301
Content: Introduction to digital signal processing (DSP): discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete-time systems, difference equation, convolution, transient and steady state response; discrete transformations: discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform, z-transformation - properties, transfer function, poles and zeros and inverse z-transform; correlation: circular convolution, auto-correlation and cross correlation.
Digital filters: FIR filters, linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters: specifications, design using impulse invariant, bi-linear z-transformation, least-square methods and finite precision effects.

Course Code: EEE 0714-336	**Course Title:** Introduction to Digital Signal Processing Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-335. In the second part, students will design simple systems using the principles learned in EEE 0714-335.

Course Code: EEE 0714-401	**Course Title:** Control Systems	**Credit:** 3

Prerequisite: EEE 0714-301
Content: Introduction to control systems; linear system models: transfer function, block diagram and signal flow graph (SFG); state variables: SFG to state variables, transfer function to state variable and state variable to transfer function; feedback control system: closed loop systems, parameter sensitivity, transient characteristics of control systems, effect of additional pole and zero on the system response and system types and steady state error, Routh stability criterion; design of feedback control system: controllability and observability, root locus, frequency response and state variable methods, introduction to PI and PID controller; analysis of feedback control system: root locus method and frequency response method.
Digital control systems: introduction, sampled data systems, closed loop feedback control data system, performance of a sampled-data (second order system), closed loop system with digital compensation, implementation of digital controller, stability analysis in Z-domain, transient response in z plane, steady state errors in z plane.

Course Code: EEE 0714-402	**Course Title:** Control Systems Lab	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-401. In the second part, students will design simple systems using the principles learned in EEE 0714-401.

Course Code: EEE 0714-422	**Course Title:** Integrated Design Project	**Credit:** 1.5

Prerequisite: Nil
Content: This course consists of three parts. In the first part, the teacher will choose a project and deliver a lecture on the design specifications. The students will learn every step of the design process. In the second phase they will prepare the project and perform experiments for verification of performance and operation. In the third phase students will give a presentation on the project in front of an evaluating board.

Course Code: EEE 0714-406	**Course Title:** Electrical Services Design	**Credit:** 1.5

Prerequisite: Nil
Content: Autocad, single line diagram, fundamentals of lighting and illumination; design of electrical service system for a building using AutoCAD: electrical load calculation for a building; cable and breaker selection: switchboard, distribution boards and conduit size.

Course Code: EEE 0713-450	**Course Title:** Industrial Training	**Credit:** 3

Prerequisite: Nil
Content: The students will be placed as interns in different industries. They will attend the regular operational activities of the respective industry for a pre-fixed period. There will be a co-supervisor from the industry and a supervisor from the university. After completing the training, the students will submit a report duly signed by both the supervisors. A defense board will be arranged by the department where the students will present their report.

Course Code: EEE 0713-400	**Course Title:** Final Year Design Project	**Credit:** 6

Prerequisite: Nil
Content: The students will perform experimental and/or theoretical investigation on a research topic related to electrical and electronic engineering discipline. Students will study relevant literatures, identify problem, formulate a research proposal. Students will conduct investigations in the form of laboratory work/simulation. The students will be required to present a progress report at the end of the first semester, and present and submit a project/thesis report at the end.

3.8.2 Elective Group A: Communication and Signal Processing

Course Code: EEE 0714-319	**Course Title:** Random Signals and Processes	**Credit:** 3

Prerequisite: EEE 0714-301
Content: Probability and random variables, distribution and density functions, conditional probability; expectation: moments and characteristic functions, transformation of a random variable, vector random variables, joint distribution and density, independence, sums of random variables, random processes, correlation functions, process measurements, Gaussian and Poisson random processes, noise models, stationarity, ergodicity, spectral estimation, correlation and power spectrum, cross spectral densities, response of linear systems to random inputs, introduction to discrete time

processes, mean-square error estimation, detection, linear filtering.

Course Code: EEE 0714-325	**Course Title:** Microwave Engineering	**Credit:** 3

Prerequisite: EEE 0713-205
Content: Transmission lines: the lumped element circuit model for a transmission line, field analysis of transmission lines, voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching, lossy transmission lines.
Waveguides: general formulation, modes of propagation, losses in parallel plate, rectangular and circular waveguides; microstrips: structures and characteristics; rectangular resonant cavities: energy storage, losses and Q; radiation: small current element, radiation resistance, radiation pattern and properties, Hertzian and half wave dipoles; antennas: mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

Course Code: EEE 0714-326	**Course Title:** Microwave Engineering Lab	**Credit:** 1.5

Prerequisite: EEE 0713-205
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-325. In the second part, students will design simple systems using the principles learned in EEE 0714-325.

Course Code: EEE 0714-407	**Course Title:** Optical Fiber Communication	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Introduction to optical fiber communication; 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: EEE 0714-415	**Course Title:** Digital Signal Processing	**Credit:** 3

Prerequisite: EEE 0714-335
Content: Spectral estimation: nonparametric methods, discrete random processes, autocorrelation sequence, periodogram, parametric method autoregressive modeling, forward/backward linear prediction, Levinson-Durbin algorithm, minimum variance method, Eigen structure method I and II; adaptive signal processing: application, equalization, interference suppression, noise cancellation, FIR filters, minimum mean-square error criterion, least mean-square algorithm and recursive least square algorithm. Multirate DSP: interpolation and decimation, poly-phase representation and multistage implementation; perfect reconstruction filter banks: power symmetric, alias-free multi-

channel and tree structured filter banks; wavelets: short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

Course Code: EEE 0714-423	**Course Title:** Digital Communication	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Introduction: communication channels, mathematical model and characteristics, probability and stochastic processes; source coding: Mathematical models of information, entropy, Huffman code and linear predictive coding; digital transmission system: baseband digital transmission, inter-symbol interference, bandwidth, power efficiency, modulation and coding trade-off
Receiver for AWGN channels: correlation demodulator, matched filter demodulator and maximum likelihood receiver; channel capacity and coding: channel models and capacities and random selection of codes; block codes and convolutional codes: linear block codes, convolution codes and coded modulation, spread spectrum signals and systems.

Course Code: EEE 0714-424	**Course Title:** Digital Communication Lab	**Credit:** 1.5

Prerequisite: EEE 0714-308
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-423. In the second part, students will design simple systems using the principles learned in EEE 0714-423.

Course Code: EEE 0714-433	**Course Title:** Mobile Cellular Communication	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Introduction: concept, evolution and fundamentals, analog and digital cellular systems; cellular radio system: frequency reuse, co-channel interference, cell splitting and components; mobile radio propagation: propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna; frequency management and channel assignment: fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment; handoffs and dropped calls: reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate; diversity techniques: concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance; digital cellular systems: global system for mobile, time division multiple access and code division multiple access.

Course Code: EEE 0714-441	**Course Title:** Telecommunication Engineering	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Introduction: principle, evolution, networks, exchange and international regulatory bodies.
Telephone apparatus: microphone, speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features.
Switching system: introduction to analog system, digital switching systems, space division switching, blocking probability, multistage switching, time division switching and two-dimensional switch-

ing.
Traffic analysis: traffic characterization, grades of service, network blocking probabilities, delay system, queuing; modern telephone services and network: internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks.
Integrated services digital network (ISDN): N- ISDN and B- ISDN, architecture of ISDN, B-ISDN implementation, digital subscribers loop (DSL), wireless local loop (WLL), FTTx, SONET/SDH, WDM network, IP telephony and VoIP, ATM network and next generation network (NGN), introduction to cellular telephony and satellite communication.

Course Code: 0714-451	**Course Title:** Wireless Communication	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Introduction: wireless communication systems, regulatory bodies; radio wave propagation: free-space and multi-path propagation, ray tracing models, empirical path loss models, large-scale and small-scale fading, power delay profile, Doppler and delay spread, coherence time and bandwidth.
Statistical channel models: time-varying channel models, narrowband and wideband fading models, baseband equivalent model, discrete-time model, space-time model, auto-correlation, cross-correlation, PSD, envelope and power distributions, scattering function; channel capacity: flat-fading channels: CSI, capacity with known/partially known/unknown CSI, frequency-selective fading channels,time-invariant channels, time-varying channels.
Performance of digital modulations: error and outage probability, inter-symbol interference, MPSK, MPAM, MQAM, CPFSK; diversity techniques: time diversity, repetition coding, beyond repetition coding; antenna diversity: SC, MRC, EGC, space-time coding, frequency diversity, fundamentals, single-carrier with ISI equalization, DSSS, OFDM; space-time communications: multi-antenna techniques, MIMO channel capacity and diversity gain, STBC, OSTBC, QOSTBC, SM, BLAST, smart antennas, frequency-selective MIMO channels; broadband communications: DSSS, FHSS, spreading codes, RAKE receivers, MC-CDMA, OFDM, OFDMA, multiuser detection, LTE, WiMAX.

Course Code: EEE 0714-449	**Course Title:** Machine Learning	**Credit:** 3

Prerequisite: Nil
Content: Introduction to machine learning: overview of machine learning and its applications, basics of Pattern Recognition; classification of machine learning: types of machine learning: supervised, unsupervised and reinforcement learning; supervised learning: linear regression and logistic regression, non-linear predictions, kernel regression, kernels support vector machine (SVM) and kernels, kernel optimization.
Decision trees: fundamentals of decision trees, tree construction, split criterion, feature selection, applications of decision trees.
Neural networks: fundamentals of neural networks, gradient descent, forward and backpropagation, artificial neural networks.
Unsupervised learning: clustering, dimensionality reduction, Markov models, anomaly detection and visualization, deep learning based unsupervised models. Evaluation and model selection: model evaluation and selection, overfitting and underfitting, cross-validation, bias-variance tradeoff, regularization.

Course Code: EEE 0714-459	**Course Title:** Digital Image Processing	**Credit:** 3

Prerequisite: EEE 0714-335
Content: Introduction to digital image processing: overview of digital image processing and its applications.
Overview of Fourier transform and z-transform and image Representations: 2-D DFT and FFT, image representation and basic image properties; image restoration: deblurring, denoising, some algorithms; image compression: lossless and lossy compression, transform coding and sub-band coding, some algorithms; image analysis: segmentation, feature extraction, edge and boundary detection, some algorithms, water shell.
Applications of digital image processing: cardiac image processing, fingerprint classification, human face recognition, computed tomography, synthetic aperture radar.

Course Code: EEE 0714-467	**Course Title:** Medical Imaging	**Credit:** 3

Prerequisite: EEE 0714-335
Content: Introduction to medical imaging: overview of medical imaging and its applications in healthcare, historical developments in medical imaging, introduction to the different medical imaging modalities.
X-ray imaging: physics of X-rays and it's bio-effects, X-ray instrumentation and image reconstruction, radiation safety.
Computed tomography (CT): physics and technology of CT scans, CT image acquisition and reconstruction, CT image analysis and interpretation.
Magnetic resonance imaging (MRI): physics and technology of MRI, image acquisition and processing techniques, MRI image analysis and interpretation.
Ultrasound imaging: physics and technology of ultrasound imaging, image acquisition and processing techniques, ultrasound image analysis and interpretation.
Other imaging: nuclear imaging (PET/SPECT): physics, instrumentation; positron emission tomography (PET/SPECT): physics, instrumentation; molecular imaging: physics, instrumentation.
Image processing and analysis techniques: image enhancement and restoration techniques, image segmentation and feature extraction, image registration and fusion.
Use of medical images in diagnosis and treatment: clinical applications of X-ray, CT, MRI, ultrasound and other imaging techniques.

3.8.3 Elective Group B: Electronics

Course Code: EEE 0714-321	**Course Title:** Analog Integrated Circuits	**Credit:** 3

Prerequisite: EEE 0714-303
Content: Analog IC design: bipolar, MOS and BiCMOS IC technology and its impact, eggshell analogy, application areas and the future of analog IC design.
Review of transistors: large and small signal models, compact models for bipolar, FET, and BiCMOS, amplifiers with passive and active loads, cascode stages.
Multiple current sources/sinks using bipolar and FET technologies; current mirrors: basic, cascode and active current mirrors; influence of channel modulation, mismatched transistors and error in aspect ratios, Wilson current mirror.
Constant current or voltage references: supply voltage and temperature independent biasing, band-gap references, constant-gm biasing, Widlar band-gap voltage reference.

Differential pairs: differential vs. single-ended operations of simple amplifiers, differential and common mode voltages, common mode rejection ratio (CMRR), input common mode range (ICMR), transfer characteristics, small signal analysis and frequency response of differential pairs.
Noise: introduction to noise, types, representation in circuits, noise in single stage and differential amplifiers and bandwidth; band-gap references: supply voltage independent biasing, temperature independent biasing, proportional to absolute temperature current generation and constant transconductance biasing; switch capacitor circuits: sampling switches, switched capacitor circuits including unity gain buffer, amplifier and integrator; phase locked loop (PLL): introduction, basic PLL and charge pump PLL.

Course Code: EEE 0714-329	**Course Title:** VLSI I	**Credit:** 3

Prerequisite: EEE 0714-303
Content: IC trends, technology and design approaches; MOS device: structure, operation, threshold voltage and characteristics.
Ratioed circuits: NMOS inverter with resistive and transistor load, pseudo NMOS inverter; ratioless circuits: CMOS inverters: operation, transfer characteristics, design for equal rise and fall time, propagation delay, rise time, fall time and power consumption estimation; NMOS pass transistor and CMOS pass gate circuits; buffer chain design to drive large capacitive loads.
Integrated circuit fabrication technology: photolithography, CMOS process flow, design rules, estimation of resistance and capacitance from layout, layout matching, stick diagram and area estimation from stick diagram, reliability issues: latch-up, electromigration.
Basic logic gates in CMOS: synthesis of arbitrary combinational logic in CMOS, pseudo-NMOS, dynamic CMOS, clocked CMOS and CMOS domino logic.
Structured design: parity generator, bus arbitration logic, multiplexers-based design, programmable logic array (PLA) design; clocked sequential circuit design: two phase clocking, dynamic shift register, CMOS latches and flip flops.
Subsystem design: 4-bit arithmetic processor: bus architectures, shifter, design of a general purpose ALU; memory elements design: system timing consideration, three transistors and one transistor dynamic memory cell, pseudo-static RAM/register cell, 4 transistors dynamic and 6 transistor static CMOS memory cells, 4x4 bit register array and 16-bit static CMOS memory array.
Finite state machine (FSM) design: design of Moore type and Mealy type FSM using Verilog, testing VLSI circuits.

Course Code: EEE 0714-330	**Course Title:** VLSI I Lab	**Credit:** 3

Prerequisite: EEE 0714-309
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-329. In the second part, students will design simple systems using the principles learned in EEE 0714-329.

Course Code: EEE 0714-409	**Course Title:** Compound Semiconductor and Heterojunction Devices	**Credit:** 3

Prerequisite: EEE 0714-309
Content: Compound semiconductor: zinc-blende crystal structures, growth techniques, alloys, band gap, density of carriers in intrinsic and doped compound semiconductors; 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 bending, carrier transport and I-V characteristics; hetero-junction field effect transistor: structure and principle, band structure, carrier transport and I-V characteristics; 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.

Course Code: EEE 0714-417	**Course Title:** Semiconductor Processing and Fabrication Technology	**Credit:** 3

Prerequisite: EEE 0714-309
Content: 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 metallization. discrete device fabrication: diode, transistor, resistor and capacitor; integrated circuit fabrication: isolation: P-N 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: EEE 0714-425	**Course Title:** VLSI II	**Credit:** 3

Prerequisite: EEE 0714-329
Content: Scaling of MOS transistor and interconnect: RC delay modeling, repeaters and cascaded drives, advanced CMOS nanometer process flow and enhancement of CMOS process, technology related CAD issues and manufacturing issues, design margin and PVT corners.
Circuit characterization: delay estimation and transistor sizing for minimum delay, crosstalk, noise analysis, high speed digital circuit design techniques, circuit families; architecture for high-speed design: carry select, carry skip, carry look ahead and tree adders, modified Booth algorithm, Wallace tree multiplication.
Sequential circuit design: sequencing methods, maximum and minimum delay constrains, clock skew, design of latches and flip-flops, clock generation and synchronization, high-speed clock generation and distribution.
ASIC cell-based design, standard cell place and route design, timing directed placement design, mixed signal design; interchange formats: LEF, DEF, SDF, DSPF, SPEF, ALF PDEF, CIF and GDS2, floor planning, power distribution and I/O design.
Algorithm and architecture for digital processors in verilog, system verilog and system-C: building block for signal processors, digital filters and signal processors, pipelined architecture.
Architecture for arithmetic processors: addition, subtraction, multiplication and division, complete design of a simple RISC processor; post-synthesis design validation: timing verification, fault simulation and testing, design for test; high speed and low power memory circuit design: advanced topics in DRAM and SRAM.

Course Code: EEE 0714-426	**Course Title:** VLSI II Lab	**Credit:** 3

Prerequisite: EEE 0714-330
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-425. In the second part, students will design simple systems using the principles learned in EEE 0714-425.

Course Code: EEE 0714-435	**Course Title:** Optoelectronics	**Credit:** 3

Prerequisite: EEE 0714-209
Content: Optical properties in semiconductor: direct and indirect band-gap materials, radiative and irradiative recombination, optical absorption, photo-generated excess carriers, minority carrier lifetime, luminescence and quantum efficiency in radiation; properties of light: particle and wave nature of light, polarization, interference, diffraction and blackbody radiation; light emitting diode (LED): principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers.
Stimulated emission and light amplification: spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions; semiconductor lasers: population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement, introduction to quantum well lasers; photo-detectors: photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors; solar cells: solar energy and spectrum, silicon and Schottky solar cells; modulation of light: phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices, introduction to integrated optics.

Course Code: EEE 0714-443	**Course Title:** Semiconductor Device Theory	**Credit:** 3

Prerequisite: EEE 0714-309
Content: Lattice vibration: simple harmonic model, dispersion relation, acoustic and optical phonons; band structure: isotropic and anisotropic crystals, band diagrams and effective masses of different semiconductors and alloys.
Scattering theory: review of classical theory, Fermi-Golden rule, scattering rates of different processes, scattering mechanisms in different semiconductors, mobility; different carrier transport models: drift-diffusion theory, ambipolar transport, hydrodynamic model, Boltzmann transport equations, quantum mechanical model, simple applications.

Course Code: EEE 0714-453	**Course Title:** Nanotechnology and Nanoelectronics	**Credit:** 3

Prerequisite: EEE 0714-209
Content: Nanotechnology: importance, size scales, quantum size effects, revolutionary applications, potentials; nanotools: scanning tunneling microscope, atomic force microscope, electron microscope, measurement techniques based on fluorescence, other techniques.
Basics of fabrication: fabrication and processing industry, wafer manufacturing; deposition techniques: evaporation, sputtering, chemical vapor deposition, epitaxy, wet and dry etching techniques, photolithography, electron beam lithography, stamp technology; bottom-up processes: chemical and organic synthesis techniques, self-assembly, other techniques; nanoelectronics: overview of quantum mechanics, Schrodinger equation, particle in a box, band theory of solids, importance of nanoelec-

tronics, Moore's law, ITRS roadmap.
Tunneling devices: quantum tunneling, resonant tunneling diodes; single electron transistor: Coulomb blockade; quantum confinement: wires and dots, carbon nanotubes, graphenes, brief introductions on molecular electronics and nanobiology.

Course Code: EEE 0714-455	**Course Title:** Medical Electronics	**Credit:** 3

Prerequisite: EEE 0714-335
Content: Electro-physiology and bio-potential recording: the origin of bio-potentials, bio-potential electrodes, biological amplifiers / instrumentation amplifiers, ECG, EEG, EMG, EOG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.
Physiological transducers: classification of transducers, performance characteristics of transducers, pressure transducers, transducers for body temperature measurement, photoelectric transducers, optical fiber sensor, biosensor and smart sensor.
Bio-chemical parameter measurement: pH (Acidity), PO2 (Partial Pressure of Oxygen), PCO2 (partial pressure of carbon dioxide), cardiac output, respiratory measurement, blood pressure, temperature, pulse.
Measuring devices: colorimeter, auto analyzer and blood cell counters; blood flow meters: electromagnetic blood flow meters, ultrasonic blood flow meters, NMR blood flow meters, laser Doppler blood flow meters, blood glucose monitoring devices.
Assist devices: cardiac pacemakers: need for cardiac pacemaker, external pacemaker, implantable pacemaker, types of implantable pacemakers and recent developments, programmable pacemaker, rate-responsive pacemakers, pacing system analyzers; defibrillator: need for defibrillator, dc defibrillators, implantable defibrillators, defibrillator analyzers; dialyzer and heart lung machine.
Recent trends in medical fields: thermograph, endoscopy unit, applications of lasers in medical fields, cryogenic application, introduction to telemedicine.

Course Code: EEE 0714-463	**Course Title:** FPGA Based System Design	**Credit:** 3

Prerequisite: EEE 0714-303
Content: Introduction to FPGA based system; verilog HDL coding style: lexical conventions, ports and modules, operators, gate level modeling, system tasks and compiler directives, test bench, data flow modeling, behavioral level modeling, tasks and functions.
Verilog modeling of combinational and sequential circuits: behavioral, data flow and structural realization, adders, multipliers, comparators, flip flops, realization of shift register, realization of a counter, synchronous and asynchronous FIFO, single port and dual port RAM, pseudo random LFSR, cyclic redundancy check.
Synchronous sequential circuit: state diagram, state table, state assignment-choice of flip-flops, timing diagram, one hot encoding, Mealy and Moore state machines, design of serial adder using Mealy and Moore state machines, state minimization, sequence detection, design of vending machine using one hot controller.
FPGA and its architecture; types of programmable logic devices: PLA and PAL- FPGA generic architecture, ALTERA Cyclone II architecture, timing analysis and power analysis using Quartus SOPC builder, NIOS-II soft-core processor, system design examples using ALTERA FPGAs, traffic light controller, real time clock, interfacing using FPGA: VGA, Keyboard, LCD.

Course Code: EEE 0714-465	**Course Title:** Mechatronics and Industrial Automation	**Credit:** 3

Prerequisite: EEE 0714-401
Content: Introduction to mechatronics: scope of mechatronics in manufacturing and products; introduction to numerical control: advantages, classification and features; fundamentals of machining: design consideration of NC (numerical control) machine tools, methods of improving machine accuracy and productivity and special tool holders.
System devices: system drives-hydraulic systems, DC motors, stepper motors, feedback devices, pulse digitizers, resolvers, inductosyn, tachometers, counting devices.
Interpolation: linear interpolator, circular interpolators, CNC software interpolator and flow of data in NC machines.
Programming: computer aided programming with examples.
Industrial robotics: basic concepts, robotics and automation, specification of robots, resolution, repeatability and accuracy of manipulator, classification of robots and industrial application.

3.8.4 Elective Group C: Power

Course Code: EEE 0714-323	**Course Title:** Economic Operation and Stability Analysis of Power System	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Economic operations: economic dispatch using numerical methods, unit commitment, economic scheduling with unreserved load, load frequency control, optimal power flow and contingency analysis.
Stability: swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation, factors affecting stability, economic operation within and among plants, transmission-loss equation and dispatch with losses.
Power quality: voltage sag and swell, surges, harmonics, flicker.

Course Code: EEE 0714-327	**Course Title:** Transmission and Distribution of Electrical Power	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Transmission system: types of conductors, composite conductors, bundled conductors and double circuits, transposition techniques.
Resistance, inductance and capacitance: resistance; inductance: inductance of a conductor due to internal flux, flux linkages between two points external to an isolated conductor, inductance of a single phase two wire line; capacitance: capacitance of a three-phase line with equilateral spacing and unsymmetrical spacing; effect on the capacitance: earth, three-phase transmission lines, bundled conductors, parallel circuits.
Underground cables: construction, resistance and capacitance, insulating materials, electrostatic stress grading, three core cables, dielectric losses and heating, modern developments, oil-filled and gas-filled cables, measurement of capacitance, cable testing.
Insulators for overhead lines: types, constructions and performances, potential distribution, special types of insulators, testing of insulators; mechanical characteristics of transmission lines: sag and stress analysis, ice and wind loading, supports at different elevations, conditions of erection, effect of temperature changes; transmission lines and cables: overhead and underground; reactive power

compensation: steady-state and dynamic VAR compensation.
Distribution: distributor calculations, copper efficiencies, radial, ring mains and inter connections, distribution losses and feeder configuration.
Flexible AC transmission system: basics of series and shunt compensation, introduction, shunt compensation (SVC, STATCOM), series compensation (SSSC, TCSC, TCSR, TCPST), series-shunt compensation (UPFC); grounding: IEEE/IEC standards, grounding problems and mitigation techniques.
High voltage DC transmission system: components, monopolar and bipolar HVDC transmission; power converters: current source and voltage source converters, operation and control of HVDC transmission lines and introduction to smart grid.

Course Code: EEE 0714-411 **Course Title:** Power Plant Engineering **Credit:** 3

Prerequisite: EEE 0714-305
Content: Classification of power plant: methods of general classification, comparison of costs of different types of thermal power plant.
Fuel resources for electricity generation: fossil fuels; fossil fuel reserves: coal, proven crude oil and gas reserves of different countries, reserve to production ratios, major exporting and importing countries.
General layout of plants: non-nuclear thermal, gas turbine, steam turbine, combined cycle, nuclear, hydro-electric, wind turbine generator.
Power plant fundamentals: steam power plant; parts and components: pressure and temperature at different stages, coal and ash handling arrangement, steam generation, types of steam, economizer, air preheater, deaerator, flue gas stack (chimney) and coal gasification, steam turbine, alternator, feed water, cooling arrangement; control system: conventional system and DCS.
Gas turbine plant: open cycle and closed cycle, compressor, combustion chamber.
Combined cycle plant: heat recovery steam generator, single shaft and dual shaft.
Nuclear Power Plant: nuclear energy: isotope, rays, changing mass to energy, enriched uranium, release of energy by nuclear reaction, initiations of nuclear reactions, chain reaction.
Reactors: general components, fuels, moderator, coolant, shielding, different types of reactors, energy harvesting principle, advantages and disadvantages.
Hydro power plant: hydro potential energy, types of hydroelectric plants, hydro potential at different places of the world, major components of hydro plants, determination of plant capacity at a particular site, environmental impact, advantages and disadvantages.
Site selection: factors of site selection, land requirement.

Course Code: EEE 0714-419 **Course Title:** Energy Conversion III **Credit:** 3

Prerequisite: EEE 0713-207
Content: Special machines: series universal 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, electrostatic motor, repulsion motor, synchronous and control transformers, permanent magnet synchronous motors, acyclic machines: generators, conduction pump and induction pump, magneto hydrodynamic generators.
Basic principles of energy conversion: electromagnetic, electrostatic, thermoelectric, electrochemical, and electromechanical, vector control, linear motors and traction.
Photovoltaic systems: stand alone and grid interfaced, induction generator, AC-DC-AC conversion.

Course Code: EEE 0714-427	**Course Title:** Power System Protection and Automation	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Introduction: necessity of power system protection, instrument transformer: PT, CT, CT error and burden.
Relay: construction; relay types: electromechanical relay, solid state, numerical relay, relay characteristics: overcurrent, directional, impedance, differential and pilot.
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.
Circuit breaker: types: air circuit breaker (ACB), air break CB, oil CB, vacuum CB, air blast CB, SF6 CB, HVDC CB, miniature circuit breakers and fuses; selection criteria and ratings of circuit breakers, calculation of breaking capacity of circuit breakers by ETAP software.
Arc extinction: introduction, principle of arc extinction, circuit breaking transients, transient recovery voltage (TRV), resistance switching, first pole to clear factor, double frequency transients, impacts of natural frequency and power factor on TRV, rate of rise of TRV and maximum RRRV.
Basic tripping circuit, sequence of operation of protecting devices during closing and opening CB, protective zones.
Unit protection schemes: generator, transformer, motor, bus bar, transmission and distribution lines.
SCADA: Basis of a real-time control system (SCADA), requirement and background, SCADA system principles, data acquisition, monitoring and event processing, control functions, data storage, archiving and analysis, hardware system configurations, SCADA programming, SCADA master station.
Substation automation: intelligent affordable substation monitoring and control; standard for substation automation: logical nodes (LN), logical device (LD), intelligent electronic devices (IEDs), process level functions, by level functions, station level functions, station bus and process bus.

Course Code: EEE 0714-428	**Course Title:** Power System Protection and Automation Lab	**Credit:** 1.5

Prerequisite: EEE 0713-208
Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 0714-427. In the second part, students will design simple systems using the principles learned in EEE 0714-427.

Course Code: EEE 0714-429	**Course Title:** High Voltage Engineering	**Credit:** 3

Prerequisite: EEE 0714-305
Content: High voltage DC: rectifier circuits, voltage multipliers, Van-de-Graaff 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 coordination, lightning and switching surges, basic insulation level, surge diverters and arresters.

Course Code: EEE 0714-430	**Course Title:** High Voltage Engineering Lab	**Credit:** 1.5

Prerequisite: EEE 0713-08
Content: This course consists of two parts. In the first part, students will perform experiments to verify the theories and concepts learned in EEE 0714-429. In the second part, students will design simple systems using the principles learned in EEE 0714-429.

Course Code: EEE 0714-437	**Course Title:** Power System Reliability	**Credit:** 1.5

Prerequisite: EEE 0714-305
Content: Review of probability concepts; probability distribution: binomial, Poisson and normal.
Reliability concepts: failure rate, outage, mean time to failure, series and parallel systems and redundancy, Markov process, probabilistic generation and load models.
Reliability indices: loss of load probability (LOLP) and loss of energy probability (LOEP), frequency and duration (FAD): reliability evaluation techniques of a single area system.

Course Code: EEE 0714-445	**Course Title:** Power System Operation and Control	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Overview: vertically integrated vs. deregulated power system; real-time operation: SCADA, EMS (energy management system); various data acquisition devices: RTU, IED, PMU, DFDR, WAMPAC (wide area monitoring, protection and control).
Application functions: state estimation, short term load forecasting, unit commitment (UC), economic dispatch (ED), optimal power flow (OPF); frequency control: generation and turbine governors, droop, frequency sensitivity of loads, ACE (area control error), AGC (Automatic Generation Control) and coordination with UC and ED; frequency collapse and emergency load shed, islanding.
Power system security: static and dynamic; security constrained, OPF; electricity market operation: generation companies, ISO, distribution companies, bidding, spot market, social welfare, market clearing price (MCP), local marginal price (LMP), bilateral contacts and forwards market, hedging.
Load management: demand side control: DMS (distribution management system), DSM (demand side management); direct load management, smart grid concept.

Course Code: EEE 0714-457	**Course Title:** Renewable Energy Systems	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Renewable energy sources: solar, wind, mini-hydro, geothermal, biomass, wave and tides.
Solar photovoltaic: characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, sun tracking systems, maximum power point tracking (MPPT); chopper, inverter, sizing the PV Panel and battery pack in stand-alone PV applications, modern solar energy applications (residential, electric vehicle, naval, and space), solar power plants concentrate on the grid, operation and control and basic characteristics of solar cells.
Solar thermal: principles of concentration, solar tower, parabolic dish, receiver, storage, steam turbine and generator.
Wind turbines: wind turbine types and their comparison, power limitation, Betz's law; control mechanism: pitch, yaw, speed, couplings between the turbine and the electric generator; wind turbine generator: DC, synchronous, self-excited induction generator and doubly fed induction generator;

grid interconnection: active power control, introduction to wind turbine generators construction.
Wave, tidal and biogas: basic principle and electricity generation.

Course Code: EEE 0714-461	**Course Title:** E-waste and Carbon Footprint	**Credit:** 3

Prerequisite: EEE 0714-305
Content: E-waste extractions and processing of the minerals used in electronic industry, manufacture, finished products, disposals of reuse and recycling of electronic devices.
Carbon footprint: carbon footprint of electronics, effects of recycling on carbon emissions; greenhouse gas emissions: sources of emission, emission of CO2 and Methane (CH4).
Direct emission: environmental effect of aviation, measurement of carbon footprint.
Indirect emission: carbon footprints of product: food, textile, materials, cements; schemes to reduce carbon emissions: Kyoto protocol, carbon offsetting and certification, carbon footprint reducing technologies.

Course Code: EEE 0714-469	**Course Title:** Smart Grid	**Credit:** 3

Prerequisite: EEE 0714-305
Content: Introduction to smart grids: overview of modern power systems, need for a smart grid, components of a smart grid, sustainable energy and smart grids.
Renewable energy integration: overview of renewable energy sources, integration challenges and solutions, distributed generation and microgrids.
Power system automation: SCADA systems, remote terminal units (RTUs), intelligent electronic devices (IEDs).
Communication technologies: wired communication technologies, wireless communication technologies (LANs: bluetooth, Zigbee, WiMAX; wired LANs- Ethernet, PSTN, PLC (Power Line Carrier), communication protocols (Modbus, DNP3 and IEC61850).
Advanced control and optimization techniques: power system stability, load frequency control, economic dispatch and optimization.
Demand response: overview of demand response, types of demand response programs, demand response and smart grids, real time pricing, ancillary markets.
Challenges of smart grids for sustainable energy: cybersecurity issues, interoperability, regulatory issues.
Benefits of smart grids for sustainable energy: improved reliability, increased efficiency, enhanced grid resilience.
Case studies: smart grid project.

Course Code: EEE 0714-333	**Course Title:** Power Electronics	**Credit:** 3

Prerequisite: EEE 0714-209
Content: Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC.
Rectifiers: uncontrolled and controlled single phase and three phase; Regulated power supplies: linear-series and shunt, switching buck, buck boost, boost and Cuk regulators.
AC voltage controllers: single and three phase, choppers, DC motor control, Single phase cycloconverter.
Inverters: single phase and three phase voltage and current source, AC motor control, stepper motor

control, resonance inverters, pulse width modulation control of static converters.

Course Code: EEE 0714-334	**Course Title:** Power Electronics Lab	**Credit:** 3

Prerequisite: EEE 0714-214
Content: This course consists of two parts. In the first part, students will perform experiments to verify the theories and concepts learned in EEE 0714-447. In the second part, students will design simple systems using the principles learned in EEE 0714-447.

3.8.5 Elective Group D: Computer

Course Code: EEE 0714-331	**Course Title:** Microprocessor System Design	**Credit:** 3

Prerequisite: EEE 0714-317
Content: Review of 8086 family of microprocessors: instructions and data access methods in a 32-bit microprocessor, representation of operands and operators, instruction formats, designing arithmetic logic unit.
Processor design: single bus, multi-bus architecture.
Control unit design: hardwired, micro-programmed and pipeline, VLSI implementation of a microprocessor or part of a microprocessor design.

Course Code: EEE 0714-332	**Course Title:** Microprocessor System Design Lab	**Credit:** 3

Prerequisite: EEE 0714-318
Content: This course consists of two parts. In the first part, students will perform experiments to verify the theories and concepts learned in EEE 0714-331. In the second part, students will design simple systems using the principles learned in EEE 0714-331.

Course Code: EEE 0714-413	**Course Title:** Real Time Computer System	**Credit:** 3

Prerequisite: EEE 0714-317
Content: Introduction to real time system: classification of real time process, real time scheduling, real time programming, implementation, operating systems, real time I/O, real time design methodologies, modeling for real time systems, reliable and safe design for critical applications.
Review of microprocessor fundamentals and programmable input/output devices and systems for PC; application examples: digital controls, robotics, on line systems, communication with real world signals and automatic control using feedback, feed-forward and adaptive control, control algorithm implementation.

Course Code: EEE 0714-421	**Course Title:** Multimedia Communication	**Credit:** 3

Prerequisite: EEE 0714-307

Content: Types of media; multimedia signal characteristic: sampling, digital representation, signal formats; signal coding and compression: entropy coding, transform coding, vector quantization; coding standards: H.26x, LPEG, MPEG.
Multimedia communication networks: network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM, internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia; entertainment networks: cable, satellite and terrestrial TV networks, ADSL and VDSL, high speed modems; transport protocols: TCP, UDP, IP, IPv4, IPv6, FTP, RTP and RTCP, use of MPLS and WDMA, multimedia synchronization, security, QoS and resource management.
Multimedia applications: WWW, internet telephony, teleconferencing, HDTV, email and e-commerce.

Course Code: EEE 0714-431	**Course Title:** Computer Networks	**Credit:** 3

Prerequisite: EEE 0714-307
Content: Switching and multiplexing: ISO, TCP-IP and ATM reference models; different data communication services.
Physical layer: wired and wireless transmission media, cellular radio, communication satellites.
Data link layer: elementary protocols, sliding window protocols, error detection and correction, HDLC, DLL of internet, DLL of ATM, multiple access protocols, IEEE.802 protocols for LANs and MANs, switches, hubs and bridges, high speed LAN.
Network layer: routing, congestion control, internetworking; network layer in internet: IP protocol, IP addresses, ARP; NI in ATM transport layer: transmission control protocol, UDP, ATM adaptation layer.
Application layer: network security, email, domain name system, simple network management protocol, HTTP and world wide web.

Course Code: EEE 0714-432	**Course Title:** Computer Networks Lab	**Credit:** 1.5

Prerequisite: EEE 0714-308
Content: This course consists of two parts. In the first part, students will perform experiments to verify the theories and concepts learned in EEE 0714-431. In the second part, students will design systems using the principles learned in EEE 0714-431.

Course Code: EEE 0714-439	**Course Title:** Computer Architecture	**Credit:** 3

Prerequisite: EEE 0714-317
Content: Instructions and data access methods; arithmetic logic unit (ALU) design: arithmetic and logical operations, floating point operations; processor design: data paths- single cycle and multi cycle implementations.
Control unit design: hardware and microprogrammed pipeline, pipelined data path and control, hazards and exceptions.
Memory organization: cache, virtual memory, buses.
Multiprocessors: types of multiprocessor, performance, single bus multiprocessors, clusters.

Course Code: EEE 0714-471	**Course Title:** Cryptography and Network Security	**Credit:** 3

Prerequisite: Nil
Content: Classical cryptography: introduction to simple cryptosystems, cryptanalysis; Shannon's theory: perfect secrecy, entropy, product cryptosystems; data encryption standard: description of DES, differential cryptanalysis.
RSA system and factoring: public-key cryptography, RSA cryptosystem, attacks on RSA, factoring algorithms, other public-key cryptosystems: ElGamal cryptosystem and discrete logs, Merkle-Hellman Knapsack system; signature schemes: ElGamal signature schemes, digital signature standard, fail-stop signatures; hash functions: signatures and hash functions, collision-free hash functions, birthday attack.
Key distribution and key agreement: key pre-distribution, Kerboros, Diffie-Hellman key exchange; identification schemes: Schnorr identification scheme, Okamoto identification schemes; authentication codes: computing deception probabilities, combinatorial bounds, entropy bounds; secret sharing schemes: Shamir threshold scheme, access structure and general secret sharing.
Pseudo-random number generation: indistinguishable probability distribution, probabilistic encryption; zero-knowledge proofs: interactive proof systems, computational zero knowledge proofs.

Course Code: EEE 0714-473	**Course Title:** Cyber Security	**Credit:** 3

Prerequisite: Nil
Content: Security environment: threats, vulnerabilities, and consequences, advanced persistent threats, the state of security today.
Concepts of information security: security principles, access control mechanisms, authentication schemes.
Operating system security: classic security models, common vulnerabilities, Linux and Windows security; cyber-attacks: examples, tools, and methodologies; network security: firewall, intrusion detection system; cyber defense techniques; cyber forensics: tools, mechanisms, challenges; cyber-ethics: cybercrimes, intellectual properties and privacy.

3.8.6 Other Engineering

Course Code: CSE 0613-101	**Course Title:** Computer Programming	**Credit:** 3

Prerequisite: Nil
Content: Introduction to Python and IDE Setup, Variables, Data Types in Python; operators: arithmetic operators, relational operators, logical operators; control structures: if, elif, else statements; Loops: While loop, for loop, and break/continue, Nested loops, Functions and Modular Programming, Lists and Arrays, Strings and String Manipulation, Dictionaries and Sets, Object-Oriented Programming (OOP);libraries: NumPy, Matplotlib, Seaborn, Pandas. Files: Reading and Writing, Data Visualization using Matplotlib and Seaborn; Charts: Line charts, bar charts, heatmaps, scatterplots, Image Processing and analysis, audio file reading and analysis.

Course Code: CSE 0613-102	**Course Title:** Computer Programming Lab	**Credit:** 1.5

Prerequisite: Nil

Content: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 0613-101. In the second part, students will learn program design.

Course Code: ME 0715-201	**Course Title:** Mechanical Engineering Fundamentals	**Credit:** 3

Prerequisite: Nil
Content: Introduction to sources of energy: steam generating units with accessories and mountings, steam turbines, introduction to internal combustion engines and their cycles, gas turbines; refrigeration and air conditioning: applications, refrigerants, different refrigeration methods; fluid machinery: impulse and reaction turbines, centrifugal pumps, fans, blowers and compressors; basics of conduction and convection: critical thickness of insulation.

3.8.7 Language and GEneral Education

Course Code: EAP 0231-009	**Course Title:** English for Academic Purposes	**Credit:** 0

Prerequisite: Nil
Content: Grammar: tense and its classification, modal verbs, pronouns and possessive, quantifiers, degree of comparison, tag questions, error correction.
Reading: jigsaw reading, guessing meaning from the context, skimming, scanning, inferring, matching title with the text.
Writing: pre-writing, brainstorming/mind mapping, topic sentence, arranging ideas in order of importance, writing short paragraphs, writing accordion paragraphs.
Speaking: presentation (group and individual), role play, describing place, person and objects, listening and practicing audio track.
Listening: listening to audio tracks, the lecture of the course teacher, and classmates and answering questions.

Course Code: PEL 0231-102	**Course Title:** Professional English Lab I	**Credit:** 1.5

Prerequisite: Nil
Content: Review: Introduction, various approaches to learn English; grammatical problems: construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction; reading, writing, listening and speaking skill development: application writing and resume writing.
Reading skill: discussion on readability, scan and skim reading, generating ideas through purposive reading, reading of selected stories.
Writing skill: principles of effective writing, organization, planning and development of writing, composition, story writing, amplification; general strategies for the writing process: generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing; approaches to communication: communication today, business communication and different types of business communication.
Listening skill: the phonemic systems and correct English pronunciation.
Speaking skill: practicing dialogue, storytelling, effective oral presentation; report writing: defining

a report, classification of reports, structure of a report and examples of report writing.

Course Code: PEL 0231-202	**Course Title:** Professional English Lab II	**Credit:** 1.5

Prerequisite: Nil
Content: Reading, writing, listening and speaking skill development: dialogue, powerpoint presentation, report writing, email writing, tender document preparation and evaluation.
Reading skill: discussion on readability, scan and skin reading, generating ideas through purposive reading and reading of selected stories.
Writing skill: principles of effective writing, organization, planning and development of writing, composition, story writing, amplification; general strategies for the writing process: generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing; approaches to communication: communication today, business communication, different types of business communication.
Listening skill: the phonemic systems and correct english pronunciation.
Speaking skill: practising dialogue, story telling; effective oral presentation.
Report writing: defining a report, classification of reports, structure of a report, and examples of report writing.

Course Code: HUM 0314-201	**Course Title:** Sociology	**Credit:** 3

Prerequisite: Nil
Content: Introduction: society, science and technology- an overview, scientific study of society, social elements, society, community, association and institution, mode of production and society industrial revolution and development of capitalism.
Culture and Socialization: culture, elements of culture, technology and culture, cultural lag, socialization and personality, family, crime and deviance, social control, technology, society and development, industrialization and development, development and dependency theory, sustainable development, development and foreign borrowing, technology transfer and globalization, modernity and environment and problem and prospects.
Pre-industrial, Industrial and Post-industrial Society: common features of industrial society, development and types of social inequality in industrial society, poverty, technology and society, social stratification and social mobility, rural and urban life and their evaluation.
Population and Society: society and population, fertility, mortality and migration, science, technology and human migration, theories of population growth-demographic transition theory, Malthusian population theory, optimum population theory and population policy.

Course Code: HUM 0311-207	**Course Title:** Engineering Economics	**Credit:** 3

Prerequisite: Nil
Content: Introduction to economics: economics and engineering, different economic systems, fundamental economic problems, basic elements of demand, supply and product market, theory of utility and preferences, consumer's surplus, theory of production and cost, theory of the firm and market structure and optimization.
Introducing macroeconomics: national income accounting, the simple Keynesian analysis of national income, employment, inflation, savings, investment and decision making, fiscal policy and monetary policy- money and interest rate, income and spending.

Economics of development and planning.

Course Code: HUM 0232-211	**Course Title:** Functional Bengali Language	**Credit:** 3

Prerequisite: Nil
Content: Review: Classical Bengali, Colloquial Bengali, Word Forms, Bengali Spelling in Government Work, Terminology
Bengali Writing Skills: Classical/Colloquial Style, Use of Punctuation; Rules of Standard Bengali Spelling (Bangla Academy)
Functional Part: Application Writing, Dialogue, Presentation Skill Development, Report Writing, Email Writing, Tender Document Preparation and Evaluation, Public Procurement Rules (PPR), Summary Writing, Service Rule Preparation

Course Code: PLS 0031-400	**Course Title:** Professional Life Skill Development	**Credit:** 1.5

Prerequisite: Nil
Content: Job searching techniques, preparation of CV, cover letter and career portfolio, mastering professional interviews.
Workplace etiquettes, leadership development and teamwork, digital skills development, technical report writing, engineering standards, codes, and compliance, engineering project management, career development and networking.

Course Code: HUM 0314-303	**Course Title:** Financial and Managerial Accounting	**Credit:** 3

Prerequisite: Nil
Content: Financial Accounting: objectives and importance of accounting, branches of accounting, accounting as an information system, computerized system and applications in accounting.
Recording System: double entry mechanism, accounts and their classification, accounting equation, accounting cycle, journal, ledger, trial balance, preparation of financial statements adjusting and closing entries, accounting concepts and conventions; financial statements analysis and interpretation: ratio analysis, tests for profitability, liquidity, solvency and overall measure.
Costs and management accounting: cost concept and classification, segregation and mixed cost; overhead cost: meaning and classification, allocation of overhead cost, overhead recovery method; job order costing: preparation of job cost sheet and quotation price; inventory valuation: absorption costing and variable costing technique; cost volume profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis; short-term investment decisions: relevant and differential cost analysis, Linear programming; long-term investment decisions: capital budgeting, various techniques of evaluation of capital investment, investment appraisal under uncertainty, risk management, capital rationing, concept of working capital, need for working capital, management of cash and stock debtors.

Course Code: HUM 0413-407	**Course Title:** Engineers in Society	**Credit:** 3

Prerequisite: Nil

Content: Introduction to engineers in society: role of engineers in society, introduction to philosophy of engineering, introduction to engineering ethics. Social implications of engineering: social responsibility and engineering ethics, worker and public safety, impact of engineering on local and global communities.
Engineering and environment: environmental impact assessment; engineers' responsibility for the environment: local and global issues.
Professionalism and engineering practice: engineering codes of ethics, professional conduct and licensure, conflict of interest, bribery and corruption, duties to profession and employers.
Professional obligations: legal and regulatory obligations; technological innovation and society: societal impact of emerging technologies, ethical considerations in technological innovation, balancing innovation and responsibility.
Engineering and public policy: role of engineers in shaping public policy, engineering ethics in a regulatory context, ethical dilemmas in engineering decision-making; engineering challenges: engineering solutions for global challenges: poverty, healthcare and climate change.
Case studies in engineering ethics: Chernobyl, Three Mile Island.

Course Code: HUM 0314-307	**Course Title:** Bangladesh Studies	**Credit:** 3

Prerequisite: Nil
Content: This course will cover the origin and development of the people of Bangladesh; religion, food, dress, festivals, cultures and geography of Bangladesh; natural and mineral sources, agriculture and forest of Bangladesh. This course will also discuss about ancient and medieval history of Bengal, history of Bangladesh from British colonialism to liberation war; culture, heritage and tourism of Bangladesh; economic system and development aspects of Bangladesh and the constitution of Bangladesh. Ethnic diversity, women empowerment, gender and development, public administration, corruption and good governance, economy and development concepts, problems and challenges of Bangladesh will be also discussed.

Course Code: HUM 0411-409	**Course Title:** Entrepreneurship and Innovation in Engineering	**Credit:** 2

Prerequisite: Nil
Content: Introduction to entrepreneurship in engineering: characteristics and skills of successful engineering entrepreneurs, overview of the startup ecosystem and emerging trends, opportunity identification and evaluation, methods for identifying and evaluating business opportunities in engineering, market research techniques and analysis for engineering innovations, competitive analysis and positioning strategies, technological innovation and intellectual property, understanding the innovation process and technological breakthroughs, intellectual property rights and strategies for protecting engineering innovations, technology transfer and Licensing.
Business planning and strategy: developing a business model canvas for engineering startups, defining target customers and value proposition crafting a sustainable competitive advantage.
Financing and funding strategies: sources of funding for engineering ventures, financial management and budgeting for startups, fundraising strategies and pitch preparation; funding mechanisms for engineering innovations: grants, venture capital, crowdfunding, etc.
Strategies for developing a compelling business case and attracting investors: introduction to financial planning and budgeting for innovation projects, legal and ethical considerations, regulatory compliance and risk management.
Guest Speakers and Case Studies: invited guest speakers from successful engineering innovators and entrepreneurs, case studies of notable engineering innovation success stories, QandA sessions and

interactive discussions with industry experts, innovation challenges and project work, collaborative project work on real-world engineering innovation challenges, applying the learned concepts and methodologies to solve practical problems, mentoring and feedback sessions to support project development.

Course Code: HUM 0223-411	**Course Title:** Industrial Management and Finance	**Credit:** 2

Prerequisite: Nil
Content: Introduction to industrial management: overview of industrial management principles and concepts, role of industrial managers and their responsibilities, industrial management challenges and opportunities; forecasting: demand estimation, production capacity planning and scheduling.
Project management in industrial operations: inventory management and control, project life cycle and phases, work breakdown structure and critical path method, resource allocation and project monitoring, introduction to financial statements and their interpretation, ratio analysis and financial performance evaluation, cash flow analysis and forecasting; cost analysis and optimization: cost concepts and classifications, break-even analysis and cost-volume-profit relationships, cost reduction techniques and value engineering.
Financial decision-making: time value of money and discounted cash flow analysis, capital budgeting techniques; risk assessment and management: types of risk in industrial operations, risk identification, analysis and evaluation, risk mitigation strategies and contingency planning.
Case studies and industrial visits: analysis of real-world industrial management and finance cases, guest lectures by industry professionals, industrial site visits to observe management practices.

Course Code: HUM 0314-213	**Course Title:** History of the Emergence of Bangladesh	**Credit:** 3

Prerequisite: Nil
Content: Political, social, and economic context prior to independence: The Bengali Language Movement (1952), cultural and linguistic differences between East and West Pakistan, economic disparities and the exploitative policies of the central government, and political oppression and the rise of independence movements all shaped the context before independence.
The liberation war and leadership: The leadership of Sheikh Mujibur Rahman, the role of political parties, students, women, and the masses, the Peace Committee and anti-liberation activities, the role of India and international organizations, and the role of Bangladesh Forces and the Allied Forces were all key elements of the liberation struggle.
Major events of the Liberation War and its outcome: The start of the Liberation War and major battles, international assistance and support during the war, post-war events and the nation-building process, and Bangladesh's declaration of independence and international recognition marked the major events and outcomes of the war.

3.8.8 Basic Science and Mathematics

Course Code: MATH 0541-101	**Course Title:** Differential and Integral Calculus	**Credit:** 3

Prerequisite: Nil
Content: Differential calculus: limits, continuity and differentiability, successive differentiation of various types of functions, Leibnitz's theorem, Rolle's theorem, mean value theorem, Taylor's and Maclaurin's theorems in finite and infinite forms, Lagrange's form of remainders, Cauchy's form of remainders, expansion of functions, evaluation of indeterminate forms of L Hospital's rule, partial differentiation, Euler's theorem, tangent and normal, subtangent and subnormal in cartesian and polar coordinates, determination of maximum and minimum values of functions, curvature, asymptotes and curve tracing.
Integral Calculus: integration by the method of substitution, standard integrals, integration by successive reduction, definite integrals, its properties and use in summing series, Walli's formula, improper integrals, beta function and gamma function, area under a plane curve and area of a region enclosed by two curves in cartesian and polar coordinates, volumes and surface areas of solids of revolution.

Course Code: MATH 0541-103	**Course Title:** Ordinary and Partial Differential Equations	**Credit:** 3

Prerequisite: MATH 0541-101
Content: Ordinary differential equations: degree and order of ordinary differential equations, formation of differential equations, solution of first order differential equations by various methods, solution of general linear equations of second and higher orders with constant coefficients, solution of homogeneous linear equations, solution of differential equations of the higher order when the dependent or independent variables are absent, solution of differential equations by the method based on the factorization of the operators and Frobenius method.
Partial differential equations: introduction, linear and non-linear first order equations, standard forms, linear equations of higher order, equations of the second order with variable coefficients, wave equations and particular solution with boundary and initial conditions.

Course Code: MATH 0541-205	**Course Title:** Linear Algebra and Complex Variable	**Credit:** 3

Prerequisite: MATH 0541-103
Content: Linear Algebra: definition of matrices, algebra of matrices, transpose of a matrix and inverse of matrix, factorization, determinants, quadratic forms, matrix polynomials, Euclidean n-space, linear transformations from IRn to IRm, properties of' linear transformations from IRn to IRm, introduction to systems of linear equations, Gaussian elimination, real vector spaces and subspaces, basis and dimension, rank and nullity, linear combination, linear dependency and independency; inner product spaces: Gram-Schmidt process and QR-Decomposition, eigenvalues and eigenvectors, diagonalization; linear transformations: kernel and range, application of linear algebra to electric networks.
Complex analysis: 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 equation, infinite series, convergence and uniform convergence, line integral of a complex function, Cauchy integral formula, Liouville's theorem, Taylor's and Laurent's theorem, singular points, residue and Cauchy's residue theorem.
Fourier Series: real and complex form, finite transform, Fourier Integral, Fourier transforms and their uses in solving boundary value problems.

Course Code: MATH 0541-207	**Course Title:** Co-ordinate Geometry and Vector Analysis	**Credit:** 3

Prerequisite: MATH 0541-103
Content: Co-ordinate Geometry: two dimensional coordinate geometry, changes of axes, transformation of co-ordinates, simplification of equation of curves; conic section: pair of straight line, system of circle, parabola, Ellipse, Hyperbola; three dimensional coordinate geometry: system of co-ordinate, distance between two points, section formula, projections, direction cosines and equations of planes and lines.
Vector Analysis: multiple products of vectors, linear dependence and independence of vectors, differentiation and integration of vectors together with elementary applications, line, surface and volume integrals, gradient of a scalar function, divergence and curl of a vector function, various formulae, integral forms of gradient, divergence and curl, divergence theorem, Stoke's theorem, Green's theorem and Gauss's theorem.
Laplace transforms: definition, theorems and properties of Laplace transformation, Laplace transforms of some elementary functions, inverse Laplace transforms, Laplace transforms of derivatives, the unit step function, periodic function, some special theorems on Laplace transforms, partial fraction, solutions of differential equations by Laplace transforms and evaluation of improper integrals.

Course Code: MATH 0541-209	**Course Title:** Probability and Statistics	**Credit:** 3

Prerequisite: Nil
Content: Statistics: population and sample, parameter, variable, constant and frequency distribution, graphical presentation of frequency distribution.
Probability: sets and probability, random variables, properties describing distributions, discrete probability distributions, normal distribution, sampling theory, estimation theory, elementary probability theory; discontinuous probability distribution: binomial, Poisson and negative binomial, characteristics of distributions, elementary sampling theory, estimation, hypothesis testing and regression analysis.
Measures of central tendency: arithmetic mean, median, mode, geometric mean and harmonic mean; measures of dispersion: range, standard deviation, mean deviation, quartile deviation and variance, moments, skewness and kurtosis, mathematical expansion.

Course Code: MATH 0541-301	**Course Title:** Numerical Methods	**Credit:** 3

Prerequisite: Nil
Content: Introduction to numerical methods and errors in numerical techniques: Taylor series; finite difference calculus: forward, backward, divided and central difference and difference of a polynomial; interpolation: Newton's formula, Lagrange, spline, Chebyshev and inverse, extrapolation; nonlinear equations: iteration, bisection, false position, Newton-Raphson, Secant and Muller's methods; simultaneous linear algebraic equations: Cramer's rule, inversion of matrices, Gauss elimination, Gauss-Jordan method, factorization and Gauss-Seidel iteration methods.
Curve Fitting: Linear and polynomial regression, fitting power, exponential and trigonometric functions; ordinary differential equations: initial value problem, Taylor's series method, Picard's method of successive approximation, Euler's method and Runge Kutta method, boundary value problems; numerical integration: general quadrature formula, trapezoidal rule and Simpson's rule and numerical differentiation.

Course Code: PHY 0533-101	**Course Title:** Physics I	**Credit:** 3

Prerequisite: Nil
Content: Waves and oscillations: differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, spring mass system, torsional pendulum, two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, stationary wave, group and phase velocities.
Optics: defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration; theories of light: interference of light, Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference in thin films, Newton's rings, interferometers; diffraction: diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; polarization: production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity and polarimeters.
Thermal Physics: heat and work, the first law of thermodynamics and its applications, kinetic theory of gases, kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law of thermodynamics, Carnot's theorem, entropy, thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation

Course Code: PHY 0533-103	**Course Title:** Physics II	**Credit:** 3

Prerequisite: Nil
Content: Electricity and magnetism: electric charge and Coulomb's law, electric field, concept of electric flux and the Gauss's law- some applications of Gauss's law, Gauss's law in vector form, electric potential, relation between electric field and electric potential, capacitance and dielectrics, gradient, Laplace's and Poisson's equations, current, current density, resistivity, the magnetic field, Ampere's law, Biot-Savart law and their applications and laws of electromagnetic induction- Maxwell's equation.
Modern Physics: Galilean relativity and Einstein's special theory of relativity, Lorentz transformation equations, length contraction, time dilation and mass-energy relation, photoelectric effect, Compton effect, De Broglie matter waves and its success in explaining Bohr's theory, Pauli's exclusion principle, constituent of atomic nucleus, nuclear binding energy, different types of radioactivity, radioactive decay law, nuclear reactions, nuclear fission and fusion and nuclear reactor.
Mechanics: linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of the momentum principle, angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of universal gravitation, the motion of planets and satellites, introductory quantum mechanics, wave function, uncertainty principle, postulates and Schrodinger equation.

Course Code: PHY 0533-104	**Course Title:** Physics Lab	**Credit:** 1.5

Prerequisite: PHY 0533-101
Content: Laboratory experiments based on PHY 0533-101 and PHY 0533-103.

Course Code: CHEM 0531-101	**Course Title:** Chemistry	**Credit:** 3

Prerequisite: Nil
Content: Atomic structure, quantum numbers, electronic configuration, periodic table, properties and uses of noble gases, different types of chemical bonds and their properties, molecular structures of compounds and selective organic reactions.
Different types of solutions and their compositions, phase rule, phase diagram of mono component system, properties of dilute solutions, thermochemistry, chemical kinetics, chemical equilibrium, ionisation of water and pH concept and electrical properties of solution.

Course Code: CHEM 0531-102	**Course Title:** Chemistry Lab	**Credit:** 1.5

Prerequisite: Nil
Content: Volumetric analysis: acid-base titration, oxidation-reduction titrations, determination of Fe, Cu and Ca volumetrically.

3.9 Teaching-Learning Strategies

A wide variety of teaching-learning strategies are used by the Department of EEE to facilitate the learning process. Some of these are highlighted below:

- Active learning strategies with a learning partner: Students create a learning partner with whom they discuss necessary topics and answer questions during the class
- Group Projects and Peer Teaching: Students work in teams to present or teach a topic
- Blended Learning: Combines online resources such as videos with in-person teaching, e.g., when a teacher is teaching synchronous generators, he first shows a video demonstration of the working of a synchronous generator and then goes on to discuss the relevant details
- Learning Reflection: Quick one-minute reflection by students at the end of a lecture to demonstrate what they have learned
- Rubric-based grading: Clear criteria for assignments and projects
- Peer Assessment: Students evaluate each others' work (with guidelines)

3.10 Sample Lesson Plan

3.10.1 For Theory Courses

Lesson Plan

Name of the Faculty Member: Ridwan Abrar
Designation: Lecturer
Department: EEE

Course Title: Energy Conversion II
Semester: 4th
Total Number of Sessions ins the Course: 28
Session Number in the Present Course: 1

1. **Topic of the Lesson:** Introduction to Syncrhonous Generators
2. **Duration:** 1 Hour
3. **Learning Objectives:** By the end of the class, students will be able to:
    - Explain the basic working principle of a synchronous generator
    - Identify the types of windings in a synchronous machine
    - Choose which method of excitation is useful in the excitation of synchronous generators, and select the best one depending on the application
4. **Content:**
    - Basic working principle of a synchronous generator
    - Parts of a synchronous generator
    - Applying DC excitation to a synchronous generator
    - Brushless excitation of synchronous generators
5. **Teaching Methods:**
    a) Lectures
    b) Plenary Question Answer Session
    c) Video Demonstration of the working of a synchronous generator
6. **Teachng Materials:** Whiteboard, Powerpoint slides
7. **Lesson Schedule:**

Step 1: (10 min) Greetings and a brief review of previous session
Step 2: (10 min) An animated video detailing the operation of a synchronous generator
Step 3: (10 min) (40 min) Interactive Lecture and PowerPoint Presentation
Step 4: (10 min) (20 min) Group Discussion, Reflection on what they have learned in this class, and if they have any questions
Step 5: (10 min) Class Attendance and Evaluation

8. **Assessment/Evaluation of Learning Outcome:** Learning Reflection, Short Quiz
9. **Assignment/Homework/Project (if any):**
10. **Supplementary Readings:** A Textbook of Electrical Technology, Volume II, AC and DC machines, B L Theraja

3.10.2 For Practical/Sessional Course

Lesson Plan

Name of the Faculty Member: Ridwan Abrar
Designation: Lecturer
Department: EEE
Course Title: Power System Protection Laboratory
Semester: 7th
Total Number of Sessions ins the Course: 14
Session Number in the Present Course: 1

1. **Topic of the Lesson:** Introduction to Auto-recloser
2. **Duration:** 2 hour 30 minutes
3. **Learning Objectives:** By the end of the class, students will be able to:
    - Explain the basic working principle of an autorecloser
    - Distinguish between an autorecloser and a circuit breaker
    - Choose which one is useful in which case
4. **Content:**
    - Basic working principle of an autorecloser
    - Parts of an autorecloser
5. **Teaching Methods:**
    a) Lectures
    b) Plenary Question Answer Session
    c) Video Demonstration of the working of an autorecloser
6. **Teachng Materials:** Whiteboard, Powerpoint slides
7. **Lesson Schedule:**

Step 1: (10 min) Greetings and a brief review of previous session
Step 2: (20 min) An animated video detailing the operation of an autorecloser
Step 3: (1Hr 50 min) Interactive Lecture and PowerPoint Presentation
Step 4: (20 min) Group Discussion, Reflection on what they have learned in this class, and if they have any questions
Step 5: (20 min) Class Attendance and Evaluation

8. **Assessment/Evaluation of Learning Outcome:** Learning Reflection, Short Quiz
9. **Assignment/Homework/Project (if any):**
10. **Supplementary Readings:** A Textbook of Electrical Technology, Volume II, AC and DC machines, B L Theraja

Green University of Bangladesh
Academic Calendar 2025
(For all Academic Departments except Law)
Spring Semester 2025

Annex-A

SL	Name of Events/Activities	Dates
1.	Last Date of Payment (for Registration)	19 Jan (Sun)
2.	Course Advising and Registration	20-22 Jan (Mon-Wed)
3.	Fresher's Orientation	22 Jan (Wed)
4.	Commencement of Classes	24 Jan (Fri)
5.	Course Advising and Registration with Late Fees	24-29 Jan (Fri-Wed)
6.	Semester Drop/Course Add/Replacement with 100% Refund	31 Jan-05 Feb (Fri-Wed)
7.	**Academic Excellence Award (VC's and Dean's Certificate)	19 Feb (Wed)
8.	Last Date of Payment before Mid Term Exam	05 Mar (Wed)
9.	Last Class before Mid Term Exam	12 Mar (Wed)
10.	Study Days	13-14 Mar (Thu-Fri)
11.	Mid-Term Exam	15-23 Mar (Sat-Sun)
12.	Commencement of Classes After Mid Term Exam	24 Mar (Mon)
13.	**Application for Make-up/Improvement Midterm Exam	04-09 April (Fri-Wed)
14.	**Open Forum of VC and Pro-VC with the Students/ Club Fair	15 April (Tue)
15.	**Make-up/Improvement Midterm Exam	18-23 April (Fri-Wed)
16.	Pre-Registration of Summer Semester	19-23 April (Sat-Wed)
17.	Teacher's Evaluation by the Students	26-30 April (Sat-Wed)
18.	Last Date of Payment before Final Exam	07 May (Wed)
19.	Last Class before Final Exam	18 May (Sun)
20.	Study Days	19-20 May (Mon-Tue)
21.	Final Exam	21-30 May (Wed-Fri)
22.	Last Date of Grade Submission	02 Jun (Mon)
23.	Publication of Final Results	04 Jun (Wed)
24.	Semester Break (Including Eid-ul-Adha Holidays)	05-12 Jun (Thu-Thu)
25.	**Application for Make-up Final Exam	13-18 Jun (Fri-Wed)
26.	**Make-up Final Exam	04-09 Jul (Fri-Wed)

Annex E

Green University of Bangladesh
Academic Calendar 2025 (Revised)
(For all Academic Departments except Law)
Summer Semester 2025

SL	Name of Events/Activities	Dates
1.	Last Date of Payment (for Registration)	15 Jun (Sun)
2.	Course Advising and Registration	16-18 Jun (Mon-Wed)
3.	Commencement of Classes	20 Jun (Fri)
4.	Course Advising and Registration with Late Fees	20-30 Jun (Fri-Wed)
5.	Semester Drop/Course Add/Replacement with 100% Refund	01-02 Jul (Tue-Wed)
6.	Semester Drop/Course Add/Replacement with 50% Refund	03-07 Jul (Thu-Mon)
7.	Last Date of Payment before Mid-Term Exam	16 Jul (Wed)
8.	Last Class before Mid-Term Exam	23 Jul (Wed)
9.	Study Days	24 Jul (Thu)
10.	Mid-Term Exam	25-30 Jul (Fri-Wed)
11.	Commencement of Classes After Mid-Term Exam	01 Aug (Fri)
12.	**Open Forum of VC and Pro-VC with the Students	06 Aug (Wed)
13.	Pre-Registration for Fall Semester 2025	09-13 Aug (Sat-Wed)
14.	**Application for Makeup Exam (Mid-term)	09-12 Aug (Sat-Tue)
15.	**Makeup Exam (Midterm)	15-20 Aug (Fri-Wed)
16.	Teacher's Evaluation by the Students	17-20 Aug (Sun-Wed)
17.	Last Date of Payment before Final Exam	13 Aug (Wed)
18.	Last Class before Final Exam	27 Aug (Wed)
19.	Study Days	28 Aug (Thu)
20.	Final Exam	29 Aug-03 Sept. (Fri-Wed)
21.	Last Date of Grade Submission	06 Sept. (Sat)
22.	Publication of Final Results	08 Sept. (Mon)
23.	Semester Break	09-10 Sept. (Tue-Wed)
24.	**Application for Makeup Exam (Midterm and/or Final)	19-24 Sept. (Fri-Wed)
25.	**Makeup Exam (Midterm and/or Final)	05-11 Oct (Sun-Sat)

23/07/2025

23/07/2025

Captain (Navy) Shaikh Mohammad Salahuddin
NGP, psc, MBA (Retd)
Registrar
Green University of Bangladesh

Green University of Bangladesh
Academic Calendar 2025 (Revised)
(For all Academic Departments except Law)
Fall Semester 2025

SL	Name of Events/Activities	Dates
1.	Last Date of Payment (for Registration)	14 Sept. (Sun)
2.	Course Advising and Registration	13-17 Sept. (Sat-Wed)
3.	Fresher's Orientation	17 Sept. (Wed)
4.	Commencement of Classes	19 Sept. (Fri)
5.	Course Advising and Registration with Late Fees	19-24 Sept. (Fri--Wed)
6.	Semester Drop/Course Add/Replacement with 100% Refund	26-30 Sept. (Fri-Tue)
7.	Semester Drop/Course Add/Replacement with 50% Refund	01-07 Oct. (Wed-Tue)
8.	**Academic Excellence Award (VC's and Dean's Certificate)	08 Oct (Wed)
9.	Last Date of Payment before Mid Term Exam	22 Oct (Wed)
10.	Last Class before Midterm Exam	05 Nov (Wed)
11.	Study Days	06-07 Nov (Thu-Fri)
12.	Mid-Term Exam	08-16 Nov (Sat-Sun)
13.	Commencement of Classes After Midterm Exam	17 Nov (Mon)
14.	**Application for Make-up/Improvement Midterm Exam	21-26 Nov (Fri-Wed)
15.	**Open Forum of VC and Pro-VC with the Students	03 Dec (Wed)
16.	**Make-up/Improvement Midterm Exam	05-10 Dec (Fri-Wed)
17.	Pre-Registration for Spring 2026	05-10 Dec (Fri-Wed)
18.	Teacher's Evaluation by the Students	12-17 Dec (Fri-Wed)
19.	Last Date of Payment before Final Exam	24 Dec (Wed)
20.	Last Class before Final Exam	30 Dec (Tue)
21.	Study Days	31 Dec-01 Jan (Wed-Thu)
22.	Final Exam	02-10 Jan (Fri-Sat)
23.	Last Date of Grade Submission	13 Jan (Tue)
24.	Publication of Final Results	14 Jan (Wed)
25.	Semester Break	15-17 Jan (Thu-Sat)
26.	**Application for Makeup Exam (Midterm and/or Final)	30 Jan-04 Feb (Fri-Wed)
27.	**Makeup Exam (Midterm and/or Final)	13-18 Feb (Fri-Wed)

N.B: Commencement of Classes of Spring 2026 will be 25 January 2026

23/07/2025

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Green University of Bangladesh
Academic Calendar 2025 (Revised)
(For all Academic Departments except Law)

List of Holidays

SL	Date	Day	Holiday
01.	14 February	Friday	*Shab-e-Barat
02.	21 February	Friday	***International Mother Language Day
03.	26 March	Wednesday	***Independence Day
04.	27 March	Thursday	*Shab-e-Qadr
05.	28 March	Friday	Jummatul Widha
06.	29 Mar-02 Apr	Sat-Wed	Holiday for Eid-ul-Fitr
07.	14 April	Monday	Pahela Baishakh
08.	01 May	Thursday	May Day
09.	11 May	Sunday	*Budha Purnima
10.	05-10 June	Thu-Tue	Holiday for Eid-ul-Adha
11.	06 July	Sunday	*Ashura
12.	16 August	Saturday	*Janmashtami
13.	05 September	Friday	*Eid-e-Miladunnabi
14.	01-02 October	Wed-Thursday	Durga Puja
15.	16 December	Tuesday	***Victory Day
16.	25 December	Thursday	Christmas Day

***Subject to the Moon Sighting**
****Tentative Dates**
***** The University will remain open to observe the National Days**

23/07/2025

23/07/2025

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