# SOUTHEAST UNIVERSITY

## COURSE CURRICULUM OF
## DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

**Introduction:**

Electrical and Electronic Engineering (EEE) education has entered a transitional phase because the technology is changing every day. The diversity of EEE education is also increasing underscoring its multi-disciplinary nature. All the areas of the electrical and electronic engineering are growing rapidly and new fascinating disciplines of this subject are being created. Thus role of and Electrical and Electronic Engineer has changed significantly. Employers demand an Engineer with excellent communication skills along with skills of multi-disciplinary engineering. Keeping this in mind, the curriculum of the EEE Department has been designed. The main focus of the EEE Department curriculum is on four major areas- power and energy, electronics, communication and computer in the undergraduate curricula. A student is expected to specialize in one of these groups without compromising the fundamental knowledge in EEE. Courses in basic science, mathematics, relevant branch of Engineering including laboratory experience in the use of modern equipment for measurement and design. Education is the humanities, social sciences, ethical principles and management, with special attention to the development of effective written and oral communication skills. Technical Elective coursework that encourages individual interests and provides the opportunity to gain further knowledge in multiple disciplines facilitates the development of problem solving, teamwork, and engineering design skills with the aid of tools, such as, the computer.

Our specifically targeted curriculum will prepare graduates to compete in the high-tech job market on a global scale. In addition to the foreign job opportunities, graduates can avail job opportunities at home, both in public and private sector in the diversified areas, such as, Electrical Power Generation, Transmission and Distribution, Sub-Station Design Firms, Telecommunication Industry, Wireless and Mobile Telecommunication Companies, Satellite Communication Systems, Integrated Circuit (IC) Design, Satellite Television Channels, Telecommunication Switching Systems, Wired and Wireless Networking, Consumer Electronics Appliance Manufacturer, Process Industries, Textile Industries, Computer Industry, Electrical and Electronic Design Firms, Microprocessor and Microcontroller Based Systems, Real Estate Sectors, etc.

Of the five departments under the School of Engineering, Electrical and Electronic Engineering Department is one of the largest departments in terms of the number of faculty members and students. The department of Electrical and Electronic Engineering (EEE) offers the undergraduate academic program of B.Sc. in Electrical and Electronic Engineering or in short B.Sc. in EEE. At present, EEE Department has over 700 undergraduate students and per year student intake is approximately 200. The university authority is giving the attention to attract quality students from home and abroad.

Alumni of this department are serving with good reputation and success in many government and semi-government and non-government organizations, multi-national companies, and educational institutions including universities within the country and abroad. The future for graduates from EEE department looks very promising both at home and abroad because there is shortage of quality graduates and professionally competent engineers in the job market especially, in the field of power and energy, electronics, computer and communication engineering.

The EEE Department is committed to provide the students various modern laboratories equipped with the state-of-the-art equipment, training kits, test and measuring instrument, simulation software packages.

The department is also committed to the study and analysis of fundamental as well as applied problems. Teachers and students of EEE department work in solving problems in the conventional and emerging fields.

The EEE Department has recruited well-qualified faculty members graduated from BUET, DU, JU and other foreign universities. They are very much dedicated and committed to our students. They provide enough time and efforts to the students and engage them in teaching, learning and research. The research areas of the faculty members of EEE Department include power, energy, electrical machines, nuclear engineering, semiconductor device modeling and simulation, digital signal processing, power electronics, biomedical electronics, control engineering, optical fiber communication, mobile telecommunication, VLSI and nano technology, electrical engineering education etc. Faculty members of this department take part in active teaching, research activities, consultancy, collaborative research work, curricula and laboratory developments etc.

Besides, this department has several adjunct faculty members from EEE Department of BUET who have national and international reputation and special subject expertise.

The Department of EEE will establish EEE Club and IEEE student branch through which students' untapped talents and potentials will be explored by conducting various extra- and co-curricular activities, such as, industry visit, seminar, work shop, project fair, quiz contest etc.

In future, Department of EEE will introduce more programs, viz. B.Sc in Electronic and Telecommunication Engineering (ETE) and M. Sc. in Electrical and Electronic Engineering.

The Department of Electrical and Electronic Engineering of Southeast University (SEU) is striving to realize its vision, mission and program educational objectives to place itself on the top position in the country. So far with the available resources and facilities, the Department has succeeded to do so as a result of sincere efforts of its faculty members and students. In this context, cooperation and support from all sectors are the prime factors in attaining such goal. It is expected that the support of different organizations and the alumni of EEE Department will continue and increase in the days ahead so that vision, mission and educational objectives of the EEE Department can be achieved.

**Vision Statement**

Electrical and Electronic Engineering (EEE) Department of Southeast University (SEU) as a leading departments devoted to ensure transformational impact on learning community of the EEE students, faculty members and staff who are engaged in teaching, innovating, discovering and creating new knowledge in the field of Electrical and Electronic Engineering and thus serving Bangladesh as well as humanity to develop human capital and to produce new knowledge based economy and society.

**Mission Statement**

The mission of the Electrical and Electronic Engineering Department of Southeast University (SEU) is to enhance the position of the EEE Department as one of the top ranked teaching and research departments in SEU by providing the highest quality teaching and learning environment for the students and thus producing the competent and compassionate EEE graduates fully equipped to achieve the highest personal and professional standards for the overall development of the university and of the country. Moreover, the Department is dedicated to attracting and sustaining a cluster of faculty members who are, through their quality teaching, research and professional services, devoted to the development of compassionate and competent EEE graduates.

**Goals of the Department**

The goals of the Department of Electrical and Electronic Engineering of Southeast University are to:

(a) Prepare the students for entry into the profession;

(b) Instill in students the capabilities required by the discipline, the recognition of the need to enhance the discipline, and the desire for life-long learning; and

(c) Equip students with a general knowledge of technical and non-technical disciplines so that they are prepared for further study in other fields including professional and graduate education.
(d) Instill moral values and ethics inside the students required by the society and by the country

**Program Outcomes**

The program outcomes (POs) of the EEE department of Southeast University (SEU) have been set in such a way so that after graduation the students can demonstrate:

(a) An ability to apply knowledge of mathematics, science, and engineering
(b) An ability to design and conduct experiments in at least one special area such as Electrical/Electronic Hardware, Computer Software, Controls, Electronics, Fields and Waves, and Communication and Signal Processing, as well as to analyze and interpret data
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints, such as, economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) An ability to function on multidisciplinary teams
(e) An ability to identify, formulate, and solve engineering problems
(f) An understanding of professional and ethical responsibility
(g) An ability to communicate effectively
(h) An ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) A recognition of the need for, and an ability to engage in life-long learning
(j) A knowledge of contemporary issues
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) A confidence and depth of knowledge to conduct subsequent post-graduate study.

**Program Educational Objectives**

The program educational objectives (PEOs) of the EEE department of Southeast University (SEU) have been set in such a way that after 3-4 years of graduation the graduates can demonstrate:

1. Be competent to develop electrical and electronic engineering solutions either individually or through interdisciplinary teams within a global and societal context
2. Professional and ethically, engage in technical or business activity through electrical and electronic engineering ability, communication skills and knowledge
3. Engage in continuing professional growth through post-graduate education, continuing education or professional activities or training
4. Contribute to the country's and its regional economic development

**Duration of the Program**

The duration for B.Sc. in Electrical and Electronic Engineering program will be of four (4) years, each year consists of 3 equal semesters if a student enrolls as a full time student. But a student may also enroll as a part time student and take less number of courses, but he/she has to complete the degree within eight (8) years from the date of course registration in the program.

**Credit-Hour**

Three credit hours are assigned to a theory course if there are three hours lecture in a week. A class period for theory courses will have a minimum duration of 50 minutes and maximum duration of 1 hour and 20 minutes. One credit of laboratory course will have a minimum of 24 hours of actual lab works per semester and each laboratory class will have a minimum duration of 2 hours if it is a 1 credit laboratory.

**Degree Requirement**

(a) Completion of minimum 144 credit hours in total.
(b) Passing of all courses individually and maintaining a minimum CGPA of 2.50.
(c) Full-filling the minimum requirements of each category of the EEE course curriculum.
(d) If any student fails in any course, he/she will get the opportunity to improve the grade by retaking the same in the subsequent semester.

**Eligibility for Admission:**

- Students having minimum 2.5 GPA or second division both in SSC and HSC from Science or its equivalent background (with Math, Physics and Chemistry).
- For 'O' level and 'A' level system an applicant must have completed 6 papers in 'O' level and 6 papers in 'A' level. In the 'A' level the student must have completed at least 2 papers of Physics, Chemistry and Mathematics. Minimum average GPA of both levels should be 'C' separately.
- Students having SSC and Diploma Engineering in Electrical/ Electronics/ Computer/ Telecommunication/ Power/ Refrigeration and Air Conditioning/ Mechanical/ Automobile/ Civil/ Electro-Medical/ Medical and Ultra-sound/ Chemical/ Mining and Mine Survey/ Aerospace/ Printing/ Food/ Tea/ Forestry etc. Technology under the Bangladesh Technical Education Board (BTEB) are also eligible for admission with waivers in few courses as per UGC guidelines.
- An applicant must submit his/her results during the application.
- No appeared students are allowed.
- Maximum 50 % credits are transferable from other universities with at least B+ (B plus) grade in each transferred course individually.

**Admission Test:**

Prospective students may have to face a written admission test in Southeast University (SEU) if their combined GPA in SSC and HSC is less than 7.00 out of 10.00. But if combined GPA is greater than 7.00 then admission test will be exempted. Admission test questions are set from HSC level's Physics, Chemistry, Mathematics and English as well as General Knowledge. Multiple Choice Questions (MCQ) are set where four options are given from which students have to select the best one answer. Besides, a written English proficiency test may also be conducted. Based on the scores in all parts of the admission test, final selection of the candidate is made.

**Student's Performance Evaluation Process:**

Each student will be evaluated individually by different ways, such as, by monitoring class attendance, by assigning home works, by taking the class tests, by conducting midterm and final examinations for theory courses. The examination syllabus will be notified before the start of the examinations. The assessment in laboratory/sessional courses is made through practical work during the class, laboratory report, viva-voce, project work and laboratory final examination.

**Marks Distribution Policy:**

The final course grade will be awarded based on the marks obtained in a particular course at the end of the semester. Marks distribution policy adopted by the EEE Department is shown in Table 1.

Table 1 Percentages of marks for the different heads adopted by EEE Department

| **For theory courses:** | | | |
|---|---|---|---|
| **Sl. #** | **Parameter** | **Percentage of Marks** | **Remarks** |
| 1 | Attendance | 05 % | If students are not present at least 60% of the total classes they will receive zero marks. For less than 85% class attendances a student will get less than 5 marks. |
| 2 | Continuous Assessment | 25 % | At least 2 class tests should be taken. Maximum one class test may be replaced by an assignment/ presentation/ course project/ field visit etc. Average of them should be counted. |
| 3 | Midterm Examination | 30 % | It should be a one hour and thirty minutes duration examination after the half of the classes of the semester as announced by the university authority. Around half of syllabuses should be covered before the examination. |
| 4 | Final Examination | 40 % | It should be a two hours duration examination after the next half of the classes of the semester as announced by the university authority. Around last half of the syllabuses should be covered before the examination. |
| | **Total:** | **100 %** | |
| | | | |
| **For laboratory courses:** | | | |
| 1 | Attendance | 10 % | If students are not present at least 60% of the total classes they will receive zero marks. For less than 85% class attendances a student will get less than 5 marks. |

| | | | |
|---|---|---|---|
| 2 | Laboratory Report | 20 % | Laboratory report must be submitted individually. |
| 3 | Laboratory Viva-Voce | 15 % | Laboratory viva-voce must be taken individually. |
| 4 | Laboratory Performance/ Quiz | 15 % | Laboratory performance must be measured individually. Quiz may be taken individual students on the experiment sheets of each laboratory works. |
| 5 | Final Quiz/ Examination | 40 % | It should be a written two hours duration examination after the end of the laboratory classes of the semester as announced by the concerned authority. All experiments must be included in the examination. But part of the final examination may be simulation/ experiment based. |
| | **Total:** | **100 %** | |
| | | | |
| **For Thesis/ Project Work:** | | | |
| 1 | Supervisor | 50% | Supervisor will consider regularity, sincerity, working method, originality, experimentation/ simulation, outcome of the work etc. to give marks. |
| 2 | Board of Examiner (Midterm) | 20% | Members of the 'Board of Examiner' will consider presentation quality mainly on what is to be done, what has done so far and what will be done next, answer to the questions etc. |
| 3 | Board of Examiner (Final Poster) | 30% | Members of the 'Board of Examiner' will consider presentation mainly on what has done in their work, how is the poster preparation, answer to the questions and Thesis/Project report. |
| | **Total:** | **100 %** | |
| **For Project/ Internship Work:** | | | |
| 1 | Supervisor | 60% | Supervisor will consider regularity, sincerity, working method, originality, experimentation/ simulation, outcome of the work etc. |
| 2 | Board of Examiner | 40% | Members of the 'Board of Examiner' will consider presentation, answer to the questions and Project/Internship report. |
| | **Total:** | **100 %** | |

Final presentation marks of Thesis/Project/Internship Work should be given by the members of the "Board of Examiners" formed by the Chairman of the Department of EEE for conducting the final presentation at a suitable to be decided by the Chairman of the Department of EEE.

Marks in each head shall be in the fractions (if any) but the total marks out of one hundred (100) shall be rounded up.

**Examination Policy:**

If any student is absent from a test that will not be retaken if prior permission is not availed by the student. If any student wants to sit for the make-up examination with permission he/she may have to pay the necessary fee as decided by the university authority. This fee may not be waived.

Midterm and final examinations are of 1.5 and 2.0 Hours duration respectively. *Zero tolerance to any kind of cheating or adopting unfair means in the examination hall and the punishment varies from cancellation of the particular examination to the expulsion from the university.*

**Grading Policy:**

This university follows the UGC's uniform grading policy. Letter grades and corresponding grade points will be awarded in accordance to the provisions shown below as prescribed by the UGC.

| Marks Obtained | Letter Grade | Grade Point |
|---|---|---|
| A+ | 4.00 | 80% and above |
| A | 3.75 | 75% to 79% |
| A- | 3.50 | 70% to 74% |
| B+ | 3.25 | 65% to 69% |
| B | 3.00 | 60% to 64% |
| B- | 2.75 | 55% to 59% |
| C+ | 2.50 | 50% to 54% |
| C | 2.25 | 45% to 49% |

| Marks Obtained | Letter Grade | Grade Point |
|---|---|---|
| D | 2.00 | 40% to 44% |
| F | 0.00 | Below 40% |
| I | - | Incomplete |
| S | - | Satisfactory (non-credit courses) |
| U | - | Unsatisfactory (non- credit courses) |

Each course has a certain number of credits, which describes its corresponding weights. A letter grade with a specified number of grade points is awarded for each course for which a student is registered. The performance of a student is measured by both the number of credits completed satisfactorily and the weighted average of the grade point earned. Thus, semester GPA and CGPA of a student will be calculated.

## Course Curriculum of B.Sc. in Electrical and Electronic Engineering (EEE)

**Course Designation and Numbering System**

Each undergraduate course is designated with 2-4 letters followed by 4 digits. The first 2-4 letters correspond to the course category and the next 4 digits indicate the level of the course and the type of the course, i.e., whether the course is a theory course or a laboratory course. Letters usually indicate department that is offering the course for the B.Sc in EEE program. If the concerned department does not exist in the university then this course may be offered and conducted by the EEE Department itself by its own Faculty or Adjunct Faculty from other reputed university. The most significant digit of the course code indicates the level of the program, then next one, i.e. the second most significant digit indicates the term of the program and the final two least significant digits indicate the actual course number according to its priority serial. If the least significant digit is odd then it represents a theory course, and if it is even number then it represents a laboratory course. Of course, if the courses are listed in the elective category then the second most significant digit indicates the number of the elective course group. In this program, 4, 5, 6, 7 are reserved for power, electronics, communication and computer course groups respectively.

**Examples:**

Few examples of course coding and course offering process are shown in the following table:

| | |
|---|---|
| EEE 4101 | Course is offered by EEE Department of SEU at Level 4, Term 1, and it is a theory course and offered at first priority |
| ENG 1101 | Course is offered by English Department of SEU at Level 1, Term 1, and it is a theory course and offered at first priority |
| PHY 1202 | Course is offered by EEE Department of SEU at Level 1, Term 2, since SEU does not have any Physics Department. It is a laboratory course and offered at second priority |
| ME 2105 | Course is offered by EEE Department of SEU at Level 2, Term 1, since SEU does not have any Mechanical Engineering Department. It is a theory course and offered at fifth priority |
| EEE 4403 | Course is offered by EEE Department of SEU at Level 4, it is a theory course of power group and offered at third priority. |

**Course Category**

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

ACT - Accounting
CE - Civil Engineering
CHEM - Chemistry
CSE - Computer Science and Engineering

ECO - Economics
EEE - Electrical and Electronic Engineering
ENG - English Courses
MATH - Mathematics
ME - Mechanical Engineering
MGT - Management
PHY - Physics
PSD - Professional Skills Development
SOC - Social Sciences
STAT - Statistics

**Course Structure**

The Bachelor of Science in Electrical and Electronic Engineering (B.Sc. in EEE) program consists of the following categories of courses:

| Category | No. of Theory Courses | No. of Sessional/ Laboratory Courses | Total Credits |
|---|---|---|---|
| Core Courses | 19 | 12 | 69 |
| Thesis/Project | - | - | 6 |
| Internship/Project | - | - | 0 |
| Elective Courses | 7 | - | 21 |
| Inter-Disciplinary Engineering | 2 | 1 | 7 |
| Mathematics | 5 | - | 15 |
| Basic Sciences | 3 | 2 | 11 |
| English Language | 3 | - | 6 |
| General Education Courses | 3 | - | 9 |
| Professional Course | 1 | - | 0 |
| **Minimum Requirement** | **43** | **15** | **144** |

## List of courses

| Course Code | Course Title | Credits |
|---|---|---|
| **Core Courses:[All courses are compulsory] (69 Credits)** | | |
| EEE 1101 | Electrical Circuits I | 3 |
| EEE 1301 | Electrical Circuits II | 3 |
| EEE 1302 | Electrical Circuits Laboratory | 1 |
| CSE 1301 | Computer Programming | 3 |
| CSE 1302 | Computer Programming Laboratory | 1 |
| EEE 2101 | Electronics I | 3 |
| EEE 2201 | Electronics II | 3 |
| EEE 2203 | Energy Conversion I | 3 |
| EEE 2205 | Engineering Electromagnetics | 3 |
| EEE 2300 | Electrical and Electronic Circuit Simulation Laboratory | 1 |
| EEE 2301 | Energy Conversion II | 3 |
| EEE 2302 | Energy Conversion Laboratory | 1 |
| EEE 2303 | Electrical Properties of Materials | 3 |
| EEE 3100 | Electronics Laboratory | 1 |
| EEE 3101 | Continuous Signals and Linear Systems | 3 |
| EEE 3103 | Numerical Techniques | 3 |

| Course Code | Course Title | Credits |
|---|---|---|
| EEE 3104 | Numerical Techniques Laboratory | 1 |
| EEE 3105 | Power Systems I | 3 |
| EEE 3201 | Solid State Devices | 3 |
| EEE 3203 | Digital Electronics | 3 |
| EEE 3204 | Digital Electronics Laboratory | 1 |
| EEE 3205 | Digital Signal Processing I | 3 |
| EEE 3206 | Digital Signal Processing I Laboratory | 1 |
| EEE 3300 | Electrical Service Design | 1 |
| EEE 3301 | Microprocessors and Interfacing | 3 |
| EEE 3302 | Microprocessors and Interfacing Laboratory | 1 |
| EEE 3303 | Communication Engineering | 3 |
| EEE 3304 | Communication Engineering Laboratory | 1 |
| EEE 3305 | Control Systems | 3 |
| EEE 3306 | Control Systems Laboratory | 1 |
| EEE 4101 | Electrical Power Transmission and Distribution | 3 |
| | **Sub Total** | **69** |
| | | |
| **Thesis/Project/Internship: [Thesis is compulsory for all students and have to take in two consecutive semesters with 3 credits in each semester; but internship is also mandatory with zero credit in one semester] (3+3+0=6 Credits)** | | |
| EEE 4002 | Thesis/Project I | 3 |
| EEE 4004 | Thesis/Project II | 3 |
| EEE 4006 | Internship/Project | 0 |
| | **Sub Total** | **6** |
| | | |
| **Inter-Disciplinary Engineering Courses: [Students have to take at least two theory courses and one laboratory course from this course group] (7 credits)** | | |
| CE 2101 | Introduction to Civil Engineering | 3 |
| CE 2200 | Civil Engineering Drawing | 1 |
| ME 2101 | Mechanical Engineering Fundamentals | 3 |
| EEE 3211 | Robotics and Automation | 3 |
| EEE 3212 | Robotics and Automation Laboratory | 1 |
| EEE 3213 | Biomedical Engineering | 3 |
| EEE 3214 | Biomedical Engineering Laboratory | 1 |
| EEE 3215 | Measurement and Instrumentation | 3 |
| EEE 3216 | Measurement and Instrumentation Laboratory | 1 |
| | **Sub Total** | **7** |
| | | |
| **Mathematics Courses: [All Mathematics Courses are compulsory] (15 Credits)** | | |
| MATH 1101 | Mathematics I (Differential and Integral Calculus) | 3 |
| MATH 1203 | Mathematics II (Complex Variables, Fourier Series and Transforms) | 3 |
| MATH 1305 | Mathematics III (Ordinary and Partial Differential Equations) | 3 |
| MATH 2107 | Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis) | 3 |
| MATH 2209 | Mathematics V (Probability and Statistics) | 3 |
| | **Sub Total** | **15** |
| | | |
| **Basic Science Courses: [All Basic Sciences Courses are compulsory] (11 credits)** | | |
| PHY 1101 | Physics I (Waves and Oscillations, Optics and Thermodynamics) | 3 |

| Course Code | Course Title | Credits |
|---|---|---|
| PHY 1201 | Physics II (Electricity and Magnetism, Modern Physics and Mechanics) | 3 |
| PHY 1202 | Physics Laboratory | 1 |
| CHEM 1201 | Chemistry | 3 |
| CHEM 1202 | Chemistry Laboratory | 1 |
| | **Sub Total** | **11** |
| | | |
| **English Language Courses:[All English Language Courses are compulsory] (6 Credits)** | | |
| ENG 1001 | Basic Composition | 0 |
| ENG 1002 | Intermediate Composition | 3 |
| ENG 2301 | English for Engineers | 3 |
| | **Sub Total** | **6** |
| | | |
| **General Education Courses:[Students have to take at least three courses from this course group] (9 Credits)** | | |
| SOC 2101 | Sociology | 3 |
| SOC 2103 | Bangladesh Studies | 3 |
| SOC 2105 | Engineering Ethics | 3 |
| ECO 2107 | Engineering Economics | 3 |
| MGT 2301 | Industrial Management | 3 |
| MGT 2303 | Business Communications | 3 |
| ACT 3101 | Financial and Managerial Accounting | 3 |
| PSD 4000 | Professional Skills Development (Mandatory) | 0 |
| | **Sub Total** | **9** |
| | **Total Credits to be completed before elective courses** | **120** |

## Elective Courses: [Minimum FOUR courses from the MAJOR Group and minimum THREE courses from the MINOR Group] (21 credits).

To full-fill the minimum course requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering, a student must take only theory courses. If he/she wants to take laboratory based courses then his/her credit requirements and hence tuition fee will increase accordingly.

| **Group A (Power and Energy)** | | |
|---|---|---|
| **Course Code** | **Course Title** | **Credits** |
| EEE 4401 | Power System II | 3 |
| EEE 4402 | Power System Laboratory | 1 |
| EEE 4403 | Nuclear Power Engineering | 3 |
| EEE 4405 | Power Electronics | 3 |
| EEE 4406 | Power Electronics Laboratory | 1 |
| EEE 4407 | Power Plant Engineering | 3 |
| EEE 4409 | Power System Protection | 3 |
| EEE 4410 | Power System Protection Laboratory | 1 |
| EEE 4411 | Energy Conversion III | 3 |
| EEE 4413 | High Voltage Engineering | 3 |
| EEE 4414 | High Voltage Engineering Laboratory | 1 |
| EEE 4415 | Power System Reliability | 3 |
| EEE 4417 | Power System Operation and Control | 3 |
| EEE 4419 | Green Power and Energy | 3 |
| EEE 4421 | Power System Economics | 3 |

| | | |
|---|---|---|
| **Group B (Electronics)** | | |
| **Course Code** | **Course Title** | **Credits** |
| EEE 4501 | Analog Integrated Circuits | 3 |
| EEE 4503 | VLSI I | 3 |
| EEE 4504 | VLSI I Laboratory | 1 |
| EEE 4505 | Compound Semiconductor and Hetero Junction Device | 3 |
| EEE 4507 | Semiconductor Processing and Fabrication Technology | 3 |
| EEE 4509 | VLSI II | 3 |
| EEE 4510 | VLSI II Laboratory | 1 |
| EEE 4511 | Optoelectronics | 3 |
| EEE 4512 | Optoelectronics Laboratory | 1 |
| EEE 4513 | Semiconductor Device Theory | 3 |
| EEE 4515 | Green Electronics | 3 |
| EEE 4517 | Nano Electronic Devices | 3 |
| EEE 4518 | Nano Electronic Devices Laboratory | 1 |
| EEE 4519 | Hardware Design with VHDL | 3 |
| EEE 4520 | Hardware Design with VHDL Laboratory | 1 |
| | | |
| **Group C (Communication)** | | |
| **Course Code** | **Course Title** | **Credits** |
| EEE 4601 | Random Signals and Processes | 3 |
| EEE 4603 | Microwave Engineering | 3 |
| EEE 4604 | Microwave Engineering Laboratory | 1 |
| EEE 4605 | Optical Fiber Communications | 3 |
| EEE 4607 | Digital Signal Processing II | 3 |
| EEE 4608 | Digital Signal Processing II Laboratory | 1 |
| EEE 4609 | Digital Communication | 3 |
| EEE 4610 | Digital Communication Laboratory | 1 |
| EEE 4611 | Mobile Cellular Communication | 3 |
| EEE 4613 | Telecommunication Engineering | 3 |
| EEE 4615 | Green Communication Engineering | 3 |
| EEE 4617 | Satellite Communication | 3 |
| EEE 4619 | Broadcast Engineering | 3 |
| EEE 4621 | Radio and Television Engineering | 3 |
| EEE 4623 | Optical Networks | 3 |
| EEE 4625 | Radar and Navigation | 3 |
| | | |
| **Group D (Computer)** | | |
| **Course Code** | **Course Title** | **Credits** |
| EEE 4701 | Microprocessor Based System Design | 3 |
| EEE 4702 | Microprocessor Based System Design Laboratory | 1 |
| EEE 4703 | Real Time Computer System | 3 |
| EEE 4705 | Multimedia Communications | 3 |
| EEE 4707 | Computer Networks | 3 |
| EEE 4708 | Computer Networks Laboratory | 1 |
| EEE 4709 | Computer Architecture | 3 |

| | | |
|---|---|---|
| EEE 4711 | Green Computing | 3 |
| EEE 4713 | Cryptography and Network Security | 3 |
| | **Sub Total** | **24** |
| | | |

**Policy for the Distribution of Elective Courses**

From Level IV, Term I, Department of EEE starts offering elective courses under four (4) groups viz. Power, Electronics, Communication and Computer. Besides these, two more elective courses are to be chosen from the inter-disciplinary course group in Levels II & III.

Rules for distributing major and minor groups and elective courses are as follows:

1. Students will be assigned one of the four groups as **MAJOR** and the other one or more groups as **MINOR** by taking written options from the students. For regular students, this will be done in Level III, Term III.

2. Maximum number of students in any group as major will be 35, but this number should not be less than ten (10). Similarly the maximum number of students in any group as minor will also be 35, but this number should not be less than ten (10).

3. Major and minor group assignment will be based on student options and CGPA of first eight (8) terms from Level I, Term I to Level III, Term II.

4. A student will have to take **minimum FOUR (4)** elective courses from the respective major group and **minimum THREE (3)** elective courses from the respective minor group. A student must also take one theory course along with its corresponding laboratory from the interdisciplinary group. If any student takes an elective course that has laboratory work then he/ she has to take that laboratory course work also and thus his/ her total credit requirements for the degree will increase from the minimum required credits of 144.

5. Students will be assigned their Level IV Thesis from the area of their respective major group. Thesis may be taken from minor groups too, but in that case number of required minor group courses may increase based on the recommendation of the concerned supervisor and subsequent approval of the Chairman of the Department.

6. Students will be assigned their Level IV, Term III Project/Internship also from the area of their respective major group, but it may also be taken from minor groups as well and thus the number of required minor group courses may increase based on the recommendation of the concerned supervisor and subsequent approval of the Chairman of the Department.

7. If a student takes an elective theory course that has a laboratory work then he/she must take the laboratory also. In that case, his/her credit requirements for the B.Sc in EEE degree will increase.

8. If a student fails in an elective theory course that has a laboratory work, the student may take that theory course again or may take another theory course together with its corresponding laboratory (if any). But if a student fails in an elective laboratory course then he/she must re-take that laboratory course only and must get at least the pass grade.

9. A student who has previously failed in an elective course will be allowed to re-register the course. But if the minimum number of re-registered students is ten (10) then a separate section may be created.

10. Elective courses to be offered in a term will be distributed in the preceding term.

11. A student will be allowed to choose a course from his/her major group regardless of his/her CGPA. After distribution of the elective courses among the students of the respective major groups, remaining seats of the elective courses will be distributed among the students who have chosen the subject's group as their minor. The distribution among the minor students will be based on their written options for their courses and CGPA at the time of the distribution.

12. In case of any unforeseen situation or ambiguity, the Department Chairman will take an appropriate decision.

## Term wise Course Offerings:

The University runs three terms per year, such as, Spring, Summer and Fall Semester and its course offerings are given in the following tables.

**First Year/Level**

**Level I, Term I**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 1101 | Electrical Circuit I | Nil | 3 | - |
| ENG 1001 | Basic Composition | Nil | 0 | - |
| MATH 1101 | Mathematics I (Differential and Integral Calculus) | Nil | 3 | - |
| PHY 1101 | Physics I (Waves and Oscillations, Optics and Thermodynamics) | Nil | 3 | - |
| **Total** | **(4+ 0) Courses with 9 credits** | | **9** | **-** |

**Level I, Term II**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| ENG 1002 | Intermediate Composition | ENG 1001 | 3 | - |
| MATH 1203 | Mathematics II (Complex Variables, Fourier Series and Transforms) | MATH 1101 | 3 | - |
| PHY 1201 | Physics II (Electricity and Magnetism, Modern Physics and Mechanics) | PHY 1101 | 3 | |
| PHY 1202 | Physics Laboratory | PHY 1101 | - | 1 |
| CHEM 1201 | Chemistry | Nil | 3 | - |
| **Total** | **(4 + 1) Courses with 13 credits** | | **12** | **1** |

**Level I, Term III**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 1301 | Electrical Circuits II | EEE 1101 | 3 | - |
| EEE 1302 | Electrical Circuit Laboratory | EEE 1101 | - | 1 |
| MATH 1305 | Mathematics III (Ordinary and Partial Differential Equations) | MATH 1203 | 3 | - |
| CSE 1301 | Computer Programming | Nil | 3 | - |
| CSE 1302 | Computer Programming Laboratory | Nil | - | 1 |
| CHEM 1202 | Chemistry Laboratory | Nil | - | 1 |

| | | | | |
|---|---|---|---|---|
| **Total** | **(3 + 3) Courses with 12 credits** | | **9** | **3** |

## Second Year/Level

### Level II, Term I

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 2101 | Electronics I | EEE 1301 | 3 | - |
| SOC 2101/<br>SOC 2103/<br>SOC 2105/<br>ECO 2107 | Sociology/<br>Bangladesh Studies/<br>Engineering Ethics/<br>Engineering Economics | Nil | 3 | - |
| MATH 2107 | Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis) | MATH 1305 | 3 | - |
| CE 2101/<br>ME 2101 | Introduction to Civil Engineering/<br>Mechanical Engineering Fundamentals | Nil | 3 | - |
| **Total** | **(4 + 0) Courses with 12 credits** | | **12** | **-** |

### Level II, Term II

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| CE 2200 | Civil Engineering Drawing | Nil | - | 1 |
| EEE 2201 | Electronics II | EEE 2101 | 3 | - |
| EEE 2203 | Energy Conversion I | EEE 1301 | 3 | - |
| EEE 2205 | Engineering Electromagnetics | MATH 2107 | 3 | - |
| MATH 2209 | Mathematics V (Probability and Statistics) | MATH 2107 | 3 | - |
| **Total** | **(4 + 1) Courses with 13 credits** | | **12** | **1** |

### Level II, Term III

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 2300 | Electrical and Electronic Circuit Simulation Laboratory | EEE 2201 | - | 1 |
| EEE 2301 | Energy Conversion II | EEE 2203 | 3 | - |
| EEE 2302 | Energy Conversion Laboratory | EEE 2203 | - | 1 |
| EEE 2303 | Electrical Properties of Materials | EEE 2201 | 3 | - |
| ENG 2301 | English for Engineers | EEE 2205 | 3 | - |
| MGT 2301/<br>MGT 2303 | Industrial Management/<br>Business Communications | Nil | 3 | - |
| **Total** | **(4 + 2) Courses with 14 credits** | | **12** | **2** |

## Third Year/Level

### Level III, Term I

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 3100 | Electronics Laboratory | EEE 2300 | - | 1 |
| EEE 3101 | Continuous Signals and Linear Systems | EEE 2201 | 3 | - |
| EEE 3103 | Numerical Techniques | MATH 2209 | 3 | - |
| EEE 3104 | Numerical Techniques Laboratory | MATH 2209 | - | 1 |
| EEE 3105 | Power Systems I | EEE 2301 | 3 | - |
| ACT 3101 | Financial and Managerial Accounting | Nil | 3 | - |
| **Total** | **(4 + 2) Courses with 14 credits** | | **12** | **2** |

**Level III, Term II**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 3201 | Solid State Devices | EEE 2303 | 3 | - |
| EEE 3203 | Digital Electronics | EEE 2201 | 3 | - |
| EEE 3204 | Digital Electronics Laboratory | EEE 2201 | - | 1 |
| EEE 3205 | Digital Signal Processing I | EEE 3101 | 3 | - |
| EEE 3206 | Digital Signal Processing I Laboratory | EEE 3101 | - | 1 |
| EEE 3211/<br>EEE 3213/<br>EEE 3215 | Robotics and Automation/<br>Biomedical Engineering/<br>Measurement and Instrumentation | EEE 2201/<br>EEE 2201/<br>EEE 2201 | 3 | - |
| EEE 3212/<br>EEE 3214/<br>EEE 3216 | Robotics and Automation Laboratory/<br>Biomedical Engineering Laboratory/<br>Measurement and Instrumentation Laboratory | EEE 2201/<br>EEE 2201/<br>EEE 2201 | - | 1 |
| **Total** | **(4 + 3) Courses with 15 credits** | | **12** | **3** |

**Level III, Term III**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 3300 | Electrical Service Design | EEE 3100 | - | 1 |
| EEE 3301 | Microprocessor and Interfacing | EEE 3203 | 3 | - |
| EEE 3302 | Microprocessor and Interfacing Laboratory | EEE 3204 | - | 1 |
| EEE 3303 | Communication Engineering | EEE 3101 | 3 | - |
| EEE 3304 | Communication Engineering Laboratory | EEE 3101 | - | 1 |
| EEE 3305 | Control Systems | EEE 3101 | 3 | - |
| EEE 3306 | Control Systems lab | EEE 3101 | - | 1 |
| **Total** | **(3 + 4) Courses with 13 credits** | | **9** | **4** |

## Fourth Year/Level

**Level IV, Term I**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 4002 | Thesis/Project I | EEE 3305 | - | 3 |
| EEE 4101 | Electrical Power Transmission and Distribution | EEE 3105 | 3 | - |
| EEE 4*** | Elective I | Level 4 | 3 | - |
| EEE 4*** | Elective II | Level 4 | 3 | - |
| EEE 4*** | Elective III | Level 4 | 3 | - |
| **Total** | **(4 + 1) Courses with 15 credits** | | **15** | **-** |

**Level IV, Term II**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 4004 | Thesis/Project II | EEE 4002 | - | 3 |
| EEE 4*** | Elective IV | Level 4 | 3 | - |
| EEE 4*** | Elective V | Level 4 | 3 | - |
| EEE 4*** | Elective VI | Level 4 | 3 | - |
| EEE 4*** | Elective VII | Level 4 | 3 | - |
| **Total** | **(4 + 1) Courses with 15 credits** | | **12** | **3** |

**Level IV, Term III**

| Course Code | Course Name | Pre-Requisite | Credits | |
|---|---|---|---|---|
| | | | Theory | Practical |
| EEE 4006 | Internship/Project | EEE 4004 | - | 0 |
| PSD 4000 | Professional Skills Development | Level 4 | 0 | - |
| **Total** | **(1 + 1) Courses with 0 credits** | | **0** | **0** |

Pre-requisite courses of elective courses will be decided by the department during course offerings of the semester.

**Summary of the Courses:**

1. Total number of theory courses is 42 with 123 credits with each course having 3.0 credits except one (1) zero (0) credit course.
2. Total number of laboratory courses is 15 with 15 credits each course having 1.0 credit.
3. Total number of inter-disciplinary courses is two (2) with minimum credit requirement is 7.
4. Total number of elective courses is five (5) in major and three (3) in minor area of concentration with minimum credit requirement is 24.
5. Thesis/ Project is one course with six (6) credits to be taken in Level IV, Terms I and II, i.e. in two consecutive semesters and Internship/ Project is another course with zero (0) credit to be taken in the last semester, i.e., in Level IV, Term III. In this semester, there will be no course work, except internship works at any industry/engineering firm and a 'Professional Skills Development' course in the department.
6. For the 'Professional Skills Development' course, there will be a 3 hour class in one day of each week of the semester and at the end of the semester, there will be a comprehensive viva-voce of the departmental subjects in front of the departmental interview board with an external expert from the other public/ private university, and an arrangement for the mock interview to be conducted by the professional interview board.

# Detail Course Contents of the Curriculum for the Bachelor of Science in Electrical and Electronic Engineering Program

## Core Courses:

**EEE 1101 Electrical Circuits I**
3 credits, 3 hours/week

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchoff'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. Responses of RL and RC 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.

**EEE 1301 Electrical Circuits II**
3 credits, 3 hours/week

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. Magnetically coupled circuits. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation.

**EEE 1302 Electrical Circuits Laboratory**
1 credit, 2 hours/week

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 1101 and EEE 1301.

**CSE 1301 Computer Programming**
3 credits, 3 hours/week

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

**CSE 1302 Computer Programming Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 1301. In the second part, students will learn program design.

**EEE 2101 Electronics I**
3 credits, 3 hours/week
P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified DC and AC diode models, dynamic resistance and capacitance. 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: 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. Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element: structure and physical operation of an 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.

**EEE 2201 Electronics II**
3 credits, 3 hours/week

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. Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, DC imperfections. 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 bandpass filters using Op-Amps. Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages.

**EEE 2203 Energy Conversion I**
3 credits, 3 hours/week

Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase induction motor: Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control. Single phase induction motor: Theory of operation, equivalent circuit and starting.

**EEE 2205 Engineering Electromagnetics**
3 credits, 3 hours/week

Static electric field: 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 co-ordinate 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 and 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 and Poynting theorem. Plane electromagnetic wave: plane wave in loss less 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.

**EEE 2300 Electrical and Electronic Circuit Simulation Laboratory**
1 credit, 2 hours/week

Simulation laboratory based on EEE 1101, EEE 1301, EEE 2101 and EEE 2201 theory courses. Students will verify the theories and concepts learned in EEE 1101, EEE 1301, EEE 2101 and EEE 2201 using simulation software like PSpice and MATLAB. Students will also perform specific design of electrical and electronic circuits theoretically and by simulation.

**EEE 2301 Energy Conversion II**
3 credits, 3 hours/week

Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting. DC generator: Types, no-load voltage characteristics, build-up of a self-excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation. DC motor: Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation. Introduction to wind turbine generators Construction and basic characteristics of solar cells.

**EEE 2302 Energy Conversion Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 2203 and EEE 2301. In the second part, students will design simple systems using the principles learned in EEE 2203 and EEE 2301.

**EEE 2303 Electrical Properties of Materials**
3 credits, 3 hours/week

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

**EEE 3100 Electronics Laboratory**
1 credit, 2 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 2101 and EEE 2201.

**EEE 3101 Continuous Signals and Linear Systems**
3 credits, 3 hours/week
Classification of signals and systems: signals- classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems- classification. Properties of Linear Time Invariant (LTI) systems: Linearity, causality, time invariance, memory, stability, inevitability. 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.

**EEE 3103 Numerical Techniques**
3 credits, 3 hours/week

Introduction: Motivation 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, Raphson, Secant and Muller's methods. Simultaneous linear algebraic equations: Cramer's rule, inversion of matrices, Gauss elimination, Gauss-Jordan method, factorization and Gauss-Siedel 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 RungeKutta method. Boundary value problems. Numerical integration: general quadrature formula, trapezoidal rule and Simpson's rule. Numerical differentiation.

**EEE 3104 Numerical Techniques Laboratory**
1 credit, 2 hours/week

Laboratory on numerical techniques using computer solution of differentiation and integration problems, transcendental equations, linear and non-linear differential equations and partial differential equations taught in EEE 3103 Numerical Techniques course.

**EEE 3105 Power Systems I**
3 credits, 3 hours/week

Network representation: Single line and reactance diagram of power system and per unit. Line representation: equivalent circuit of short, medium and long lines. Load flow: Gauss- Siedel and Newton Raphson Methods. Power flow control: Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor. Fault analysis: Short circuit current and reactance of a synchronous machine. Symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation. Protection: Introduction to relays, differential protection and distance protection. Introduction to circuit breakers. Typical layout of a substation. Load curves: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor and plant factor.

**EEE 3201 Solid State Devices**
3 credits, 3 hours/week

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.

**EEE 3203 Digital Electronics**
3 credits, 3 hours/week

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. 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.

**EEE 3204 Digital Electronics Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3203. In the second part, students will design simple systems using the principles learned in EEE 3203.

**EEE 3205 Digital Signal Processing I**
3 credits, 3 hours/week

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.

**EEE 3206 Digital Signal Processing I Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3205. In the second part, students will design simple systems using the principles learned in EEE 3205.

**EEE 3300 Electrical Service Design**
1 credit, 2 hours/week

Wiring system design, drafting, and estimation. Design for illumination and lighting. Electrical installations system design: substation, BBT and protection, air-conditioning, heating and lifts. Design for intercom, public address systems, telephone system and LAN. Design of security systems including CCTV, fire alarm, smoke detector, burglar alarm, and sprinkler system. A design problem on a multi-storied building.

**EEE 3301 Microprocessor and Interfacing**
3 credits, 3 hours/week

Introduction to microprocessors. Intel 8086 microprocessor: Architecture, addressing modes, instruction sets, assembly language programming, system design and interrupt. Interfacing: programmable peripheral interface, programmable timer, serial communication interface, programmable interrupt controller, direct memory access, keyboard and display interface. Introduction to micro-controllers.

**EEE 3302 Microprocessor and Interfacing Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3301. In the second part, students will design simple systems using the principles learned in EEE 3301.

**EEE 3303 Communication Engineering**
3 credits, 3 hours/week

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- 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.

**EEE 3304 Communication Engineering Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3303. In the second part, students will design simple systems using the principles learned in EEE 3303.

**EEE 3305 Control Systems**
3 credits, 3 hours/week

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. Analysis of feedback control system: Root locus method and frequency response method. Design of feedback control system: Controllability and observability, root locus, frequency response and state variable methods. Digital control systems: introduction, sampled data systems, stability analysis in z-domain.

**EEE 3306 Control Systems Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3305. In the second part, students will design simple systems using the principles learned in EEE 3305.

**EEE 4101 Electrical Power Transmission and Distribution**
3 credits, 3 hours/week

Transmission System: types of conductors, resistance, definition of inductance, inductance of conductor due to internal flux, flux linkages between two points external to an isolated conductor, inductance of a single phase two wire line. Capacitance of transmission lines: Capacitance of a three-phase with equilateral spacing and unsymmetrical spacing, effect of earth on the capacitance of three-phase transmission lines, bundled conductors, parallel-circuit three-phase lines.
Current and voltage relations on a transmission line: Representation of lines, the short transmission line, the medium transmission line, the long transmission line, solution of differential equation, interpretation of the equations, hyperbolic form of the equations, the equivalent circuit of a long line, direct current transmission. General line equation in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks, measurement and advantages of generalized line constants.
Power circle diagram: Receiving and sending end power circle diagrams, transmitted maximum power, universal power circle diagrams, use of circle diagrams.
Voltage and power factor control in transmission systems: Tap changing transformer, induction regulators, moving coil regulators, booster transformer, power factor control, static condensers in series or parallel, synchronous condensers, Ferranti effect.

Distribution: Distributor calculations, copper efficiencies, radial ring mains and inter connections. Mechanical characteristics of transmission lines: sag and stress analysis, ice and wind loading. Supports at different elevations, conditions of erection, effect of temperature changes. Electrical power transmission and distribution policy.

**EEE 4002 Thesis/Project I**
3 credits, 3 hours/week at Level 4, Term I
**EEE 4004 Thesis/Project II**
3 credits, 3 hours/week at Level 4, Term II

Students must take Thesis/Project after completion of their course work as a partial fulfillment of the requirements of their degree of B. Sc. in EEE. They must complete this work within two consecutive semesters under the supervision of a Faculty Member of EEE Department of Southeast University (SEU). The first part should be completed at Level 4, Term I, and the second part should be completed at Level 4, Term II. The work may be performed individually or by forming a group of not more than 3 members. After completion of their work they must submit a Thesis Paper or Project Report on their research findings /project work and must present their works by appearing at an oral presentation and examination on a date fixed by the Chairman of the Department before a Board of Examiners comprising at least four members including the Supervisor and an External Member outside of the Department/ SEU. Research/ study and/ or design and implementation of a practical and/or real life system or solving a problem in the field of electrical and electronic engineering.

**EEE 4006 Project/Internship**
0 credits, 3 hours/week at Level 4, Term III for project work, otherwise practical training/work in an industry or an engineering firm

Students must take Internship/ Project work after completion of their course and Thesis/ Project works as a partial fulfillment of the requirements of their degree of B. Sc. in EEE. They must complete this work within one semester under the supervision of a Faculty Member of EEE Department of Southeast University (SEU). This work can be executed in an industry or in an engineering firm. After completion of their work they must submit an Internship/ a Project Report on their work and must present his report by appearing at an oral presentation and examination on a date fixed by the Chairman of the Department before a Board of Examiners comprising at least four members including the Supervisor and an External outside of the Department/ SEU. The training work may include the study and/ or design and implementation of a practical and/ or real life system or solving a problem in the field of electrical and electronic engineering.

## Inter-Disciplinary Engineering Courses:

**CE 2101 Introduction to Civil Engineering**
3 credits, 3 hours/week

Definition and history of Civil Engineering. Specializations in civil engineering: structural, geotechnical, transportation, water resources, environmental; Description of some outstanding civil engineering projects. Scope and nature of jobs of a civil engineer. Foundations; different types of foundations; brick masonry; framed structures and bearing walls; arches and lintels; details of floors and roofs; pointing; plastering and interior finishing; scaffolding, staging; shoring and underpinning; thermal insulation and acoustics; House plumbing.

**CE 2200 Civil Engineering Drawing**
1 credit, 2 hours/week

Introduction: lettering, numbering and heading; instrument and their use; sectional views and isometric views of solid geometrical figures. Plan, elevation and section of multistoried building; building services drawings; detailed drawing of lattice towers.

**ME 2101 Mechanical Engineering Fundamentals**
3 credits, 3 hours/week

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.

**EEE 3211 Robotics and Automation**
3 credits, 3 hours/week

Robot system concepts and fundamentals: review of kinematics, forces, moments and Euler's law. Control techniques, path/position control. Bandwidth, transmission techniques and design optimization.
Robot sensors: Introduction to physical sensing devices. Sensor interfaces to computer systems. Organization of sensor suits. Contact proximity and machine vision sensors and interfaces. Learning fundamental sensor-motor competences.
Multi-sensor data fusion: Multi-sensor data fusion fundamentals. Wavelet transform for data fusion. System organization for multi-sensor fusion. Current algorithms and their performance evaluation.
Robot system integration: Program and teach modes. Manipulation of interfaces. Interface devices and mechatronic fundamentals, Motion/sensor/actuator interface integration.
Robot programming languages and systems: Machine programming. Current trends in robotics. Computer vision techniques, Image acquisition and processing techniques. Vision based control of robot manipulators, Robotics in industry, Military application in robotics.

**EEE 3212 Robotics and Automation Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3211. In the second part, students will design simple systems using the principles learned in EEE 3211.

**EEE 3213 Biomedical Engineering**
3 credits, 3 hours/week

Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics. Measurement of bio-signals: Ethical issues, transducers, amplifiers and filters. Electrocardiogram: electrocardiography, phono cardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator.
Blood pressure: systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring. Blood flow measurement: Plethymography and electromagnetic flow meter. Measurement and interpretation: electroencephalogram, cerebral angiograph and cronical X-ray. Electroencephalogram: cerebral angiograph and analysis of EEG signals. Brain scans. Electromayogram (EMG). Tomograph: Positron emission tomography and

computer tomography. Magnetic resonance imaging. Ultrasonogram. Patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body.

**EEE 3214 Biomedical Engineering Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3213. In the second part, students will design simple systems using the principles learned in EEE 3213.

**EEE 3215 Measurement and Instrumentation**
3 credits, 3 hours/week

Introduction: Applications, functional elements of a measurement system and classification of instruments. Measurement of electrical quantities: Current and voltage, power and energy measurement. Current and potential transformer. Transducers: mechanical, electrical and optical. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque. Basic elements of DC and AC signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits. Data Transmission and Telemetry: Methods of data transmission, DC/AC telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.

**EEE 3216 Measurement and Instrumentation Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3215. In the second part, students will design simple systems using the principles learned in EEE 3215.

## Elective Courses: Group A (Power and Energy)

**EEE 4401 Power System II**
3 credits, 3 hours/week

Transmission lines cables: overhead and underground. Insulated cables: Cables versus overhead lines, 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. Insulated of overhead lines: types of insulators, their constructions and performances, potential distribution, special types of insulators, testing of insulators. Stability: swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation. Factors affecting stability. Reactive power compensation. Flexible AC transmission system (FACTS). High voltage DC transmission system. Power quality: harmonics sag and swell.

**EEE 4402 Power System Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments/simulations to verify practically the theories and concepts learned in EEE 3105 and EEE 4401. In the second part, students will design simple systems using the principles learned in EEE 3105 and EEE 4401.

**EEE 4403 Nuclear Power Engineering**
3 credits, 3 hours/week

Basic concepts: nuclear energy, atoms and nuclei, radioactivity, nuclear processes, fission, fusion. Nuclear systems: particle accelerator, isotope separators, neutron chain reaction, reactor types, power generation. Layout of nuclear power plant (NPP). Nuclear power plant reactors : pressurized water reactor, boiling water reactor, CANDU reactor, gas cooled reactor, liquid metal cooled reactor, breeder reactor. Auxiliaries, instrumentation and control. Grid interconnection issues: effects of frequency and voltage changes on NPP operation. Advanced and next generation nuclear plants; very high temperature reactors. Biological effects, reactor safety and security; Three Mile island case; Chernobyl case; Fukushima case. Fuel cycle; radioactive waste disposal.

**EEE 4405 Power Electronics**
3 credits, 3 hours/week
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 cyclo-converter. 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.

**EEE 4406 Power Electronics Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4405. In the second part, students will design simple systems using the principles learned in EEE 4405.

**EEE 4407 Power Plant Engineering**
3 credits, 3 hours/week

Power plants: general layout and principles, steam turbine, gas turbine, combined cycle gas turbine, hydro and nuclear. Power plant instrumentation. Selection of location: Technical, economical and environmental factors. Load forecasting. Generation scheduling: deterministic and probabilistic. Electricity tariff: formulation and types.

**EEE 4409 Power System Protection**
3 credits, 3 hours/week

Purpose of power system protection. 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. Instrument transformers: CT and PT. Electromechanical, electronic and digital Relays: basic modules, over current, differential, distance and directional. Trip circuits. Unit protection schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Miniature circuit breakers and fuses. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF6 and vacuum.

**EEE 4410 Power System Protection Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4409. In the second part, students will design simple systems using the principles learned in EEE 4409.

**EEE 4411 Energy Conversion III**
3 credits, 3 hours/week

Special machines: series universal motor, permanent magnet DC motor, unipolar and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drive circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors. Acyclic machines: Generators, conduction pump and induction pump. Magneto hydrodynamic generators. Fuel Cells, thermoelectric generators, flywheels. Vector control, linear motors and traction. Photovoltaic systems: stand alone and grid interfaced. Wind turbine generators: induction generator, AC-DC-AC conversion.

**EEE 4413 High Voltage Engineering**
3 credits, 3 hours/week

High voltage DC: Rectifier circuits, voltage multipliers, Van-de-Graaf 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.

**EEE 4414 High Voltage Engineering Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4413. In the second part, students will design simple systems using the principles learned in EEE 4413.

**EEE 4415 Power System Reliability**
3 credits, 3 hours/week

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 and loss of energy probability. Frequency and duration. Reliability evaluation techniques of single area system.

**EEE 4417 Power System Operation and Control**
3 credits, 3 hours/week

Principles of power system operation: SCADA, conventional and competitive environment. Unit commitment, static security analysis, state estimation, optimal power flow, automatic generation control and dynamic security analysis.

**EEE 4419 Green Power and Energy**
3 credits, 3 hours/week

Introduction to non-conventional power plants and their environmental impacts; Wind Energy: wind turbine generator, wind mapping, cost of wind energy generation and its environmental impacts. Solar Energy: PV Technology, fabrication of solar cells, open circuit voltage, short circuit current, maximum power and maximum power point tracker; solar home system (SHS), charge controller, battery- energy storage for renewable power; other sources of renewable energies; introduction to Green Smart Power Grid; renewable power economics.

**EEE 4421 Power System Economics**
3 credits, 3 hours/week

Economic structure of electric power systems. Electricity generation system design, operation and maintenance, electricity market players, market places, alternative structures of the electricity industry. Role of spot (balancing) markets and power exchanges among the neighboring countries. Private power generation and purchase policy; revenue recovery and pricing of transmission network and distribution services; electrical energy tariff determination. Role of Bangladesh Energy Regulatory Commission (BERC).
Problem formulation, optimization methods and programming for economic analysis of power system operation, planning and economic reliability. Locational marginal pricing, impact of losses and network constraints, modeling of network constraints, concept of contract networks, locational hedging, value of transmission, alternative approaches to investment pricing.
Economic dispatch, load forecasting, unit commitment, interchange, planning and reliability analysis. Background study to pursue advanced work in network planning and operation.

## Elective Courses: Group B (Electronics)

**EEE 4501 Analog Integrated Circuits**
3 credits, 3 hours/week

Review of FET amplifiers: Passive and active loads and frequency limitation. Current mirror: Basic, cascode and active current mirror. Differential Amplifier: Introduction, large and small signal analysis, common mode analysis and differential amplifier with active load. 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 trans-conductance 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 pumped PLL.

**EEE 4503 VLSI I**
3 credits, 3 hours/week

VLSI technology: Top down design approach, technology trends and design styles. Review of MOS transistor theory: Threshold voltage, body effect, I-V equations and characteristics, latch-up problems, NMOS inverter, CMOS inverter, pass-transistor and transmission gates. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. CMOS subsystem design: Adders, multiplier and memory system, arithmetic logic unit. Programmable logic arrays. I/O systems. VLSI testing.

**EEE 4504 VLSI I Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4503. In the second part, students will design simple systems using the principles learned in EEE 4503.

**EEE 4505 Compound Semiconductor and Hetero-Junction Devices**
3 credits, 3 hours/week

Compound semiconductor: Zinc-blend 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 banding, 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.

**EEE 4507 Semiconductor Processing and Fabrication Technology**
3 credits, 3 hours/week

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

**EEE 4509 VLSI II**
3 credits, 3 hours/week

VLSI MOS system design: Layout extraction and verification, full and semi-full custom design styles and logical and physical positioning. Design entry tools: Schematic capture and HDL. Logic and switch level simulation. Static timing. Concepts and tools of analysis, solution techniques for floor planning, placement, global routing and detailed routing. Application specific integrated circuit design including FPGA.

**EEE 4510 VLSI II Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4509. In the second part, students will design simple systems using the principles learned in EEE 4509.

**EEE 4511 Optoelectronics**
3 credits, 3 hours/week

Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, 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 Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

**EEE 4512 Optoelectronics Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4511. In the second part, students will design simple systems using the principles learned in EEE 4511.

**EEE 4513 Semiconductor Device Theory**
3 credits, 3 hours/week

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, Boltzman transport equations, quantum mechanical model, simple applications.

**EEE 4515 Green Electronics**
3 credits, 3 hours/week

Introduction: technology scaling and major bottlenecks for digital and mixed signal design: power dissipation, parameter variations, reliability (NBTI, HCI, TDDB), transistor basics and short channel effects, leakage power, dynamic power, and parameter variations; leakage tolerant design - logic and memory, design of ultra-low power digital CMOs circuits, including near-threshold and sub-threshold logic, low-power DSP; memory design in scaled technologies - parameter variations and memory stability, low voltage and low power memories, new bit-cells, array architecture, parameter variations and low-voltage and low power design - voltage over-scaling and variation tolerance, application to general purpose computing and DSP systems, emerging technologies- FinFETs and variants, Tunnel FETs, III-V devices, Spin-torque transfer based logic and memories; power and performance implications.

Quality of Service Constraints: energy resource efficiency, product longevity and lifecycle extension, sustainable, safe and benign materials, corporate transparency and supply chain management, optimization of product lifecycle resource management.

**EEE 4517 Nano Electronic Devices**
3 credits, 3 hours/week

Basic concepts: 3D, 2D, 1D carriers, DOS, carrier densities, directed moments, quantized conductance, semi-classical carrier transport, ballistic transport (classical and quantum).
The MOSFET: MOS electronics: the MOS capacitor, MOSFET energy bands vs. bias, 2D electrostatics (the geometrical scaling factor). MOSFET current-voltage characteristics: General expression, linear region current, saturation region current (long channel), saturation region current (velocity saturated), full-range (above threshold and sub-threshold).
The bipolar transistor: Device structure, I-V characteristics, MOSFET as a bipolar transistor. CMOS technology: the CMOS inverter and digital gates, device, circuit and system, figures of merit, MOSFET scaling, system considerations.
The Ballistic MOSFET: the mean-free paths and L, ballistic I-V ($T > 0$ non-degenerate, $T = 0$ degenerate and $T > 0$), numerical simulation of the ballistic MOSFET. Scattering theory of the MOSFET: I-V in terms of the transmission coefficient, the transmission coefficient (low and high), the mean-free path for backscattering.
Beyond the silicon MOSFET (the Carbon Nano Tube FET): carbon nanotubes, band-structure basics, MIS electrostatics of carbon nanotube capacitors, theory of the ballistic CNTFET, CNTFETs vs. MOSFETs, discussion.

**EEE 4518 Nano Electronic Devices Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4517. In the second part, students will design simple systems using the principles learned in EEE 4517.

**EEE 4519 Hardware Design with VHDL**
3 credits, 3 hours/week

VHDL: meaning, history and reasons for studying hardware design, design hierarchy. VHDL design example: Behavioral, Data flow and Structural descriptions. Introduction to PLD, PLA, PAL, CPLDs and FPGA technology and implementation of various logic functions using these technologies. Basic VHDL constructs, coding styles and synthesis. Design of various combinational and sequential logic circuits using VHDL. Bus Architecture, ALU, RAM, simple processor, CPU and various controller circuit design using VHDL. Pipelining. Implementation of FSM and ASM based design in VHDL. Writing VHDL test benches.

**EEE 4520 Hardware Design with VHDL Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4519. In the second part, students will design simple systems using the principles learned in EEE 4519.

## Elective Courses: Group C (Communication)

**EEE 4601 Random Signals and Processes**
3 credits, 3 hours/week

Probability and random variables. Distribution and density functions and 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 and 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 and linear filtering.

**EEE 4603 Microwave Engineering**
3 credits, 3 hours/week

Transmission lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching and lossy transmission lines. Waveguides: general formulation, modes of propagation and 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.

**EEE 4604 Microwave Engineering Laboratory**
1 credit, 2 hours/week
This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4603. In the second part, students will design simple systems using the principles learned in EEE 4603.

**EEE 4605 Optical Fiber Communication**
3 credits, 3 hours/week

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

**EEE 4607 Digital Signal Processing II**
3 credits, 3 hours/week

Spectral estimation: Nonparametric methods discrete random processes, autocorrelation sequence, periodogram; parametric method autoregressive modeling, forward/backward linear prediction, Levinson-Durbin algorithm, minimum variance method and 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.

**EEE 4608 Digital Signal Processing II Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4607. In the second part, students will design simple systems using the principles learned in EEE 4607.

**EEE 4609 Digital Communication**
3 credits, 3 hours/week

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: Base band 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 conventional codes: Linear block codes, convolution codes and coded modulation. Spread spectrum signals and system.

**EEE 4610 Digital Communication Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4609. In the second part, students will design simple systems using the principles learned in EEE 4609.

**EEE 4611 Mobile Cellular Communication**
3 credits, 3 hours/week

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.

**EEE 4613 Telecommunication Engineering**
3 credits, 3 hours/week

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 and multistage switching, time division switching and two dimensional switching. Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Modern telephone services and network: Internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks. Introduction to cellular telephony and satellite communication.

**EEE 4615 Green Communication Engineering**
3 credits, 3 hours/week

Introduction of green communication technology; Theory and modeling of sustainable green communication systems; Architecture, design and strategies for green communication; Algorithms and protocols for green communication; Allocation and scheduling for green communication systems.
Environment Friendly Communication: electromagnetic pollution mitigation, green terminals for wireless and wire-line communication, contention of distribution network; signal processing; software and hardware, device and equipment; green cognitive communication and computing, data storage and cloud computing.
Quality of Service Constraints: improving energy efficiency of green communication systems.

**EEE 4617 Satellite Communication**
3 credits, 3 hours/week

Brief history and overview of satellite communications, communication satellite systems, communication satellites, orbiting satellites, satellite frequency bands, satellite multi-access formats, the Regulatory Bodies. Frequency allocations. Fundamental orbital laws, GEO, MEO, LEO satellites, subsystems of a communication satellite, earth station, satellite link analysis, attenuation, effect of rain on propagation. Modulation and multiplexing techniques for satellite link, Communication payload, transponders, coverage. Multiple access techniques: FDMA, SPADE, TDMA, CDMA, Antijam advantage of spectral spreading, satellite jamming, DS-CDMA acquisition and tracking, FH-CDMA acquisition and tracking, random access. Phase coherency in satellite systems: carrier phase-noise, phase noise spectra, carrier frequency and phase stability, phase errors in carrier referencing. Satellite ranging systems: ranging systems, component-ranging codes, and tone-ranging systems. Inter-satellite links, VSAT satellite system concept, link analysis, transformation path, path loss, mobile-satellite communication systems, mobile satellite channel, direct home TV broadcasting.

**EEE 4619 Broadcast Engineering**
3 credits, 3 hours/week

Acoustics: Basic theory of sound waves, sound propagation in different media, acoustometry, electro-acoustic transducers, measurement, sound synthesis, studio design and construction. Audio Systems: Overview of microphones, loudspeakers, digital audio. Audio Production: Development of studio skills, audio post production. Conventional FM Broadcasting, MPEG and MP3 audio layers, Digital Audio: Digital Audio Broadcasting (DAB) techniques, acquisition, storage and processing of digital audio signals; generation of digital effects e.g. reverb, compression. Video Systems: Theory and digital video production, lighting techniques, MPEG source coding, HDTV production techniques. Post Production Processing Technologies: Conventional Editing, Non-Linear Editing (NLE), Digital Video Effects (DVE) etc. Broadcast Systems: technical material on broadcast systems including radio and optical fiber systems, News Gathering techniques (ENG and SNG).Transmission Technologies: Analog TV transmission (PAL, NTSC, SECAM), NICAM Audio, MPEG transmission layer, Orthogonal Frequency Division Multiplexing (OFDM), Digital Terrestrial TV Broadcasting (DTTB) techniques (DVB-T, ISDB, ATSC), Single Frequency Networking (SFN), Digital Satellite TV Broadcasting (DVB-S and ISDB), Digital Cable TV transmission. New Developments in Television Broadcasting: Interactive TV, 3D-TV, Teletext, Data Services etc.

**EEE 4621 Radio and Television Engineering**
3 credits, 3 hours/week

Introduction to radio frequencies. Radio Frequency (RF) Amplifiers; Amplitude Modulation and Demodulation; Angle Modulation and Demodulation; Frequency Conversion and Mixing; Propagation of Radio Waves. Radio Transmitter and Receiver, Super-heterodyne Radio Receivers.
Basics of Antenna: gain and effective area; radiation pattern, gain and radiation impedance of monopole, dipole, folded dipole, array of isotropic radiators
Television Fundamentals; Analysis and synthesis of television pictures, composite video signal. Television picture tube. Television Cameras: types, construction and operating principles. Color Signal; Television Receivers; Television Measurements; Colorimetry.
Television transmission systems: PAL, SECAM and NTSC systems. Antenna and television signal transmission and distribution Systems.
Introduction to Satellite Television Receiver (STVR) system: elements of the system and construction, erection and operation of the system. Design of Low Noise Amplifier (LNA) and Voltage Controlled Oscillator (VCO).

**EEE 4623 Optical Networks**
3 credits, 3 hours/week

Introduction to Optical Networks, Optical Transmission Basics, Signal Propagation through Optical Fiber Networks, Optical Fiber and Waveguide, Optical Transmitter and Detector, Optical Switching, Optical Multiplexing and De-multiplexing Techniques, Optical Modulation and Demodulation Techniques, Optical Amplifiers, Client Layers of Optical Layers, SONET/SDH, Optical Ethernet, Optical IP, Optical Network Design, Optical Network Control and Management, Optical Network Security and Survivability, Photonic Packet Switching.

**EEE 4625 Radar and Navigation**
3 credits, 3 hours/week

Air Traffic Management: Air Traffic Management (ATM) concepts, En-route and Terminal Guidance, Supporting technology, Types of Navigational Aids, An introduction to ICAO.
Radar Systems: Introduction & early history, Classification of Radars, Basic concepts and measurements, Radar Equation, Propagation effects of atmospheric refraction, Properties of radar targets, Radar detection in the presence of noise, Introduction to Radar Signal Processing, Radar Antennas, CW Radar, Frequency-Modulated CW Radar, MTI and Pulse Doppler Radar, Tracking Radar, Introduction to Secondary Surveillance Radar (SSR).
En-Route Navigational Aids: Rho-Theta Navigation, VHF Omni-Range (VOR), Distance Measuring Equipment (DME), Radio altimeter. Introduction to Doppler Navigation and Satellite based navigation.
Navigational Aids for Landing: Instrument Landing System (ILS), Microwave Landing System (MLS), Approach and Terminal Radars, Use of Precision Approach Path Indicators (PAPI), Automatic Dependent Surveillance (ADS) System.

## Elective Courses: Group D (Computer)

**EEE 4701 Microprocessor Based System Design**
3 credits, 3 hours/week

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 pipe line; VLSI implementation of a microprocessor or part of a microprocessor design.

**EEE 4702 Microprocessor Based System Design Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4701. In the second part, students will design simple systems using the principles learned in EEE 4701.

**EEE 4703 Real Time Computer System**
3 credits, 3 hours/week

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.

**EEE 4705 Multimedia Communications**
3 credits, 3 hours/week

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: The www, Internet telephony, teleconferencing, HDTV, email and e-commerce.

**EEE 4707 Computer Networks**
3 credits, 3 hours/week

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.

**EEE 4708 Computer Networks Laboratory**
1 credit, 2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4707. In the second part, students will design systems using the principles learned in EEE 4707.

**EEE 4709 Computer Architecture**
3 credits, 3 hours/week

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 micro-programmed Pipeline- pipelined data path and control, hazards and exceptions. Memory organization: cache, virtual memory; Buses; Multiprocessors, type of multiprocessor performance, single bus multiprocessors, clusters.

**EEE 4711 Green Computing**
3 credits, 3 hours/week

Green use of computer: minimizing the electricity consumption of computers and their peripheral devices. Green disposal: re-purposing an existing computer or appropriately disposing of, or recycling, unwanted electronic equipment. Green design: designing energy-efficient computers, servers, storage devices, printers, projectors and other digital devices. Green manufacturing: minimizing waste during the manufacturing of computers and other subsystems to reduce the environmental impact of these activities.
Introduction: service providers' battle to reduce carbon footprint as data centers expand, green data center; reduction of energy consumption with hot and cold aisles, optimization for best energy efficiency, MAID 2.0 and disk spin down for reducing energy costs. Designing, manufacturing, using, and disposing of computers, servers, and associated subsystems, such as, monitors, printers, storage devices, and networking and communications systems etc. Software and deployment optimization: algorithmic efficiency, resource allocation, virtualizing, terminal servers. Power Management: data center power, operating system support, power supply, storage and display etc.
Government regulatory authorities to promote green computing concepts.

**EEE 4713 Cryptography and Network Security**
3 credits, 3 hours/week

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: ElGamalcryptosystem 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.

## Mathematics Courses:

**MATH 009 Remedial Mathematics Course**
0 credits, 3 hours/week

Algebra: Set, function, hyperbolic function, matrix, series-exponential, logarithmic and trigometric function, complex numbers.

Geometry: Coordinate, direction cosines, circle, plane, straight line, sphere, parabola, hyperbola, ellipse.
Trigonometry: Plane trigonometry, spherical trigonometry, trigonometric ratios of associated and compound angles, circular function.
Calculus: Differential calculus, limits, addition, multiplication, division, Integral calculus, substitution method, integration by parts, reduction formulae, definite integral.

**MATH 1101 Mathematics I (Differential and Integral Calculus)**
3 credits, 3 hours/week

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 co-ordinates. Determination of maximum and minimum values of functions.Curvature. Asymptotes. 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 formulae. 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 co-ordinates. Volumes and surface areas of solids of revolution.

**MATH 1203 Mathematics II (Complex Variables, Fourier Series and Transforms)**
3 credits, 3 hours/week

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, Cauchy's residue theorem.
Fourier Series: Real and complex form. Finite transform. Fourier Integral. Fourier transforms and their uses in solving boundary value problems.
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; Evaluation of improper integrals.

**MATH 1305 Mathematics III (Ordinary and Partial Differential Equations)**
3 credits, 3 hours/week

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 equation by the method based on the factorization of the operators. 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. Particular solution with boundary and initial conditions.

**MATH 2107 Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis)**
3 credits, 3 hours/week

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. Eigen values and Eigen vectors. Diagonalization. Linear transformations: Kernel and Range., Application of linear algebra to electric networks.
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 coordinate, distance between two points, section formula, projections, direction cosines, equations of planes and lines.
Vector Analysis : Multiple product of vectors. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar 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.

**MATH 2209 Mathematics V (Probability and Statistics)**
3 credits, 3 hours/week

Introduction: Definition of statistics: Population and Sample, Parameter, Variable, constant and Frequency distribution. Graphical presentation of Frequency distribution. Sets and Probability, Random Variables, Properties Describing Distributions, Discrete Probability Distributions, Normal Distribution, Sampling Theory, Estimation Theory. Elementary probability theory and 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.

## Basic Science Courses:

**PHY 1101 Physics I (Waves and Oscillations, Optics and Thermal Physics)**
3 credits, 3 hours/week

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, 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 thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

**PHY 1201 Physics II (Electricity and Magnetism, Modern Physics and Mechanics)**
3 credits, 3 hours/week

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, 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, nuclear fusion, atomic power plant.
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, Schrodinger time independent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

**PHY 1202 Physics Laboratory**
1 credit, 2 hours/week

Laboratory experiments based on PHY 1101 and PHY 1201.

**CHEM 1201 Chemistry**
3 credits, 3 hours/week

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. Selective organic reactions.
Different types of solutions and their compositions. Phase rule, phase diagram of mono component system. Properties of dilute solutions. Thermo chemistry, chemical kinetics, chemical equilibrium. Ionization of water and pH concept. Electrical properties of solution.

**CHEM 1202 Chemistry Laboratory**
1 credit, 2 hours/week

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

## English Language Courses:

**ENG 1001 Basic Composition**
0 credit, 3 hours/week

General discussion: Introduction, various approaches to learning English.
Grammar: Tense, Right form of verbs, Voice, Narration, article, preposition, subject-verb agreement, clause, conditional and sentence structure, Transformation of Sentences.
Grammatical Problems: Construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction.
Reading Skill: Discussion readability, scan and skin reading, generating ideas through purposive reading, reading of selected stories
Writing Skill: Principles of effective writing; Organization, planning and development of writing; Composition, précis writing, amplification
General strategies for the writing process: Generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing
Listening Skill: The phonemic systems and correct English pronunciation
Speaking Skill: Practicing dialogue; Story telling; Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complains, apologies, describing people and places, narrating events.

**ENG 1002 Intermediate Composition**
3 credits, 3 hours/week

Grammar: Modals, Conditionals, Phrasal verbs, Transitional words,
Guided Writing: Comprehension.
Creative Writing: Essay-Cause & Effect, Compare & Contrast types.
Assignment: Project work & Demonstration (Posters)

**ENG 2301 English for Engineers**
3 credits, 3 hours/week

Discussion on common terms related to Engineering Education, Electricity, Electrical Circuits and Systems, Electronics, Communication Engineering and Computer System. Technology based paragraph writing.
Approaches to Communication: Communication today, business communication, different types of business communication, technical tender call and evaluation report preparation.
Effective oral presentation: Academic Presentations, preparation and styles of presentation using power point slides.
Report Writing: Defining a report, classification of reports, structure and components of a technical report, and writing of reports.

## General Education Courses:

**SOC 2101 Sociology**
3 credits, 3 hours/week

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, 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; 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; Population Policy.

**SOC 2103 Bangladesh studies**
3 credits, 3 hours/week

People of Bangladesh: Origin & development, Language, Religion, Dress, Food. Geography of Bangladesh, Natural Resources of Bangladesh, Mineral resources of Bangladesh, History of Bengal: Ancient Period, Medieval Period, British Rule, Language Movement: 1948-1952, Liberation War 1971 and Birth of Bangladesh. Minority Ethnic Group of Bangladesh, Heritage and Tourism in Bangladesh, Culture of Bangladesh, Festivals of Bangladesh, Religion of Bangladesh, Agriculture and Forest of Bangladesh. Economic System of Bangladesh: Major Aspect of Bangladesh Economy in Agriculture, Industry, Trade and Commerce, Development Aspect of Bangladesh. Problems of Bangladesh: Social Problems, Global Warming and Climate Change Issue. Prospects of Future Bangladesh.

**SOC 2105 Professional Ethics**
3 credits, 3 hours/week

Definition and scopes of Ethics. Different branches of Ethics. Social change and the emergence of new technologies. History and development of Engineering Ethics. Science and Technology-necessity and application. Study of Ethics in Engineering. Applied Ethics in engineering. Human qualities of an engineer. Obligation of an engineer to the clients. Attitude of an engineer to other engineers. Measures to be taken in order to improve the quality of engineering profession. Ethical Expectations: Employers and Employees; inter-professional relationship: Professional Organization-maintaining a commitment of Ethical standards. Desired characteristics of a professional code. Institutionalization of Ethical conduct.

**ECO 2107 Engineering Economics**
3 credits, 3 hours/week

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. Optimization.
Introducing macroeconomics. National income accounting, the simple Keynesian analysis of national income, employment and inflation. Savings, investment and decision making. Fiscal policy and monetary policy- money and interest rate, income and spending.
Economics of development and planning.

**MGT 2301 Industrial Management**
3 credits, 3 hours/week

Management Functions and Organization: Evolution, management function: organization, theory and structure, span of control, authority delegation, manpower planning. Personal Management: Importance, need hierarchy, motivation, leadership, wage incentives, performance appraisal, participative management.

Operation Management: Production planning and control (PPC) functions, quantitative methods applied in production, quality management, location and layout planning safety and loss management. Cost and Financial Management: Elements of cost products, cost analysis, investment analysis, benefit cost analysis, risk analysis. Management Accounting: Cost planning and control, budget and budgetary control. Marketing Management: Concepts, strategy, sales promotion, patent laws. Technology Management: Management of innovation and changes, technology life cycle. Case studies.

**MGT 2303 Business Communications**
3 credits, 3 hours/week

Various forms of communications in business and business organizations: verbal and nonverbal communications, dyadic and organizational communication, communication roles and relationships, small-group communication, communication networks, diagnosis and improvement of organizational communications. Effective styles and formats of business communication including memorandums, letters reports, resumes, visual aids, oral presentations. Study progresses to planning, and developing skills in written and oral communications including business reports and letter writing. Business presentation skills and styles.

**ACT 3101 Financial and Managerial Accounting**
3 credits, 3 hours/week

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 considering adjusting and closing entries. Accounting concepts and conventions. Financial statements analysis and interpretation: ration 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, stock debtors.

**PSD 4000 Professional Skills Development**
0 credits, 3 hours/week

Socialization and Introduction of Professional Life Skills Development Program; Introduction to Career Planning; Identifying Professional Talents: Self-Assessment; Preparing Cover Letters; Developing and Enhancing Professional Resume: Resume Preparation Techniques, Resume Contents and Sample Resumes; Introduction to the Career Search Processes: Job Search Strategies and Prospecting for Job Leads; Professional Communication: Communicating with Potential Employers; Interviews: Preparing for Interviews and Managing Interviews; Developing Professional Career Portfolio and Presentation; Working in Organizations: Work Ethics; Managing Workplace; Mock Interview, Professional Career Portfolio and Presentation. Comprehensive viva-voce on curriculum.

## Course Equivalence of New Syllabus with Old Syllabus with Pre-Requisites:

| Course(s) of old syllabus | Equivalent Course(s) of new syllabus | Pre-requisite courses |
|---|---|---|

| Course(s) of old syllabus | | Equivalent Course(s) of new syllabus | | Pre-requisite courses | |
|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Course Code** | **Course Title** | **Course Code** | **Course Title** |
| EEE1021 | Electrical Circuits I | EEE 1101 | Electrical Circuits I | | Nil |
| EEE1031 | Electrical Circuits II | EEE 1301 | Electrical Circuits II | EEE 1101 | Electrical Circuits I |
| EEE1032 | Electrical Circuits Lab | EEE 1302 | Electrical Circuits Laboratory | EEE 1101 | Electrical Circuits I |
| CSE1011 | Programming Language I (C) | CSE 1301 | Computer Programming | | Nil |
| CSE1012 | Programming Language I (C) Lab | CSE 1302 | Computer Programming Laboratory | | Nil |
| EEE2011 | Electronic Devices I | EEE 2101 | Electronics I | EEE 1301 | Electrical Circuits II |
| EEE2013 | Digital Electronics | EEE 2201 | Electronics II | EEE 2101 | Electronics I |
| EEE2035 | Energy Conversion-I | EEE 2203 | Energy Conversion I | EEE 1301 | Electrical Circuits II |
| EEE3015 | Engineering Electromagnetic | EEE 2205 | Engineering Electromagnetics | MATH 2107 | Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis) |
| EEE2046 | Circuit Simulation Lab | EEE 2300 | Electrical and Electronic Circuit Simulation Laboratory | EEE 2201 | Electronics II |
| EEE2037 | Energy Conversion-II | EEE 2301 | Energy Conversion II | EEE 2203 | Energy Conversion I |
| EEE2038 | Energy Conversion Lab | EEE 2302 | Energy Conversion Laboratory | EEE 2203 | Energy Conversion I |
| EEE 3027 | Electrical Properties of Materials | EEE 2303 | Electrical Properties of Materials | EEE 2201 | Electronics II |
| EEE2044 | Electronic Devices II Lab | EEE 3100 | Electronics Laboratory | EEE 2300 | Electrical and Electronic Circuit Simulation Laboratory |
| EEE3021 | Signals and Systems | EEE 3101 | Continuous Signals and Linear Systems | EEE 2201 | Electronics II |
| CSE1032 | Numerical Methods | EEE 3103 | Numerical Techniques | MATH 2209 | Mathematics V (Probability and Statistics) |
| | New Course | EEE 3104 | Numerical Techniques Laboratory | MATH 2209 | Mathematics V (Probability and Statistics) |
| EEE2031 | Power System-I | EEE 3105 | Power Systems I | EEE 2301 | Energy Conversion II |
| EEE3025 | Semiconductor Devices | EEE 3201 | Solid State Devices | EEE 2303 | Electrical Properties of Materials |
| EEE2013 | Digital Electronics | EEE 3203 | Digital Electronics | EEE 2201 | Electronics II |
| EEE2014 | Digital Electronics Lab | EEE 3204 | Digital Electronics Laboratory | EEE 2201 | Electronics II |
| EEE4013 | Digital Signal Processing | EEE 3205 | Digital Signal Processing I | EEE 3101 | Continuous Signals and Linear Systems |
| EEE4014 | Digital Signal Processing Lab | EEE 3206 | Digital Signal Processing I Laboratory | EEE 3101 | Continuous Signals and Linear Systems |
| EEE2042 | Electrical Services Design | EEE 3300 | Electrical Service Design | EEE 3100 | Electronics Laboratory |
| CSE3013 | Microprocessor Design & Assembly Language Programming | EEE 3301 | Microprocessors and Interfacing | EEE 3203 | Digital Electronics |
| CSE3014 | Microprocessor Design & Assembly Language Programming Lab | EEE 3302 | Microprocessors and Interfacing Laboratory | EEE 3204 | Digital Electronics Laboratory |
| EEE2023 | Analog & Digital Communication | EEE 3303 | Communication Engineering | EEE 3101 | Continuous Signals and Linear Systems |
| ETE4026 | Communication Engineering Lab | EEE 3304 | Communication Engineering Laboratory | EEE 3101 | Continuous Signals and Linear Systems |
| EEE4011 | Control System | EEE 3305 | Control Systems | EEE 3101 | Continuous Signals and Linear Systems |
| | New | EEE 3306 | Control Systems Laboratory | EEE 3101 | Continuous Signals and Linear Systems |
| | New | EEE 4101 | Electrical Power Transmission | EEE 3105 | Power Systems I |

| Course(s) of old syllabus | | Equivalent Course(s) of new syllabus | | Pre-requisite courses | |
|---|---|---|---|---|---|
| | | | and Distribution | | |
| EEE4000 | Research Methodology | EEE 4002 | Thesis/Project I | EEE 3305 | Control Systems |
| | | EEE 4004 | Thesis/Project II | EEE 4002 | Thesis/Project I |
| EEE4055/EEE4056 | Project/Internship | EEE 4006 | Project/Internship | EEE 4004 | Thesis/Project II |
| | New | CE 2101 | Introduction to Civil Engineering | | Nil |
| MEC1001 | Engineering Drawing | CE 2200 | Civil Engineering Drawing | | Nil |
| MEC2011 | Mechanical Engineering Fundamentals | ME 2101 | Mechanical Engineering Fundamentals | | Nil |
| EEE 4027 | Robotics | EEE 3211 | Robotics and Automation | EEE 2201 | Electronics II |
| | New | EEE 3212 | Robotics and Automation Laboratory | EEE 2201 | Electronics II |
| EEE 4029 | Biomedical Engineering | EEE 3213 | Biomedical Engineering | EEE 2201 | Electronics II |
| | New | EEE 3214 | Biomedical Engineering Laboratory | EEE 2201 | Electronics II |
| EEE 2025 | Measurement & Instrumentation | EEE 3215 | Measurement and Instrumentation | EEE 2201 | Electronics II |
| EEE 2026 | Measurement & Instrumentation Lab | EEE 3216 | Measurement and Instrumentation Laboratory | EEE 2201 | Electronics II |
| MATH1034 | Differential & Integral Calculus | MATH 1101 | Mathematics I (Differential and Integral Calculus) | | Nil |
| MATH1035 | Ordinary Differential Equations and Partial Differential Equation | MATH 1203 | Mathematics II (Complex Variables, Fourier's Series and Transforms) | MATH 1101 | Mathematics I (Differential and Integral Calculus) |
| MATH2014 | Complex Variables and Transforms | MATH 1305 | Mathematics III (Ordinary and Partial Differential Equations) | MATH 1203 | Mathematics II (Complex Variables, Fourier's Series and Transforms) |
| MATH2015 | Linear Algebra & Vector Analysis | MATH 2107 | Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis) | MATH 1305 | Mathematics III (Ordinary and Partial Differential Equations) |
| STAT2012 | Statistical Methods and Probability | MATH 2209 | Mathematics V (Probability and Statistics) | MATH 2107 | Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis) |
| PHY1033 | Advanced Physics | PHY 1101 | Physics I (Waves and Oscillations, Optics and Thermodynamics) | | Nil |
| PHY1033 | Advanced Physics | PHY 1201 | Physics II (Electricity and Magnetism, Modern Physics and Mechanics) | PHY 1101 | Physics I (Waves and Oscillations, Optics and Thermodynamics) |
| PHY1034 | Physics Lab (Based on Basic Physics) | PHY 1202 | Physics Laboratory | PHY 1101 | Physics I (Waves and Oscillations, Optics and Thermodynamics) |
| CHEM1031 | Chemistry | CHEM 1201 | Chemistry | | Nil |
| | New | CHEM 1202 | Chemistry Laboratory | | Nil |
| ENG 1001 | Basic Composition | ENG 1001 | Basic Composition | | Nil |
| ENG 1002 | Intermediate Composition | ENG 1002 | Intermediate Composition | ENG 1001 | Basic Composition |
| ENG 1021 | English for Engineers | ENG 2301 | English for Engineers | EEE 2205 | Engineering Electromagnetics |
| SOC1031 | Introduction to Sociology | SOC 2101 | Sociology | | Nil |
| BDS1011 | Bangladesh Studies | SOC 2103 | Bangladesh Studies | | Nil |
| SOC2031 | Engineering Ethics | SOC 2105 | Engineering Ethics | | Nil |
| ECO2021 | Principle of Economics | ECO 2107 | Engineering Economics | | Nil |
| MGT2011 | Introduction to Business & | MGT 2301 | Industrial Management | | Nil |

| Course(s) of old syllabus | | Equivalent Course(s) of new syllabus | | Pre-requisite courses | |
|---|---|---|---|---|---|
| | Management | | | | |
| | New | MGT 2303 | Business Communications | | Nil |
| ACT1021 | Introduction to Accounting | ACT 3101 | Financial and Managerial Accounting | | Nil |
| | New | PSD 4000 | Professional Skills Development | EEE 4002 | Thesis |
| EEE 2033 | Power System-II | EEE 4401 | Power System II | EEE 3105 | Power Systems I |
| | New | EEE 4402 | Power System Laboratory | EEE 3105 | Power Systems I |
| | New | EEE 4403 | Nuclear Power Engineering | EEE 3105 | Power Systems I |
| EEE 3011 | Power Electronics and drives | EEE 4405 | Power Electronics | EEE 3105 | Power Systems I |
| EEE 3012 | Power Electronics and drives Lab | EEE 4406 | Power Electronics Laboratory | EEE 3105 | Power Systems I |
| EEE4017 | Power Plant Engineering | EEE 4407 | Power Plant Engineering | EEE 3105 | Power Systems I |
| EEE 3023 | Power System protection | EEE 4409 | Power System Protection | EEE 3105 | Power Systems I |
| EEE 3024 | Power System protection Lab | EEE 4410 | Power System Protection Laboratory | EEE 3105 | Power Systems I |
| | New | EEE 4411 | Energy Conversion III | EEE 3105 | Power Systems I |
| EEE 4033 | High Voltage Engineering | EEE 4413 | High Voltage Engineering | EEE 3105 | Power Systems I |
| | New | EEE 4414 | High Voltage Engineering Laboratory | EEE 3105 | Power Systems I |
| | New | EEE 4415 | Power System Reliability | EEE 3105 | Power Systems I |
| EEE 3017 | Power System Operation and Control | EEE 4417 | Power System Operation and Control | EEE 3105 | Power Systems I |
| EEE 3018 | Power System Operation and Control Lab | EEE 4419 | Green Power and Energy | EEE 3105 | Power Systems I |
| | New | EEE 4421 | Power System Economics | EEE 3105 | Power Systems I |
| | New | EEE 4501 | Analog Integrated Circuits | EEE 3201 | Solid State Devices |
| EEE 4025 | VLSI Design | EEE 4503 | VLSI I | EEE 3203 | Digital Electronics |
| EEE 4026 | VLSI Design Lab | EEE 4504 | VLSI I Laboratory | EEE 3204 | Digital Electronics Laboratory |
| | New | EEE 4505 | Compound Semiconductor and Hetero Junction Device | EEE 3201 | Solid State Devices |
| EEE 3029 | Semiconductor Processing and Fabrication Technology | EEE 4507 | Semiconductor Processing and Fabrication Technology | EEE 3201 | Solid State Devices |
| | New | EEE 4509 | VLSI II | EEE 4503 | VLSI I |
| | New | EEE 4510 | VLSI II Laboratory | EEE 4504 | VLSI I Laboratory |
| EEE 3035 | Optoelectronic Devices | EEE 4511 | Optoelectronics | EEE 3201 | Solid State Devices |
| | New | EEE 4512 | Optoelectronics Laboratory | EEE 3201 | Solid State Devices |
| EEE3025 | Semiconductor Devices | EEE 4513 | Semiconductor Device Theory | EEE 3201 | Solid State Devices |
| | New | EEE 4515 | Green Electronics | EEE 3201 | Solid State Devices |
| | New | EEE 4517 | Nano Electronic Devices | EEE 3201 | Solid State Devices |
| | New | EEE 4518 | Nano Electronic Devices Laboratory | EEE 3201 | Solid State Devices |
| | New | EEE 4519 | Hardware Design with VHDL | EEE 3203 | Digital Electronics |
| | New | EEE 4520 | Hardware Design with VHDL Laboratory | EEE 3204 | Digital Electronics Laboratory |
| | New | EEE 4601 | Random Signals and Processes | EEE 3101 | Continuous Signals and Linear Systems |
| EEE4021 | Microwave Engineering | EEE 4603 | Microwave Engineering | EEE 3303 | Communication Engineering |
| ETE4026 | Communication Engineering Lab | EEE 4604 | Microwave Engineering Laboratory | EEE 3304 | Communication Engineering Laboratory |
| EEE-4023 | Optical Fiber Communication | EEE 4605 | Optical Fiber Communications | EEE 3303 | Communication Engineering |

| Course(s) of old syllabus | | Equivalent Course(s) of new syllabus | | Pre-requisite courses | |
|---|---|---|---|---|---|
| | New | EEE 4607 | Digital Signal Processing II | EEE 3205 | Digital Signal Processing I |
| | New | EEE 4608 | Digital Signal Processing II Laboratory | EEE 3206 | Digital Signal Processing I Laboratory |
| | New | EEE 4609 | Digital Communication | EEE 3303 | Communication Engineering |
| | New | EEE 4610 | Digital Communication Laboratory | EEE 3304 | Communication Engineering Laboratory |
| | New | EEE 4611 | Mobile Cellular Communication | EEE 3303 | Communication Engineering |
| EEE-3031 | Telecommunication Engineering | EEE 4613 | Telecommunication Engineering | EEE 3303 | Communication Engineering |
| | New | EEE 4615 | Green Communication Engineering | EEE 3303 | Communication Engineering |
| | New | EEE 4617 | Satellite Communication | EEE 3303 | Communication Engineering |
| | New | EEE 4619 | Broadcast Engineering | EEE 3303 | Communication Engineering |
| | New | EEE 4621 | Radio and Television Engineering | EEE 3303 | Communication Engineering |
| | New | EEE 4623 | Optical Networks | EEE 3303 | Communication Engineering |
| | New | EEE 4625 | Radar and Navigation | EEE 3303 | Communication Engineering |
| | New | EEE 4701 | Microprocessor Based System Design | EEE 3301 | Microprocessors and Interfacing |
| | New | EEE 4702 | Microprocessor Based System Design Laboratory | EEE 3302 | Microprocessors and Interfacing Laboratory |
| | New | EEE 4703 | Real Time Computer System | EEE 3301 | Microprocessors and Interfacing |
| | New | EEE 4705 | Multimedia Communications | EEE 3303 | Communication Engineering |
| | New | EEE 4707 | Computer Networks | EEE 3303 | Communication Engineering |
| | New | EEE 4708 | Computer Networks Laboratory | EEE 3303 | Communication Engineering |
| | New | EEE 4709 | Computer Architecture | EEE 3301 | Microprocessors and Interfacing |
| | New | EEE 4711 | Green Computing | EEE 3301 | Microprocessors and Interfacing |
| | New | EEE 4713 | Cryptography and Network Security | EEE 3303 | Communication Engineering |

# Recommended Books' List of the various Courses of the Course Curriculum of the Bachelor of Science in Electrical and Electronic Engineering

## Core Courses:

**EEE 1101 Electrical Circuits I**

**Recommended Books:**
**Text:**
1. Introductory Circuit Analysis - Boylestad R.L

**Reference:**
1. Fundamentals of Electric Circuits - Alexander & Sadiku

**EEE 1301Electrical Circuits II**

**Recommended Books:**
**Text:**
1. Introductory Circuit Analysis - Boylestad R.L

**Reference:**
1. Fundamentals of Electric Circuits - Alexander & Sadiku

**CSE 1301 Computer Programming**

**Recommended Books:**
**Text:**
1. Programming with C (Schaum's outline series) - B. S. Gottfried

**Reference:**
1. C Programming Language - Brian W. Kernighan and Dennis M. Ritchie
2. Teach Yourself C - H. Schildt

**EEE 2101 Electronics I**

**Recommended Books:**
**Text:**
1. Electronic Circuits Theory - Boylested, R. L.

**Reference:**
1. Electronic Circuits Theory - Bell, David A.
2. Integrated Electronics: Analog and Digital Circuits Systems - Millman, J.

**EEE 2201 Electronics II**

**Recommended Books:**
**Text:**
1. Electronic Circuits Theory - Boylested, R. L.

**Reference:**
1. Electronic Circuits Theory - Bell, David A.
2. Electronic Principles - Malvino, A. P.

**EEE 2203 Energy Conversion I**

**Recommended Books:**
**Text:**
1. Electric Machinery Fundamentals - Stephen J. Chapman

**Reference:**
1. Electric Machines: Theory, Operating Applications, and Controls. - Charles I Hubert

**EEE 2205 Engineering Electromagnetics**

**Recommended Books:**
**Text:**
1. Engineering Electromagnetics – Jr. Hayt and H. William

**Reference:**
1. Field and Wave Electromagnetics – I. Chiang
2. Fields and Waves in Communication Electronics - Simon Ramo, John R. Whinnery, Theodore Van Duzer

**EEE 2301 Energy Conversion II**

**Recommended Books:**
**Text:**
1. Electric Machinery Fundamentals - Stephen J. Chapman

**Reference:**
1. Electric Machines: Theory, Operating Applications, and Controls. - Charles I Hubert

**EEE 2303 Electrical Properties of Materials**

**Recommended Books:**
**Text:**
1. Electrical Properties of Materials - L. Solymar & D. Walsh.

**Reference:**
1. Electrical Properties of Materials - Rolf E. Hummel

**EEE 3101 Continuous Signals and Linear Systems**

**Recommended Books:**
**Text:**
1. Signals and systems- Alan V. Oppenheim

**Reference:**
1. Scham's Outlines of Theory and Problems of Signals and Systems - HweiP.Hsu
2. Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis & Dimitries G. Manolakis

**EEE 3103 Numerical Techniques**

**Recommended Books:**
**Text:**
1. Numerical Methods for Engineers - S. C. Chapra and R. P. Canale

**Reference:**
1. Numerical Methods for Scientists and Engineers - R. Hamming.

**EEE 3105 Power Systems I**

**Recommended Books:**
**Text:**
1. Elements of Power System Analysis–Willaim D. Stevenson, Jr.

**Reference:**
1. Power System Analysis- Hadi Sadat.

**EEE 3201 Solid State Devices**

**Recommended Books:**
**Text:**
1. Solid State Electronic Devices – Ben G. Streetman

**Reference:**
1. Semiconductor Physics and Devices - D. Neamen
2. Semiconductor Devices, Physics and Technology J. Wiley and Sons - S. M. Sze

**EEE 3203 Digital Electronics**

**Recommended Books:**
**Text:**
1. Digital Design - Mano, M. M.

**Reference:**
1. Digital Design: A Pragmatic Approach - Johnson, E. L. &Karim, M. A
2. Digital Logic Design - Tocci

**EEE 3205 Digital Signal Processing I**

**Recommended Books:**
**Text:**
1. Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis & Dimitries G. Manolakis

**Reference:**
1. Theory and Application of Digital processing - L.R. Rabiner& B. Gold
2. Digital Signal Processing - S. K .Mitra

**EEE 3300 Electrical Service Design**

**Recommended Books:**
**Text:**
1. Tutorial Guide to AutoCAD by Shawna Lockhart, Latest Edition, Prentice Hall.

2. Introduction to PSpice using OrCAD for Circuits and Electronics by Muhammad H. Rashid, Latest Edition, Prentice Hall.

**Reference:**
1. First year Engineering Drawing by A.C Parkinson, Latest Edition.
2. Illustrated AutoCAD by T.W. Berghauser and P. L. Sclive, BPB, Latest Edition.
3. Mastering AutoCAD 2010.

**EEE 3301 Microprocessor and Interfacing**

**Recommended Books:**
**Text:**
1. The Intel Microprocessors – Barry B. Brey

**Reference:**
1. Microprocessors and Microcomputers: Hardware and Software – Tocci and Ambrosio,
2. Microcomputer Systems: 8086/8088 Family - Liu, Y. & Gibson, G. A.
3. Microprocessor – Rafiquzzaman

**EEE 3303 Communication Engineering**

**Recommended Books:**
**Text:**
1. Modern Digital and Analog Communication Systems - Lathi, B. P.

**Reference:**
1. Communication Systems - Haykin, S.

**EEE 3305 Control Systems**

**Recommended Books:**
**Text:**
1. Linear Control System Analysis and Design, Conventional and Modern - John J. D'Azzo& Constantine H. Houpis

**Reference:**
1. Modern Control Systems - Richard C. Dorf
2. Control Engineering - C.C. Bissel

**EEE 4101 Electrical Power Transmission and Distribution**

**Recommended Books:**
**Text:**
1. Electrical Power Distribution and Transmission. - Luces M. Faulkenberry

**Reference:**
1. Power system analysis - John Grainger & William Stevenson.

## Courses of Inter-disciplinary Group:

**CE 2101 Introduction to Civil Engineering**

**Recommended Books:**
**Text:**
1. Fundamental of Civil Engineering–Richard H. McCuen, Edna Z. Ezzell

**Reference:**
1. Civil Engineering: Avery short Introduction - David Muir Wood

**ME 2101 Mechanical Engineering Fundamentals**

**Recommended Books:**
**Text:**
1. Fundamentals of Mechanical Engineering -G. S. Sawhney

**Reference:**
1. Air Conditioning and Refrigeration – T. Hossain

**EEE 3211 Robotics and Automation**

**Recommended Books:**
**Text:**
1. Robotics Demystified - Edwin Wise

**Reference:**
1. Robot Mechanisms and Mechanical Devices Illustrated - Paul Sandin
2. Concise Encyclopedia of Robotics - Stan Gibilisco

**EEE 3213 Biomedical Engineering**

**Recommended Books:**
**Text:**
1. Introduction to Biomedical Engineering - John Denis Enderle& Joseph D Bronzino

**Reference:**
1. Signals and Systems in Biomedical Engineering - Suresh R Devasahayam.

**EEE 3215 Measurement and Instrumentation**

**Recommended Books:**
**Text:**
1. Electrical and Electronic Measurements and Instrumentation - A. K. Sawhney

**Reference:**
1. Electrical Instrument and Measuring Technique - Cooper

## Elective Courses: Group A (Power)

**EEE 4401 Power System II**

**Recommended Books:**
**Text:**
1. Principles of Power System –V. K. Mehta

**Reference:**
1. Electrical Power Distribution and Transmission. - Luces M. Faulkenberry
2. Power system analysis - John Grainger & William Stevenson.

**EEE 4403 Nuclear Power Engineering**

**Recommended Books:**
**Text:**
1. Nuclear Power Engineering–M. M. El-Wakil

**Reference:**
1. Fundamentals of Nuclear Power Engineering – D. K. Singhai

**EEE 4405 Power Electronics**

**Recommended Books:**
**Text:**
1. Power Electronics - Rashid, H.R

**Reference:**
1. Industrial Electronics & Robotics - Charles A Schuler, William L McNamee

**EEE 4407 Power Plant Engineering**

**Recommended Books:**
**Text:**
1. Power Plant Engineering, - P. K. Nag

**Reference:**
1. Power Plant Engineering. - Larry Drball.

**EEE 4409 Power System Protection**

**Recommended Books:**
**Text:**

1. Power System Stability and Control – Prabha Kundur

**Reference:**

1. Power system operations and control - S. Kumar

**EEE 4411 Energy Conversion III**

**Recommended Books:**

**Text:**

1. Electric Machinery Fundamentals - Stephen J. Chapman

**Reference:**

1. Electric Machines: Theory, Operating Applications, and Controls. - Charles I Hubert

**EEE 4413 High Voltage Engineering**

**Recommended Books:**

**Text:**

1. High Voltage Engineering Fundamentals - J. Kuffel, E. Kuffel & W. S. Zaengl.

**Reference:**

1. High Voltage Engineering - M. S. Naidu.

**EEE 4415 Power System Reliability**

**Recommended Books:**

**Text:**

1. Power System Stability and Control – Prabha Kundur

**Reference:**

1. Power system operations and control - S. Kumar

**EEE 4417 Power System Operation and Control**

**Recommended Books:**

**Text:**

1. Power System Stability and Control – Prabha Kundur

**Reference:**

1. Power system operations and control - S. Kumar

**EEE 4419 Green Power and Energy**

**Recommended Books:**

**Text:**

1. Green Power- Solar and Wind Power–Peter Lerangis

**Reference:**

1. Energy Conversion - D. Yogi Goswami, Frank Kreith

**EEE 4421Power System Economics**

**Recommended Books:**

**Text:**

1. Fundamental of Power System Economics–Daniel S. Kirschen, Goran Strbac

**Reference:**

1. Power System Economics- Designing Markets for Electricity–Stiven Stoft

## Elective Courses: Group B (Electronics)

**EEE 4501 Analog Integrated Circuits**

**Recommended Books:**

**Text:**

1. Integrated Electronics: Analog and Digital Circuits Systems - Millman, J.

**Reference:**

1. Op-amps & Linear Integrated Circuits - Gayakwad R.L

**EEE 4503 VLSI I**

**Recommended Books:**
**Text:**
1. Basic VLSI design - Douglas A. Pucknell, Kamran Eshraghian,

**Reference:**
1. Design of VLSI systems: A practical introduction - Linda, E. M. Brackenbury

**EEE 4505 Compound Semiconductor and Hetero-Junction Devices**

**Recommended Books:**
**Text:**
1. Solid State Electronic Devices – Ben G. Streetman

**Reference:**
1. Semiconductor Physics and Devices - D. Neamen
2. Semiconductor Devices, Physics and Technology – S. M. Sze

**EEE 4507 Semiconductor Processing and Fabrication Technology**

**Recommended Books:**
**Text:**
1. Fundamentals of Semiconductor Fabrication – S. May Gary

**Reference:**
1. Plasma Etching in Semiconductor Fabrication – R. A. Morgan

**EEE 4509 VLSI II**

**Recommended Books:**
**Text:**
1. Basic VLSI design - Douglas A. Pucknell, Kamran Eshraghian,

**Reference:**
1. Design of VLSI systems: A practical introduction - Linda, E. M. Brackenbury

**EEE 4511 Optoelectronics**

**Recommended Books:**
**Text:**
1. Optoelectronic Devices - J. W Wilson

**Reference:**
1. Semiconductor physics - S.M. Sze.
2. Optical fiber communication - John Senior

**EEE 4513 Semiconductor Device Theory**

**Recommended Books:**
**Text:**
1. Solid State Electronic Devices – Ben G. Streetman

**Reference:**
1. Semiconductor Physics and Devices - D. Neamen

**EEE 4515 Green Electronics**

**Recommended Books:**
**Text:**
1. Green Electronics Designing and Manufacturing – Sammy Shina

**Reference:**
1. Green Electronics Manufacturing - John X Wang

**EEE 4517Nano Electronic Devices**

**Recommended Books:**
**Text:**
1. Nano Electronics and Nano Systems – Goser, Karl

**Reference:**
1. Nanoelectronic Device Application - James E. Morris

**EEE 4519 Hardware Design with VHDL**

**Recommended Books:**
**Text:**
1. VHDL Programming by Example – Douglas Perry

**Reference:**
1. Circuit Design and Simulation with VHDL - Volnei A. Pedroni

## Elective Courses: Group C (Communication)

**EEE 4601 Random Signals and Processes**

**Recommended Books:**
**Text:**
1. Signals and systems- Alan V. Oppenheim

**Reference:**
1. Scham's Outlines of Theory and Problems of Signals and Systems –Hwei P. Hsu
2. Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis

**EEE 4603 Microwave Engineering**

**Recommended Books:**
**Text:**
1. Fields and Waves in Communication Electronics -Simon Ramo, John R. Whinnery

**Reference:**
1. Microwave Devices and Circuits - Samuel Y. Liao
2. Microwave Communication–Hund

**EEE 4605 Optical Fiber Communication**

**Recommended Books:**
**Text:**
1. Optical fiber Communication ( Principles and practice) - John. M. Senior

**Reference:**
1. Optical fiber Communication - Agarwall

**EEE 4607 Digital Signal Processing II**

**Recommended Books:**
**Text:**
1. Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis & Dimitries G. Manolakis

**Reference:**
1. Theory and Application of Digital processing - L.R. Rabiner & B. Gold
2. Digital Signal Processing - S.K.Mitra

**EEE 4609 Digital Communication**

**Recommended Books:**
**Text:**
1. Data & Computer Communications - Stallings, W.

**Reference:**
1. Data Communication and Networking - Forauzan, B. A.
2. Information, Transmission, Modulation and Noise - Schwartz, M. M.
3. Data Communication - Gupta, P. C.

**EEE 4611 Mobile Cellular Communication**

**Recommended Books:**
**Text:**

1. Mobile Communication 2nd& 3rd generation cellular system. - Raymond Steeb & Lazos Hanzo.

**Reference:**

1. Wireless Communication. - Theodore *S.* Rappaport
2. Mobile Communication Engineering - William C. Y. Lee.

**EEE 4613 Telecommunication Engineering**

**Recommended Books:**

**Text:**

1. Digital Telephony – John C. Bellamy

**Reference:**

1. Telecommunication Switching Systems and Networks-Viswanathan Thiagarajan

**EEE 4615 Green Communication Engineering**

**Recommended Books:**

**Text:**

1. Green Communication: Theoretical Fundamentals, Algorithm and Applications – Jinsong Wu, SundeepRangan, Honggang Zhang

**Reference:**

1. Green Communications and Networking – F. Richard Yu, Xi Zhang, Victor C.M. Leung

**EEE 4617Satellite Communication**

**Recommended Books:**

**Text:**

1. Satellite Communications - Timothy Pratt.

**Reference:**

1. Satellite Communications - Dennis Roddy

**EEE 4619 Broadcast Engineering**

**Recommended Books:**

**Text:**

1. Digital Telephony – John C. Bellamy

**Reference:**

1. Telecommunication Switching Systems And Networks-Viswanathan Thiagarajan

**EEE 4621 Radio and Television Engineering**

**Recommended Books:**

**Text:**

1. Radio Engineering - G. K. Mithal

**Reference:**

1. Television Engineering – Grobe

**EEE 4623 Optical Networks**

**Recommended Books:**

**Text:**

1. Optical Networks–Rajiv Ramaswami

**Reference:**

1. Optical Networks – Mukharjee, Bishwanath

**EEE 4625 Radar and Navigation**

**Recommended Books:**

**Text:**

1. The Radar Book: Effective Navigation and Collision Avoidance–Kevin Monahan

**Reference:**

1. Radar and Electronic Navigation – G. J. Sonnenberg

## Elective Courses: Group D (Computer)

**EEE 4701 Microprocessor Based System Design**

**Recommended Books:**
**Text:**
1. The Intel Microprocessors – Barry B. Brey

**Reference:**
1. Microprocessors and Microcomputers: Hardware and Software – Tocci and Ambrosio,
2. Microcomputer Systems: 8086/8088 Family - Liu, Y. & Gibson, G. A.

**EEE 4703 Real Time Computer System**

**Recommended Books:**
**Text:**
1. Real-Time Systems, Architecture, Scheduling, and Application – Syed Mortoza Babamir

**Reference:**
1. Real-Time Systems for Distributed Embedded Applications – Hermann Koptez

**EEE 4705 Multimedia Communications**

**Recommended Books:**
**Text:**
1. Theoretical Foundations of Multimedia, Tanenbaum, R. S.

**Reference:**
1. Digital Watermarking: Principles & Practice, Cox, I. J. & Bloom, J. & Miller, M. & Cox, I.

**EEE 4707 Computer Networks**

**Recommended Books:**
**Text:**
1. Computer Networking: A Top-Down Approach Featuring the Internet - Kurose, J. F. & Ross, K. W.

**Reference:**
1. Computer Networks - Tanenbaum, A. S.

**EEE 4709 Computer Architecture**

**Recommended Books:**
**Text:**
1. Computer Architecture–Hennessy, Patterson.

**Reference:**
1. Computer Organization and Design Fundamentals- David L. Tarnoff

**EEE 4711 Green Computing**

**Recommended Books:**
**Text:**
1. Green Computing–Bud E. Smith

**Reference:**
1. The Green Computing Book- Wu-chun Feng

**EEE 4713 Cryptography and Network Security**

**Recommended Books:**
**Text:**
1. Cryptography and network security: William Stallings.

**Reference:**
1. Cryptography and Network Security by Behrouz A. Forouzan
2. Network security Essentials: William Stallings.

## Mathematics Courses:

**MATH 009 Remedial Mathematics Course**

**Recommended Books:**
**Text:**
1. Calculus: A New Horizon - Anton, H.

**Reference:**
1. Integral Calculus - Das, B. C. & Mukherjee, B. N.
2. Differential Calculus - Das, B. C. & Mukherjee, B. N.

**MATH 1101 Mathematics I (Differential and Integral Calculus)**

**Recommended Books:**
**Text:**
1. Calculus: A New Horizon - Anton, H.

**Reference:**
1. Integral Calculus - Das, B. C. & Mukherjee, B. N.
2. Differential Calculus - Das, B. C. & Mukherjee, B. N.

**MATH 1203 Mathematics II (Complex Variables, Fourier Series and Transforms)**

**Recommended Books:**
**Text:**
1. Complex Variables and Applications - Brown, J. W.

**Reference:**
1. Schaum's Outline Series: Theory and Problems of Complex Variables - Spiegel, M. R.
2. Schaum's Outline Series: Theory and Problems of Laplace Transforms - Spiegel, M. R.
3. Schaum's Outline of Fourier Analysis with Applications to Boundary Value Problems - Spiegel, M. R.

**MATH 1305 Mathematics III (Ordinary and Partial Differential Equations)**

**Recommended Books:**
**Text:**
1. Differential Equations - Sharma, B.

**Reference:**
1. An Elementary Treatise on differential Equations and their Applications - Piaggio, H. T

**MATH 2107 Mathematics IV (Linear Algebra, Co-ordinate Geometry and Vector Analysis)**

**Recommended Books:**
**Text:**
1. Elementary Linear Algebra - Anton, H. &Rorres, C.

**Reference:**
1. Coordinate Geometry - Eisenhart, L. P.

**MATH 2209 Mathematics V (Probability and Statistics)**

**Recommended Books:**
**Text:**
1. Introduction to Statistics and Probability - Islam, M. N.

**Reference:**
1. Schaum's Outline Series of Statistics - Spiegel, M. R. & Stephens, L. J.

## Basic Science Courses:

**PHY 1101 Physics I (Waves and Oscillations, Optics and Thermal Physics)**

**Recommended Books:**
**Text:**
1. Outlines of Physics Vol. 1 - Ahmed, Giasuddin

**Reference:**
1. Physics: Part-1 - Resnick, R. & Haliday, D.
2. Properties of Matters – Brijlal & Subrahmanyam

3. Heat & Thermodynamics – Brijlal & Subrahmanyam
4. Waves & Oscillations – Brijlal & Subrahmanyam
5. Elements of Properties of Matters - Mathur, D. S.

**PHY 1201 Physics II (Electricity and Magnetism, Modern Physics and Mechanics)**

**Recommended Books:**
**Text:**
1. Outlines of Physics Vol. 2 - Ahmed, Giasuddin

**Reference:**
1. Physics: Part-2 - Resnick, R. & Haliday, D.
2. Properties of Matters – Brijlal & Subrahmanyam
3. A Textbook of Optics – Brijlal & Subrahmanyam
4. Elements of Properties of Matters - Mathur, D. S.

**CHEM 1101 Chemistry**

**Recommended Books:**
**Text:**
1. Essentials of Physical Chemistry – Bhal, Arun and G.D. Tuli.

**Reference:**
1. A Textbook of Physical Chemistry – K. L. Kapoor.
2. A Textbook of Physical Chemistry – A. S. negi, S.C. Anand.

## English Language Courses:

**ENG 1001 Basic Composition**

**Recommended Books:**
**Text:**
1. Real English Grammar Pre-intermediate – Hester Lott
2. Real English Grammar Intermediate – Hester Lott

**Reference:**
1. Oxford Handbook of Commercial Correspondence-New Edition –A. Ashley

**ENG 1002 Intermediate Composition**

**Recommended Books:**
**Text:**
1 Intermediate Composition Study Pack, Dept. of English, Southeast University
2. English Skills with Readings, Sixth Edition- John Langan

**ENG 2301 English for Engineers**

**Recommended Books:**
**Text:**
1. Cambridge English for Engineering – Mark Ibbotson, Jeremy Day, Cambridge University Press
2. English for Electrical and Mechanical Engineering – Eric H.Glendinning and Norman Glendinning, Oxford University Press

**Reference:**
1. A Practical English Grammar - A. J. ThomsonV. Martinet
2. How to Write Reports and Proposals- Patrick Forsyth

## General Education Courses:

**SOC 2101 Sociology**

**Recommended Books:**
**Text:**
1. Introduction to Sociology (Paperback)- Anthony Giddens, Mitchel Duneier

**Reference:**

1. Introduction to Sociology - Henry L. Tischler

**SOC 2103 Bangladesh studies**

**Recommended Books:**
**Reference:**
1. Banglapedia: National encyclopedia of Bangladesh – Sirajul Islam
2. Blood and Fire: The untold story of Bangladesh's War of Independence – Jahanara Imam

**SOC 2105 Professional Ethics**

**Recommended Books:**
**Text:**
1. Engineering Ethics - M. Govindarajan

**Reference:**
1. Ethics in Engineering Practice and Research - Caroline Whitbeck

**ECO 2107 Engineering Economics**

**Recommended Books:**
**Text:**
1. Fundamentals of Engineering Economics–Chan S. Park

**Reference:**
1. Engineering Economics–James L. Riggs, Devid D. Bedworth

**MGT 2301 Industrial Management**

**Recommended Books:**
**Text:**
1. Industrial Management–B. Narayan

**Reference:**
1. Engineering Management- Fausto Pedro García Márquez and Benjamin Lev

**MGT2303 Business Communications**

**Recommended Books:**
**Text:**
1. Business English for Success–Scott McLean

**Reference:**
1. Business Communication: Achieving Results- Lori Harvill Moore

**ACT 3101 Financial and Managerial Accounting**

**Recommended Books:**
**Text:**
1. Accounting Principle – Weygandt, Kieso and Kimmel

**Reference:**
1. Accounting Theory – Ahmed Riahi Belkaoui
2. Fundamentals of Accounting Principles – Pyle and Larson

**Professional Course:**

**PSD 4000 Professional Skills Development**

**Recommended Books:**
**Text:**
1. Skill Development for Engineers – Kevin Hoag

**Reference:**
1. Ten Essential Skills for Electrical Engineers – Ahmed Riahi Belkaoui