Chapter 1

GENERAL INFORMATION

1.1 Historical Background

Bangladesh University of Engineering and Technology, abbreviated as BUET, is the oldest institution for the study of Engineering and Architecture in Bangladesh. The history of this institution dates back to the days of Dhaka Survey School which was established at Nalgola in 1876 to train surveyors for the then Government of Bengal of British India. As Engineering and Technology continued to play a more and more dominant role in the advancement of the country, this institution continued to act as the focal point for the development and the dissemination of engineering and technological know how in this region. To meet this challenge, the Survey School grew in size and content, and became the Ahsanullah School of Engineering offering three-year diploma courses in Mechanical, Civil and Electrical Engineering. In 1948, the School was upgraded to Ahsanullah Engineering College under the University of Dhaka, offering four-year bachelor's courses in Civil, Electrical and Mechanical Engineering with a view to meet the increasing demand for engineers in the country and to expand the facilities for quicker advancement of engineering education. In order to create facilities for post graduate studies and research, Ahsanullah Engineering College was upgraded to the status of a University under the name of East Pakistan University of Engineering and Technology in the year 1962. After the independence of Bangladesh in 1971, it was renamed as the Bangladesh University of Engineering and Technology. Starting with two faculties, the university has now enlarged into five faculties.

Undergraduate courses in the faculties of Engineering, Civil Engineering, Electrical and Electronic Engineering, and Mechanical Engineering extend over four years and lead to B. Sc. Engineering in

Civil, Electrical & Electronic, Mechanical, Chemical, Materials and Metallurgical, Computer Science and Engineering, and Naval Architecture & Marine Engineering. In the faculty of Architecture and Planning the degree of Bachelor of Architecture extends over five years, while the Bachelor of Urban and Regional Planning extends over four years.

Postgraduate studies and research are now among the primary functions of the university. Most of the departments under the different faculties offer M.Sc. Engg. and M. Engg. degrees and some department have Ph.D. programs. Postgraduate degrees in Architecture (M. Arch) and in Urban and Regional Planning (MURP) are offered by the Faculty of Architecture and Planning.

In addition to its own research programs, the university undertakes research projects sponsored by organizations, such as United Nations' Organizations, Commonwealth Foundation, University Grants Commission, Ministry of Science & Technology, etc. The expertise at the University, its teachers and the laboratory facilities are also available to other organizations of the country.

1.2 The BUET Campus

The BUET campus is situated at the centre of the Dhaka city, capital of Bangladesh, with easy access to the Zia International Airport, Kamalapur Railway Station, Bus Terminals and Sadarghat River Port. The campus is compact with five main multistoried buildings housing sixteen departments. It also has several institutes like Institute of Water and Flood Management (IWFM), Institute of Appropriate Technology (IAT), Institute of Information and Communication Technology (IICT), Accident Research Center, and Energy Center. Several large workshops, such as carpentry, foundry, sheet metal, and machine shops, etc. support and facilitate research and undergraduate project works. Students' housing and teachers' residence are at

walking distance. There are eight halls of residence for students including one for female students within the campus.

1.3 Teaching Staff of the University

The total number of filled up teaching posts is 500 out of which 387 teachers are in active service and 113 teachers are on leave for higher studies, and teaching and research in various universities/institutes around the world (as on May 11, 2005). The following is a list of teachers in active service including those against leave vacancies.

Sl. No.	Designation	Active	Abroad
1.	Professor	128	11
2.	Associate Professor	63	9
3.	Assistant Professor	79	63
4.	Lecturer	117	30
Total		387	113

Besides these teaching posts, there are Professorships and Chairs namely:

a) Dr. Rashid Chair

In memory of late Dr. M. A. Rashid, formerly Professor of Civil Engineering and the first Vice-Chancellor of BUET, a chair has been created, The chair is sponsored by the graduates of the year 1961 of BUET (61 Club).

b) Professor Emeritus and Supernumerary Professors.

In order to get the benefits from the services of the eminent people of either scholastic and academic brilliance or outstanding professionals in Engineering Architecture and Planning, the university has

established- provisions for appointment of such persons as emeritus and supernumerary professors.

1.4 Faculties and Teaching Departments

In the year 1978 there were only two faculties in this university, the Faculty of Engineering and the Faculty of Architecture and Planning, With the gradual expansion of the university some of the major engineering departments formed their own faculties. The Department of Electrical and Electronic Engineering was upgraded to the Faculty of Electrical and Electronic Engineering with two departments under it.

The University has now sixteen teaching departments under five faculties. All departments offer degree programs, with the exception of some non-engineering departments. However, some of them offer postgraduate (PG) degrees. The engineering departments offer B. Sc. Engineering, M. Sc. Engineering, M. Engineering, and Ph. D. degrees. The Faculty of Architecture and planning offers Bachelor of Architecture, Master of Architecture and Master of Urban and Regional Planning degrees. The departments of Chemistry, Physics and Mathematics offer M. Phil and Ph.D. degrees. Institutes like IWFM and IICT offer postgraduate diploma, Masters and M. Phil degrees in their areas. The status of degrees offered by faculties and institutes are given below:

Sl. No	Faculty	Degree/Program
1.	**Faculty of Electrical and Electronic Engineering**	
	Department of Electrical and Electronic Engineering.	Both UG and PG
	Department of Computer and Science and Engineering	Both UG and PG

Sl. No	Faculty	Degree/Program
2.	**Faculty of Civil Engineering**	
	Department of Civil Engineering	Both UG and PG
	Department of Water Resources Engineering	Both UG and PG
3.	**Faculty of Mechanical Engineering**	
	Department of Mechanical Engineering	Both UG and PG
	Department of Naval Architecture and Marine Engineering	Both UG and PG
	Department of Industrial and Production Engineering	Both UG and PG
4.	**Faculty of Engineering**	
	Department of Chemical Engineering	Both UG and PG
	Department of Materials and Metallurgical Engineering	Both UG and PG
	Department of Petroleum and Mineral Resources Engineering	PG only
	Department of Chemistry	PG only
	Department of Mathematics	PG only
	Department of Physics	PG only
5.	**Faculty of Architecture and Planning**	
	Department of Architecture	Both UG and PG
	Department of Urban and Regional Planning	Both UG and PG
	Department of Humanities	No degree offered
	Institutes	
6.	Institute of Information and Communication Technology	PGDIP and PG
7.	Institute of Water and Flood Management	PG only

1.5 University Administration

Chancellor : Begum Khaleda Zia, Honorable Prime Minister of the Government of the Peoples Republic of Bangladesh

Vice-Chancellor : Professor Dr. Md. Alee Murtuza

List of Administrative Officers

Registrar
Controller of Examinations
Comptroller
Director of Student-s Welfare
Director of Advisory, Extension & Research Service
Director of Bureau of Research, Testing & Consultation
Director of Planning and Development

Deans of Faculties

Dean of Civil Engineering
Dean of Architecture & Planning
Dean of Electrical & Electronic Engineering
Dean of Mechanical Engineering
Dean of Engineering

Directors of Institutes & Centers

Director, Institute of Water and Flood Management
Director, Institute of Appropriate Technology

Institute of Information and
Communication Technology
Director for Energy Studies
Director of Continuing Education

Provost of Residential Halls

Provost, Ahsanullah Hall
Provost, Chatri Hall
Provost, Nazrul Islam Hall
Provost, Shahid Smrity Hall
Provost, Shere-e-Bangla Hall

Provost, MA. Rashid Hall
Provost, Shohrawardy Hall
Provost, Titumir Hall

Chapter 2

THE DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

2.1 Introduction

Electrical and Electronic Engineering (EEE) education today has entered a transitional phase. On one hand, EEE curricula around the globe are experiencing increasing specialization. The use of specialized CAD and simulation software as teaching tools is on the rise. On the other hand, diversity of EEE education is also increasingly underscoring its multi-disciplinary nature. Over the last decade or so, the traditional role played by an Electrical and Electronic Engineer has changed quite significantly. Today's employers require Electrical and Electronic Engineers with excellent communication skills along with awareness about environmental and safety issues. Increasing the ethical and moral standards of the engineers is also getting higher priority in the industry. To keep pace with this globally changing need, the EEE department in BUET continually updates and reviews its curriculum and teaching practices. The graduates of this department serve as leaders in the Electrical and Electronic industry in Bangladesh. They also excel in the international arena as professional engineers, researchers and academicians and bring accolades for the University as well as for the country.

The EEE department has recently introduced a new curriculum, included in this booklet, in which emphasis has been given on specialization. The undergraduate program has been arranged around four groups, namely, power, communication, electronics and computer. A student is expected to specialize in one of these groups without compromising the fundamental knowledge in Electrical and Electronic Engineering. The department is also committed to provide

the students access to modern laboratories, and simulation and CAD softwares. A number of new laboratories, including the Digital Signal Processing Lab and the Simulation Lab, have been developed or updated within the department during the last few years. Popular softwares, such as, SPICE and MATLAB, have been integrated into the undergraduate program. The department, with the help of its expatriate alumni now working in Intel, has acquired CADENCE, a state-of-the-art CAD tool for design and analysis of VLSI circuits and systems.

EEE students in BUET are encouraged to participate in research and development activities of the department. Problems of national, regional and international importance receive serious attention in the department. In the recent past, students of this department have earned prizes in prestigious international project competitions arranged by IEEE, the premier worldwide organization of Electrical and Electronic Engineers. Research work in the department is conducted in various areas of EEE, such as, Digital Signal Processing, Optical Fiber and Satellite Communication, Semiconductor Devices, VLSI, Microwave, Power Electronics, Power Systems, Electric Machines and Drives, Control System, Biomedical Engineering etc. In addition to this, there is opportunity in the department for postgraduate studies and research leading to a higher degree: M.Sc. Engg., M. Engg. and Ph.D.

Another significant part of the departmental activities is the Testing, Advisory and Consulting services provided to the industry and various national and international organizations. These types of activities provide the teachers with the opportunity to gain valuable practical experience. Such interaction between the university and the industry extends the role of the university in the national development.

EEE is one of the largest departments in the university with over 900 undergraduate and 100 postgraduate students. The department has more than 50 members of the teaching staff, more than half of whom have Ph.D. degrees. The department is housed in the west wing of the

EME building. A new building with most modern facilities is under construction for the EEE department in West Palassy. It is expected that the department will move to its new building within next few years.

2.2 List of Teaching Staff of the Department

Professors

A.B.M. Siddique Hossain	B.Sc. Engg., M.Sc. Engg. (Pakistan), Ph.D. (Greece)
Md. Abdul Matin	B.Sc. Engg., M.Sc. Engg. (Japan), Ph.D. (Japan)
Saiful Islam (on leave)	B.Sc. Engg., M.Sc. Engg. , Ph.D. (UK)
Md. Quamrul Ahsan	B.Sc. Engg., M.Sc. Engg., Ph.D. (Canada)
Shahidul Islam Khan	B.Sc. Engg., M.Sc. Engg., Ph.D. (Canada)
M. M. Shahidul Hassan	B.Sc. Engg., M.Sc. Engg., Ph.D. (USA)
Enamul Basher (on leave)	M. Sc. Engg. (USSR), Ph.D. (USSR)
Mohammad Ali Choudhury	B.Sc. Engg., M.Sc. Engg., M. Engg. (Canada), Ph.D. (Canada)
S. M. Lutful Kabir (on deputation to IICT)	B.Sc. Engg., M.Sc. Engg. , Ph.D. (UK)
S. Shahnawaz Ahmed	B.Sc. Engg., M.Sc. Engg., Ph.D. (UK)
Satya Prasad Majumder	B.Sc. Engg., M.Sc. Engg., Ph.D. (India)
Aminul Hoque	B.Sc. Engg., M.Sc. Engg.. Ph.D. (Bangladesh)
Md. Saifur Rahman	B.Sc. Engg., M.Sc. Engg., Ph.D. (UK)
Pran Kanai Saha (on leave)	B.Sc. Engg., M.Sc. Engg. , Ph.D. (Ireland)
Taifur Ahmed Choudhury	M. Sc. Engg. (USSR), Ph.D. (USSR)
Quazi Deen Mohd Khosru	B. Engg. (India), M.Sc. Engg., Ph.D. (Japan)
Anisul Haque	B.Sc. Engg., M.Sc. Engg., Ph.D. (USA)
Md. Shafiqul Islam (on leave)	B.Sc. Engg., M.Sc. Engg., Ph.D. (Ireland)
Md. Kamrul Hasan	B.Sc. Engg., M.Sc. Engg., M. Engg. (Japan), Ph.D. (Japan)

Associate Professors

A.B.M. Harun Ur-Rashid	B.Sc. Engg., M. Engg. (Japan), Ph.D. (Japan)
Md. Aynal Haque	B.Sc. Engg., M.Sc. Engg., Ph.D. (Japan)
Md. Quamrul Huda	B.Sc. Engg., M.Sc.Engg., Ph.D. (UK)
Kazi Mujibur Rahman (on leave)	B.Sc. Engg., M. Tech (India), Ph. D (BUET)
M. Nazrul Islam (on leave)	B.Sc. Engg., M.Sc. Engg., Ph.D. (Japan)
Sharif Mohammad Mominuzzaman	B.Sc. Engg., M.Sc. Engg., M.Engg. (Japan), Ph.D. (Japan)
Md. Nasim Ahmed Dewan	B.Sc. Engg., M.Sc. Engg., Ph.D. (Ireland)
Mohammad Jahangir Alam	B.Sc. Engg., M.Sc. Engg., Ph.D. (Ireland)
Md. Shah Alam	B.Sc. Engg., M.Sc. Engg. (Japan), Ph.D. (Japan)
Newaz Muhammad Syfur Rahim	B.Sc. Engg., M.Sc. Engg., Ph.D. (Japan)

Assistant Professors

Abdul Hasib Chowdhury	B.Sc. Engg., M.Sc. Engg.
Hamidur Rahman	B.Sc. Engg., M. Engg. (USA)
Md. Md. Hasanuzzaman (on leave)	B.Sc. Engg. M. Sc. Engg.
Khan Mohammad Ziaus Shams (on leave)	B.Sc. Engg. M. Sc. Engg.
Mohammd Imamul Hasan Bhuiyan (on leave)	B.Sc. Engg. M. Sc. Engg.
Ashok Kumar Karmakar (on leave)	B.Sc. Engg. M. Sc. Engg.
Jesmin Farzana Khan (on leave)	B.Sc. Engg. M. Sc. Engg.
Mohammad Zahed Kauser (on leave)	B.Sc. Engg. M. Sc. Engg.
Md. Ziaur Rahman Khan	B.Sc. Engg., M.Sc. Engg.

S. M. Mahbubur Rahman (on leave)	B.Sc. Engg. M. Sc. Engg.
Mojammel Al Hakim (on leave)	B.Sc. Engg. M. Sc. Engg.
Md. Shofiqul Islam (on leave)	B.Sc. Engg. M. Sc. Engg.
Mohammad Yunus (on leave)	B.Sc. Engg. M. Sc. Engg.
Muhammad Shamsul Arefeen Zilany (on leave)	B.Sc. Engg. M. Sc. Engg.
Shaik Anowarul Fattah (on leave)	B.Sc. Engg. M. Sc. Engg.
Farseem Mannan Mohammedy (on leave)	B.Sc. Engg. M. Sc. Engg.
Md. Ataur Rahman Sarkar	B.Sc. Engg., M.Sc. Engg., M.Sc. Engg. (Canada)
Muhammad Zulfikar Alam (on leave)	B.Sc. Engg. M. Sc. Engg.
Celia Shahnaz (on leave)	B.Sc. Engg. M. Sc. Eng
Sharif Md. Ataullah Bhuiyan (on leave)	B.Sc. Engg. M. Sc. Engg.
Muhammad Anisuzzaman Talukder	B.Sc. Engg., M.Sc. Engg.
Mohammad Faisal	B.Sc. Engg., M.Sc. Engg.
Lutfa Akter	B.Sc. Engg., M.Sc. Engg.
Touhidur Rahman	B.Sc. Engg., M.Sc. Engg.
Mohammad Aminul Huque	B.Sc. Engg., M.Sc. Engg. (UK)
Mohammad Rafiqul Haider	B.Sc. Engg., M.Sc. Engg.

Lecturers

Mahbub Alam	B.Sc. Engg.
Yeasir Arafat	B.Sc. Engg.

Md. Zahurul Islam	B.Sc. Engg.
Abul Bashar Mohammad Ishteak Hossain	B.Sc. Engg.
Md. Farhad Hossain	B.Sc. Engg.
Rashed Hossain Bhuiyan	B.Sc. Engg.
Mohammad Ariful Haque	B.Sc. Engg.
Md. Forkan Uddin	B.Sc. Engg.
Sazia Afreen Eliza	B.Sc. Engg.
Samia Subrina	B.Sc. Engg.
Mohammad Abul Khayer	B.Sc. Engg.
Ahmad Ehteshamul Islam	B.Sc. Engg.
Md. Waliullah Khan Nomani	B.Sc. Engg.
Md. Zahid Hossain	B.Sc. Engg.
Abu Naser Md. Zainuddin	B.Sc. Engg.
Shaikh Asif Mahmood	B.Sc. Engg.
Fahmida Ferdous	B.Sc. Engg.
Fahmida Ferdousi	B.Sc. Engg.
Mustafa Jamil	B.Sc. Engg.
Md. Masuduzzaman	B.Sc. Engg.

2.3 Research Areas of the Teachers Offering Post-Graduate Courses

Prof. A.B.M. Siddique Hossain	Telecommunication, Microwave Theory and Technique.
Prof. Abdul Matin	Antennas and Propagation, Electromagnetism.
Prof. Quamrul Ahsan	Power System Reliability and Planning, Electrical Machines.
Prof. Shahidul Islam Khan	Power Electronics, Converters, Motor Drives, Electric Vehicles, Energy Management and Renewable Energy.
Prof. M. M. Shahidul Hassan	Solid State Electronics.
Prof. Enamul Basher	Electrical Machines and Power

	Electronics.
Prof. Mohamad Ali Chowdhury	Power Electronics and Motor Drives.
Prof. S. Shahnawaz Ahmed	On-Line Power System Control, Neural Networks and Fuzzy Logic Applications, and Renewable Energy.
Prof. Satya Prasad Majumder	Optoelectronics, Lasers, Optical Fibres, Optical Network and Communications.
Prof. Aminul Hoque	Energy, Power Systems
Prof. Md. Saifur Rahman	Digital Communication and Signal Processing, Computer Networks.
Prof. Taifur Ahmed Chowdhury	Power System Optimization and Captive Generation.
Prof. Quazi Deen Mohd Khosru	Solid State Devices.
Prof. Anisul Haque	Solid State Physics and Devices.
Prof. Md. Kamrul Hasan	Digital Signal Processing, System Identification, Speech Processing, Image Processing, Adaptive Filtering.
Dr. A.B.M. Harun-ur Rashid	Solid State Devices, VLSI Design, Power Electronics
Dr. Md. Aynal Haque	Biomedical Engineering
Dr. Md. Quamrul Huda	Nanoelectronics, Advanced Silicon Devices, Optoelectronics, Semiconductor Materials & Heterostructures
Dr. M. Nazrul Islam	Communications
Dr. Sharif Mohammad Mominuzzaman	Optoelectronic Devices, Processing of Nanostructured Materials for Semiconductor Devices
Dr. Nasim Ahmed Dewan	Plasma Technology, Thin Film, Solid State Devices
Dr. Mohammad Jahangir Alam	Thin Film Technology, Solid State Devices
Dr. Md. Shah Alam	Optical Waveguide Devices, Photonic Crystal Fibres, Microwaves, Finite Element Methods
Dr. Newaz M. Syfur Rahim	Digital Signal Processing, Image Processing

2.4 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities. The departmental undergraduate courses are laboratory intensive and this requirement is catered by following laboratories at present:

1. Electrical Circuits and network Lab I
2. Electrical Circuits and network Lab II
3. Electrical Machines Lab
4. Electronics Lab
5. Measurement and Instrumentation Lab
6. Power Electronics Lab
7. Microwave Engineering Lab
8. Telecommunication Lab
9. High Voltage Engineering Lab
10. Switchgear and Protection Lab
11. Control Systems Lab
12. Computer Lab for Faculty and Postgraduate Students
13. Advanced Machine Lab
14. VLSI Lab
15. Digital Signal Processing Lab
16. Robert Noyce Simulation Lab
17. Electronic Simulation Laboratory
18. Digital Electronics and Microprocessor Laboratory (under development)
19. Materials and Fabrication Laboratory (under development)

Students in Level-I (freshman) and Level-II (sophomore) have to undertake laboratory/sessional classes in physics, chemistry, mechanical, civil engineering and in different workshops. If necessary undergraduate and postgraduate students can access the laboratory facilities of other departments, institutes and centers during their project, thesis and research works.

Chapter 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMME UNDER COURSE SYSTEM

3.1 Introduction

From the academic session 1990-91, this university is following a course system for undergraduate studies. Given below an extract from the report of the committee for framing recommendations for implementation and administration of course system of instruction at undergraduate level as approved in the meetings of the Academic Council held on September 24 and 30, 1992, and October 4 and 19, 1992. Only relevant sections of the report and the amendments that were subsequently made to it are included so that the students can have a clear understanding about Course System. The rules and regulations administering undergraduate curricula through Course System began applicable for students admitted to this university in First Year classes in Engineering and Architecture in 1990-91 and subsequent sessions.

3.1.1 The Course System

The undergraduate curricula at BUET is based on the course system. The salient features of the course system are:

i. Reduction of the number of theoretical courses and examination papers around five in each term,
ii. The absence of a pass or a fail on an annual basis,
iii. Continuous evaluation of student's performance,
iv. Introduction of Letter Grades and Grade Points instead of numerical grades,
v. Introduction of some additional optional courses and thus enable students to select courses according to his/her interest as far as possible,

vi. Opportunity for students to choose fewer or more courses than the normal course load depending on his/her capabilities and needs,
vii. Flexibility to allow the student to progress at his/her own pace depending on his/her ability or convenience, subject to the regulations on credit and minimum grade point average (GPA) requirements, and
viii. Promotion of teacher-student contact.

In the curriculum for the undergraduate programmes, besides the professional courses pertaining to each discipline, there is a strong emphasis on acquiring a thorough knowledge in the basic sciences of Mathematics, Physics and Chemistry. Due importance is also given for the study of several subjects in Humanities and Social Sciences which, it is expected will help the student to interact more positively with the society in which he/she lives. Thus the course contents of the undergraduate programmes provide a harmonious blend of both basic sciences and their applications as well as their social relevance.

The first two terms of bachelor's degree programmes consist of courses in basic sciences, mathematics, humanities and social sciences, basic engineering and architecture subjects. The third and subsequent terms build directly on the knowledge of the basic subjects gained in the first two terms and go on to develop competence in specific disciplines.

3.2 Student Admission

Students will be admitted in undergraduate curricula in the Departments of Architecture, Urban and Regional Planning, Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Industrial and Production Engineering, Materials and Metallurgical Engineering, Water Resources Engineering and Naval Architecture and Marine Engineering as per existing rules of the university. The

Registrar's Office serves as Admissions Office and deals with course registration in addition to student admission.

3.3 Number of Terms in a Year

There will be two Terms (Term I and Term II) in an academic year. In addition to these two regular Terms there may be a Short Term in the intervening period between end of Term II and commencement of Term I. During this term students, those who need, may take additional courses either to make up deficiencies in credit and GPA requirements or to fulfill the credit requirements for bachelor's degree spending less time than the normal duration; and other students may take vacation.

3.3.1 Duration of Terms

The duration of each of Term I and Term II will be 18 weeks which will be used as follows:

Classes	14 weeks
Recess before Term Final Examination	2 weeks
Term Final Examination	2 weeks
Total	18 weeks

The duration of a Short Term will be around 8 weeks of which about 7 weeks will be spent for class lectures and one week for Term Final Examination.

3.4 Course Pattern and Credit Structure

The entire undergraduate programme is covered through a set of theoretical and laboratory/sessional/studio courses.

3.4.1 Course Designation and Numbering System

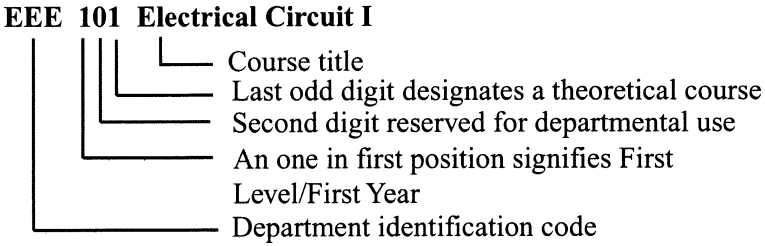
Each course is designated by a two to four letter word identifying the department which offers it followed by a three digit number with the following criteria:

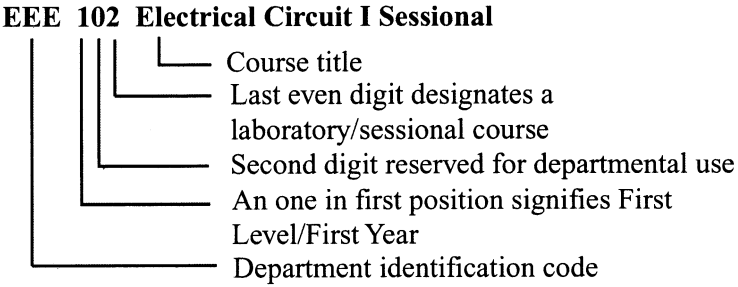
(a) The first digit will correspond to the year/level in which the course is normally taken by the students.

(b) The second digit will be reserved for departmental use for such things as to identify different areas within a department.

(c) The last digit will usually be odd for theoretical and even for laboratory or sessional courses.

The course designation system is illustrated by two examples.





3.4.2 Assignment of Credits

(a) Theoretical Courses:
One lecture per week per term will be equivalent to one credit.

(b) Laboratory/Sessional/Design:
Credits for laboratory/sessional or design courses will be half of the class hours per week per term.

Credits are also assigned to project and thesis work taken by students. The amount of credits assigned to such work may vary from discipline to discipline.

The curriculum does not demand the same rate of academic progress from all students for obtaining the degree but only lays down the pace expected of a normal student. A student whose background or capacity for assimilation is lower will be permitted to complete the programme at a slower pace by studying a lesser number of courses during a given term (subject to a minimum course load). He may keep pace with his class by taking during the Short Term those courses which he had dropped during the Regular Terms, or by covering the entire degree programme over an extended period without developing any feeling of inferiority complex.

3.5 Types of Courses

The courses included in undergraduate curricula are divided into several groups as follows:

3.5.1 Core Courses

In each discipline a number of courses will be identified as core courses which form the nucleus of the respective bachelor's degree programme. A student has to complete all of the designated core courses for his/her discipline.

3.5.2 Pre-requisite Courses

Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one which is required to be completed before some other course(s) can be taken. Any such course, on which one or more subsequent courses build up, may be offered in each of the two regular Terms.

3.5.3 Optional Courses

Apart from the core courses, students will have to complete a number of courses which are optional in nature in that students will have some choice to choose the required number of courses from a specified group/number of courses.

3.6 Course Offering and Instruction

The courses to be offered in a particular term will be announced and published in the Course Catalog along with a tentative Term Schedule before the end of the previous term. Whether a course is to be offered in any term will be decided by the respective Board of Undergraduate Studies (BUGS). Respective departments may arrange to offer one or more pre-requisite or core courses in any term depending on the number of students who dropped or failed the course in the previous term.

Each course is conducted by a teacher. The course teacher is responsible for maintaining the expected standard of the course and for the assessment of student's performance. Depending on the strength of registered students (i.e. the number of students) enrolled for the course, the teacher concerned might have course associates and teaching assistants (TA) to help him/her in teaching and assessment.

For a course strength necessitating two or more parallel classes or sections, one of the course teachers or any other member of the teaching staff of the department may be designated as course

coordinator. He/She has the full responsibility for coordinating the work of the other members of the department involving in that course.

3.7 Departmental Monitoring Committee

Consistent with its resilient policy to keep pace with new developments in the field of science and technology, the university will update its course curriculum at frequent intervals (at least every three years). Such updating aims not only to include the expanding frontiers of knowledge in the various fields but also to accommodate the changing social, industrial and professional need of the country. This can be done through deletion and modification of some of the courses and also through the introduction of new ones.

BUGS of each department will constitute a Departmental Monitoring Committee with three teachers of the department. This committee will monitor and evaluate the performance of the Course System within the department. In addition to other teachers of the department, the committee may also propose from time to time to the BUGS any changes and modifications needed for upgrading the Undergraduate Curriculum and the Course System.

3.8 Teacher Student Contact

The proposed system encourages students to come in close contact with teachers. For promotion of teacher-student contact, each student is assigned to an Adviser and the student is free to discuss with his/her adviser all academic matters, especially those related to courses taken and classes being attended by him/her. Students are also encouraged to meet with other teachers any time for help on academic matters.

3.9 Student Adviser

One Adviser would normally be appointed for a batch of students by the BUGS of the concerned department(s) who will advise each student on the courses to be taken by a student. Adviser will discuss

with the student his/her academic programme and then decide the number and nature of courses for which he/she can register. However, it is the student's responsibility to keep contact with his/her adviser who will review and eventually approve the student's specific plan of study and check on subsequent progress. The adviser should be in the rank of an Assistant Professor or above from the concerned department(s).

For a student of second and subsequent terms, the number and nature of courses for which he/she can register will be decided on the basis of his/her academic performance during the previous term. The adviser will advise the students to register for the courses during the next term within the framework of the guidelines with respect to minimum/maximum credit hour limits, etc. which are elaborated at appropriate places in this booklet. He/She is also authorized to permit the student to drop one or more courses based on his/her academic performance and the corresponding categorization (Art.3.16).

Special provisions exist for academically weak students with regard to make-up courses (Art. 3.19).

3.10 Registration Requirements

Any student who makes use of classroom or laboratory facilities or faculty time is required to register formally. Being admitted to the university, each student is assigned to a student adviser. The student can register for courses he/she intends to take during a given term only on the basis of the advice and consent of his/her adviser.

3.10.1 Registration Procedure

Students must register for each class in which they will participate. Each student will fill up his/her Course Registration Form in consultation with and under the guidance of his/her adviser. The original copy of the Course Registration Form will be submitted to the Registrar's Office, and then the requisite number of photocopies will

be made by the Registrar's Office for distribution. The date, time and venue will be announced in advance by the Registrar's Office. Much counseling and advising are accomplished at registration time. It is absolutely necessary that all students present themselves at the registration desk at the specified time.

3.10.2 Limits on the Credit Hours to be Taken

A student must be enrolled in at least 15 credit hours. He/She may be allowed to enroll in up to a maximum of 24 credit hours if recommended by his/her Adviser. A student must enroll for the prescribed sessional/laboratory courses in the respective Term within the allowed credit hour limits.

In special cases where a student cannot be allotted the minimum required 15 credit hours in a Term, the relevant BUGS may approve a lesser number of credit hours to suit individual requirements. Such cases shall only be applicable to students needing less than 15 credits for graduation.

3.10.3 Pre-condition for Registration

A student will be allowed to register in those courses subject to the capacity constrains and satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any Term, the concerned BUGS may allow him/her to register for a course which builds on the pre-requisite course provided his/her attendance and grades in continuous assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each term. The Registration programme with dates and venue will be announced in advance. Late registration is, however, permitted during the first week on payment of a late registration fee. Students having outstanding dues to university or a hall of residence shall not be permitted to register. All students have, therefore, to clear their dues and get a

clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Forms and complete the course registration procedure. Registration Forms will normally be available in the Register's Office. However, for the First Year students, prior department-wise enrollment/admission is mandatory. An orientation programme will be conducted for them at the beginning of the first term when they will be handed over the registration package on producing enrollment slip/proof of admission.

3.10.4 Pre-registration

Pre-registration for courses to be offered by the students in a particular term will be done on specified dates before the end of the previous term. All students in consultation with their course advisers are required to complete the pre-registration formalities, failing which a fine of Tk. xx.xx (amount may be decided by the authority) will have to be paid before registration in the next term. Further a student who does not pre-register may not get the courses desired by him/her subsequently.

3.10.5 Registration Deadline

Student must register for the courses to be taken before the commencement of each term and no late registration will be accepted after one week of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer of the University or some other academic commitments which precluded enrolling prior to the last date of registration.

3.10.6 Penalty for Late Registration

Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. xx.xx (amount may be decided by the authority). This extra fee will not be waived whatever be the reason for late registration.

3.10.7 Course Adjustment Procedure

A student will have some limited options to add or delete courses from his/her registration list, within the first two weeks from the beginning of the term. He/She may add courses only within the first two weeks of a regular Term and only the first week of a short Term. In case of dropping a course a student will be allowed to do so within four weeks after the commencement of a regular Term and two weeks after the commencement of a short Term. Adjustment of initially registered courses in any Term can be done by duly completing the Course Adjustment Form. These forms will normally be available in the Registrar's Office. For freshman students such forms can be included in the registration packet at the time of orientation.

Any student willing to add or drop courses will have to fill up a Course Adjustment Form in consultation with and under the guidance of his/her adviser. The original copy of the Course Adjustment Form will be submitted to the Registrar's Office, and then the requisite number of photo copies will be made by the Registrar's Office for distribution to the concerned Adviser, Head, Dean, Controller of Examination and the student.

All changes in courses must be approved by the Adviser and the Head of the department concerned. The Course Adjustment Form will have to be submitted to the Registrar's Office after duly filled in and signed by the concerned persons. To add/drop a course, respective teacher's consent will be required.

3.10.8 Withdrawal from a Term

If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the Term within a week after the end of the Term Final Examination. However, he/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from the Chief Medical Officer of the University. The Academic Council will take the final decision about such application.

3.11 Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes/in class evaluation, class participation, homework assignments, and a term final examination. The assessment in laboratory/sessional courses is made through observation of the student at work in class, viva-voce during laboratory hours, and quizzes. For architecture students, assessments in design sessionals would be done through evaluation of a number of projects assigned throughout the term. As discussed earlier, each course has a certain number of credits which describe its weightage. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. A student's performance is measured by the number of credits that he/she has completed satisfactorily and the weighted average of the grade points that he/she has maintained. A minimum grade point average is required to be maintained for satisfactory progress. Also a minimum number of earned credits should be acquired in order to qualify for the degree as prescribed under article 3.22.

Letter grades and corresponding grade-points will be awarded in accordance with provisions shown below:

Numerical Grade	Letter Grade	Grade Point
80% or above	A^+ (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A^- (A minus)	3.50
65% to less than 70%	B^+ (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% to less than 60%	B^- (B minus)	2.75
50% to less than 55%	C^+ (C plus)	2.50
45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D	2.00
less than 40%	F	0.00
Continuation (for project & thesis/design courses)	X	-

3.11.1 Distribution of Marks

Thirty percent (30%) of marks shall be allotted for continuous assessment i.e., quizzes and homework assignments, in class evaluation and class participation. The remainder of the marks will be allotted to Term Final examination which will be conducted centrally by the University. There will be internal and external examiners for each course in the Term Final examination of 3 hours duration. The distribution of marks for a given course will be as follows:

i.	Class participation	10%
ii.	Homework Assignment and Quizzes	20%
iii.	Final Examination (3 hours)	70%
	Total	100%

Basis for awarding marks for class participation and attendance will be as follows:

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
less than 60%	0

The number of quizzes of a course shall be at least n+1, where n is the number of credits of the course. Evaluation of the performance in quizzes will be on the basis of the best n quizzes. The scheme of continuous assessment that a teacher proposes to follow for a course will be announced on the first day of classes.

3.12 Earned Credits

The courses in which a student has obtained 'D' or a higher Grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credits.

A student who obtains 'F' grade in a Core Course in any term will have to repeat the course.

If a student obtains 'F' grade in an Optional Course he/she may choose to repeat the Course or take a Substitute Course if available.

'F' grades will not be counted for GPA calculation but will stay permanently on the Grade Sheet and Transcript. When a student will

repeat a course in which he/she previously obtained 'F' grade, he/she will not be eligible to get a grade better than "B" in such a course.

If a student obtains a grade lower than 'B' in a course, he/she will be allowed to repeat the course only once for the purpose of grade improvement by forgoing his/her earlier grade, but he/she will not be eligible to get a grade better than 'B' in such a course. A student will be permitted to repeat for grade improvement purposes a maximum of four courses in B.Sc Engg. and BURP programmes and a maximum of five courses in B Arch programme.

If a student obtains 'B' or a better grade in any course, he/she will not be allowed to repeat the course for the purpose of grade improvement.

3.13 Honours

Candidates for Bachelor's degree in engineering and architecture will be awarded the degree with honours if their over all GPA is 3.75 or better.

3.13.1 Dean's List

As a recognition of excellent performance, the names of students obtaining a cumulative GPA of 3.75 or above in two regular Terms in each academic year may be published in the Dean's List in each faculty. Students who have received F grade in any course during any of the two regular terms will not be considered for Dean's List in that year.

3.14 Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student. For example, if a student passes/completes five courses in a semester

having credits of C_1, C_2, C_3, C_4, and C_5 and his/her grade points in these courses are G_1, G_2, G_3, G_4, and G_5, respectively then

$$GPA = \frac{\sum C_i G_i}{\sum C_i}.$$

3.14.1 A Numerical Example

Suppose a student has completed five courses in a Term and obtained the following grades:

Course	Credits	Grade	Grade points
EEE 203	3	A^+	4.00
EEE 205	3	B	3.00
EEE 207	3	A	3.75
Math 205	2	B^+	3.25
Hum 203	1	A^-	3.50

Then his/her GPA for the term will be computed as follows:

$$GPA = \frac{3\times 4.0 + 3\times 3.0 + 3\times 3.75 + 2\times 3.25 + 1\times 3.5}{3+3+3+2+1} = 3.52$$

3.15 Student Classification

For a number of reasons it is necessary to have a definite system by which to classify students as First Year/Freshman, Second Year/Sophomore, Third Year/Junior and Fourth Year/Senior. At BUET, regular students are classified according to the number of credit hours earned towards a degree. The following classification applies to the students.

Year/Level	Earned Credit Hours	
	Engineering/URP	Architecture
First Year (Freshman) Level I	0 to 36	0 to 34
Second Year (Sophomore) Level II	37 to 72	>34 to 72
Third Year (Junior) Level III	73 to 108	>72 to 110
Fourth Year (Senior) Level IV	109 and above	>110 to 147
Fifth Year Level V		>147

3.16 Registration for the Second and Subsequent Terms

A student is normally required to earn at least 15 credits in a Term. At the end of each term, the students will be classified into the following three categories:

Category 1: Consisting of students who have passed all the courses prescribed for the term and have no backlog of courses. A student belonging to Category 1 will be eligible to register for all courses prescribed for the next term.

Category 2: Consisting of students who have earned at least 15 credits in the term but do not belong to category 1. A student belonging to Category 2 is advised to take at least one course less in the next term subject to the condition that he/she has to register for such backlog courses as may be prescribed by the adviser.

Category 3: Consisting of students who have failed to earn 15 credits in the term. A student belonging to Category 3 is advised to take at least two courses less subject to registration for a minimum of 15 credits. However he/she will be required to register for such backlog courses as may be prescribed by the adviser.

3.17 Performance Evaluation

The performance of a student will be evaluated in terms of two indices, viz. term grade point average, and cumulative grade point average, which is the grade average for all the terms. The term grade point average is computed dividing the total grade points earned in a term by the number of term hours taken in that term. The overall or cumulative grade point average (CGPA) is computed by dividing the total grade points accumulated up to date by the total credit hours earned. Thus a student who has earned 275 grade points in attempting 100 credit hours of courses would have a cumulative grade point average of 2.75.

Students will be considered to be making normal progress toward a degree if their cumulative or overall GPA for all work attempted is 2.20 or more. Students who regularly maintain Term GPA of 2.20 or better are making good progress toward their degrees and are in good standing with the university. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when one or more of the following conditions exist:

i. Term GPA falls below 2.20,
ii. Cumulative GPA falls below 2.20,
iii. Earned credits fall below 15 times the number of Terms attended/studied.

All such students can make up deficiencies in GPA and credit requirements by completing courses in next term(s) and backlog courses, if there be any, with better grades. When GPA and credit requirements are achieved, the student is returned to good standing.

3.18 Academic Progress, Probation and Suspension

Academic Progress: Undergraduate students will be considered to be making normal progress toward a degree if their cumulative or overall GPA for all work attempted is not less than 2.20.

Probation and Suspension: Undergraduate students who regularly maintain Term GPA of 2.20 or better are making good progress toward their degrees and are in good standing with the university. Students who fail to maintain this minimum rate of progress may be placed on academic probation.

The status of academic probation is a reminder/warning to the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists:

i. The Term GPA falls below 2.20, or
ii. The cumulative GPA falls below 2.20.

Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Dean of faculty.

The minimum period of probation is one Term, but the usual period is for one academic year. This allows the student an opportunity to improve the GPA through the completion of additional course work during the period that the student is on probation. The probation is extended for additional terms until the student achieves an overall

GPA of 2.20 or better. When that condition is achieved, the student is returned to good standing.

Academic probation is not to be taken lightly- it is very serious matter. A student on academic probation who fails to maintain a GPA of at least 2.20 during two consecutive academic years may be suspended from this university. A student who has been suspended may make a petition to the Dean of faculty, but this petition will not be considered until the student has been suspended at least one full Term.

Petitions for reinstatement must set forth clearly the reasons for the previous unsatisfactory academic record and it must delineate the new conditions that have been created to prevent the recurrence of such work. Each such petition is considered individually on its own merits.

After consideration of the petition, and perhaps after consultation with the student, the Dean in some cases, reinstate the student if this is the first suspension. However, a second suspension will be regarded as final and absolute.

3.19 Measures for Helping Academically Weak Students

The following provisions will be made as far as possible to help academically weak students to enable them to complete their studies within the maximum period of seven years in engineering and eight years in architecture student, respectively:

i. All such students whose cumulative grade point average (CGPA) is less than 2.20 at the end of a term may be given a load of not exceeding four courses, in the next term.
ii. For other academic deficiencies, some basic and core courses may be offered during the Short Term in order to enable the student to partially make-up for the reduced load during Regular Terms.

Following criteria will be followed for determining academically weak students:

i. CGPA falling below 2.20.
ii. Term grade point average (TGPA) falling below 2.20 points below that of previous term.
iii. Earned credit falling below 15 times the number of terms attended.

3.20 Special Courses

a) These courses, which include self-study courses, will be from amongst the regular theory courses listed in the course catalog, a special course can be run only in exceptional cases.

b) Whether a course is to be floated as a special course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Decision to float a course as a special course shall be reported to the Academic Council.

c) The special course may be offered to any student in his/her last term if it helps him/her to graduate in that term. It will be offered only if the course is not running in that term as a regular course.

d) Normally no lecture will be delivered for the special course but laboratory/design classes may be held if they form a part of the course. The course coordinator/course teacher will also assign homeworks, administer quizzes and final examination for giving his or her assessments at the end of the term.

e) A student will be allowed to register for a maximum of two courses on self study basis.

f) A Special Course Shall not be utilized for grade improvement purposes.

3.21 Rules for Courses offered in a Short Term

a) The courses to be run during the Short Term shall be decided on the recommendations of the Departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constrains and satisfaction of pre-requisites.

b) Students will be allowed to register in a maximum of two courses during the Short Term.

c) A course may be given a weightage up to 6 credits in any Short Term following a graduating/final Term if he/she is short by a maximum of 6 earned credits only, on a self-study basis with no formal instruction. In a self-study course, there will be a Final Examination, besides the continuous assessment.

d) A fee of Tk. xx.xx for each credit hour to be registered is to be borne by the students who enroll during Short Term.

3.22 Minimum Earned Credit and GPA Requirements for Obtaining Graduation

Minimum credit hour requirements for the award of bachelor's degree in engineering and architecture will be decided by the respective BUGS. However, at least 157 credit hours for engineering and 190 credit hours for architecture must be earned to be eligible for graduation, and this must include the specified core courses.

The minimum GPA requirement for obtaining a bachelor's degree in engineering, URP or architecture is 2.20.

Completion of fulltime Studentship: Students who have completed minimum credit requirement for graduation for a Bachelors degree shall not be considered and registered as fulltime students.

A student may take additional courses with the consent of his/her adviser in order to raise GPA, but he/she may take a maximum of 15 such additional credits in engineering and URP and 18 such additional credits in architecture beyond respective credit-hour requirements for bachelor's degree during his/her entire period of study.

3.22.1 Application for Graduation and Award of Degree

A student who has fulfilled all the academic requirements for Bachelor's degree will have to apply to the Controller of Examinations through his/her Adviser for graduation. Provisional degree will be awarded on completion of credit and GPA requirements. Such provisional degrees will be confirmed by the Academic Council.

3.23 Industrial/Professional Training Requirements

Depending on each department's own requirement a student may have to complete a prescribed number of days of industrial/professional training in addition to minimum credit and other requirements, to the satisfaction of the concerned department.

3.24 Time Limits for Completion of Bachelor's Degree

A student must complete his studies within a maximum period of seven years for engineering and URP and eight years for architecture.

3.25 Inclusion of Repeaters from Annual System in Course System

Repeater students including Private students of Annual system will be included in the Course System of curricula as and when such situation will arise.

3.25.1 Equivalence of Courses and Grades

Equivalence of courses passed previously by any repeater student including Private students shall be determined by the respective BUGS for the purpose of:

a) Allowing course exemption, and
b) Conversion of numerical grades into letter grades in exempted courses.

3.25.2 Exemption of Courses

Repeater students including private students may be granted exemption in theoretical course(s) in which he/she secured 45% or more marks and in sessional/laboratory course(s) in which he/she secured 41% or more marks.

3.25.3 Time Limit for Completion of Bachelor's Degree

Time allowed for a student included in Course System from Annual System to complete studies leading to a bachelor's degree will be proportional to the remaining credits to be completed by him/her.

A student in engineering, for example, having earned 40 credit hours through equivalence and exemption (of previously completed courses) out of a total requirement of 160 credits for bachelor's degree will get (7 yrs$\times$120/160 = 5.25) = 5.5 years (rounded to next higher half-a-year) or 11 (eleven) Regular Terms to fulfill all requirements for

bachelor's degree. For a student in architecture, time allowed will be calculated in a similar way.

3.25.4 Relaxation of Course Registration for Students Transferred to Course System from Annual System

The requirement of registration of a minimum 15 credit hours in a term shall be waived for only the terms of the level where he/she has been transferred in course system provided that he/she has been granted exemption in some of the courses offered in those terms.

3.26 Attendance, Conduct, Discipline, etc.

3.26.1 Attendance

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in every course.

3.26.2 Conduct and Discipline

A student shall conform to a high standard of discipline, and shall conduct himself/herself, within and outside the precincts of the university in a manner befitting the students of an university of national importance. He/She shall show due courtesy and consideration to the employees of the university and Halls of Residence, good neighborliness to his/her fellow students and the teachers of the university and pay due attention and courtesy to visitors.

To safeguard its ideals of scholarship, character and personal behaviour, the university reserves the right to require the withdrawal of any student at any time for any reason deemed sufficient.

3.27 Absence During Term

A student should not be absent from quizzes, tests, etc. during the Term. Such absence will naturally lead to reduction in points/marks which count towards the final grade. Absence in Term Final Examination will result in 'F' grades.

A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up quizzes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from a university Medical officer. The medical certificate issued by a registered medical practitioners (with the Registration Number shown explicitly on the certificates) will also be acceptable only in those cases where the student has valid reasons for his absence from the university.

Chapter 4

COURSES FOR UNDERGRADUATE ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME

Course schedule for the undergraduate students of the Department of Electrical and Electronic Engineering is given below. The first digit of a course number represents the level, the second digit is for group. Odd number in the third digit signifies a theory course and even number represents a laboratory/sessional course. For all 3 credit theory and 1.5 credit laboratory/sessional courses, contact hour is 3 hours.

The second digit in the course number has the following meaning:

Digit 0 and 1 is for core course
2 for interdisciplinary
3 and 4 for communication
5 and 6 for electronics
7 and 8 for power
9 for computer

4.1 Core Courses for EEE Undergraduate Programme

4.1.1 Core Courses (EEE)

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 101	Electrical Circuits I	3
2	EEE 105	Electrical Circuits II	3
3	EEE 106	Electrical Circuits Laboratory.	1.5
4	EEE 110	Electrical Circuit Simulation Laboratory	1.5
5	EEE 201	Electronics I	3

Sl. No	Course Number	Course Name	Credit Hour
6	EEE 203	Energy Conversion I	3
7	EEE 205	Energy Conversion II	3
8	EEE 206	Energy Conversion Laboratory	1.5
9	EEE 207	Electronics II	3
10	EEE 208	Electronics Laboratory	1.5
11	EEE 209	Engineering Electromagnetics	3
12	EEE 210	Electronic Circuit Simulation Laboratory	1.5
13	EEE 212	Numerical Technique Laboratory	1.5
14	EEE 301	Continuous Signals and Linear Systems	3
15	EEE 303	Digital Electronics	3
16	EEE 304	Digital Electronics Laboratory	1.5
17	EEE 305	Power System I	3
18	EEE 306	Power System I Laboratory	1.5
19	EEE 307	Electrical Properties of Materials	3
20	EEE 309	Communication Theory	3
21	EEE 310	Communication Laboratory	1.5
22	EEE 311	Digital Signal Processing I	3
23	EEE 312	Digital Signal Processing I Laboratory	1.5
24	EEE 314	Electrical Services Design	1.5
25	EEE 315	Microprocessor and Interfacing	3
26	EEE 316	Microprocessor and Interfacing Laboratory	1.5
27	EEE 401	Control System I	3
28	EEE 402	Control System I Laboratory	1.5
29	EEE 413	Solid State Devices	3
30	EEE 400	Project/Thesis	6
		Subtotal	**73.5**

4.1.2 Core Courses (Humanities)

Sl. No	Course Number	Course Name	Credit Hour
1	HUM 127	Sociology	3
2	HUM 137	Professional Ethics	3
3	HUM 135	English	3
4	HUM 272	Developing English Skills Laboratory	1.5
5	HUM 277	Fundamentals of Economics	3
6	HUM 279	Financial and Managerial Accounting	3
		Subtotal	**13.5**

4.1.3 Core Courses (CSE)

Sl No	Course Number	Course Name	Credit Hour
1	CSE 109	Computer Programming	3
2	CSE 110	Computer Programming Sessional	1.5
		Subtotal	**4.5**

4.1.4 Core Courses (Mathematics)

Sl. No	Course Number	Course Name	Credit Hour
1	MATH 157	Calculus I	3
2	MATH 159	Calculus II	3
3	MATH 257	Ordinary and Partial Differential Equations	3
4	MATH 259	Linear Algebra	3
5	MATH 357	Probability and Statistics	3
		Subtotal	**15**

4.1.5 Core Courses (Physics)

Sl. No	Course Number	Course Name	Credit Hour
1	PHY 121	Waves and Oscillations, Optics and Thermal Physics	3
2	PHY 102	Physics Laboratory	1.5
3	PHY 123	Electricity and Magnetism, Modern Physics and Mechanics	3
4	PHY 104	Physics Sessional	1.5
		Subtotal	**9**

4.1.6 Core Courses (Chemistry)

Sl. No	Course Number	Course Name	Credit Hour
1	CHEM 101	Chemistry I	3
2	CHEM 114	Inorganic, Quantitative Analysis Sessional	1.5
		Subtotal	**4.5**

4.1.7 Core Courses (ME)

Sl. No	Course Number	Course Name	Credit Hour
1	ME 267	Mechanical Engineering Fundamentals	3
2	ME 268	Mechanical Engineering Fundamentals Sessional	1.5
		Subtotal	**4.5**

4.1.8 Core Course (CE)

Sl No	Course Number	Course Name	Credit Hour
1	CE 152	Engineering Drawing	1.5
		Subtotal	**1.5**

4.1.9 Core Course (IPE)

Sl No	Course Number	Course Name	Credit Hour
1	IPE 493	Industrial Management	3
		Subtotal	**3**

4.2 Elective Courses

From Level-3, Term-II, EEE Department starts offering elective courses under 4 groups viz. Power, Communication, Electronics and Computer. Besides these, one elective course is to be chosen from interdisciplinary group.

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 another as minor by taking written options from the students. For regular students, this will be done in Level-3, Term-I.

2. Maximum number of students in any group as major will be N/4, where N is the number of students in a batch. Similarly the maximum number of students in any group as minor will also be N/4.

3. Major and minor group assignment will be based on options and CGPA of first four terms from Level-1, Term-I to Level-2, Term-II.

4. A student will have to take 4 or 5 elective theory courses from the respective major group and remaining (3 or 2) elective theory courses from the respective minor group. A student must also take one theory course along with its corresponding sessional from the interdisciplinary group.

5. Students will be assigned their Level-4 theses/projects from the area of the respective major group.

6. If a student fails in an elective theory course that has a sessional, the student may take that theory course again or may take another theory course together with its corresponding sessional.

7. Maximum class size of an elective course for regular students will be (N/4 + 5). However, a student who has previously failed in an elective course will be allowed to re-register regardless of the class size.

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

9. 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 courses and CGPA at the time of the distribution.

10. In case of any unforeseen situation or ambiguity, the Departmental BUGS will take an appropriate decision.

4.2.1 Power Group

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 371	Power System II	3
2	EEE 471	Energy Conversion III	3
3	EEE 473	Power Electronics	3
4	EEE 474	Power Electronics Laboratory	1.5
5	EEE 475	Power Plant Engineering	3
6	EEE 477	Power System Protection	3
7	EEE 478	Power System Protection Laboratory	1.5
8	EEE 479	Power System Reliability	3
9	EEE 481	Power System Operation and Control	3
10	EEE 483	High Voltage Engineering	3
11	EEE 484	High Voltage Engineering Laboratory	1.5

4.2.2 Electronics Group

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 351	Analog Integrated Circuits	3
2	EEE 451	Processing and Fabrication Technology	3
3	EEE 453	VLSI I	3
4	EEE 454	VLSI I Laboratory	1.5
5	EEE 455	Compound Semiconductor and Hetero-junction Devices	3
6	EEE 457	VLSI II	3
7	EEE 458	VLSI II Laboratory	1.5
8	EEE 459	Optoelectronics	3
9	EEE 461	Semiconductor Device Theory	3

4.2.3 Communication Group

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 331	Random Signals and Processes	3
2	EEE 431	Digital Signal Processing II	3
3	EEE 433	Microwave Engineering	3
4	EEE 434	Microwave Engineering Laboratory	1.5
5	EEE 435	Optical Fiber Communication	3
6	EEE 437	Digital Communication	3
7	EEE 438	Digital Communication Laboratory	1.5
8	EEE 439	Mobile Cellular Communication	3
9	EEE 441	Telecommunication Engineering	3

4.2.4 Computer Group

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 493	Microprocessor System Design	3
2	EEE 494	Microprocessor System Design Laboratory	1.5
3	EEE 495	Real Time Computer System	3
4	CSE 451	Computer Networks	3
5	CSE 452	Computer Networks Laboratory	1.5
6	CSE 453	Computer Architecture	3
7	CSE 491	Multimedia Communications	3

4.2.5 Interdisciplinary Courses

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 421	Control System II	3
2	EEE 422	Control System II Laboratory	1.5
3	EEE 423	Numerical Methods	3
4	EEE 424	Numerical Methods Laboratory	1.5
5	EEE 425	Biomedical Instrumentation	3
6	EEE 426	Biomedical Instrumentation Laboratory	1.5
7	EEE 427	Measurement and Instrumentation	3

Sl. No	Course Number	Course Name	Credit Hour
8	EEE 428	Measurement and Instrumentation Laboratory	1.5

4.3 Course Offering

Level-1 Term-I

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 101	Electrical Circuits I	3
2	CSE 109	Computer Programming	3
3	CSE 110	Computer Programming Sessional	1.5
4	PHY 121	Waves and Oscillations, Optics and Thermal Physics	3
5	PHY 102	Physics Sessional	1.5
6	MATH 157	Calculus I	3
7	MATH 159	Calculus II	3
8	CE 152	Engineering Drawing	1.5
		Subtotal	**19.5**

Level-1 Term-II

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 105	Electrical Circuits II	3
2	EEE 106	Electrical Circuits Laboratory	1.5
3	EEE 110	Electrical Circuit Simulation Laboratory	1.5
4	PHY 123	Electricity and Magnetism, Modern Physics and Mechanics	3
5	PHY 104	Physics Sessional	1.5
6	CHEM 101	Chemistry	3
7	CHEM 114	Inorganic and Quantitative Analysis Laboratory	1.5

Sl. No	Course Number	Course Name	Credit Hour
8	MATH 257	Ordinary and Partial Differential Equations	3
9	HUM 127 / HUM 137	Sociology / Professional Ethics	3
		Subtotal	**21**

Level-2 Term-I

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 201	Electronics I	3
2	EEE210	Electronic Circuit Simulation Laboratory	1.5
3	EEE 203	Energy Conversion I	3
4	MATH 259	Linear Algebra	3
5	HUM 135	English	3
6	HUM 272	Developing English Skills Laboratory	1.5
7	HUM 277	Fundamentals of Economics	3
		Subtotal	**18**

Level-2 Term-II

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 205	Energy Conversion II	3
2	EEE 206	Energy Conversion laboratory	1.5
3	EEE 207	Electronics II	3
4	EEE 208	Electronics Laboratory	1.5
5	EEE 209	Engineering Electromagnetics	3
6	EEE 212	Numerical Technique Laboratory	1.5
7	ME 267	Mechanical Engineering Fundamentals	3
8	ME 268	Mechanical Engineering Fundamentals Sessional	1.5
8	MATH 357	Probability and Statistics	3
		Subtotal	**21**

Level-3 Term-I

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 301	Continuous Signals and Linear Systems	3
2	EEE 303	Digital Electronics	3
3	EEE 304	Digital Electronics Laboratory	1.5
4	EEE 305	Power System I	3
5	EEE 306	Power System I Laboratory	1.5
6	EEE 307	Electrical Properties of Materials	3
7	EEE 314	Electrical Services Design	1.5
8	HUM 279	Financial and Managerial Accounting	3
		Subtotal	**19.5**

Level-3 Term-II

Sl. No	Course Number	Course Name	Credit Hour
1	IPE 493	Industrial Management	3
2	EEE 309	Communication Theory	3
3	EEE 310	Communication Laboratory	1.5
4	EEE 311	Digital Signal Processing I	3
5	EEE 312	Digital Signal Processing I Laboratory	1.5
6	EEE 315	Microprocessor and Interfacing	3
7	EEE 316	Microprocessor and Interfacing Laboratory	1.5
8	EEE 3**	Elective I	3
		Subtotal	**19.5**

Level-4 Term-I

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 400	Project/Thesis	3
2	EEE 413	Solid State Devices	3
3	EEE 401	Control System I	3
4	EEE 402	Control System I Laboratory	1.5

Sl. No	Course Number	Course Name	Credit Hour
5	EEE 4**	Elective II	3
6	EEE 4**	Elective III	3
7	EEE 4**	Elective III Laboratory	1.5
8	EEE 4**	Elective IV	3
		Subtotal	**21**

Level-4 Term-II

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 400	Project/Thesis	3
2	EEE 4**	Elective V	3
3	EEE 4**	Elective V Laboratory	1.5
4	EEE 4**	Elective VI	3
5	EEE 4**	Elective VII	3
6	EEE 4**	Elective VIII	3
7	EEE 4**	Elective VIII Laboratory	1.5
		Subtotal	**18**

Grand Total 157.5

Elective Courses

Elective I

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 371	Power System II	
2	EEE 351	Analog Integrated Circuits	
3	EEE 331	Random Signals and Processes	
			3

Elective II

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 471	Energy Conversion III	
2	EEE 451	Processing and Fabrication Technology	
3	EEE 431	Digital Signal Processing II	
4	CSE 491	Multimedia Communications	
			3

Elective III

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 473	Power Electronics	
2	EEE 474	Power Electronics Laboratory	
3	EEE 453	VLSI I	
4	EEE 454	VLSI I Laboratory	
5	EEE 433	Microwave Engineering	
6	EEE 434	Microwave Engineering Laboratory	
7	EEE 493	Microprocessor System Design	
8	EEE 494	Microprocessor System Design Laboratory	
			3+1.5=4.5

Elective IV

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 475	Power Plant Engineering	
2	EEE 455	Compound Semiconductor and Hetero-Junction Devices	
3	EEE 435	Optical Fiber Communication	
4	EEE 495	Real Time Computer System	
			3

Elective V

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 477 / EEE 483	Power System Protection / High Voltage Engineering	
2	EEE 478/ EEE 484	Power System Protection Laboratory/ High Voltage Engineering Laboratory	
3	EEE 457	VLSI II	
4	EEE 458	VLSI II Laboratory	
5	EEE 437	Digital Communication	
6	EEE 438	Digital Communication Laboratory	
7	CSE 451	Computer Networks	
8	CSE 452	Computer Networks Laboratory	
			3+1.5=4.5

Elective VI

Sl. No.	Course Number	Course Name	Credit Hour
1	EEE 479	Power System Reliability	
2	EEE 459	Optoelectronics	
3	EEE 439	Mobile Cellular Communication	
4	CSE 453	Computer Architecture	
			3

Elective VII

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 481	Power System Operation and Control	
2	EEE 461	Semiconductor Device Theory	
3	EEE 441	Telecommunication Engineering	
4	CSE 491	Multimedia Communications	
			3

Elective VIII (Interdisciplinary)

Sl. No	Course No.	Course Name	Credit Hour
1	EEE 421	Control System II	
2	EEE 422	Control System II Laboratory	
3	EEE 423	Numerical Methods	
4	EEE 424	Numerical Methods Laboratory	
5	EEE 425	Biomedical Instrumentation	
6	EEE 426	Biomedical Instrumentation Laboratory	
7	EEE 427	Measurement and Instrumentation	
8	EEE 428	Measurement and Instrumentation Laboratory	
			3+1.5=4.5

4.4 Course Curriculum of the Department of Electrical and Electronic Engineering

Core Courses

EEE 101 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 supernode and supermesh. 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 105 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 106 Electrical Circuits Laboratory
1.5 credits, 3 hours/week

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 101 and EEE 105.

EEE 110 Electrical Circuit Simulation Laboratory
1.5 credits, 3 hours/week

Simulation laboratory based on EEE 101 and EEE 105 theory courses. Students will verify the theories and concepts learned in EEE 101 and

EEE 105 using simulation software like PSpice and Matlab. Students will also perform specific design of DC and AC circuits theoretically and by simulation.

EEE 201 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. Junction Field-Effect-Transistor (JFET): Structure and physical operation of JFET, transistor characteristics, pinch-off voltage. Differential and multistage amplifiers: Description of differential amplifiers, small-signal operation, differential and common mode gains, RC coupled mid-band frequency amplifier.

EEE 203 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 205 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 206 Energy Conversion Laboratory

1.5 credits, 3 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 203 and EEE 205. In the second part, students will design simple systems using the principles learned in EEE 203 and EEE 205.

EEE 207 Electronics II

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 208 Electronics Laboratory
1.5 credits, 3 hours/week

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 201 and EEE 207.

EEE 209 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 210 Electronic Circuit Simulation Laboratory
1.5 credits, 3 hours/week

Simulation laboratory based on EEE 201 and EEE 207 theory courses. Students will verify the theories and concepts learned in EEE 201 and EEE 207 using simulation softwares like PSpice and Matlab. Students will also perform specific design of electronic circuits theoretically and by simulation.

EEE 212 Numerical Technique Laboratory
1.5 credits, 3 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.

EEE 301Continuous 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, invertibility. Time domain analysis of LTI systems: Differential equations- system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response- convolution integral, determination of system properties; state variable- basic concept, state equation and time domain solution. Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion-less systems. Applications of time and frequency domain analyses:

solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing. Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

EEE 303 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 304 Digital Electronics Laboratory
1.5 credits, 3 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 303. In the second part, students will design simple systems using the principles learned in EEE 303.

EEE 305 Power System 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 306 Power System I Laboratory
1.5 credits, 3 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 305. In the second part, students will design simple systems using the principles learned in EEE 305.

EEE 307 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 309 Communication Theory
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 memoryless 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 310 Communication Laboratory

1.5 credits, 3 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 309. In the second part, students will design simple systems using the principles learned in EEE 309.

EEE 311 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 312 Digital Signal Processing I Laboratory
1.5 credits, 3 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 311. In the second part, students will design simple systems using the principles learned in EEE 311.

EEE 314 Electrical Services Design
1.5 credits, 3 hours/week

Wiring system design, drafting, 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 315 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 316 Microprocessor and Interfacing Laboratory
1.5 credits, 3 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 315. In the second part, students will design simple systems using the principles learned in EEE 315.

EEE 400 Project/Thesis
3 credits, 6 hours/week for Level-4, Term-I
3 credits, 6 hours/week for Level-4, Term-II

Study of practical problems in the fields of electrical and electronic engineering.

EEE 401 Control System I
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 402 Control System I Laboratory
1.5 credits, 3 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 401. In the second part, students will design simple systems using the principles learned in EEE 401.

EEE 413 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.

Elective Courses

Interdisciplinary

EEE 421 Control System II
3 credits, 3 hours/week

Compensation using pole placement technique. State equations of digital systems with sample and hold, state equation of digital systems, digital simulation and approximation. Solution of discrete state equations: by z-transform, state equation and transfer function, state diagrams, state plane analysis. Stability of digital control systems. Digital simulation and digital redesign. Time domain analysis. Frequency domain analysis. Controllability and observability. Optimal linear digital regulator design. Digital state observer. Microprocessor control. Introduction to neural network and fuzzy control, adaptive control. H_{∞}Control, nonlinear control.

EEE 422 Control System II Laboratory
1.5 credits, 3 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 421. In the second part, students will design simple systems using the principles learned in EEE 421.

EEE 423 Numerical Methods
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 Runge Kutta method. Boundary value problems. Numerical integration: general quadrature formula, trapezoidal rule and Simpson's rule. Numerical differentiation.

EEE 424 Numerical Methods Laboratory
1.5 credits, 3 hours/week

Students will perform experiments to verify practically the theories and concepts learned in EEE 423.

EEE 425 Biomedical Instrumentation
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. 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 426 Biomedical Instrumentation Laboratory
1.5 credits, 3 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 425. In the second part, students will design simple systems using the principles learned in EEE 425.

EEE 427 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 428 Measurement and Instrumentation Laboratory
1.5 credits, 3 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 427. In the second part, students will design simple systems using the principles learned in EEE 427.

Communication Group

EEE 331 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 431 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 Eigenstructure 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 433 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 halfwave dipoles. Antennas: Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

EEE 434 Microwave Engineering Laboratory
1.5 credits, 3 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 433. In the second part, students will design simple systems using the principles learned in EEE 433.

EEE 435 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 437 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 438 Digital Communication Laboratory
1.5 credits, 3 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 437. In the second part, students will design simple systems using the principles learned in EEE 437.

EEE 439 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 441 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.

Electronics Group

EEE 351 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 transconductance biasing. Switch capacitor circuits: Sampling switches, switched capacitor circuits including unity gain buffer, amplifier and integrator. Phase Locked Loop (PLL): Introduction, basic PLL and charge pumped PLL.

EEE 451 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 453 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 454 VLSI I Laboratory
1.5 credits, 3 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 453. In the second part, students will design simple systems using the principles learned in EEE 453.

EEE 455 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 457 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 458 VLSI II Laboratory
1.5 credits, 3 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 457. In the second part, students will design simple systems using the principles learned in EEE 457.

EEE 459 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 461 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.

Power Group

EEE 371 Power System II
3 credits, 3 hours/week

Transmission lines cables: overhead and underground. 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 471 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 473 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, buckboost, boost and Cuk regulators. AC voltage controllers: single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: Single phase and three phase voltage and current source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

EEE 474 Power Electronics Laboratory
1.5 credits, 3 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 473. In the second part, students will design simple systems using the principles learned in EEE 473.

EEE 475 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 477 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 478 Power System Protection Laboratory
1.5 credits, 3 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 477. In the second part, students will design simple systems using the principles learned in EEE 477.

EEE 479 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 481 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 483 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 484 High Voltage Engineering Laboratory
1.5 credits, 3 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 483. In the second part, students will design simple systems using the principles learned in EEE 483.

Computer Group

EEE 493 Microprocessor System Design
3 credits, 3 hours/week

Review of 80x86 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 494 Microprocessor System Design Laboratory
1.5 credits, 3 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 493. In the second part, students will design simple systems using the principles learned in EEE 493.

EEE 495 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.

4.5 Courses offered by other Departments to EEE students

4.5.1 Computer Science and Engineering

CSE 109 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; polyorphism; function and operator overloading; inheritance.

CSE 110 Computer Programming Sessional
1.5 credits, 3 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 109. In the second part, students will learn program design.

CSE 451 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.

CSE 452 Computer Network Laboratory
1.5 credits, 3 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 451. In the second part, students will design systems using the principles learned in CSE 451.

CSE 453 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.

CSE 491 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.

4.5.2 Civil Engineering

CE 152 Engineering Drawing
1.5 credits, 3 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.

4.5.3 Mechanical Engineering

ME 267 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.

ME 268 Mechanical Engineering Fundamentals Sessional
1.5 credits, 3 hours/week

Sessional based on ME 267**.**

4.5.4 Industrial and Production Engineering

IPE 493 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.

4.5.5 Physics

PHY 121 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 102 Physics Sessional
1.5 credits, 3 hours/week

Laboratory experiments based on PHY121.

PHY 123 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 104 Physics Sessional
1.5 credits, 3 hours/week

Laboratory experiments based on PHY 123.

4.5.6 Chemistry

CHEM 101 Chemistry I
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 monocomponent system. Properties of dilute solutions. Thermochemistry, chemical kinetics, chemical equilibria. Ionization of water and pH concept. Electrical properties of solution.

CHEM 114 Inorganic, Quantitative Analysis Sessional
1.5 credits, 3 hours/week

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

4.5.7 Mathematics

MATH 157 Calculus I
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 159 Calculus II
3 credits, 3 hours/week

Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem.

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 257 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 259 Linear Algebra
3 credits, 3 hours/week

Introduction to systems of linear equations. Gaussian elimination. Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Euclidean n-space. Linear transformation from

IR^n to IR^m. Properties of linear transformation from IR^n to IR^m . Real vector spaces and subspaces. Basis and dimension. Rank and nullity. Inner product spaces. Gram-Schmidt process and QR-decomposition. Eigenvalues and eigenvectors. Diagonalization. Linear transformations. Kernel and Range. Application of linear algebra to electric networks.

MATH 357 Probability and Statistics
3 credits, 3 hours/week

Introduction. Sets and probability. Random variable and its probability distributions. Treatment of grouped sampled data. Some discrete probability distributions. Normal distribution. Sampling theory. Estimation theory. Tests of hypotheses. Regression and correlation. Analysis of variance.

4.5.8 Humanities

HUM 127 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.

HUM 135 English
3 credits, 3 hours/week

General discussion: Introduction, various approaches to learning English.

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.

Approaches to Communication: Communication today, business communication, different types of business communication.

Listening Skill: The phonemic systems and correct English pronunciation.

Speaking Skill: Practicing dialogue; Story telling; Effective oral presentation.

Report Writing: Defining a report, classification of reports, structure of a report, and writing of reports.

HUM 137 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.

HUM 272 Developing English Skills Laboratory
1.5credits, 3 hours/week

Grammar: Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure.

Vocabulary building: correct and precise diction, affixes, level of appropriateness. Colloquial and standard, informal and formal.

Developing reading skill: Strategies of reading- skimming, scanning, predicting, inferencing; Analyzing and interpreting variety of texts; Practicing comprehension from literary and nonliterary texts.

Developing writing skill: Sentences, sentence variety, generating sentences; Clarity and correctness of sentences, linking sentences to form paragraphs, writing paragraphs, essays, reports, formal and informal letters.

Listening skill and note taking: Listening to recorded texts and class lectures and learning to take useful notes based on listening.

Developing speaking skill: 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.

HUM 277 Fundamentals of 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.

HUM 279 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.

4.6 Equivalence of Old Courses with New Courses

4.6.1 Equivalence of EEE Courses

Course(s) of Old Syllabus		Equivalent Course(s) of New Syllabus	
EEE 101	Electrical Circuits I	EEE 101	Electrical Circuits I
EEE 102	Electrical Circuits I Sessional	EEE 106	Electrical Circuits Laboratory
EEE 103	Electrical Circuits II	EEE 105	Electrical Circuit II
EEE 104	Electrical Circuits II Sessional	EEE 106	Electrical Circuits Laboratory
EEE 105	Computer Programming & Numerical Analysis in Electrical Engineering	CSE 109	Computer Programming
EEE 106	Computer Programming & Numerical Analysis in Electrical Engineering Sessional	CSE 110 EEE212	Computer Programming Laboratory and Numerical Technique Laboratory
EEE 211	Electronic Circuits I	EEE 201	Electronics I
EEE 212	Electronic Circuits I Sessional	EEE 208	Electronics Laboratory
EEE 213	Electronic Circuits II	EEE 207	Electronics II
EEE 214	Electronic Circuits II Sessional	EEE 208	Electronics Laboratory
EEE 230	Electrical Design and Drafting	EEE 314	Electrical Services Design
EEE 231	Electrical Machines I	EEE 203	Energy Conversion I
EEE 232	Electrical Machines I Sessional	EEE 206	Energy Conversion Laboratory
EEE 233	Electrical Machines II	EEE 205	Energy Conversion II
EEE 234	Electrical Machines II Sessional	EEE 206	Energy Conversion Laboratory
EEE 301	Signals and Linear	EEE 301	Continuous Signals and

Course(s) of Old Syllabus		Equivalent Course(s) of New Syllabus	
	Systems		Linear Systems
EEE 303	Electromagnetic Fields and Waves	EEE 209	Engineering Electromagnetics
EEE 305	Measurement and Instrumentation	EEE 427	Measurement and Instrumentation
EEE 306	Measurement and Instrumentation Sessional	EEE 428	Measurement and Instrumentation Laboratory
EEE 307	Electrical Engineering Materials	EEE 307	Electrical Properties of Materials
EEE 310	Electronics Shop Sessional		None
EEE 311	Electronic Circuits III	EEE 207	Electronics II
EEE 312	Electronic Circuits III Sessional	EEE 208	Electronics Laboratory
EEE 313	Telecommunication Engineering	EEE 309 / EEE 441	Communication Theory / Telecommunication Engineering
EEE 314	Telecommunication Engineering Sessional	EEE 310	Communication Laboratory
EEE 315	Industrial Electronics	EEE 473	Power Electronics
EEE 316	Industrial Electronics Sessional	EEE 474	Power Electronics Laboratory
EEE 331	Electrical Machines III	EEE 205	Energy Conversion II
EEE 332	Electrical Machines III Sessional	EEE 206	Energy Conversion Laboratory
EEE 333	Power Transmission and Distribution	EEE 311	Power System II
EEE 400	Project and Thesis	EEE 400	Project/Thesis
EEE 401	Control Systems	EEE 401	Control System I
EEE 402	Control Systems Sessional	EEE 402	Control System I Laboratory
EEE 403	Digital Signal Processing	EEE 311	Digital Signal Processing I
EEE 411	Biomedical Electronics	EEE 425	Biomedical

Course(s) of Old Syllabus		Equivalent Course(s) of New Syllabus	
			Instrumentation
EEE 413	Semiconductor Devices	EEE 413	Solid State Devices
EEE 415	Optoelectronic Devices	EEE 459	Optoelectronics
EEE 417	Digital and Satellite Communication	EEE 437	Digital Communication
EEE 418	Digital and Satellite Communication Sessional	EEE 438	Digital Communication Laboratory
EEE 419	Microwave Engineering	EEE 433	Microwave Engineering
EEE 420	Microwave Engineering Sessional	EEE 434	Microwave Engineering Laboratory
EEE 421	VLSI Circuits	EEE 453	VLSI I
EEE 422	VLSI Circuits Sessional	EEE 454	VLSI I Laboratory
EEE 431	Power System Analysis	EEE 305	Power System I
EEE 432	Power System Analysis Sessional	EEE 306	Power System I Laboratory
EEE 433	Power Stations	EEE 475	Power Plant Engineering
EEE 435	Energy Conversion and Special Machines	EEE 471	Energy Conversion III
EEE 437	Power System Operation and Reliability	EEE 481	Power System Operation and Control
EEE 439	Renewable Energy Systems		None
EEE 441	Switchgear and Protection	EEE 477	Power System Protection
EEE 442	Switchgear and Protection Sessional	EEE 478	Power System Protection Laboratory
EEE 443	High Voltage Engineering	EEE 483	High Voltage Engineering
EEE 444	High Voltage Engineering Sessional	EEE 484	High Voltage Engineering Laboratory

4.6.2 Equivalence of Non-EEE Courses

Course(s) of Old Syllabus		Equivalent Course(s) of New Syllabus	
CHEM 101	Chemistry I	CHEM 101	Chemistry I
CHEM 114	Inorganic, Quantitative Analysis Sessional	CHEM 114	Inorganic Quantitative Analysis Sessional
PHY 109/ PHY 119	Physics	PHY 121	Waves and Oscillation, Optics and Thermal Physics
PHY 102	Physics Sessional	PHY 102	Physics Laboratory
MATH 151	Differential and Integral Calculus	MATH 157 & MATH 159	Calculus I & Calculus II
MATH 153	Differential Equations and Matrices	MATH 257 & MATH 259	Differential Equations & Linear Algebra
MATH 155	Co-ordinate Geometry, Vector Analysis and Statistics	MATH 357	Probability and Statistics
MATH 251	Complex Variables and Harmonics	MATH 159	Calculus II
MATH 253	Transformations and Partial Differential Equations	MATH 257	Ordinary and Partial Differential Equations
HUM 111	English	HUM 135	English
HUM 153	Accounting	HUM 279	Financial and Managerial Accounting
HUM 113	Economics	HUM 277	Fundamentals of Economics
IPE 493	Industrial Management	IPE 493	Industrial Management
CSE 325	Digital Techniques	EEE 303	Digital Electronics
CSE 326	Digital Techniques Sessional	EEE 304	Digital Electronics Laboratory

Course(s) of Old Syllabus		Equivalent Course(s) of New Syllabus	
CSE 421	Microprocessor and Digital Computer	EEE 315	Microprocessor and Interfacing
CSE 422	Microprocessor and Digital Computer Sessional	EEE 316	Microprocessor and Interfacing Laboratory
CE 152	Engineering Drawing	CE 152	Engineering Drawing
ME 263	Fundamentals of Mechanical Engineering	ME 267	Mechanical Engineering Fundamentals
ME 264	Fundamentals of Mechanical Engg. Sessional	ME 268	Mechanical Engineering Fundamentals Laboratory
Shop 256	Foundry, Welding and Machine shop Sessional		None

Chapter 5

EEE COURSES FOR OTHER DEPARTMENTS

The courses offered by the Department of Electrical and Electronic Engineering for undergraduate students of other departments of BUET are following.

5.1 Computer Science and Engineering

EEE 163 Introduction to Electrical Engineering
3 credits, 3 hours/week
Level 1 Term II

Fundamental electrical concepts and measuring units. Direct current: voltage, current, resistance and power. Laws of electrical circuits and methods of network analysis; Introduction to magnetic circuits. Alternating Current: instantaneous and rms values of current, voltage and power, average power for various combination of R, L and C circuits, phasor representation of sinusoidal quantities.

EEE 164 Introduction to Electrical Engineering Sessional
1.5 credits, 3 hours/week
Level 1 Term II

Laboratory experiments based on EEE153.

EEE 263 Electronic Devices and Circuits
4 credits, 4 hours/week
Level 2 Term I

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: Half wave and

full wave rectifiers, clipping and clamping circuits, regulated power supply using Zener diode.

Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies: Hybrid model, h parameters, simplified hybrid model; small signal analysis of single and multi stage amplifiers, frequency response of BJT amplifiers.

Field-Effect-Transistor (FET): principle of operation of JFET and MOSFET; Depletion and Enhancement type NMOS and PMOS; biasing of FETs; low and high frequency models of FETs, switching circuits using FETs; Introduction to CMOS.

Operational Amplifiers (Op-Amps): linear applications of Op-Amps, gain, input and output impedances, active filters, frequency response and noise.

Introduction to feedback, Oscillators, silicon controlled rectifier (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes.

EEE 264 Electronic Devices and Circuits Sessional
1.5 credits, 3 hours/week
Level 2 Term I

Laboratory experiments based on EEE 263.

EEE 269 Electrical Drives and Instrumentation
3 credits, 3 hours/week 3
Level 2 Term II

Introduction to three phase circuits, alternators and transformers; Principles of operation of DC, synchronous, induction, universal and

stepper motors; Thyristor and microprocessor based speed control of motors.

Instrumentation amplifiers: differential, logarithmic, and chopper amplifiers; frequency and voltage measurements using digital techniques; recorders and display devices, spectrum analyzers and logic analyzers; data acquisition and interfacing to microprocessor based systems; Transducers: terminology, types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable resistance and optoelectronic transducers; Noise reduction in instrumentation.

EEE 270 Electrical Drives and Instrumentation Sessional
1.5 credits, 3 hours/week
Level 2 Term II

Laboratory experiments based on EEE 269.

5.2 Civil Engineering

EEE 165 Basic Electrical Technology
3 credits, 3 hours/week
Level 1 Term II

Electrical units and standards. Electrical networks and circuit solution: series, parallel, node and mesh analysis. Instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase RLC circuits: phasor algebra, balanced three phase circuits. Electrical wiring for residential and commercial loads. Introduction to transformers and induction motors.

EEE 166 Basic ElectricalTechnology Sessional
1.5 credits, 3 hours/week
Level 1 Term II

Laboratory experiments based on EEE 165.

5.3 Water Resources Engineering

EEE 165 Basic Electrical Technology
3 credits, 3 hours/week
Level 1 Term II

Electrical units and standards. Electrical networks and circuit solution: series, parallel, node and mesh analysis. Instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase RLC circuits: phasor algebra, balanced three phase circuits. Electrical wiring for residential and commercial loads. Introduction to transformers and induction motors.

EEE 166 Basic Electrical Technology Sessional
1.5 credits, 3 hours/week
Level 1 Term II

Laboratory experiments based on EEE 165.

5.4 Mechanical Engineering

EEE 159 Fundamentals of Electrical Engineering
3 credits, 3 hours/week
Level 1 Term I

Laws of Electric Circuit: Ohm's law, Kirchhoff's voltage and current laws, delta wye transformation. Electrical networks: network analysis methods of branch and loop currents, method of node pair voltages, Thevenin's and Norton's theorems, magnetic concepts and units: magnetic field, right hand rule, magnetic flux density, Biot-Savart law, magnetic field intensity, measurement of magnetic flux, energy of magnetic field, characteristic of ferromagnetic materials, theory of ferromagnetism, B-H curve, hysteresis loss, eddy current and eddy current loss, total core loss, introduction to magnetic circuits. Electromagnetic forces: forces upon a current carrying conductor and charges particle moving in a magnetic field. Electromagnetic torque; electric motor. Electromagnetic induction and emf; Lenz's law, Blv rule, elementary ac generator.

General concepts and definitions. Instantaneous current, voltage and power, R, L, C, RL, RC, and RLC branches, Effective value, average value, form factor, crest factor, power real and reactive. Introduction to vector algebra. Impedance in polar and Cartesian forms. Sinusoidal single phase circuit analysis. Impedance in series, parallel branches, series parallel circuits. Network analysis- Thevenin's theorem. Balanced poly phase circuits: three phase, four wire system of generated emfs, three phase three wire systems, balanced Y loads, balanced delta loads, power in balanced systems, power factor.

EEE 160 Fundamentals of Electrical Engineering Sessional
1.5 credits, 3 hours/week
Level 1 Term I

Laboratory experiments based on EEE 159.

EEE 259 Electrical and Electronic Technology
4 credits, 4 hours/week
Level 2 Term I

Balanced three phase circuit analysis and power measurement. Single phase transformer- equivalent circuit and laboratory testing, introduction to three phase transformers. DC generator principle, types, performances and characteristics. DC Motor: principles, types of motor, performances, speed control, starters and characteristics. AC Machines: three phase induction motor principles, equivalent circuit. Introduction to synchronous machines and fractional horse power motors.

Semiconductor diode, transistor characteristics, equivalent circuits, self biasing circuits, emitter follower amplifiers, push pull amplifier. Introduction to silicon controlled rectifier and its application. Oscilloscope. Transducers: strain, temperature, pressure, speed and torque measurement.

EEE 260 Electrical and Electronic Technology Sessional
1.5 credits, 3 hours/week
Level 2 Term I

Laboratory experiments based on EEE 259.

5.5 Chemical Engineering

EEE155 Electrical Engineering Fundamental:
3 credits, 3 hours/week
Level 1 Term I

Electrical units and standards, electrical networks and circuit theorems, introduction to measurement and instrumentations.

Alternating current, RLC series, parallel circuits, magnetic concepts and magnetic circuits.

EEE 156 Electrical Engineering Fundamentals Sessional
1.5 credits, 3 hours/week
Level 1 Term I

Laboratory experiments based on EEE 155.

EEE 267 Electrical and Electronic Technology
3 credits, 3 hours/week
Level 2 Term I

Balanced three phase circuits. Introduction to single phase and three phase transformers. Principles of construction, operation and applications of DC generator, DC motor, synchronous generator, synchronous motor and induction motor. Semiconductor diode, transistors, operational amplifiers (Op-Amps), silicon controlled rectifiers (SCRs): principles of operation and applications. Oscilloscope. Transducers: temperature, pressure, flow rate, speed and torque measurements.

EEE 268 Electrical and Electronic Technology Sessional
1.5 credits, 3 hours/week
Level 2 Term I

Laboratory experiments based on EEE 267.

5.6 Materials and Metallurgical Engineering

EEE155 Electrical Engineering Fundamental
3 credits, 3 hours/week
Level 1 Term I

Electrical units and standards, electrical networks and circuit theorems, introduction to measurement and instrumentations.

Alternating current, RLC series, parallel circuits, magnetic concepts and magnetic circuits.

EEE 156 Electrical Engineering Fundamentals Sessional
1.5 credits, 3 hours/week
Level 1 Term I

Laboratory experiments based on EEE 155.

EEE 267 Electrical and Electronic Technology
3 credits, 3 hours/week
Level 2 Term II

Balanced three phase circuits. Introduction to single phase and three phase transformers. Principles of construction, operation and applications of DC generator, DC motor, synchronous generator, synchronous motor and induction motor. Semiconductor diode, transistors, operational amplifiers (Op-Amps), silicon controlled rectifiers (SCRs): principles of operation and applications. Oscilloscope. Transducers: temperature, pressure, flow rate, speed and torque measurements.

5.7 Naval Architecture and Marine Engineering

EEE 161 Electrical Engineering Principles
3 credits, 3 hours/week
Level 1 Term II

Direct Current: Theorems of electric circuit, electrical network analysis, measuring instruments.

Alternating current: AC quantities and waveforms, phasor algebra, AC circuit analysis, three phase circuits.
Transformers: Single phase and three phase, auto transformer.

Fundamentals of DC generators, DC motors: principle and operation.

EEE 261 Electrical and Electronic Technology for Marine Engineers
3 credits, 3 hours/week
Level 2 Term II

Three phase induction motors. AC generators, synchronous motor, speed control of three phase motors.

Diodes, BJTs, diode and BJT circuits, BJT, MOSFET and SCR as power switching devices, controlled rectifiers and inverters.

Radar and wireless equipments, electronic navigation aids, LORAN, RDF and Decca Chain.

EEE 262 Electrical and Electronic Technology for Marine Engineers Sessional
1.5 credits, 3 hours/week
Level 2 Term II

Laboratory experiments based on EEE 261.

5.8 Industrial and Production Engineering

EEE 167 Basic Electrical and Electronic Circuits
4 credits, 4 hours/week
Level 1 Term II

Direct Current Circuits: laws and theorems, DC network analysis.

Alternating current: AC quantities and sinusoidal waveforms, phasors, AC circuit analysis: series and parallel branches –RL, RC and RLC. Balanced three phase circuits.

Semiconductor diode: operation, characteristics and applications. Introduction to bipolar transistor (BJTs): characteristics, common emitter (CE), common base (CB) and common collector (CC) amplifier configurations.

EEE 168 Basic Electrical and Electronic Circuits Sessional
1.5 credits, 3 hours/week
Level 1 Term II

Laboratory experiments based on EEE 167.

EEE271 Electrical Machines and Electronics
3 credits, 3 hours/week
Level 2 Term I

Single phase transformer. DC motor: principle and applications. Three phase induction motor: principle and applications. Introduction to synchronous motors and fractional horse power motors.

Introduction to operational amplifiers (Op-Amps) and applications. Silicon controlled rectifier (SCR): operation and characteristics. Power control using SCR. Transducers: strain, temperature, pressure, speed and torque measurements.

EEE272 Electrical Machines and Electronics Sessional
1.5 credits, 3 hours/week
Level 2 Term I

Laboratory experiments based on EEE 271.

5.9 Architecture

EEE 373 Building Services III: Electrical
2 credits, 2 hours/week
Level 3 Term II

Electrical units and standards, electrical networks and circuit theorems, alternating current (AC) RLC series and parallel circuits, introduction to electrical wiring for residential, commercial and industrial installations and buildings, illumination and different types of lighting.