Syllabus for Academic Year 2017-2018

Department of Electrical and Electronic Engineering (EEE)

Undergraduate Program

Bachelor of Science in Electrical and Electronic Engineering

LEADING UNIVERSITY

SYLHET, B A N G L A D E S H

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Syllabus for B.Sc. in Electrical and Electronic Engineering
Academic year 2017-18
Faculty of Modern Science
Leading University

OUTLINES

1. Introduction

The establishment of the Leading University in Sylhet, a holy place of the country, was exclusively a noble idea of a distinguished personality, Dr. Sayed Ragib Ali, who is well known for his philanthropic contributions to educational institutions all over the country. Dr. Sayed Ragib Ali is a pioneer in establishing the first private university in Bangladesh named North South University. He is the founder vice chairman of North South University and the chairman of Asia Pacific University. On his proposal for establishing Leading University to the Ministry of Education on 24th August 1996, the Ministry issued permission on 28th August 2001 to establish this university. Leading University was inaugurated on 4th March, 2002. It started its first semester that day. It had on its rolls 106 students in the first semester at undergraduate program. The large number of students in the initial semester itself was a milestone and a source of inspiration to the organizers of the University.

2. Overview of the department

Department of Electrical and Electronic Engineering was established in 2010. It started programs for regular and evening batch in Fall-2010. In the sequel of continuous development, the department set up some sophisticated laboratories of vigorous technology. In addition to the fruity teaching environment comprising of experienced teachers from national and international universities, the department in not only determined to provide high standard education but also committed to offer research facilities of modern engineering technology. We believe in serving quality education to the students so that they become matured, smart in engineering and skilled to compete in acquiring jobs after their graduation from this department.

3. Vision

To develop the B.Sc. in EEE program providing nobility in the territory of Electrical & Electronic Engineering through outstanding education and research to advance a climate of novelty and inclination for the betterment of humanity.

4. Mission

The mission of the B.Sc. in EEE program is to build its graduates with knowledge, skill, attitudes, commitment to professional and societal responsibilities and doctrine, by developing the ability of self-motivation and critical thinking, for diverse and competitive career path.

5. Faculty Members

Advisor

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Adjunct Lecturer

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*** denotes 'Faculties on study leave'**

6. Program Objective

- Graduates will successfully engage in careers in EEE appropriate to their background, interest and skills.
- Graduates will engage in continuous learning and professional development in engineering and other professional fields.
- Graduates will develop as technical leaders in their chosen profession and contribute to the technical growth.

7. Program Learning Outcomes (PLOs)

A. Knowledge and Understanding

At the end of the program, students should have –

1. detailed knowledge of scientific concepts, facts, principles and theories required by electrical and electronic engineers,
2. the ability to apply the mathematical formulas required by electrical and electronic engineers,
3. Basic knowledge of different interdisciplinary engineering courses, especially programming, IT and mechanical engineering.
4. The Knowledge of general educations and contemporary issues.
5. A knowledge and understanding of professional and ethical responsibility of an engineer to the society.

B. Intellectual Skills

At the end of the course, students should be able to –

1. Design a model, component and process to meet a need.
2. Critically evaluate alternate assumptions, approaches, procedures and results related to engineering problems.
3. Analyze and interpret data.
4. Plan, conduct and report on a program of original research.

C. Practical Skills

At the end of the program, students will be able to –

1. Execute experiments in a laboratory safely.
2. Demonstrate techniques and skills required for engineering practice.
3. Work in a group/team and communicate effectively.
4. Analyze experimental results and determine their validity.
5. Write technical reports and give technical presentations.
6. Handle the real life technical challenges.

8. Program Education Outcomes (PEOs)

I. Graduates of the EEE program will successfully integrate the fundamentals of electrical and electronic engineering to design, implement and develop innovative solutions to complex technological problems. [A(1-3), B(1-2), C(1-2)]

II. Graduates of the EEE program will be prepared to launch their careers or pursue graduate studies in electrical engineering, electronics, communications engineering, power systems, control system, robotics, or their chosen field and engage in life-long learning. [A(1-2), B, C(4-6)]

III. Graduates of the EEE program will possess excellent communication and organizing skills, and excel in team work. [A(3-4), C(3)]

IV. Graduates of the EEE program will be recognized in their chosen fields for their leadership, integrity and sensitivity to global societal issues. [A(4-5), C(3)]

9. Degree offered by the faculty

Our degree-offering department is the Department of Electrical and Electronic Engineering, which is under Faculty of Modern Sconce.

10. Duration of a semester

University's academic programs operate on semester system (14 weeks per academic semester including exam). For 1 credit theory course, will be equal to minimum 13 hours of actual lecture time per semester of a tri-mister system. For 1 credit lab course minimum of 26-hours of actual lab works per semester of a tri-mister system will be required that means theory class will have a duration of 1 hour for 1 credit hour and each lab class will have a minimum duration of 2-hours for 1 credit hour and 3 hours for 1.5 credit hour. Course credit is assigned according to the number of in-class contact hours associated with the course.

11. Requirements for admission into the EEE program

For EEE program, students passed H.S.C. /A level with mathematics, physics and chemistry are eligible for the admission. At least a second division or minimum CGPA 2.5 out of 5.0 GPA in the S.S.C and H.S.C. examination, or five subjects O-level and two major subjects in A-level where grade B in at least 4 subjects and grade C in remaining subjects are required for admission into EEE program of the Leading university. Students obtaining diploma in engineering from Bangladesh Technical Education Board (BTEB) or equivalent with a GPA of 2.5 or above, or at least second division are eligible for admission.

12. Grading system

All course works are graded according to a unified grading system* as shown in the following chart.

Numerical Grade	Letter Grade		Grade Point
80% and 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

*Uniform grading system is provided by UGC

13. Degree requirement and graduation time

Minimum requirement to obtain B.Sc. in EEE degree is 157 credits. Student may complete the EEE program in four (4) years unless otherwise permitted for the extension for the study. Students have to complete the program with at least CGPA of 2.00 in all university courses. In addition, a minimum CGPA of 2.50 should be maintained in all core and advanced courses.

14. Grade Points

Grade point Average (G.P.A.) is an expression for the average performance of a student in the course he/she has offered during a particular semester. This is calculated by adding the quality points of all the courses taken, divided by the total number of Credit Hours offered: -

$$G.P.A = \frac{Sum \text{ of Quality Points}}{Sum \text{ of the Credit Hours}}$$

Cumulative Grade Point Average (C.G.P.A) is the expression describing the performance of a student in all semester is determined by the following way:

$$C.G.P.A. = \frac{Sum\text{ of the Quality Points for the courses appeared}}{Sum\text{ of the Credit Hours for all the courses appeared}}$$

A student's grade point average will be determined by dividing the total number of grade points by the total number of hours attempted with the exception of courses in which marks of "W" and "I" are received. The letters correspond to withdrawal, retake and incomplete respectively.

- The grade withdrawal (W) is given when a student officially drops a course during the period as noticed by the registrar office. A "W" does not affect the students CGPA.
- The grade incomplete (I) is given when a student absents in the semester final examination in special circumstances. The student may also be given "I" grade if he/she does not complete the mandatory assessment sections such as viva, assignment and lab report. However, the student will be given appropriate grade as soon as he /she complete the required assessment within period noticed by the registrar office.

15. Readmission

Students who do not register for two consecutive Semesters have to submit application for readmission by payment of the requisite readmission fee of the university.

16. Cancellation of Admission

Admission of a student may be cancelled by the university authority for under-mentioned reasons:

- If a student gets involved in any activity that goes against discipline or rules and regulations of the university.
- If a student submits fake certificates and/or transcripts at the time of his / her admission.

17. Supplementary, Overlapped, Improvement and Reading Courses:

a) The students of final semester may be permitted to appear at the supplementary examination to pass their dropped/failed courser s) maximum of 12 credits. The fees of the supplementary examination will be 20 percent per credit higher than regular fees per credit.

b) The student(s) who dropped/failed more than 12 credits he/she will have to complete their credits after taking special permission of the authority. In this case, re-registration will be required for any semester(s) to complete the rest coursers) along with regular course fee.

c) Dropped students who could not appear at the examinations for unavoidable circumstances will appear at the make-up examination within 10 days after the mid- term & final examination are over as per existing rules.

d) The students who did not pass the regular examination, he/she will retake the courser(s) in the next semester to pass & complete the course(s) within two consecutive semesters, as per existing rules. (Continuous\assessment marks will remain valid for the said students).

e) Students who obtained below letter grade B in a course, he/she may avail the opportunity for improving the results by retaking the course(s). Students who want to improve grade, he/she must appear in the next immediate semester final examination for once only, students who obtained F grade, they also be permitted to appear at the said examination twice for improving 'the F grade. (Continuous assessment marks of the relevant semester will remain valid for the said students.)

f) Supplementary examination will be held within 15 days after publication of final semester result.

g) As regards Reading course(s): students will be treated like as dropped and failed students and they will appear at the Supplementary examinations. (Continuous assessments marks will remain valid). Reading students who are time barred/validity of registration is expired may be permitted on special ground by the authority to appear at the supplementary examination after re-admission in the program.

18. Course Designation and Numbering System

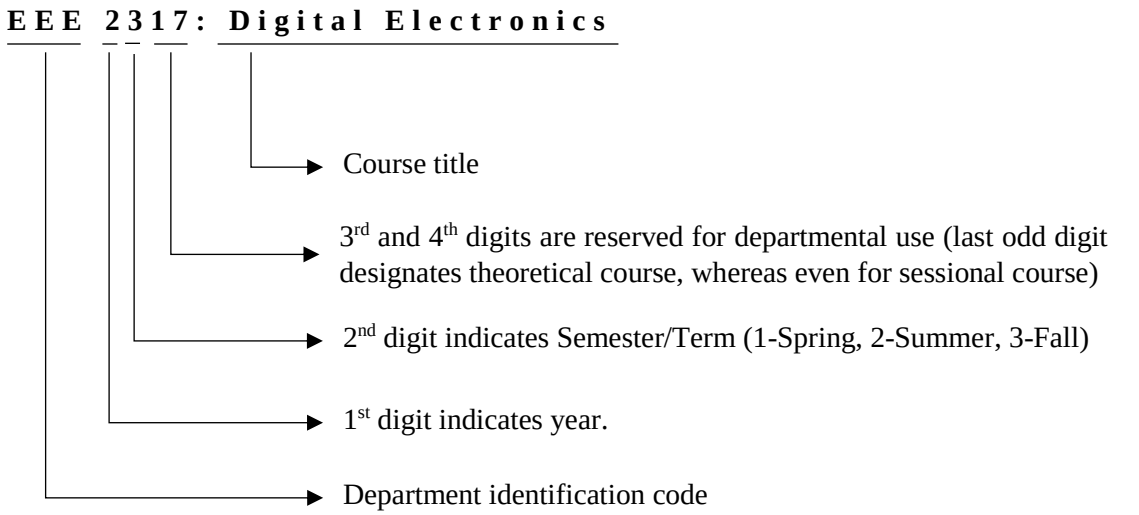
- The first part of a course code having three letters indicate the course offering department followed by a four-digit number with the following criteria:

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

b. The second digit will correspond to the semester/term in which the course is normally taken by the students.

c. The third and fourth digits will be reserved for departmental use, of which the last digit will be odd for theoretical and even for sessional/laboratory course.

- The course designation system is illustrated by the following example:



- Project/thesis courses shall be designated by the departmental identification code followed by 4800 (Example EEE 4800) applicable in both odd and even Terms.

19. Classification of Courses

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

- **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 program. A student has to complete all of the designated core courses for his/her discipline.
- **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.
- **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.

20. Department Functional Bodies

S/N	Description	Members	Responsibility
1.	Project/Thesis & Research Advisory Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rupak Kanti Dhar	1. Proposal collection 2. Assigning supervisor and co-supervisor
2.	Course Offering, Distribution and Registration Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rafiqul Islam 4. Md. Ashraful Islam	1. Course offering, distribution and registration
3.	Routine Committee	1. Prof. Dr. Kh. Mominul Haque 2. Rafiqul Islam 3. Rupak Kanti Dhar	1. preparing exam and class routine
4.	Exam Management & Question Moderation Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rafiqul Islam	1. arranging mid and final term exam 2. moderating questions
5.	Curriculum Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rafiqul Islam	1. Curriculum development, upgradation and moderation.
6.	Treasurer of the Department	1. Md. Ashraful Islam	1. Monitoring financial activities
7.	Lab advisory Committee	1. Prof. Dr. Kh. Mominul Haque 2. Rafiqul Islam 4. Rupak Kanti Dhar	1. Lab monitoring
8.	Departmental Disciplinary Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rafiqul Islam	1. monitoring disciplinary activities

9.	Documentation Committee	1. Prof. Dr. Kh. Mominul Haque 2. Md. Ashraful Islam 3. Niaz Morshedul Haque	1. Preparing and publishing all kinds of documents 2. Public relation
10.	Departmental Equivalence Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rafiqul Islam 4. Engr. Md. Lutfor Rahaman	1. Credit correction
11.	Departmental Requisition & Purchase Committee	1. Prof. Dr. Kh. Mominul Haque 2. Mrinal Kanti Dhar 3. Rupak Kanti Dhar 4. Niaz Morshedul Haque	1. Requisition and Purchase
• Head of the department is by default convener of all the committees.			

21. Academic Policy

21.1 Right to change Rules

The University reserves the right to change or revise requirement, rules, and fees. Such regulations shall come into force whenever the proper authorities may determine.

21.2 Right to dismiss students

Students are individually responsible to read and know regulations contained in the LU prospectus. Failure to read and comply will not exempt students from liabilities.

21.3 Conducts of Students

LU strives to maintain a healthy academic atmosphere in its campus. They should read and grasp students' conduct rules. All students are expected to actively contribute to achieving this goal by attending classes regularly and making appropriate use of all campus facilities. They shall endeavor to enhance their academic atonements, maintain discipline, and keep the campus clean. In short, students are expected to be good citizens. The university does not prescribe any dress requirement, but students are expected to be dressed properly.

21.4 Academic Honesty

Any material plagiarized or otherwise dishonestly prepared that a student submits as original work is taken to be cheating and constitutes grounds for disciplinary actions. Any student judged to have engaged in cheating might receive a reduced grade for the work in question, a failing grade in the course, or such other lesser penalty, as the teacher deems appropriate. Serious instance of discipline shall be dealt with more severity.

21.5 Medium of Instruction

English is the medium of instruction and examination. It is also the campus language. A remedial English course has been introduced for the students who are deficient in English.

21.6 Course Load

The normal load of eighteen-hour class lectures and lab session per week is generally expected of the students by accepted standard. In addition, there will be assignments, homework and examinations each week. Moreover, the faculty will hold consultation and/or tutorial. Thus, raising contact hours to twenty-two. Students will have to access to the computer lab to prepare their papers and other assignments under supervision for up to 30 hours each semester. Preparation of papers and other assignments under supervision will raise workload to 30 hours a week. A student can graduate with the minimum requirements of 157 credits in four years.

21.7 Semester

The University offers three semesters in each academic year namely, Spring, Summer and Fall Semesters. Each semester lasts for 14 weeks. Spring semester starts in January, Summer in May and Fall in September.

21.8 Change of Department and Program

Students may change his/ her Program and Department by a written application to the Registrar through receiving permission from the departments concerned. Then, Office of the Admission will make necessary changes in the student's record for change or transfer. Inter department Change or Transfer must be made within one year of getting admitted into LU (Fee applicable).

21.9 Class Attendance

Regular class attendance is a prerequisite for successful completion of course works. Teacher shall be responsible to inform students of the consequences of absence from class. The student shall be responsible to inform the teachers of possible absence from classes. Absence

does not exempt students from obligations of class assignments and examinations. The teacher concerned will determine the manner in which missed assignments and examinations may be made up. A student may be dropped from a course for consecutive three absences. Attendance is regarded as a part of the course requirement. The expected attendance is 90% of classes being held. A student may be debarred from appearing at the course Final Examinations if his/her attendance falls below 60%. Students are given marks on class attendance.

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

Attendance	**Marks**
90% and above	100%
85% to less than 90%	90%
80% to less than 85%	80%
75% to less than 85%	70%
70% to less than 75%	60%
65% to less than 70%	50%
60% to less than 65%	40%
Less than 60%	0%

21.10 Student Classification (class)

A student is called a freshman, sophomore, junior, Senior or graduate. Students are classified in accordance with credits earned. The credits earned are used to establish class standing as follows:

Credits Earned	**Class**
0 to 30	Freshman
31 to 60	Sophomore
61 to 90	Junior
Over 90	Senior
Earned	Graduate

21.11 Change of Degree Program

Students who wish to change their degree program must submit a request to the Chair of the Department. Upon recommendation of the Chairperson of the academic department to which the student intends to change, the office of the registrar shall make the necessary changes to a student's record.

21.12 Credit Transfer from Other Institutions

Students may transfer credit from other equivalent and *UGC* approved institutions from home and abroad to LU by submitting syllabus and official transcripts from previous institutions along with admission application. In case of transfer of credits, a student is required to complete a minimum 60% of total credits in any program of LU to obtain a degree. That is maximum 40% credits of a program may be accepted from other institutions. Students intend to transfer credits must obtain minimum grade point of 2.75 out of 4 on a particular course/courses along with satisfaction of other rules of equivalence in the LU that would be determined by the specific program and department. Students not applying for course waiver/credit transfer within stipulated time will not be granted course waiver later on. Regarding transfer of credit the decision of the Equivalence Committee of the specific academic program in a department at the LU shall be final. If Equivalence Committee desires, in appropriate case, students applied for transfer of credits may be required to sit for placement examinations to determine eligibility of credit transfer. Credits transferred from other institutions will not be counted for CGPA calculation. The transferred credits will be presented in the transcript of LU by showing as 'Waived'.

21.13 Student Dismissal

Students are dismissed from the program, for failing to maintain the required CGPA (2.00) in two consecutive semesters. Students dropped out of the program may appeal to the Dean/Head of the Department for re-admission. Re-admission will not be granted without strong evidence of significant change in students' ability to complete the requirements satisfactorily.

21.14 Distribution of Marks

The distribution of marks for a given course will be as follows:

i. Theory courses:

Attendance	10%
Class tests/Assignments/Spot test, etc.	10%
Viva-voce/Presentation, etc.	10%
Mid-term examination	30%
Final term examination	40%
Total:	100%

ii. Independent laboratory/design/sessional/field work courses:

Attendance	10%
Viva-voce/Presentation, etc.	10%
Reports	20%
Skill test	20%
Lab Exam/Quiz	40%
Total:	100%

iii. Project/Thesis (Continued for two terms)

At the beginning of the 11th semester, students should enroll a 6-credit thesis/project, which will continue for consecutive two semesters, i.e. 11th semester and 12th semester. At the end of the 11th semester, students should attend a pre-defense to demonstrate their work progress. At the end of the 12th semester, students should appear for their final defense. Following evaluation scheme will be followed while evaluating and awarding grades:

(a) Day to day work, **40**% awarded by the Supervisor(s).

(b) Pre-defense Viva-Voce, **10**% awarded by a panel.

(c) Project/Thesis Report **25**% awarded by a Panel.

(d) Final Viva-Voce, **25**% awarded by a panel.

A panel should be consisted of at least three members including supervisor(s) against five students. An external expert is preferred to form the part of panel, if possible.

21.15 Assessments, Tests and Examinations

- The nature of questions should be of varied nature such as MCQ, short type, Broad type, Case Study, Specific problems etc. or in any other form as the tutors deem it necessary to judge the comprehensive study as well as the merit of the students.
- Questions for mid-term and semester final examination will be submitted at least two weeks ahead of Exam dates as these questions will be sent to Moderation Board.
- Duration of the Mid-Term exam is 1.5 hour and Final Examination is 2 hours.
- According to the schedule of examinations, written examinations are held in all courses upon the completion of each semester's work. No one is to be excused from the final examinations.

- Course Instructor/Tutor shall conduct their respective tests and Exams.
- *Continuous assessment*: For theory courses, minimum two class tests will be taken, one before mid-term examination and another before final term examination. The class teacher may also assign problems to the students and take spot test for assessment. Duration of class test should be 20-30 minutes and spot test should be 10-20 minutes. Apart from these, assessment can be carried on in the form of viva-voce/presentation/quiz, etc.

21.16 Assessment Tools

i. Theory courses:

Class participation (attendance)

Continuous assessment (quiz, spot test, open book exam, viva-voce (oral), presentation, assignments, written exams, etc.)

Term final examination (written test)

ii. Sessional courses:

Class participation (attendance)

Sessional assessment (field work, lab work, case study, performance, spot test, open book exam, presentation, assignments, written exams, etc.)

Viva-voce (oral)

iii. Thesis/project:

Participation (Contact/Discussion/Communication with the supervisor)

Evaluation (report, project paper, monograph)

Viva-voce (oral)

21.17 Teaching Strategy

Teachers of the Department of EEE of Leading University use lecture, assignment, group assignment, role playing, presentation, viva-voce, students centered learning/interactive teaching, seminar in theory courses and for practical courses they use demonstration, project/assignment, skill test, quiz, etc. The teaching aids that are used by the teachers are: multimedia projector, whiteboard, overhead projector but now-a-days mostly multimedia projector.

22. Program Structure

Program Name: Bachelor of Science in Electrical and Electronic Engineering

Program Duration: 04 years

No. of semesters/term: 12

Semester/Term duration: 14 Weeks

Minimum credit hours to be earned: 157

There are several types of courses included in the program which are shown in below.

• **English (6 Credit Hour):** English Reading, English Composition, Spoken English, English Reading and Speaking.

• **General Education Courses (GED) (15 Credit Hour):** Students will have to complete five GED Courses in the following academic areas: History, Anthropology, Geography, Sociology, Political Science, Psychology, International Relations, Art, Literature, Music, and Philosophy**.** There is a list of our GED courses from where five courses are offered.

• **Basic Sciences (09 Credit Hour):** Courses in the following academic areas qualify as science credits: Chemistry, Physics I & II with labs.

• **Interdisciplinary Engineering Courses (17 Credit Hour):** Students will have to complete interdisciplinary Engineering Courses in the following academic areas: Computer Science, Mechanical Engineering, and Civil Engineering.

• **Mathematics (15 Credit Hour):** There are five mathematics courses in different mathematical area such as Differential and Integral Calculus, Linear Algebra and Complex Analysis, Differential Equations and Fourier analysis, Co-ordinate Geometry and Vector Analysis, Probability and Statistics.

• **Program Core Courses (95 Credit Hour):** Students will have to complete 95 credit hours of core courses including 30 credit hours of elective courses based on different field of electrical and electronic engineering.

Course outline and detailed course description are given in following section.

Course Outline for

Bachelor of Science in Electrical and Electronic Engineering

Summary of Courses

Types of Courses	No. of Courses	Credit Hours
English Courses	2	6
GED courses	5	15
Basic Science Courses	3	9
Mathematics Courses	5	15
Computer Courses	4	11
Inter disciplinary Engineering Courses	2	6
Program core courses	31	65
Elective courses	10	30
Total	**62**	**157**

List of Courses

Interdisciplinary Courses				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours / Week**	**Prerequisite Courses**
English Courses (6 credit hours)				
ENG-1113	English Reading and Speaking	3	3	N/A
ENG-1213	English Composition / Writing	3	3	N/A
Total		**6**	**6**	
List of General Education Courses (15 credit hours)				
ART-1111	Bangladesh Studies	3	3	N/A
ART-1213	Introduction to Sociology	3	3	N/A
ART- 2213	Professional Ethics	3	3	N/A
ECON-2311	Principals of Economics	3	3	N/A
ACC-2111	Principles of Accounting	3	3	N/A
Basic Science Courses (9 credit hours)				
PHY-1311	Physics I	2	2	N/A

PHY-1312	Physics I Lab	1	2	N/A
PHY-2213	Physics II	2	2	PHY-1311
PHY-2214	Physics II Lab	1	2	PHY-1312
CHEM-2311	Chemistry	2	2	N/A
CHEM-2312	Chemistry Lab	1	2	N/A
Total		**09**	**12**	
Mathematics Courses (15 credit hours)				
MATH-1111	Differential and Integral Calculus	3	3	N/A
MATH-1213	Linear Algebra and Complex Analysis	3	3	MATH-1111
MATH-1315	Differential Equations and Fourier Analysis	3	3	MATH-1213
MATH-2111	Co-ordinate Geometry and Vector Analysis	3	3	MATH-1315
MATH-2213	Probability and Statistics	3	3	N/A
Total		**15**	**15**	
Computer courses (11 credit hours)				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours / Week**	**Prerequisite Courses**
CSE-1111	Introduction to Computers	2	2	N/A
CSE-1213	Computer Programming	2	2	CSE-1111
CSE-1214	Computer Programming Lab	1	2	CSE-1112
CSE-2111	Numerical Methods	2	2	N/A
CSE-2112	Numerical Methods Lab	1	2	N/A
CSE-3115	Computer Networks	2	2	CSE- 1111
CSE-3116	Computer Networks Lab	1	2	CSE- 1112
Total		**11**	**22**	
Other Engineering Discipline Courses (6 credit hours)				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours / Week**	**Prerequisite Courses**
CE-2112	Computer Aided Engineering Drawing	2	4	N/A
ME-2211	Mechanical Engineering Fundamentals	3.0	3.0	N/A
ME-2212	Mechanical Engineering Fundamentals Lab	1.0	2.0	N/A
Total		**6**	**9**	
EEE Core Courses (65 credit hours)				

Course Outline (Regular)

Course Code	Course Title	Credit Hours	Contact Hours	Prerequisite Courses
EEE-1111	Electrical Circuits I	3.0	3.0	N/A
EEE - 1112	Electrical Circuits I Lab	1.0	2	N/A
EEE-1213	Electrical Circuits II	3.0	3.0	EEE-1111
EEE-1214	Electrical Circuits II Lab	1.5	3.0	EEE-1111 & EEE-1112
EEE-1315	Electronics I	3.0	3.0	EEE-1111 & EEE-1213
EEE-1316	Electronics Circuit Simulation Lab	1.5	3.0	EEE-1214 & EEE-1112
EEE-1317	Energy Conversion I	3.0	3.0	EEE-1111 & EEE-1213
EEE-2213	Energy Conversion II	3.0	3.0	EEE-1317
EEE-2214	Energy Conversion Lab	1.5	3.0	EEE-1214
EEE-2315	Electronics II	3.0	3.0	EEE-1315
EEE-2316	Electronics II Lab	1.5	3.0	EEE-1316
EEE-2317	Digital Electronics	3.0	3.0	EEE-2315
EEE-2318	Digital Electronics Lab	1.5	3.0	EEE-2316
EEE-3111	Signals and Linear Systems	2.0	2.0	MATH- 1213
EEE-3112	Signals and Linear Systems Lab	1.5	3.0	CSE- 2112 & EEE- 1316
EEE-3113	Electromagnetic Field and Waves	2.0	2.0	PHY-3111 & MATH- 2111
EEE-3115	Power System I	3.0	3.0	EEE-2213
EEE-3116	Power System I Lab	1.0	2.0	EEE-1214 & EEE-2214
EEE-3217	Basic Communication Engineering	2.0	2.0	EEE-3111
EEE-3218	Basic Communication Engineering Lab	1.0	2.0	EEE-3112
EEE-3221	Microprocessor, Assembly Language & Computer Interfacing	3.0	3.0	EEE-2317
EEE-3222	Microprocessor, Assembly Language & Computer Interfacing Lab	1.0	2.0	EEE- 2318
EEE-3324	Electrical Services Design	1.0	2.0	EEE- 1213 & EEE-1214
EEE-3325	Electrical Properties of Materials	2.0	2.0	PHY- 2213
EEE-3327	Digital Communication	3.0	3.0	EEE-3217
EEE-3328	Digital Communication Lab	1.0	2.0	EEE-3218
EEE-3219	Control System I	2.0	2.0	EEE-3111
EEE-3220	Control System I Lab	1.0	2.0	EEE-3112
EEE-3329	Digital Signal Processing I	2.0	2.0	EEE-3327
EEE-3330	Digital Signal Processing I Lab	1.0	2.0	EEE-3328
EEE 4800	Project/Thesis	6.0	12.0	
	Total	**65**	**88**	

List of Elective courses (30 credit hours)

Communication group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours**	**Prerequisite Courses**
ECE-4111	Random Signals and Processes	3	3	EEE-3329
ECE-4113	Digital Signal Processing II	3	3	EEE-3329
ECE-4115	Microwave Engineering	2	3	EEE-3313 & EEE- 3327
ECE-4117	Optical Fiber Communication	3	3	EEE-3327
ECE-4221	Cellular Mobile & Satellite Communication	3	3	EEE-3327
ECE-4223	Telecommunication Engineering	3	3	EEE-3327
ECE-4229	Data Communication	2	2	N/A
ECE-4230	Data Communication Lab	2	1	N/A

Power group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours**	**Prerequisite Courses**
EEE-4011	Power System II	3	3.0	EEE-3115
EEE-4113	Energy Conversion III	3	3.0	EEE-2213
EEE-4115	Power Electronics	3	3.0	EEE-2315
EEE-4116	Power Electronics Lab	1	2.0	EEE-2316
EEE-4117	Power Plant Engineering	3	3.0	EEE-4011
EEE-4119	Renewable Energy Conversion	2	2.0	EEE-2213
EEE-4229	Switchgear and Protection	3	3.0	EEE-4011
EEE-4230	Switchgear and Protection Lab	1	2.0	EEE-2214
EEE-4231	High Voltage Engineering	2	2.0	EEE-4011
EEE-4232	High Voltage Engineering Lab	1	2.0	EEE-2214
EEE-4341	Advanced Machines	3	3.0	EEE-2213

Electronics group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours**	**Prerequisite Courses**
EEE-4121	Solid State Devices	2	2	EEE-1317
EEE-4123	Analog Integrated Circuits	3	3	EEE-1317
EEE-4127	VLSI I	2	2	EEE-2315
EEE-4128	VLSI I Lab	1	2	EEE-2316
EEE-4237	Optoelectronics	3	3	EEE-2315
EEE-4343	Biomedical Instrumentation	2	3	N/A
EEE-4344	Biomedical Instrumentation Lab	1	2	N/A
EEE-4345	Measurement and Instrumentation	2	2	EEE- 1213

Approximate Course Distribution

First Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ENG-1113	English Reading and speaking	3	3	N/A
ART-1111	Bangladesh Studies	3	3	N/A
MATH-1111	Differential and Integral Calculus	3	3	N/A
CSE-1111	Introduction to Computers	2	2	N/A
EEE-1111	Electrical Circuits I	3	3	N/A
EEE-1112	Electrical Circuits I Lab	1	2	N/A
Total		**15**	**16**	

Second Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ENG-1213	English Writing/ composition	3	3	ENG-1111
ART-1213	Introduction to Sociology	3	3	N/A
MATH-1213	Linear Algebra and Complex Analysis	3	3	MATH-1111
CSE-1213	Computer Programming	2	2	CSE-1111
CSE-1213	Computer Programming Lab	1	2	CSE-1112
EEE-1213	Electrical Circuits II	3	3	EEE-1111
EEE-1214	Electrical Circuits II Lab	1.5	3	EEE-1112
Total		**16.5**	**18**	

Third Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
MATH-1315	Differential Equations and Fourier Analysis	3	3	MATH-1213
PHY-1311	Physics I	2	2	N/A
PHY-1312	Physics I Lab	1	2	N/A
EEE-1315	Electronics I	3	3	EEE-1213 & EEE- 1111
EEE-1316	Electronics Circuit Simulation Lab	1.5	3	EEE-1214
EEE-1317	Energy Conversion I	3	3	EEE-1213
Total		**13.5**	**16**	

Fourth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ACC-2111	Principles of Accounting	3	3	N/A
MATH-2111	Co-ordinate Geometry and Vector Analysis	3	3	MATH-1315
CSE-2111	Numerical Methods	2	2	N/A
CSE-2112	Numerical Methods Lab	1	2	N/A
CE-2112	Computer Aided Engineering Drawing	2	2	N/A
EEE-2213	Energy Conversion II	3	3	EEE-1317
EEE-2214	Energy Conversion Lab	1.5	3	EEE-1214
Total		**15.5**	**18**	

Fifth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ECON-2211	Principles of Economics	3	3	N/A
MATH-2213	Probability and Statistics	3	3	N/A
PHY-2213	Physics II	2	2	PHY-1311
PHY-2214	Physics II Lab	1	2	PHY-1312
ME-2211	Mechanical Engineering Fundamentals	2	2	N/A
ME-2212	Mechanical Engineering Fundamentals Lab	1	2	N/A
Total		**12**	**14**	

Sixth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
CHEM-2311	Chemistry	2	2	N/A
CHEM-2312	Chemistry Lab	1	2	N/A
MGT-2315	Introduction to Business	3	3	N/A
EEE-2315	Electronics II	3	3	EEE-1315
EEE-2316	Electronics II Lab	1.5	3	EEE-1316
EEE-2317	Digital Electronics	3	3	EEE-2315
EEE-2318	Digital Electronics Lab	1.5	3	EEE-2316
Total		**15**	**19**	

Seventh Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
CSE-3113	Computer Networks	2	2	N/A
CSE-3114	Computer Networks Lab	1	2	N/A
EEE-3111	Signals and Linear Systems	2	2	MATH-1213
EEE-3112	Signals and Linear Systems Lab	1.5	3	CSE-2112
EEE-3113	Electromagnetic Fields & Waves	2	2	PHY-3111
EEE-3115	Power System I	3	3	EEE-2213
EEE-3116	Power System I Lab	1	2	EEE-2214
Total		**12.5**	**16**	

Eighth Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
EEE-3217	Basic Communication	3	3	EEE-3111
EEE-3218	Basic Communication Lab	1	2	EEE-3112
EEE-3219	Control System I	2	2	EEE-3111
EEE-3220	Control System I Lab	1	2	EEE-3112
EEE-3221	Microprocessor, Assembly Language & Computer Interfacing	3	3	EEE-2317
EEE-3222	Microprocessor, Assembly Language & Computer Interfacing Lab	1	2	EEE-2318
Total		**11**	**14**	

Ninth Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
EEE-3324	Electrical Services Design	1	2	EEE-1111& EEE-1213
EEE-3325	Electrical Properties of Materials	2	2	PHY- 2213
EEE-3327	Digital Communication	2	2	EEE-3217
EEE-3328	Digital Communication Lab	1	2	EEE-3218
EEE-3329	Digital Signal I Processing	2	2	EEE-3327
EEE-3330	Digital Signal Processing I Lab	1	2	EEE-3328
	Elective 1	3	4	
Total		**12**	**16**	

Tenth Semester (Fourth Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
	Elective 2	3	4	
	Elective 3	3	4	
	Elective 4	3	4	
	Elective 5	3	4	
Total		**12**	**16**	

Eleventh Semester (Fourth Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
EEE-4800	Project / Thesis (Supervisor based)	6	12	
	Elective 6	3	4	
	Elective 7	3	4	
Total		**12**	**20**	

Twelfth Semester (Fourth Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
	Elective 8	3	4	
	Elective 9	3	4	
	Elective 10	3	4	
EEE-4800	Project / Thesis (Finalize & Submission)	-	-	
Total		**9**	**12**	

Course Outline for Bachelor of Science in Electrical and Electronic Engineering for BTEB approved diploma holders

The Diploma holders who study B.Sc. in EEE (for Diploma holders) have to complete 124 credits. However, the total number of credit hours for B.Sc. in EEE (regular) is 157. As the diploma holders have already completed courses equivalent to 33 credits in their diploma programs, those credits are waived for diploma holders.

Summary of Courses

Types of Courses	No. of Courses	Credit Hours
English Courses	03	09
GED courses	00	00
Basic Science Courses	01	03
Mathematics Courses	05	15
Computer Courses	02	06
Inter disciplinary Engineering Courses	00	00
Program core courses	31	64
Elective courses	09	27
Total	**51**	**124**

List of waived courses

Course Code	Course Title	Credit Hours
ART-1213	Introduction to Sociology	3
MGT-2315	Introduction to Business	3
ACC-2111	Principles of Accounting	3
MGT-3211	Industrial Management	3
ART-1217	Political Science	3
PHY-1311	General Physics I	2
PHY-1312	General Physics Lab	1
CSE-1111	Introduction to Computers	2
CSE-1112	Introduction to Computers Lab	1
CSE-2113	Object Oriented Programming	2
CSE-2114	Object Oriented Programming Lab	1
CSE-3113	Computer Networks	2
CSE-3114	Computer Networks Lab	1
CHE-2111	Chemical Process Principles	3
CE-2112	Engineering Drawing Lab	2
ME-2212	Mechanical Engineering Fundamentals Lab	1
	Total	**33**

List of Courses

Interdisciplinary Courses				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours / Week**	**Prerequisite Courses**
English Courses (9 credit hours)				
ENG- 1111	English Reading	3.0	3.0	N/A
ENG-1213	English Composition / Writing	3.0	3.0	ENG-1111
ENG- 1315	English Spoken	3.0	3.0	N/A
Total		**9.0**	**9.0**	
Basic Science Courses (3 credit hours)				
PHY-2213	General Physics II	2.0	2.0	N/A
PHY-2214	General Physics Lab	1.0	2.0	N/A
Total		**3.0**	**4.0**	
Mathematics Courses (15 credit hours)				
MATH-1111	Differential and Integral Calculus	3.0	3.0	N/A
MATH-1213	Linear Algebra and Complex Analysis	3.0	3.0	MATH-1111
MATH-1315	Differential Equations and Fourier Analysis	3.0	3.0	MATH-1213
MATH-2111	Co-ordinate Geometry and Vector Analysis	3.0	3.0	MATH-1315
MATH-2213	Probability and Statistics	3.0	3.0	N/A
Total		**15.0**	**15.0**	

Computer courses (6 credit hours)				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours / Week**	**Prerequisite Courses**
CSE-1213	Computer Programming	2.0	2.0	CSE-1111
CSE-1214	Computer Programming Lab	1.0	2.0	CSE-1112
CSE-2111	Numerical Methods	2.0	2.0	N/A
CSE-2112	Numerical Methods Lab	1.0	2.0	N/A
Total		**6.0**	**8.0**	

EEE Core Courses (64 credit hours)				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours/week**	**Prerequisite Courses**
EEE-1111	Electrical Circuits I	3.0	3.0	N/A
EEE-1213	Electrical Circuits II	3.0	3.0	EEE-1111
EEE-1214	Electrical Circuits Lab	1.5	3.0	EEE- 1111 & EEE- 1213
EEE-1315	Electronics I	3.0	3.0	EEE-1111 & EEE-1213
EEE-1316	Electronics Circuit Simulation Lab	1.5	3.0	EEE-1214
EEE-1317	Energy Conversion I	3.0	3.0	EEE-1213
EEE-2213	Energy Conversion II	3.0	3.0	EEE-1317
EEE-2214	Energy Conversion Lab	1.5	3.0	EEE-1214
EEE-2315	Electronics II	3.0	3.0	EEE-1317
EEE-2316	Electronics II Lab	1.5	3.0	EEE-1316

EEE-2317	Digital Electronics	3.0	3.0	EEE-2315
EEE-2318	Digital Electronics Lab	1.5	3.0	EEE-2316
EEE-3111	Signals and Linear Systems	2	2.0	MATH-1213
EEE-3112	Signals and Linear Systems Lab	1.5	3.0	CSE- 2112& EEE- 1316
EEE-3113	Electromagnetic Fields & Waves	2.0	2.0	MATH- 2111
EEE-3115	Power System I	3.0	3.0	EEE-1317
EEE-3116	Power System I Lab	1.0	2.0	EEE-1214 & EEE-2214
EEE-3217	Basic Communication Engineering	2.0	2.0	EEE-3111
EEE-3218	Basic Communication Engineering Laboratory	1.0	2.0	EEE-3112
EEE-3219	Control System I	2.0	2.0	EEE- 3111
EEE-3220	Control System I Lab	1.0	2.0	EEE-3112
EEE-3221	Microprocessor, Assembly Language & Computer Interfacing	3.0	3.0	EEE- 2317
EEE-3222	Microprocessor, Assembly Language & Computer Interfacing Lab	1.0	2.0	EEE- 2318
EEE-3324	Electrical Services Design	1.0	2.0	EEE-1213 & EEE-1214
EEE-3325	Electrical Properties of Materials	2.0	2.0	PHY- 2213
EEE-3327	Digital Communication	3.0	3.0	EEE-3217
EEE-3228	Digital Communication Lab	1.0	2.0	EEE-3218
EEE-3329	Digital Signal Processing I	2.0	2.0	EEE-3327
EEE-3330	Digital Signal Processing I Lab	1.0	2.0	EEE-3328
EEE 4800	Project/Thesis	6.0	12.0	
Total		**64.0**	**86.0**	

List of Elective courses (27 credit hours)

Communication group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours/week**	**Prerequisite Courses**
ECE-4111	Random Signals and Processes	3.0	3.0	EEE-3329
ECE-4113	Digital Signal Processing II	3.0	3.0	EEE-3329
ECE-4115	Microwave Engineering	2.0	3.0	EEE-3313& EEE-3327
ECE-4117	Optical Fiber Communication	3.0	3.0	EEE-3327
ECE-4221	Cellular Mobile & Satellite Communication	3.0	3.0	EEE-3327
ECE-4223	Telecommunication Engineering	3.0	3.0	EEE-3327
ECE-4229	Data Communication	3.0	3.0	N/A
ECE-4230	Data Communication Lab	1.0	2.0	N/A

Power group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours**	**Prerequisite Courses**
EEE-4011	Power System II	3.0	3.0	EEE-3115
EEE-4113	Energy Conversion III	3.0	3.0	EEE-2213
EEE-4115	Power Electronics	3.0	3.0	EEE-2315
EEE-4116	Power Electronics Lab	1.0	2.0	EEE-2316
EEE-4117	Power Plant Engineering	3.0	3.0	EEE-4011
EEE-4119	Renewable Energy Conversion	2.0	2.0	EEE-2213
EEE-4229	Switchgear and Protection	3.0	3.0	EEE-4011
EEE-4230	Switchgear and Protection Lab	1.0	2.0	EEE-3116
EEE-4231	High Voltage Engineering	2.0	2.0	EEE-4011
EEE-4232	High Voltage Engineering Lab	1.0	2.0	EEE-3116
EEE-4341	Advanced Machines	3.0	3.0	EEE-2213

Electronics group				
Course Code	**Course Title**	**Credit Hours**	**Contact Hours**	**Prerequisite Courses**
EEE-4121	Solid State Devices	2.0	2.0	EEE-1317
EEE-4123	Analog Integrated Circuits	3.0	3.0	EEE-1317
EEE-4125	Processing and Fabrication Technology	3.0	3.0	EEE-2317
EEE-4127	VLSI I	2.0	2.0	EEE-2315
EEE-4128	VLSI I Lab	1.0	2.0	EEE-2316
EEE-4237	Optoelectronics	3.0	3.0	EEE-2315
EEE-4343	Biomedical Instrumentation	2.0	3.0	N/A
EEE-4344	Biomedical Instrumentation Lab	1.0	2.0	N/A
EEE-4345	Measurement and Instrumentation	3.0	3.0	EEE-1213

Approximate Course Distribution

First Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ENG-1111	English Reading	3.0	3.0	N/A
MATH-1111	Differential and Integral Calculus	3.0	3.0	N/A
CSE-1213	Computer Programming	2.0	2.0	CSE-1111
CSE-1213	Computer Programming: Lab	1.0	2.0	CSE-1112
EEE-1111	Electrical Circuits I	3.0	3.0	N/A
EEE-1213	Electrical Circuits II	3.0	3.0	
EEE-1214	Electrical Circuits Lab	1.5	3.0	N/A
Total		**16.5**	**19**	

Second Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ENG- 1213	English Composition/Writing	3.0	3.0	ENG-1111
PHY-2213	General Physics II	2.0	2.0	N/A
PHY-2214	General Physics II Lab	1.0	2.0	N/A
MATH-1213	Linear Algebra and Complex Analysis	3.0	3.0	MATH-1111
EEE-1315	Electronics I	3.0	3.0	EEE-1213
EEE-1316	Electronics Circuit Simulation Lab	1.5	3.0	EEE-1214
CSE-2111	Numerical Methods	2.0	2.0	N/A
CSE-2112	Numerical Methods Lab	1.0	2.0	N/A
Total		**16.5**	**20.0**	

Third Semester (First Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
ENG- 1315	English Spoken	3.0	3.0	ENG-1111
EEE-2315	Electronics II	3.0	3.0	EEE-1315
EEE-2316	Electronics II Lab	1.5	3.0	EEE-1316
MATH-1315	Differential Equations and Fourier Analysis	3.0	3.0	MATH-1213
EEE-1317	Energy Conversion I	3.0	3.0	EEE-1213
Total		**13.5**	**15.0**	

Fourth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
MATH-2111	Co-Ordinate Geometry and Vector Analysis	3.0	3.0	MATH-1315
EEE-2213	Energy Conversion II	3.0	3.0	EEE-2213
EEE-2214	Energy Conversion Lab	1.5	3.0	EEE-1214
EEE-2317	Digital Electronics	3.0	3.0	EEE-2315
EEE-2318	Digital Electronics Lab	1.5	3.0	EEE-2316
EEE-3111	Signals and Linear Systems	2.0	2.0	MATH- 1213
EEE-3112	Signals and Linear Systems Lab	1.5	3.0	CSE-2112 & EEE-1316
Total		**15.5**	**20.0**	

Fifth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
MATH-2213	Probability and Statistics	3.0	3.0	N/A
ECE-3113	Electromagnetic Fields & Waves	2.0	2.0	MATH-2111
EEE-3115	Power System I	3.0	3.0	EEE-2213
EEE-3116	Power System I Lab	1.0	3.0	EEE-1214 & EEE-2214
EEE-3211	Microprocessor, Assembly Language & Computer Interfacing	3.0	3.0	EEE-2317
EEE-3212	Microprocessor, Assembly Language & Computer Interfacing Laboratory	1.0	2.0	EEE-2318
Total		**13.0**	**16.0**	

Sixth Semester (Second Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
EEE-3219	Control System I	2.0	2.0	EEE-3111
EEE-3220	Control System I Lab	1.0	2.0	EEE-3112
EEE-3217	Basic Communication Engineering	2.0	2.0	EEE-3111
EEE-3218	Basic Communication Engineering Lab	1.0	2.0	EEE-3112
EEE-3324	Electrical Services Design	1.0	2.0	EEE-1213 & EEE-1214
EEE-3325	Electrical Properties of Materials	2.0	2.0	PHY- 2213
Total		**9.0**	**12.0**	

Seventh Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
EEE-3327	Digital Communication	3.0	3.0	EEE-3217
EEE-3328	Digital Communication Lab	1.0	2.0	EEE-3218
EEE-3329	Digital Signal Processing	2.0	2.0	EEE-3327
EEE-3330	Digital Signal Processing Lab	1.0.	2.0	EEE-3328
	Elective 1	3.0	3.0	-
	Elective 2	3.0	3.0	-
Total		**13.0**	**14.0**	

Eighth Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
	Elective 3	3.0	3.0	-
	Elective 4	3.0	3.0	-
	Elective 5	3.0	3.0	-
	Elective 6	3.0	3.0	-
EEE-4800	Project / Thesis (Supervisor based)	-	-	-
Total		**12.0**	**12.0**	

Ninth Semester (Third Year)

Course No.	Course Title	Credit Hours	Contact Hour/ Week	Prerequisite Courses
	Elective 7	3.0	3.0	-
	Elective 8	3.0	3.0	-
	Elective 9	3.0	3.0	-
EEE-4800	Project / Thesis (Finalize & Submission)	6.0	6.0	-
Total		**15.0**	**15.0**	

COURSE SYNOPSIS

ENGLISH COURSES

Course Code: ENG-1111; Course Title: English Reading

Credit Hour: 03; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: This course attempts to strengthen students' basic skills of reading through building vocabulary, increasing reading and comprehension.

Course Objectives: This course is designed to help students –

- build up their vocabularies,
- observe and adopt the techniques of reading,
- develop reading skills.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- enrich vocabulary,
- infer the meaning of the text,
- read thoroughly and confidently,
- differentiate between reading academic texts and reading newspapers and magazine,
- identify elements and features of academic reading.

Course Content: This course focuses on the basic skills of reading. This is designed for students at all reading levels. Emphasis is given in increasing the rate of reading and comprehension and on vocabulary expansion.

Unit-1: Reading Fiction Texts

Materials: fractions of various modern fictions written in easy language, short stories etc.; Skills: making inference, understanding how impressions are created, examining impact of words, examining points of view and reaching a conclusion etc.

Unit-2: Reading Fiction Texts

Reading non-fiction texts: newspapers, prose relating to history, geography, science and technology; Skills: summarizing a text, understanding use of words and their effects, comparing the style of fiction and non-fiction texts etc.

Course Code: ENG-1113; Course Title: English Reading and Speaking

Credit Hour: 03; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: The course will enable the students to acquire knowledge about basic use of grammar and sentence structure both in speaking and in writing. Students will be introduced with different types of texts and will be asked to infer the meaning of texts with particular questions or in whole. Also, an overview will be given on pronunciations, speaking style and on presenting themselves.

Course Objectives: This course is designed to help students –

- build up their vocabularies,
- observe and adopt the techniques of reading,
- develop reading skills,
- learn the mechanics of speaking,
- use phonetic symbols,
- use English in real life situation.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- enrich vocabulary,
- read thoroughly and confidently,
- understand the story,
- infer the meaning of the text,
- articulate place and manner,
- pronounce well.

Contents: This course focuses on the basic skills of reading and speaking. This is designed for students at all reading levels. Emphasis is given in increasing the rate of reading and comprehension and on vocabulary expansion. Reading fiction texts: fractions of various modern fictions written in easy language, short stories etc.; Skills: making inference, understanding how impressions are created, examining impact of words, examining points of view and reaching a conclusion etc. Reading non-fiction texts: newspapers, prose relating to history, geography, science and technology; Skills: summarizing a text, understanding use of words and their effects, comparing the style of fiction and non-fiction texts etc.

Speaking: introduction to pronunciation, place and manner of articulation, phonetic symbols, the most common mistakes in pronunciation, etc.; Skills: making requests, giving commands,

inviting people, giving advice, giving suggestions, agreeing and disagreeing, asking questions, giving opinion, making comments, presenting a paper, addressing an audience, etc.

Course Code: ENG-1213; Course Title: English Composition/ Writing

Credit Hour: 03; 1st Year *Semester II*

Pre-requisite: N/A

Rationale: The course will enable the students to acquire knowledge about basic use of grammar, parts of speech, sentence structure, and use of idioms, synonyms, antonyms and phrases. Also, an overview will be given on independent writing using knowledge of vocabulary and avoiding basic grammatical errors.

Course Objectives: This course is designed to help students –

- improve sentence structure,
- enhance students' grammatical competence,
- understand meaning from the context.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- write accurately and confidently,
- develop inference ability,
- give commands,
- summarize monologue.

Contents: This course aims at building the ability of the students in correct writing, composition and presentation of English. The Emphasis of the course is on correct and independent writing and correct listening to individual phoneme and word pronunciation, listening to monologue, listening to dialogue and conversation.

Course Code: ENG-1315; Course Title: English Spoken

Credit Hour: 03; 1st Year *Semester III*

Pre-requisite: N/A

Rationale: The course will enable the students to acquire knowledge about basic use of grammar, parts of speech and sentence structure in speaking. Also, an overview will be given on common mistakes of pronunciations, speaking style and on presenting themselves.

Course Objectives: This course is designed to help students –

- learn the mechanics of speaking,
- use phonetic symbols,
- use English in real life situation.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- speak thoroughly and confidently,
- understand the conversation,
- give commands,
- articulate place and manner,
- pronounce well.

Contents: This course focuses on the basic skills of speaking. This is designed for students at all reading levels. Unit-1: Introduction to pronunciation, place and manner of articulation, phonetic symbols, the most common mistakes in pronunciation, etc.

Unit-2 Skills: making requests, giving commands, inviting people, giving advice, giving suggestions, agreeing and disagreeing, asking questions, giving opinion, making comments, presenting a paper, addressing an audience, etc.

The following contexts may be emphasized: Classroom, shopping center, ticket counter, bus stop, train station, airport, playground, residential hotel etc.

GENERAL EDUCATION (GED) COURSES

Course Code: ART-1111; Course Title: Bangladesh Studies

Credit Hour: 03; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: Bangladesh Studies is about the exploration of Bangladesh culture, society, and practice of the territory. How and when the production system is being changed with the passage of time it is basically the point of studying the course. Moreover, the movements and patterns of striking throughout the history of Bangladesh helped to go ahead its nationalism and economic liberalism. Although the country has some complexities, the people have the capacity to initiate steps to adapt its barriers with their indigenous knowledge.

Course Objectives: This course is designed to help students –

- facilitate the necessary knowledge about the emergence of Bangladesh including its location, diversity, climate and environment,
- recognize the importance's of movements to the next movement and lastly got freedom it is an indication of brave nation,
- illustrate the social structure, social change, social and political system of the country,
- familiarize with the culture, cultural diversity, mobilization, influences of globalization towards our culture,
- provide the knowledge of govt. system, constitution, climate and geography, social problems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- our origin in terms of race,
- understand origin of Bengal,
- know Foundation of Bangladesh,
- understand variation of culture,
- recognize the agents of socializations,
- understand the emergence of democracy.

Contents: The objectives this study is to create awareness among the students about the History, Geography, Economics, Sociology, Politics, Language, Literature, Philosophy, Art and culture of Bangladesh and such other subjects as are significantly related to the life and society of

Bangladesh. Outline: Introduction to the course and its objectives. Outline of geography of Bangladesh. Advent of Islam in Bengal and the Muslim conquest, Its impact on the people. Origin of the Muslims of Bengal (Formation of Muslim society under the Bengal sultanate, Impact of Sufism in Bengal) (Reform Movements) Educational development under the Muslims, The British policy towards the education: A brief discussion Struggle for freedom from the British Colonialism Development of Bengali Prose Literature (New Trend of Nationalism) Creation of Pakistan and the Emergence of Bangladesh. Political development in Bangladesh: Political parties & Constitutional Development. Economic condition of Bangladesh, Socio-Cultural problems and prospects of Bangladesh.

Course Code: ART- 1213; Course Title: Introduction to Sociology

Credit Hour: 03; 1st Year *Semester II*

Pre-requisite: N/A

Rationale: The social phenomenon is now understood in the light of scientific knowledge and enquiry. Sociology is of great importance in the solution of international problems as well. It also lies in the fact that it keeps us update on modern situations. However, in order to be social and our action to be functional in the society, we can't image anything beyond sociology.

Course Objectives: This course is designed to help students –

- learn the concepts, theories and methods of the behavioral and social services,
- understand basic social processes of society, social institutions and patterns of social behavior,
- understand and to interpret objectively the role of social processes, social institutions and social interactions in their lives,
- cope effectively with the socio-cultural and interpersonal processes of a constantly changing complex society,
- train for positions in criminal justice, gerontology, social science and social welfare,
- strengthen the marketable expertise in quantitative analysis and computer applications in advertising, demography, marketing and the social sciences.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand how a theory is established,
- explain the critics of modern society,
- apply the knowledge of technology in the social research by finding problems,
- familiarize the importance's of family and socialization,
- describe and explain how macroeconomic model can be used to analyses the economy as a whole,
- understand Social, political and religious disparity,
- Can differentiate the agencies of social control,

Contents: Scope, Social evolution and techniques of production; Culture and civilization; Social structure of Bangladesh; Population and world resources; Oriental and occidental societies, Industrial revolution; Family- urbanization industrialization; Urban ecology, Co-operative and socialist movements, Rural sociology.

Course Code: ACC-2111; Course Title: Principles of Accounting

Credit Hour: 03; 2nd Year *Semester I*

Pre-requisite: N/A

Rationale: This course views the accounting function as an essential and powerful activity in the business environment. It will present the concepts and application of beginning accounting principles.

Course Objectives: This course is designed to help students –

- learn the basic accounting vocabulary,
- study theories of financial accounting.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- recognize, record, and classify new accounting data,
- analyze business transactions from an accounting viewpoint,
- Prepare financial statements for service and merchandising operations.

Contents: Preliminaries: Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles and ethics, Accounting Equation and Transaction Analysis. Introduction to Financial Statements. Recording Business Transactions: The Accounts and their types. Double-Entry Book keeping system; Invoice, discount from purchase

price, purchase return and allowances, Sale of inventory, sales discount, sales return and allowances; Journals, ledger and Trial balance. Correcting errors in the trial balance. The Adjusting & Closing Procedure: The adjusting process, Accrual versus cash basis Accounting, Preparation of Adjusted trial balance and financial statements, Closing entries and Reversing entries. Using accounting information in decision-making. Accounting in practice: worksheet, Purchase book, sales book, cashbook, patty cashbook, etc. Control accounts and subsidiary accounts. Bank reconciliation statement. Cost in General: objectives and classifications; Costing Journals; Job order costing, Process costing and Overhead costing, cost sheet; Cost of goods sold statement. Marginal and Relevant costing: Marginal costing tools and techniques, cost-volume-profit analysis. Guidelines for decision-making. Budget: Capital budgeting; Planning, evaluation & control of capital expenditures.

Course Code: ART- 2213; Course Title: Professional Ethics

Credit Hour: 03; 2nd Year *Semester II*

Pre-requisite: N/A

Rationale: It has been perceived from different evaluation that intellectual ability needs to be exercised in an effective way through scheduled practice and performance. Success comes not just from the knowledge and skills but also from behavior which can create distance between success and failure. And we can achieve expected behavior only by learning and unlearning ways of thinking that finally craft body language and ensure effective living in this beautiful world.

Course Objectives: This course is designed to help students –

- achieve ability to understand life positively in personal, family and professional levels by joining this course,
- Able to find a new way of thinking for better living,
- Able to become a self-evaluation expert and developmental.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- create synergy of learning and unlearning for effective development and living,
- reform essential skills for 21st century survival by young people and community,
- learn about creative problem solving and action in need,
- transform conceptual learning into action,
- facilitate and enhance relationships within the locality, county, and region,

- ensure tangible change in student's thinking in terms of their vision about happiness, prosperity and improvement in human relationship,
- understand the ultimate role of education in transforming a man or a woman into a human being.

Content: Human values: morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, character, spirituality. Engineering ethics: senses of 'engineering ethics', variety of moral issue, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, models of professional roles, theories about right action, self-interest, customs and religion, uses of ethical theories. Engineering as social experimentation: engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study. Safety, responsibilities and rights: safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the three-mile-island and Chernobyl case studies. Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, occupational crime, professional rights, employee rights, intellectual property rights, discrimination. Global issues: multinational corporations, environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of ethics like ASME, ASCE, IEEE.

Course Code: ECON- 2311; Course Title: Principle of Economics

Credit Hour: 03; 2nd Year *Semester III*

Pre-requisite: N/A

Rationale: The course will enable the students to acquire knowledge and capacities of Economics. This course provides an introduction to a broad range of economic concepts, theories and analytical techniques of microeconomics and macroeconomics that help us understand the process of decision making by individuals and societies.

Course Objectives: This course is designed to help students –

- develop knowledge about fundamental economic activities of production, distribution, exchange and consumption at both the micro and macro level,
- introduce the nature and scope of economics,

- concern them with the solution of major economic problems,
- develop an understanding of the functioning of a free market system,
- develop an understanding of the functioning of a free market system.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- distinguish between microeconomics and macroeconomics,
- describing the nature and scope of economics,
- describe and explain how microeconomic models can be used to consider fundamental economic choices of households and firms,
- describe and explain how macroeconomic model can be used to analyses the economy as a whole,
- describe government policy to influences microeconomic choices and macroeconomic outcomes,
- interpret and use economic models, diagrams and tables and use them to analyses economic situations.

Contents: Introduction: Definition of economics, Scope and utility of studying economics. Microeconomics: The theory of demand and supply and their elasticity, Price determination, Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis, Production: Production function, types of productivity, the nature of Isoquants and Isocosts, Rational region of production of an engineering firm. Euler's theorem. Market: Concepts of market and market structure. Cost analysis and cost function. Small-scale production and large-scale production, Optimization, Theory of distribution. Macroeconomics: Savings, investment, employment, National income analysis, Inflation, Monetary policy, Fiscal policy and trade policy with reference to Bangladesh. Economics of development: Dimensions of development, Relevance of theory, the employment problem, Human resource development Economics of planning: Planning and market, Policy models, Planning experience.

BASIC SCIENCE COURSES

Course Code: PHY- 1311; Course Title: General Physics I

Credit Hour: 02; 1st Year *Semester III*

Pre-requisite: N/A

Rationale: The aim here is to equip the student with the knowledge of linear motion of objects, rigid bodies and their dynamics, gravitation and motion of an object in gravitational field, elastic behavior of solids, adhesive and cohesive forces of molecules, surface tension, viscosity of liquids, hydrodynamics, and thermodynamics.

Course Objectives: This course is designed to help students –

- Understand the linear motion of an object and associated principles.
- Understand the dynamics of rigid body
- Learn the gravitation, gravitational motion, and planetary motion.
- Understand the elastic and viscous properties of solids and liquids, hydrodynamics.
- Understand the harmonic motion, oscillation, and wave motion.
- Learn different principles of thermodynamics, and thermodynamic scales.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Explain linear motion, simple harmonic motion, oscillatory motion, and wave motion.
- Apply the theorems for calculating rotational inertia of rigid bodies.
- Calculate orbital velocity of satellite, escape velocity of an object from the patents.
- Determine the elastic constant of solids, and surface tension and viscous coefficient of liquids.
- Apply the laws of hydrodynamics to calculate pressure, velocity inside a liquid.
- Establish various thermodynamic scale, determine entropy, and efficiency of thermal engine.

Contents: Mechanics: Linear motion of a body as function of time, position and velocity, Momentum, Conservation of Linear momentum, collision simple harmonic motion and its application, damped and forced Vibration and resonance. Dynamics of rigid body: Conservation theorem of angular momentum, torque, center of mass of rigid body, rotational kinetic energy, fly wheel, axes theorems and their application, Determination of moment of inertia of a rigid body. Gravity and Gravitation: Definitions, compound pendulum, gravitational potentials and fields, relation between, potential due to spherical shell, escape velocity and Kepler's law of

planetary motion. Elasticity: Hooke's law, relation between different elastic constants, bending of beams, cantilever, determination of Young's modulus and its engineering applications Surface tension and viscosity: molecular theory of surface tension, capillarity, angle of contact, expression for surface tension, stream line and turbulent motion, Bernauli's equation and its application, coefficient of viscosity, Stoke's law, Determination of coefficient of viscosity. Waves: Waves in elastic media, standing waves and resonance, Sound waves, beats and Doppler's effect.

Course Code: PHY- 1312; Course Title: General Physics I Lab

Credit Hour: 01; 1st Year *Semester III*

Pre-requisite: N/A

Rationale: In this laboratory course students will learn how to use various scientific apparatuses for the laboratory purpose, and various scientific methods of determining physical parameters describing numerous physical properties of matter and their associated mechanics.

Course Objectives: This course is designed to help students –

- Understand the fundamental laws of physics for the engineering use.
- Use of scientific tools for the verification of physical laws.
- Determine various properties of solids, liquid, and gases.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Determine various errors involves in the laboratory tools.
- Determine the rotational inertial of dynamical systems.
- Verify Hook's law of elasticity, and to determine various elastic constants of matters.
- Determine the thermal conductivity of solid, and specific heat and surface tension of liquids.

Contents:

Exp. 01: For an ideal spring (i) verify Hooke's law and (ii) determine the modulus of rigidity of the materials of the spring.

Exp. 02: To determine the sensitivity of an oscillating balance.

Exp. 03: To determine the moment of inertia of a fly wheel about its axis of rotation.

Exp. 04: To determine the acceleration due to gravity 'g' by means of a compound pendulum.

Exp. 05: To determine the Young's Modulus by the method of bending.

Exp. 06: To determine the modulus of rigidity of the materials of a wire by the method of oscillation (dynamical method).

Exp. 07: To form a standing wave and to determine the frequency of its source by using Melde's apparatus.

Exp. 08: Determine the specific heat of a liquid by the method of cooling.

Exp. 09: To determine the thermal conductivity of a bad conductor by Lee's Method.

Exp. 10: To determine the surface tension of a liquid by capillary rise method.

Course Code: PHY-2213; Course Title: General Physics II

Credit Hour: 02; 2nd Year *Semester II*

Pre-requisite: PHY-1311

Rationale: The aim here is to equip the student with knowledge of electrostatics, magneto statics, electromagnetic induction, wave nature and particle nature of light, and modern physics, and their use in the engineering study.

Course Objectives: This course is designed to help students –

- Understand the concept of electric charge and its properties, electric forces, and electric field strength, electric potential, electric lines of forces.
- Learn magnetic field, magnetic field lines, and electromagnetic induction.
- Understand the fundamental postulates and principles of electrostatics, magneto-statics, and electromagnetic induction, and the generation of alternating e. m. f, and current.
- Understand the wave optics, interference, diffraction and polarization of light.
- Learn different atomic models, principles and postulates of modern physics, the particle nature of light, Compton effect, photoelectric effect, relativity and radioactivity.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Explain properties of charges, and electrification.
- Apply laws and formulae to calculate the electric and magnetic field for various symmetry of problems.
- Apply the concept of wave and particle nature of light to explain interaction of light with particle like electron.

- Use the concept of modern physics to determine the energy and spectral series of H_2 atom, Zeeman effects, and radioactive decay.

Contents: Charge and Matter: Electric charge, conductors and insulators, Coulomb.s law, electric field, electric field strength E, Gauss's law and its applications, electric potential and potential function, electric dipole, Dielectrics and Gauss's law, energy storage in an electric field. Current and Resistance: Current and current density, Ohm's law, Resistively, Electromotive force, potential difference. RC Circuits The Magnetic Field: The definition of B, the magnetic force on a current, magnetic force on current, Ampere.s law, Biot –Savart law and their application, Lorentz force. Electromagnetic induction: Faraday.s law of induction, Lenz.s law, self and mutual induction, energy density in the magnetic field, generation of alternating current and emf, Interference and Diffraction of light: Definition, Young.s experiment, Newton.s ring, Fresnel and Fraunhofer diffraction, diffraction gratings, Polarization of light and Optical fiber. Relativity and Light waves: Postulates of special relativity, time dilation and length contraction.

Course Code: PHY-2214; Course Title: General Physics II Lab

Credit Hour: 01; 2nd Year *Semester II*

Pre-requisite: PHY-1312

Rationale: In this laboratory course students will learn the use of various electrical components and their connection in circuit, the fundamental laws of electrostatics, magneto statics, and electromagnetic induction. Students will also be able to observe practically the basic phenomena of optics and modern physics, and to determine numerous parameters connecting them.

Course Objectives: This course is designed to help students –

- Understand the fundamental laws of electrostatics, magneto statics, optics, and modern physics.
- Verify the various phenomena of optics and modern physics.
- Determine numerous parameter of electrostatics, magneto statics, optics, and modern physics.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Use galvanometer, potentiometer, capacitor, resistor, ammeter, voltmeter, Meter Bridge etc.

- Determine resistance of galvanometer, internal resistance and e. m. f of a cell, and mechanical equivalent of heat.
- Observe Hall Effect and to determine hall voltage and hall coefficient.
- Observe interference, diffraction of light, and to determine the radius of curvature of lens, wavelength of light, and refractive index of the materials used.
- Observe the particle nature of light - photoelectric effect, and to determine the plank's constant.

Contents:

Exp. 01: To determine the resistance of a galvanometer by half deflection method.

Exp. 02: To determine the internal resistance of a cell by using potentiometer.

Exp. 03: To determine the unknown e.m.f. a cell by using potentiometer.

Exp. 04: To draw the charging and discharging curve of a capacitor in an RC circuit, and hence to determination of time constant.

Exp. 05: To determine the value of mechanical equivalent of heat (J), by electrical method.

Exp. 06: To determine the Hall voltage and calculate the Hall coefficient and carrier concentration of a semiconductor sample.

Exp. 07: To determine the radius of curvature of a plano-convex lens by Newton ring experiment.

Exp. 08: To determine the refractive index of the materials of a liquid by thin film interference.

Exp. 09: To determine the wavelength of light by plane diffraction grating.

Exp. 10: To determine the value of Plank's constant h from photoelectric effect.

Course Code: CHEM -2311; Course Title: Chemistry

Credit Hour: 02; 2nd Year *Semester III*

Pre-requisite: N/A

Rationale: We live in a dynamic chemical universe. We certainly rely upon chemical properties and reactions to both sustain and enrich our lives. Chemical properties and reactions influence our every action (and reaction). This course introduces the areas of physical and inorganic

chemistry and a bit of organic chemistry. This course will provide a rational basis for interpreting and predicting chemical phenomena through examples of chemical behavior observed in nature.

Course Objectives: This course is designed to help students –

- understand the selected chemical processes,
- apply the understanding to solve new problems in chemical behavior,
- think how chemists and other scientists think and solve problems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- know different atomic models, laws and number,
- calculate enthalpy and know stale of chemical equilibrium,
- know the periodic properties of elements,
- differentiate different organic reactions.

Contents: Atomic structure, periodic table, chemical bonds. Chemistry of cement, silicates and limes. Physical and chemical properties of water. Different types of solutions, concentration units. Chemical equilibria and thermochemistry.

Course Code: CHEM -2312; Course Title: Chemistry Lab

Credit Hour: 01; 2nd Year *Semester III*

Pre-requisite: N/A

Rationale: The laboratory experience is an integral part of CHEM-2311 and will provide students with the opportunity to develop their skills in making observations, taking measurements, designing experiments, and communicating their data, results and conclusions in oral written and graphical form.

Course Objectives: This course is designed to help students –

- expand their experience with characteristic properties and chemical changes,
- perform several chemical reactions under laboratory environment.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- classify a given material as an element, compound or mixture using the properties of the material,
- describe atomic structure,
- define chemical bonding and synthesis.

Contents:

Exp. 01: Introducing Measurements in the Laboratory.

Exp. 02: The Density of Liquids and Solids.

Exp. 03: The Properties of Oxygen Gas.

Exp. 04: The Composition of Potassium Chlorate.

Exp. 05: Single and Double Displacement Reactions.

Exp. 06: Mole Ratios and Reaction Stoichiometry.

Exp. 07: Flame Tests of Metal Cations.

Exp. 08: Determination of the Gas Constant.

Exp. 09: Titration of Vinegar.

Exp. 10: Acids, Bases, and pH.

MATHEMATICS COURSES

Course Code: MATH- 1111; Course Title: Differential and Integral Calculus

Credit Hour: 03; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: The course will enable the students to know the fundamental knowledge about Differential and Integral Calculus Specially Function, Graph, limit, continuity, Differentiation and Integration their application for different engineering sectors.

Course Objectives: This course is designed to help students –

- define different terms in Differential and Integral Calculus,
- discuss different theories and their applications.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- apply and analyze the applications of Differential and Integral Calculus,
- Demonstrate basics kills to solve critical problems in Differential and Integral Calculus,
- solve series and find its value.

Contents: Functions of one variable & their plots, Limit, Continuity, Differentiability, Successive differentiation, Leibnitz's theorem, Rolle's, Mean-value, Taylors, Maclurin's Theorem,

Langrange's & Cauchy's forms of Reaminder, Expansion of functions in Taylor's & Maclaurin's series, Evaluation of Indeterminate form by L'Hospital' rule, Maxima and Minima of a function, Points of inflexion, Tangent, Normal, Curvature & radius of curvature, Functions of several variables, Partial derivatives, Euler's theorem, Jacobians, Directional derivatives. Integral Calculus: Physical meaning of an integration of function, different techniques of integrations, Integration by parts, Definite integration, Integration by summation of series, Fundamental theorem of integral calculus.

Course Code: MATH-1213; Course Title: Linear Algebra and Complex Analysis

Credit Hour: 03; 1st Year *Semester II*

Pre-requisite: MATH-1111

Rationale: In this course students will learn to solve systems of linear equations. This course will demonstrate comprehension of operations on matrices and linear transformations. Besides, construct curves and surfaces passing through specified points will be taught. The use of linear algebra in traffic flow, electrical circuits, graph theory and cryptography will be discussed here.

Course Objectives: This course is designed to help students –

- solve problems using linear algebra, and Complex number system,
- know about the applications,
- know about logical arguments.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- learn to solve problems using linear algebra,
- demonstrate comprehension of operations on matrices,
- find Eigen values and Eigenvectors of a matrix,
- use linear algebra in traffic flow, electrical circuits, graph theory and cryptography,
- learn the operation of vectors and scalar,
- learn the complex number system,
- learn about limit and continuity of a function of complex variable,
- learn about complex differentiation,
- learn how to find area of a cylinder, sphere etc.,
- learn about the geometrical discussion.

Contents: Matrix: Definition, Types of Matrices, Rank of the Matrix, Equivalence Matrix, System of linear equations. Linear Algebra: Different types of matrices, Algebraic operations on matrices, Adjoint & inverse of a matrix, Orthogonal & Unitary matrices, System of linear equations, Vector space, Linear transformations, Characteristic roots & vectors, Diagonalization of matrices. Complex Variable: De-Moiver's theorem & its application, Functions of a complex variable, Limit, Continuity & Differentiability of a function of complex variable, Analytic functions, Cauchy-Riemann equations, Cauchy's theorem, Singularity & poles, Residues, Simple contour integration.

Course Code: MATH-1315; Course Title: Differential Equations and Fourier analysis

Credit Hour: 03; 1st Year *Semester III*

Pre-requisite: MATH-1213

Rationale: Students will be able to apply the concepts and methods described in the syllabus. They will be able to solve problems. They will know a number of applications. The text and class discussion will introduce the concepts, methods, applications, and logical arguments; Students will practice them and solve problems on daily assignments, and they will be tested on quizzes, midterms and the final.

Course Objectives: This course is designed to help students –

- Solve first order or higher order differential equation by various kind of methods,
- Solve a differential equation when dependent and independent variable is absent,
- identify the order and degree of a differential equation Form a differential equation and it genres,
- Know about Laplace transformation and Fourier Analysis.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- learn about the basic and solution of ODE and initial value problem of differential equation,
- solve heat and wave equations,
- Learn about Laplace transformation,
- learn about Fourier Analysis, Fourier series and Fourier transform.

Contents: Differential equation: Ordinary differential equation, Formation of DE (=Differential equation), Degree & order of DE, Solutions of 1st & 2nd order ordinary DE, Separable equations,

Linear equations, Homogeneous linear equations with constant coefficients, Solution by variation of parameters, Undermined coefficients & operator method, Solution by series. Laplace Transformation: Definition of Laplace transform (LT), LT of different functions, First Shift theorem, Inverse transform, Linearity, use of first shift theorem & Partial functions, transform of derivative, Transform of an integral, Heaviside unit function, The 2nd shift theorem, Periodic functions, Convolutions, Solution of ordinary differential equation by Laplace transform. Fourier Analysis: Real & Complex form, Finite transform, Fourier integral, Fourier series & convergence of Fourier series, Fourier transform & uses in solving boundary value problem.

Course Code: MATH- 2111; Course Title: Co-Ordinate Geometry and Vector Analysis

Credit Hour: 03; 2nd Year *Semester I*

Pre-requisite: MATH-1315

Rationale: The goal of this course is to extend the ideas of co-ordinate geometry and vector analysis, as these are the fundamentals of describing electric and magnetic fields.

Course Objectives: This course is designed to help students –

- learn co-ordinate in two and three dimension,
- learn vector components and vector operators.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- apply techniques of finding area of a cylinder, sphere etc.,
- learn about the geometrical discussion,
- apply concepts and methods of vector analysis.

Content: Two dimensional geometry: Transformation of co-ordinates, translation and rotation of axes, invariants, polar co-ordinates, pairs of straight lines, homogeneous second degree equation, general second degree equation, angle between pairs of straight lines, bisectors of angles, general equation of second degree. Three dimensional geometry: Co-ordinates in three dimensions, direction cosines and direction ratios, planes, straight lines, spheres. Vector Analysis: Vector components, Vector components in spherical & cylindrical system, Derivative of vector, Vector operators, Del, Gradient, Divergence and Curl. Their physical significance, Vector integration, Line, Surface & Volume integration, Green's & Stoke's theorem and their applications.

Course Code: MATH- 2213; Course Title: Probability and Statistics

Credit Hour: 03; 2nd Year *Semester II*

Pre-requisite: N/A

Rationale: Statistics is the science that deals with the collection, description, analysis, interpretation, and presentation of data. Statistics can be used to describe a particular data set (termed descriptive statistics) as well as to draw conclusions about the population from a particular data set (termed inferential statistics). In real life, statistical methods can apply to solve different problems and help to make an effective decision that affect our daily lives. Statistical methods are used in development of planning, commerce, industry, business, formation of development policy, agricultural sector, social science etc. By studying this course, students will learn the fundamental knowledge about statistics and their applications.

Course Objectives: This course is designed to help students –

- Achieve a sound understanding of the theoretical and practical knowledge of statistics,
- Impart them with fundamental knowledge about descriptive statistics and their applications.
- Able to apply their statistical knowledge and skills throughout their future studies.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Define statistics and relevant terms
- Obtain the knowledge about data; variation and distribution,
- Attain the knowledge about bivariate data and statistics
- Draw and interpret scatter diagram,
- Apply regression analysis to estimate the linear relationship between two variables,
- Test statistical hypothesis

Course Content: Preliminaries: Definition of Statistics, Its necessity and importance, Population and Sample, Variable and Constants, Different types of variables, Statistical data, Data Collection and presentation, Construction of Frequency distribution, Graphical presentation of Frequency distribution. Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean, and Theorems & Problems. Measures of Dispersion: Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance, Moments, Skew ness and Kurtosis, Theorems and Problems. Correlation Theory: Linear Correlation: Its measures and

significance, Rank Correlation, Theorems and Problems. Regression Analysis: Linear and non-linear regression, Least-square method of curve fittings, Theorems & Problems. Probability: Elementary Concepts, Laws of Probability: Additive and Multiplicative Law, Conditional Probability and Bay's theorem, Random Variables, Mathematical Expectation and Variance of a random variable, Theorems & Problems. Probability Distributions: Binomial distribution, Poisson distribution and Normal distribution.

COMPUTER COURSES

Course Code: CSE–1111; Course Title: Introduction to computers

Credit Hour: 02; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: The aim is to gather knowledge about introduction to computer concepts, logic, and computer programming. Includes designing, coding, debugging, testing, and documenting programs using a high-level programming language.

Course Objectives: This course is designed to help students –

- learn about basic concepts of computer,
- understand different types of software and their application.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- demonstrate the understanding about application software and practically use those in solving specific problems,
- describe the functionalities of different components of computers and operating systems,
- identify how digital and analog data is processed using CPU, Modem, and the ALU,
- generate the basic modeling technics for power system analysis.

Contents: History and development of computer Science, fundamental concepts, types of computers, a variety of computer applications (Word, Excel, Access, LAN). Hardware: CPU, motherboards, storage media, I/O devices. Software: Basic concepts, types of software. Operating system: Types, Importance, components, and basic functions. Application software: Programming languages, Applications Packages. Maintenance: Power supply, UPS, Virus protections.

Course Code: CSE–1213; Course Title: Computer Programming

Credit Hour: 02; 1st Year *Semester II*

Pre-requisite: CSE-1111

Rationale: This course introduces computer programming and problem solving in a structured program logic environment. Upon completion, students should be able to manage files with operating system commands, use top-down algorithm design, and implement algorithmic solutions in a programming language.

Course Objectives: This course is designed to help students –

- understand data types and language syntax,
- learn program organization, problem-solving methods, algorithm design, and logic control structures,

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the major components in problem solving for a computer program,
- create flowcharts to illustrate program algorithm or process,
- analyze and write pseudocode to illustrate compact and informal high-level descriptions of computer programming algorithms,
- explain the concept of data storage and named memory locations.

Contents: Introduction Programming Language: Machine language, assembly language, mid-level language, high-level language, language translation, interpreter, assembler and compiler. Programming Concepts: Algorithm and logic, flow-chart, keywords, syntax, data object, data types, declaration, operator, identifier, expressions and statements, structure, functions, built-in-functions, I/O functions, control statements, branching, looping, subprogram, storage management. The objective of this course is to enable the students to know the keywords and basic programming techniques in different structured languages.

Course Code: CSE–1214; Course Title: Computer Programming Lab

Credit Hour: 01; 1st Year *Semester II*

Pre-requisite: N/A

Rationale: In this course, the students will perform experiments to practice and verify different programming techniques learned in Computer Programing, CSE-1213.

Course Objectives: This course is designed to help students –

- make program structure and construct algorithm, and learn program organization, problem-solving methods, algorithm design, and logic control structures,
- acquire first-hand experience on coding.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- write and incorporate methods and functions to demonstrate program competence,
- apply decision and repetition structures in program design,
- implement input and output to access and process files,
- apply recursion techniques to problem solving.

Contents:

Exp. 01: Introduction to C.

Exp. 02: Study on variables and constants.

Exp. 03: Study on control flow and functions.

Exp. 04: Study on Pointers and Arrays.

Exp. 05: Study on data structures.

Exp. 06: Study on manipulating files.

Exp. 07: Study on Loops.

Exp. 08: Introduction to recursion.

Exp. 09: Problem solving with recursion.

Exp. 10: Managing Memory in C.

Course Code: CSE–2111; Course Title: Numerical Methods

Credit Hour: 02; 2nd Year *Semester I*

Pre-requisite: N/A

Rationale: In order to adapt with computational science and meet the challenges in data communication, students need to learn about numerical methods for the analysis, simulation, and design of engineering processes and industrial systems.

Course Objectives: This course is designed to help students –

- learn methods for root finding,
- learn methods for different mathematical operations,

- adopt the techniques of numerical method to obtain approximate solutions to mathematical problems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand the theoretical and practical aspects of the use of numerical methods,
- explore a variety of numerical algorithms using appropriate technology to find solutions and errors.
- demonstrate the use of numerical methods for a variety of multidisciplinary applications.

Contents: 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, Lagranage, 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.

Course Code: CSE–2112; Course Title: Numerical Methods Lab

Credit Hour: 01; 2nd Year *Semester I*

Pre-requisite: N/A

Rationale: In this course, the students will practice and verify different numerical methods learned in Numerical Methods, CSE-2111. It will help the students to acquire skills to implement these methods for computer solution.

Course Objectives: This course is designed to help students –

- use MATLAB simulation software to explore a variety of numerical algorithms using appropriate technology to find solutions and errors.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- use MATLAB simulation software,
- write and execute codes for different numerical methods in MATLAB simulator,

- apply numerical methods for different problem solving cases.

Contents:

Exp. 01: Introduction to MATLAB.

Exp. 02: Introduction to Mathematical operation and Matrices.

Exp. 03: Study on Matrix operations and Trigonometric.

Exp. 04: Study on basic arithmetic operations (Multiplication/Division) using MATLAB.

Exp. 05: Program execution using Conditional operation and Decision in MATLAB

Exp. 06: Study on non-linear equations.

Exp. 07: Study on numerical integration and differentiation.

Exp. 08: Study on curve fitting.

Exp. 09: Study on interpolation.

Exp. 10: Study on Ordinary Differential Equations.

Course Code: CSE–3115; Course Title: Computer Networks

Credit Hour: 03; 3rd Year *Semester I*

Pre-requisite: CSE-1111

Rationale: After completing this course, students can gather knowledge about existence of networks. Distinguish between the three types of networks: LANs, MANs, and WANs. After analyzing various topics about networking, the students should be able to list different connecting devices and the OSI layers in which each device operates. Understand client-server models. Understand the OSI model and TCP/IP. The main objective of this course is to create a competent workforce in computer networking environment.

Course Objectives: This course is designed to help students –

- Become familiar with layered communication architectures (OSI and TCP/IP),
- Learn the principles of routing and the semantics and syntax of IP,
- Understand the client/server model and key application layer protocols.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Describe network components and architectures,
- Explain the fundamental principles of computer communication at the physical layer, data link layer and network layer,
- Describe some standardized and popular networks, including Ethernet and WiFi,

- Design and implement client-server applications using socket programming.

Contents: An introductory course on theory and practice of computer networking. Topics includes; Introduction: Goals, Applications, Network structures, Network architectures, OSI, Connection oriented and connectionless services. Service primitives. Public networks, ARPANET, SNA. Local Area Networking: Technology, Architecture, Topology, Wireless LAN. LAN system: Ethernet and Fast Ethernet. Token Ring and FDDI. ATM LAN. Wide Area Networking: Circuit switching and Packet switching. ISDN, Frame Relay and cell relay. Data Link Layer: Service provided to the network layer, Framing, Error control, Flow control, Error detection and correction. Communication Architecture and Protocols: Network reference model, TCP/IP protocol, VLSM, Internetworking, Internet protocol, Routing protocol, Transport protocols. Network Security: Privacy with conventional encryption, Digital signature. Distributed Applications.

Course Code: CSE–3114; Course Title: Computer Networks Lab

Credit Hour: 01; 3rd Year *Semester I*

Pre-requisite: CSE-1111

Rationale: This course provides students with hands on training regarding the design, troubleshooting, modeling and evaluation of computer networks. In this course, students will be able to experiment in real test-bed networking environment and learn about network design and troubleshooting topics and tools. Students will also be introduced to network modeling and simulation, and they will have the opportunity to build some simple networking models using the tool and perform simulations that will help them evaluate their design approaches and expected network performance.

Course Objectives: This course is designed to help students –

- get hand-on experience on networking (using routers, host computers, switches, cables, network monitoring and management tools.
- learn the fundamentals of data communication: Mainly TCP/IP layers and protocols (Application Layer, Transport Layer, Network Layer, and Data Link Layer)
- open the hood of the Internet and learning how Internet work.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- use IP addressing and apply routing algorithms to find shortest paths for network-layer packet delivery,
- describe and compare data link layer services and multiple access techniques,
- explain the concept of packet-switching, and identify and analyze the different types of packet delay in packet-switched networks,
- use networking tools to observe and analyze behaviors of networking protocols.

Contents:

Exp. 01: Study on different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.

Exp. 02: Study of network IP.

Exp. 03: Connect the computers in Local Area Network.

Exp. 04: Configure a network topology (Mesh, Ring etc.) using packet tracer software.

Exp. 05: Configure a network topology (Star, Tree etc.) using packet tracer software.

Exp. 06: Configure a network using RIP protocol.

Exp. 07: Configure a network using OSPF protocol.

Exp. 08: Configure a network using EIGRP protocol.

Exp. 09: Configure a network using Distance Vector Routing Protocol.

Exp. 10: Configure a network using Link State Vector Routing Protocol.

OTHER ENGINEERING DISCIPLINE COURSES

Course Code: CE- 2112; Course Title: Computer Aided Engineering Drawing

Credit Hour: 02; 2nd Year *Semester I*

Pre-requisite: N/A

Rationale: This course will introduce the students to the concept of lines, geometry and computer aided design. It will help to acquire knowledge about drawing of pentagon, parabola, cone etc. This course will also help the students to design buildings and others.

Course Objectives: This course is designed to help students –

- understand the basics, techniques and ways of different geometric shapes/figures and to design buildings/bridges.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- learn the basics of lines and lettering,
- draw linear and curved geometric figures,
- understand & learn to design buildings,
- learn the basics of computer aided design.

Course Content: Introduction - Lines and lettering, Plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola. Solid geometry: Projections of cube, prism, cone, cylinder, developments, true shapes and sections of cube, pyramid, cone, prism, isometric and oblique drawings of cube, pyramid, cone. Plan, elevations and sections of one storied buildings and bridges. Computer Aided Design basics.

Course Code: ME-2211; Course Title: Mechanical Engineering Fundamentals

Credit Hour: 03; 2nd Year *Semester II*

Pre-requisite: N/A

Rationale: This is a fundamental course which enable students to understand about the very basic of mechanical engineering. Some inseparable concepts of mechanical engineering, i.e thermodynamics low, boiler, engine, compressor, turbines will be discussed in the course. The course is decorated with theoretical study supported with mathematical expressions. Students will understand and learn about very basic mechanical components mostly appear in various electrical networks as well.

Course Objectives: This course is designed to help students –

- understand the principles of various laws,
- learn about mechanical components and their uses.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- identify mechanical components in large scale network,
- Solve simple problems in mechanical devices,
- analyze mechanical models mathematically.

Contents: Introduction to the sources of heat energy, renewable and non-renewable sources and their potential; introduction to steam generation, steam generator; boilers and their classification; Working principle of few common and modern boiler; boiler mounting and accessories;

performance of boiler; heat engines; gas turbines, diesel engines, petrol engines, fuel, lubrication and cooling systems of I.C engines, Jet engine. Energy and first law: systems and surroundings; conservation of energy; different thermodynamic processes; energy transfer as heat for a control volume. Entropy and second law: reversibility and irreversibility; definition and corollaries of second law of thermodynamics. Entropy: its transfer and change. Characteristics of some thermodynamic cycles: analysis of different thermodynamic cycles, vapor power cycles, representation of various cycles on PV & TS planes. Basic concepts of refrigeration systems: vapor compression refrigeration, absorption refrigeration, cop, refrigerants and their classifications and properties. Air conditioning: introduction, objectives and major components of air conditioning systems; humidity; dew point. Impulse and reaction turbine, condenser and compressor.

Course Code: ME-2212; Course Title: Mechanical Engineering Fundamentals Lab

Credit Hour: 01; 2nd Year *Semester II*

Pre-requisite: N/A

Rationale: This is sessional course is consisting of three activities: video tutorial, drawing mechanical components and plant visit. The theories students come to learn in theory course will be demonstrated using video clips. Besides, they will learn to draw engines, turbine and compressor using software means. Eventually, a technical visit will be arranged to make them familiar with engines and turbines.

Course Objectives: This course is designed to help students –

- Understand and visualize the principles of various laws.
- learn to draw mechanical components using software.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- differentiate between IG engines.
- realize the vast application of mechanical devices.

Contents: Video clips of boilers, heat engines; gas turbines, diesel engines, petrol engines, fuel, cooling systems, Jet Engine, refrigeration systems, air conditioning systems, Impulse and reaction turbine, condenser and compressor, vacuum tube, steam power plants. Drawing of IC engines; Impulse and reaction turbine, condenser.

EEE CORE COURSES

Course Code: EEE–1111; Course Title: Electrical Circuit I

Credit Hour: 03; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: The course will enable the students to acquire knowledge about electrical units & measurements, electrical circuit parameters, DC analysis of resistive circuits. Students will be introduced with different network theorems and their applications. Also, an overview will be given on magnetic circuit, its laws and analysis. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- understand DC electrical circuit analysis,
- become familiarize with basic laws and different network theorems,
- learn fundamentals of magnetic circuits.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the concepts of electric voltage, current, power and energy,
- explain basic electrical circuits and Kirchhoff's laws,
- derive, comprehend, and apply circuit analysis techniques, such as branch analysis, mesh analysis, nodal analysis etc.,
- analyze different network theorems, for instance Superposition theorem, Thevenin's and Norton's theorem, Maximum power transfer theorem etc.,
- define basics of magnetic circuit, its parameters, laws and analysis.

Contents: S.I. Units, Basic concepts of electric charge, Voltage, current, power, energy, independent and dependent sources, and resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation. Techniques of circuit analysis: Mesh and Nodal analysis including super mesh and super node. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems, maximum power transfer condition. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, hysteresis, eddy currents, flux density, magnetization curve etc. Laws in magnetic circuits:

Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits.

Course Code: EEE–1112; Course Title: Electrical Circuits I Lab

Credit Hour: 01; 1st Year *Semester I*

Pre-requisite: N/A

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in Electrical Circuits-I, EEE-1111. They will verify and analyze basic laws and theorems of electrical circuits. Also, they will learn circuit simulation using Proteus simulation software. Finally, magnetic circuit will be demonstrated in this course.

Course Objectives: This course is designed to help students –

- acquire first-hand experience on electrical DC circuits.
- learn magnetic circuits.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- verify basic laws of circuits.
- verify different network theorems.
- design and implement magnetic circuits.
- design and simulate circuits using Proteus simulation software.

Contents:

Exp. 01: Introduction to equipment and measuring devices.

Exp. 02: Verification of Ohm's law.

Exp. 03: Verification Kirchhoff's voltage law and voltage divider rule.

Exp. 04: Verification of Kirchhoff's current law and current divider rule.

Exp. 05: Introduction of Proteus simulation software.

Exp. 06: Design and simulation of circuits in Proteus.

Exp. 07: Verification of Super-position theorem.

Exp. 08: Verification of Thevenin's and Norton's theorem.

Exp. 09: Verification of Maximum power transfer theorem.

Exp. 10: Study on magnetic circuit.

Course Code: EEE–1213; Course Title: Electrical Circuit II

Credit Hour: 01; 1st Year *Semester II*

Pre-requisite: EEE-1111

Rationale: This is an introductory course where students, for the first time, will familiar themselves with Alternating Current (AC) circuits. Since, most of our household appliance, equipment and industries relay on AC supply, the knowledge of AC circuits are mandatory. This course basically focuses on some particular topics, like as, sinusoidal signal, phase relations, poly phase system, AC network theorem and resonance circuits. Each and every topic will build up there very basic of electrical and electronic engineering.

Course Objectives: This course is designed to help students –

- understand AC parameters and relate with the behavior off phase, reactive elements,
- learn about poly-phase network both for balance and unbalance conditions.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- solve complex circuits using various network theorems,
- design practical serious and parallel resonance circuits,
- improve the power factor of power system.

Contents: Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses. 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, transients in ac circuits. Resonance in ac circuits: Series and parallel resonance. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, and power calculation. Filters: Fundamental filter equation, Low-pass. High-pass and band-pass filter.

Course Code: EEE–1214; Course Title: Electrical Circuits II Lab

Credit Hour: 1.5; 1st Year *Semester II*

Pre-requisite: EEE-1112

Rationale: In this laboratory course student will learn and calculate various AC parameters. They will further study and satisfy several circuit theorems. Some frequency response will be

demonstrating in these sessional. Lastly, some AC load and wiring will be introduced for better understanding of real power system.

Course Objectives: This course is designed to help students –

- understand the significance of AC system,
- learn several AC circuit theorems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Measure various AC parameters,
- explain frequency response in circuits,
- describe filter theorems.

Contents:

Exp. 01: Study and observation of Oscilloscope and function generator.

Exp. 02: Verification of KVL for AC network.

Exp. 03: Verification of KCL for AC network.

Exp. 04: Study of superposition theorem using Ac sources.

Exp. 05: To be familiar with RLC series Resonance circuit.

Exp. 06: To be familiar with RLC parallel Resonance circuit.

Exp. 07: To be familiar with passive RC low pass and High pass filters.

Exp. 08: To be familiar with passive RC band pas and band reject filters.

Exp. 09: Study of Poly phase system.

Exp. 10: Study of AC house appliance.

Course Code: EEE–1315; Course Title: Electronics I

Credit Hour: 03; 1st Year *Semester III*

Pre-requisite: EEE-1213

Rationale: The goal of this course is to introduce students to the operation and application of electronic solid state devices such as diodes, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) and Bipolar Junction Transistors (BJTs). The physical operating principles of these nonlinear devices will be covered with the goal of understanding their impact on external behavior such as current-voltage (I-V) characteristics. This course will provide the requisite background for Electronics II.

Course Objectives: This course is designed to help students –

- understand diode operation and their use in circuits such as rectifiers,
- learn anout the operation of BJTs and utilize their I-V characteristics,
- explain the operation of FETs and utilize their I-V characteristics.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the processes for the operation of diode.
- illustrate the construction of semiconductor devices.
- design of semiconductor devices.
- define the MOS circuits.

Contents: Introduction to electronics devices, Semiconductors. P-N junction: 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. Load line analysis, series- parallel configuration of Diodes. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, Zener shunt regulator, clamping and clipping circuits. Transistor construction and operation. Bipolar junction transistor (BJT): current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, Common emitter, Common base, α, β. Fixed Bias Configuration including load line analysis, Emitter Follower Configuration including load line analysis. Emitter Follower Configuration including load line analysis, Voltage Divider Bias Configuration including load line analysis. Collector Feedback Configuration including load line analysis. Junction field-effect-transistor (JFET): Structure and physical operation of JFET, transistor characteristics, pinch-off voltage.

Course Code: EEE–1316; Course Title: Electronics Circuit Simulation Lab

Credit Hour: 1.5; 1st Year *Semester III*

Pre-requisite: EEE-1214

Rationale: The course introduces the concepts physical view of semiconductor devices and circuits. The course teaches fundamental design principles of hands-on experience in electronic circuits based on silicon technology but extendable to other materials. By the end of the course, the students should understand the broad aspects of semiconductor like BJT and FET.

Course Objectives: This course is designed to help students –

- learn about diode and transistor using lab experiment.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- explain the I-V characteristics curve of diode and transistor including load line analysis,
- illustrate clipper and clamper circuits,
- analyze half wave and full wave rectification,
- describe switching characteristics of BJT including configuration.

Contents:

Exp. 01: Working principle of oscilloscope and function generator.

Exp. 02: Determination of characteristic curve of a diode.

Exp. 03: Study on half-wave rectification.

Exp. 04: Study on full-wave rectification.

Exp. 05: Study of diode clipper circuits.

Exp. 06: Study of diode clamper circuits.

Exp. 07: Switching characteristics of Bipolar Junction Transistors (BJTs).

Exp. 08: Transistor characteristics in common-emitter configuration.

Exp. 09: Study of common-emitter amplifier circuit.

Exp. 10: Transistor characteristics in collector-feedback configuration.

Course Code: EEE–1317; Course Title: Energy Conversion I

Credit Hour: 3; 1st Year *Semester III*

Pre-requisite: EEE-1111, EEE 1213

Rationale: The primary aim of the course is to teach students the very basic of machine. The laws of electromagnetism will be introducing in this course. The principle and construction of Dc motor/generator and transformers will be introduced here. A lot of mathematical problems relevant with practical cases will enlarge their skills. Moreover, machine test will make student able to understand and handle machines at critical situations.

Course Objectives: This course is designed to help students –

- understand theory of DC machines and transformers.
- learn the necessity of machines in power system, home appliance and even in research field.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- define the construction and operating principles of Dc motor/generator and transformer.
- Design the armature winding of DC machine.
- Solve mathematical problems related to Dc motor/generator and transformers.
- Operate machines using various testing skills.

Contents: DC Generator: Working principles, construction, classification/types of generator. Pitch: coil pitch, back pitch, front pitch, resultant pitch, commutator pitch. Lap and wave winding, emf equation of a dc generator, different types of losses in a dc generator, power stages, condition for maximum efficiency, armature reaction, commutation, methods of improving commutation, parallel operation of dc generator, characteristics curve of dc generator, critical resistance and critical speed, Voltage buildup of a shunt generator, external characteristics of dc generator, voltage regulation and uses of dc generators. DC Motor: Working principle, significance of the back emf, voltage equation of a motor, condition for maximum power. Torque: armature torque of a motor, shaft torque. Torque-speed characteristics, characteristics curve of dc series motor and shunt motor, losses and efficiency, power stages and methods of speed control. Transformer: Working principle of transformer, construction, emf equation of a transformer, transformer on no load and on load operation, vector diagrams of a loaded transformer, equivalent circuit, transformer test, voltage regulation, condition for maximum efficiency, auto-transformer. Three-phase transformer: Three-phase transformer connections, current transformer and potential.

Course Code: EEE–2213; Course Title: Energy Conversion II

Credit Hour: 3; 2nd Year *Semester II*

Pre-requisite: EEE-1317

Rationale: This course discusses about the most important two machines, Induction motor and Alternator. Induction motor is highly used in industrial and domestic purpose. Alternator, on the other hand, is widely used in conventional power plants. At first, students will learn about the basic construction and operating principles of these two machines. Then, they will learn to design these machines using mathematical expressions. Students will also concern about different practical situation and challenges of these machines.

Course Objectives: This course is designed to help students –

- understand the construction and operating principles of these two machines.

- learn the complete use and control of Induction motor and Alternator.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- solve practical problems related to Induction motor and alternator.
- design the layer of winding of alternator.
- conduct research in machine designing.

Contents: Synchronous Generator: Basic principle, construction, pitch factor and distribution factor, salient poles and non-salient poles, equation of induced emf, factors affecting alternator size, alternator on load, vector diagram of a loaded alternator, synchronous reactance, voltage regulation, determination of voltage regulation, power developed by a alternator, parallel operation of alternators, synchronizing current and synchronizing power, synchronizing torque, effect of unequal voltages, distribution of load. Three-phase Induction Motor: Working principle, construction, types of rotor, Rotating magnetic field, why does the rotor rotate?, slip, relation between torque and rotor power factor, starting torque, condition for maximum starting torque, torque under running condition, condition for maximum running torque, effect of change in supply voltage on torque and speed, full load torque and maximum torque, starting torque and maximum torque, torque-speed curves, plugging of an induction motor, induction motor operating as a generator, power stages in an induction motor, torque developed by an induction motor, equivalent circuit, vector diagram, no-load test, blocked rotor test, starting of induction motors, speed control of induction motors, Synchronous motor.

Course Code: EEE–2214; Course Title: Energy Conversion Lab

Credit Hour: 1.5; 2nd Year *Semester II*

Pre-requisite: EEE-1214

Rationale: In this laboratory course students will learn about Construction and operation of DC and AC machines. Single and three phase induction motor will be demonstrated in this lab. Thee detail experiments on synchronous motor and generator will be shown here. They will measure various parameter like, speed, torque, high voltage using multiple measuring device.

Course Objectives: This course is designed to help students –

- understand the construction of DC and AC machines,
- learn the operation of DC and AC machines.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe and measure laboratory parameters of DC and AC machines,
- develop the skill to handle heavy weight industrial machines.

Contents:

Exp.01: Study on DC generator.

Exp.02: Study on DC motor.

Exp.03: Study on 1-phase and 3-phase transformers.

Exp.04: Study on squirrel cage Induction Motor: Current, speed, torque measurement.

Exp.05: Study on squirrel cage Induction Motor: Characteristics curves.

Exp.06: Study on Synchronous Motor: Characteristics at different loading condition.

Exp.07: Study on three phase alternator: Characteristics at Resistive and Inductive load.

Exp.08: Study on Synchronization.

Exp.09: Single phase induction motor: Split phase motor.

Exp.10: Single phase induction motor: Capacitor start motor.

Course Code: EEE–2315; Course Title: Electronics II

Credit Hour: 03; 2nd Year *Semester III*

Pre-requisite: EEE-1315

Rationale: The Course will enable the students to acquire knowledge about the principles and practices of analog systems, both at the device and circuit level. The course covers topics in electronics including: Operational amplifier circuit and operations, Field effect transistor, Timer circuit and various amplifiers. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- various fundamentals of methods and techniques require designing and implementing of analog computation and Electronics devices.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand IC-741,
- understand and implementation of operational amplifier,
- design and implement of Active filters circuits,
- understand Timer circuit and Pulse generator,

- design and implement Field Effect Transistor Concept and Implementation.

Contents: OPAMP: Pin configuration, Biasing System, Trimming, Open loop gain, close loop gain, Comparator circuit, Inverting and Non-inverting Amplifier, Buffer, Adder, Subtractor, Differentiator, Integrator, PWM converter, Window controlling system, Smoke detector, Filter: Design procedure of active filter and concept of butter worth filter, -20db,-40db and -60db Low pass and High pass filters, Band pass, Band stop, Notch Filter, Timer : 555 timer basic and controlled the triggered and threshold terminal, Operation mode, Free running Astable operation, Frequency oscillation, One-shot or Monostable operation, MOSFET: Structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, and current-voltage characteristics of an enhancement MOSFET, Biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter. Differential and multistage amplifiers: Description of differential amplifiers, small-signal operation, and differential and common mode gains, RC coupled mid-band frequency amplifier. Large signal amplifiers: class A, class B, class AB and class, C amplifiers. Analysis and design tuned and un-tuned power amplifiers.

Course Code: EEE–2316; Course Title: Electronics II Lab

Credit Hour: 1.5; 2nd Year *Semester III*

Pre-requisite: EEE-1316

Rationale: In this sessional course students will get familiar with the operation of MOSFET and Op-amp. Switching and biasing will be discussed with measuring the outputs. Since, op-amp deals with high gain, it is widely used in electronics devices. MOSFET, on the hand, has high switching speed which is better for some particular application. Besides, some filter response will be demonstrated in this course.

Course Objectives: This course is designed to help students –

- understand the operation of MOSFET and Op-amp.
- learn biasing and switching characteristics of MOSFET and Op-amp.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- explain the comparison between MOSFET and Op-amp.
- Design several practical filters.

Contents:

Exp. 01: Study of Switching characteristics and switching loss of MOSFET.

Exp. 02: Design an amplifier circuit using n channel MOSFET.

Exp. 03: Study on C-MOS inverter.

Exp. 04: Study on push pull amplifier.

Exp. 05: Study on multi-vibrators using 555 timer IC.

Exp. 06: Design a RC Phase Shift Oscillator using transistor (BJT).

Exp. 07: Study on Comparators: Inverting and Non-Inverting comparators.

Exp. 08: Study on inverting and non-inverting amplifier using op-amp.

Exp. 09: Study on Differential and Integrator circuit using op-amp.

Exp. 10: Study on filters using op-amp.

Course Code: EEE–2317; Course Title: Digital Electronics

Credit Hour: 03; 2nd Year *Semester III*

Pre-requisite: EEE-2315

Rationale: The course will enable the students to acquire knowledge about the principles and practices of digital systems, both at the device and circuit level. The course covers topics in digital electronics including: Number Theory, Boolean Algebra, Combinational and sequential logic circuits, Memory Circuits, etc. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- understand number systems and codes.
- learn fundamentals of digital electronics,
- get to know design procedure of digital logic circuits.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- generate binary codes,
- Implement Boolean algebra and logic gates.
- design and implement combinational and sequential logic circuits.
- explain synchronous and asynchronous logic design procedure.
- design and implement registers, counters and timing sequences.

Contents: Number systems and codes, Digital logic: signed binary number, binary codes, Boolean algebra: De-Morgan's law, Logic-gates and their truth tables, canonical forms Simplification of Boolean function: minimization techniques, map method, NAND, NOR implementation, don't

care condition, determination of prime implicates. Combinational logic circuits: Arithmetic and data handling logic circuit, integrated circuits decoders and encoders, Multiplexers and De-multiplexers, Read-Only Memory (ROM). Sequential logic design: Flip-flops, triggering of flip-flop, flip-flop excitation table, registers. Counters: Asynchronous and Synchronous counters and their applications. Synchronous and asynchronous logic design: state diagram, State minimization and assignments. Timing sequences: Word-time generation, Johnson counter.

Course Code: EEE–2318; Course Title: Digital Electronics Lab

Credit Hour: 1.5; 2nd Year *Semester III*

Pre-requisite: EEE-2316

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in Digital Electronic, EEE-2317. After being acquainted with different logic gates, students will design and implement different combinational and sequential logic circuits in the laboratory.

Course Objectives: This course is designed to help students –

- acquire first-hand experience on digital logic circuits.
- learn combinational and sequential logic.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- demonstrate the use of seven logic gates.
- implement Boolean functions with logic gates.
- design and implement different combinational logic circuits.
- design and implement sequential logic circuits.
- design and implement counter circuits.

Contents:

Exp. 01: Study on digital logic gates.

Exp. 02: Study on implementing Boolean functions using logic gates.

Exp. 03: Study on half adder and full adder circuits.

Exp. 04: Study on half subtractor and full subtractor circuits.

Exp. 05: Study on Decoder and DeMUX.

Exp. 06: Study on Encoder and MUX.

Exp. 07: Study on flip-flops.

Exp. 08: Study on binary counter.

Exp. 09: Study on register.

Exp. 10: Study on Johnson Counter.

Course Code: EEE–3111; Course Title: Signal and Linear Systems

Credit Hour: 02; 3rd Year *Semester I*

Pre-requisite: MATH-1213

Rationale: The course will enable the students to acquire knowledge about the principles and practices of different types of signals & systems, properties of linear systems. The course covers topics in time & frequency domain signal analysis: Fourier series, Fourier transform, Laplace transform & their applications. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- To understand various fundamentals, characteristics and properties of different signals and systems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand signals, systems & linear systems,
- understand linear systems & classical solution of linear systems,
- understand analogous systems,
- analyze signals in time and frequency domain,
- analyze signals in Laplace domain.

Course Content: Continuous-time, discrete-time signals and systems; Different types of signals; Energy & Power signals; Signal properties: shifting, multiplication and others; Unit step, impulse and ramp functions; Linear Systems & its properties; Classical solution of Linear 1st & 2nd order equations; Analogous Systems: Translational & Rotational systems; D'Alemberts principle, Mechanical system representation using D'Alemberts principle; Mechanical system to Electrical system conversion using f-v & f-i analogy; Frequency-domain signal analysis: Fourier Series and Fourier Transform; Properties of Fourier series, Trigonometric Fourier series; Exponential Fourier series; Application of Fourier series in electrical circuits; Fourier Transform & its properties; Forward and inverse Fourier transforms; Laplace-domain signal analysis & its

properties; Forward and inverse Laplace transforms; Application of Laplace Transform in electrical circuits.

Course Code: EEE–3112; Course Title: Signal and Linear Systems Lab

Credit Hour: 02; 3rd Year *Semester I*

Pre-requisite: CSE- 2112, EEE- 1316

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in signals & linear systems, EEE-3111. Students will understand the practical use of different properties of signals and linear systems. This course will help the students to know the practical use of Fourier series, Fourier transform and Laplace transform.

Course Objectives: This course is designed to help students –

- This course provides practical knowledge about the basics & properties of signals and linear systems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- acquire knowledge on different signals
- acquire knowledge on different properties of signals
- transform a signal from time domain to frequency domain
- learn the basics & applications Fourier series and Fourier transform
- learn the basics & applications Laplace transform

Contents:

Exp. 01: Basics of MATLAB.

Exp. 02: Study of different signals: continuous-time, discrete-time.

Exp. 03: Study of unit step and impulse functions.

Exp. 04: Study of the properties of a signal: periodicity, shifting, multiplication.

Exp. 05: Study of the properties of a signal: energy and power.

Exp. 06: Study of Fourier series.

Exp. 07: Study of Fourier transform.

Exp. 08: Study of the applications of Fourier series & Fourier transform.

Exp. 09: Study of Laplace transform.

Exp. 10: Study of the applications of Laplace transform.

Course Code: EEE–3113; Course Title: Electromagnetic Fields and Waves

Credit Hour: 02; 3rd Year *Semester I*

Pre-requisite: PHY-3111, MATH- 2111

Rationale: The course will enable the students to recall the application of orthogonal coordinate systems, and the basic principles of electrostatics and magneto statics. Students will also be able to calculate electric and magnetic fields for various geometrics, and also at the boundary between two different media. Students will also acquire the knowledge of propagation of plane electromagnetic wave in lossy and lossless media, the polarization of plane electromagnetic wave.

Course Objectives: This course is designed to help students –

- Understand the use of orthogonal coordinate systems, vector triple product, divergence, gradient and curl of any vector filed.
- Understand the basic principle of electrostatics, magneto statics, and electromagnetic induction,
- Understand the propagation and polarization of Electromagnetic waves in lossless and lossy media.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Use the orthogonal coordinate systems for different distribution of charge,
- Use divergence, gradient, and curl to any vector field.
- Calculate the electric vector, magnetic induction for different geometric distribution, and at the boundary between different media.
- Use the concept of propagation and polarization of electromagnetic waves in lossy and lossless media.

Contents: 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, and 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.

Course Code: EEE–3115; Course Title: Power System I

Credit Hour: 03; 3rd Year *Semester I*

Pre-requisite: EEE-2213

Rationale: The course will enable the students acquire knowledge about the principles and practices of Power systems, both at the device, Implementation System and associated parameters. The course covers topics in power system including: Power System Basic and Classification, Inductance and Capacitance of Transmission Line, Types of Transmission line, Insulation System, Mechanical Design of Transmission Line, Corona and Sag of Transmission Line. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- Various fundamentals of methods and techniques require designing and implementing of Power system.
- Design and types of Transmission Line.
- Various Mechanical component of Transmission line.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand Power System.
- understand of Transmission line parameters.
- Understand of Transmission Line.
- design and mathematical representation of Mechanical design of transmission line.
- Understand Corona of Transmission Line.
- Understand Sag of Transmission Line.

Contents: Power System Concept: Generation, Transmission and Distribution of Power System, Various Voltage ratings, lay out of Power System and Various Conductor of Transmission Line; Transmission line parameters : Resistance ,Inductance, Capacitance and Impedance of Transmission Line, Representation of Transmission Line : Short, Medium and Long Transmission Line, T and π model and General line equation in terms of A, B, C and D constant; Mechanical design of transmission line: Main Component of Overhead lines, Conductor materials, Line support, Insulators Properties, Safety factor, Potential distribution over suspension, String Efficiency and Mathematical Expression; Corona of Transmission Line : Basic Concept of Corona, Theory of Corona formation, Factor affecting Corona, Important term: Critical disruptive voltage, Visual critical Voltage and Power loss due to corona, Advantages, Disadvantages ,Method of reducing Corona Effect; Sag of Transmission Line: Basic Concept of Sag in Overhead Lines, Important Point, Calculation of Sag: When supports are at equal level, When supports are unequal level, Effect of wind and Ice Coating.

Course Code: EEE–3116; Course Title: Power System I Lab

Credit Hour: 01; 3rd Year *Semester I*

Pre-requisite: EEE-1214, EEE-2214

Rationale: In this laboratory course student will get the opportunity to understand an overall power system network starting from generating station to three phase load. In addition, they will familiar with various transformers including auto-transformer and phase meter operation. The significance of line resistance will be shown through the laboratory experiments. Again, the effect of resistive and inductive loads will be discussed here. In this course, students will get the chance to measure and observe high voltage power system parameters.

Course Objectives: This course is designed to help students –

- understand the significance of line resistance and load impedance on transmission line.
- learn about the high voltage power system equipment.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Synchronize two generating station using Synchronizing module.
- illustrate voltage regulation and phase shifting in power system.
- analysis a practical power system network using Power world simulator.

Content:

Exp. 01: Study on Synchronizing Module.

Exp. 02: Study on effect of line resistance and load impedance on transmission line.

Exp. 03: Study on phase shift for different load.

Exp. 04: Study on effect of load in percentage regulation.

Exp. 05: Study on Auto-transfer and Phase meter.

Exp. 06: Study on two stations with unequal voltage and phase angle connected with transmission line.

Exp. 07: Introduction to Power world simulator.

Exp. 08: Design one line diagram of power systems using Power world simulator.

Exp. 09: Perform load flow analysis in Power system using Power world simulator

Exp. 10. Perform fault analysis in Power system using Power world simulator.

Course Code: EEE- 3217; Course Title: Basic Communication Engineering

Credit Hour: 02; 2nd Year *Semester II*

Pre-requisite: EEE-3111

Rationale: The course will enable the students to understand the basics of analog communication system. Students will be familiarized with different amplitude and angular modulation and demodulation techniques. Also, they will learn about different noise and interferences associated with the communication system. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- understand analog communication system,
- learn data transmission and reception techniques for both baseband and bandpass signaling.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the concepts of analog communication system.
- derive, comprehend, and adopt AM, FM and PM modulation-demodulation techniques.
- explain the effects of noise and interference.

Contents: Overview of communication systems: Basic principles, fundamental elements, various signals and tones, transmission media, bandwidth and transmission capacity. Noise: Noise

sources, characteristics of noise, types of noise, signal to noise ratio, noise figure. Modulation technique: Amplitude modulation- DSBFC, DSBSC, SSB, VSB; Angle Modulation- FM, PM; Carrier suppression: balanced modulator, Sideband suppression: phase shift method. AM and FM generator circuit: transistor-based AM generator, FM reactance modulator, Varactor diode modulator. Interference: adjacent channel interference, co-channel interference. Demodulation technique: AM demodulation- square law diode detection, linear diode detection; FM demodulation – zero crossing detection (ZCD). Radio transmitter and receiver: types, super-heterodyne receiver.

Course Code: EEE- 3218; Course Title: Basic Communication Engineering Lab

Credit Hour: 01; 2nd Year *Semester II*

Pre-requisite: EEE-3112

Rationale: In this sessional course student will perform experiments on modulation and demodulation techniques. Here, they will train basically on amplitude and frequency modulations. They will handle EMONA-101 training KIT with the help of oscilloscope. Some software simulation regarding the experiments will firm their knowledge to a higher extent.

Course Objectives: This course is designed to help students –

- understand analog signal modulation and demodulation.
- learn operation of training kits.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe modulation and demodulation techniques
- explain the effect of noise.
- Handle EMONA-101 training KIT.
- define the significance of amplitude and frequency modulations.

Course Content:

Exp. 01: Study on Amplitude modulation (AM).

Exp. 02: Study on Double Sideband (DSB) modulation.

Exp. 03: Study on Amplitude demodulation.

Exp. 04: Study on Double Sideband (DSB) demodulation.

Exp. 05: Study on Single sideband (SSB) modulation and demodulation.

Exp. 06: Study on DSB-SC modulation and demodulation.

Exp. 07: Study on Frequency modulation.

Exp. 08: Study on Frequency demodulation.

Exp. 09: Study of Modulations using MATLAB.

Exp. 10: Study of demodulations using MATLAB.

Course Code: EEE-3219; Course Title: Control System I

Credit Hour: 02; 3rd Year *Semester II*

Pre-requisite: EEE-3111

Rationale: The course will enable the students to acquire knowledge about analysis and design objectives, case study, design process, Transfer Function, electric circuits analogs. Students will be introduced with different systems theorems and their design process. Also, an overview will be given on PID to facilitate students on their final year thesis or project.

Course Objectives: This course is designed to help students –

- learn fundamentals of control engineering.
- understand its application in different aspects.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the concepts of control system, open loop, close loop.
- understand Laplace Transform.
- derive, comprehend, and apply Laplace transform in different equations.
- understand network theorem for Electric Circuit Analogs.
- understand modeling in Time and Frequency Domain.
- understand Reduction of multiple subsystems.
- understand stability and steady-state errors.

Contents: Introduction to feed-back control terminologies with example, Transfer function modeling with DC and AC servo and other familiar systems. Block diagram representation and simplification to canonical form by Mason Rule. Time domain specifications-unit step response. Location poles and stability of Routh's criterion. Steady State performance: types of systems, examples, steady state error and static error co-efficient. Frequency response: Bode, Nyquist and Nichols plots, gain margin, phase margin, maximum magnitude, resonant frequency and bandwidth, correlation with time response. Stability from Nyquist diagram (direct polar plot). Gain adjustment using Nichols chart, Root Locus: construction rules, dominant rules. Stability.

P+I, P+D and PID compensation using root locus and Nichols chart. Feed-back compensation using Root-locus. Introduction to pole placement compensation. State space representation: formulation of state equations, transfer function from state equation, stability and Eigen values of state transition matrix. Introduction to digital control.

Course Code: EEE-3220; Course Title: Control System I Lab

Credit Hour: 01; 3rd Year *Semester II*

Pre-requisite: EEE-3112

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in Control System I, EEE-3219. After being acquainted with different Ladder diagrams, students will design and implement different programmable logic circuits in the laboratory.

Course Objectives: This course is designed to help students –

- apply control system techniques in different problem solving cases.
- acquire first-hand experience on PLC.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- implement Ladder diagrams in PLC.
- design and implement different combinational circuits.
- design and implement underdamped circuits in MATLAB.
- design and implement steady state error circuits.

Contents:

Exp. 01: Study on steady state error analysis of different types of system simulated on a pc using the MATLAB software.

Exp. 02: Study of the unit step response of a second order system simulated on a pc using the MATLAB software.

Exp. 03: Study of a root locus of a system simulated on a pc using the MATLAB software.

Exp. 04: Study of self-holding circuit using one input and one output.

Exp. 05: Study of self-holding circuit 2 using holding contact.

Exp. 06: Study of self-holding circuit 3 using two input.

Exp. 07: Study of flashing circuit 1.

Exp. 08: Study of flashing circuit 2 using two timers.

Exp. 09: Study of flashing circuit 3 using pulse output instruction.

Exp. 10: Study on self-holding circuit 4 using set and reset.

Course Code: EEE-3221; Course Title: Microprocessor, Assembly Language & Computer Interfacing

Credit Hour: 03; 3rd Year *Semester II*

Pre-requisite: EEE-2317

Rationale: The course introduces the concepts of microprocessor which used to provide an understanding of microprocessor hardware and software. This course introduces to engineering graduates the microprocessor and its assembly language programming. The course is designed based on the popular Intel 8086 microprocessor and provides good understanding of the microprocessor operation at the address, data, and control level. The course also covers the software part through teaching of assembly language programming techniques.

Course Objectives: This course is designed to help students –

- learn about microprocessors based system to peripheral devices
- understand how an external resource can be connected to the microprocessor using the address bus, data bus, and control bus

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe basic microprocessor architecture
- explain internal Registers of microprocessor
- define Addressing Modes
- illustrate Arithmetic and Logic Instructions
- define memory interfacing with the microprocessor
- illustrate I/O interfacing with the microprocessor
- generate basic interrupt processing

Contents: Fundamental concept: microprocessor and microcontroller, microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM and emu8086, microprocessor instructions. System Design (8086 based digital weighing machine: DWM) Top down/Bottom up design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display,

cost computation and processing and display. Introduction to different types of microprocessors: 8bit, 16 bit, 32bit and their architectures, pin diagrams and junction, Pentium microprocessor and co-processors, RISK and CISK processor. Introduction to 16-bit architecture: Pin diagram and functions, memory organization, bus activities, register layout, internal processing blocks. Instruction Set: classifications of instructions, addressing modes, address computing chart. Programming language, EPROM, RAM and assembly language programming. IO Controller Programming: Port definition and read/write instructions, parallel I/O programming using 8255, serial I/O programming using 8255, display programming using 8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter. Interrupt Structure: 8086 interrupt structure, Interrupt Vector Table (IVT), Interrupt terminologies, hardware and software interrupt, multiple interrupt management, 8259 interrupt controller Minimum & maximum mode of 8086, support chips. Standard for bus architectures and ports: ISA, EISA, MCA, PCI, VESA, Accelerated Graphics port(AGP), Universal Serial Port (USB), RS-232C, RS-423A, RS-499 and RS-366, IEEE-488 BUS and bus system in a microprocessor System.

Course Code: EEE-3222; Course Title: Microprocessor, Assembly Language & Computer Interfacing Lab

Credit Hour: 01; 3rd Year *Semester II*

Pre-requisite: EEE-2318

Rationale: The course introduces the concepts of microprocessor 8086 which used to provide an understanding of basic arithmetic operations by sending data directly and via memory location in registers. The students can gather knowledge about the programming of 8255 PIO controller by blinking character for several times on the CA7SDD/CC7SDD, peripherals and interfacing experiment as well as DOT MATRIX ARRAY by programming 8255 PIO controller.

Course Objectives: This course is designed to help students –

- learn about 8086 MPU providing basic arithmetic operations, peripherals and interfacing **P**IO controller.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- explain basic arithmetic operations using assembly code,

- illustrate programming of 8255 PIO controller,
- describe Peripherals and Interfacing Experiment using Stepper motor control, traffic light control,
- generate DOT MATRIX ARRAY by programming 8255 PIO controller.

Contents:

Exp. 01: Study on basic arithmetic operations (Addition/Subtraction) of 8086 MPU by sending data directly in registers.

Exp. 02: Study on basic arithmetic operations (Multiplication/Division) of 8086 MPU by sending data directly in registers.

Exp. 03: Study on basic arithmetic operations (Addition/Subtraction) of 8086 MPU by sending data via memory location in registers.

Exp. 04: Study on basic arithmetic operations (Multiplication/Division) of 8086 MPU by sending data via memory location in registers.

Exp. 05: Study on the programming of 8255 PIO controller by blinking character '0-9' for several times on the CA7SDD/CC7SDD.

Exp. 06: Study on the programming of 8255 PIO controller by blinking character '0-9' for several times on the CC7SDD.

Exp. 07: Study on Peripherals and Interfacing Experiment using traffic light control.

Exp. 08: Study on Peripherals and Interfacing Experiment using Stepper motor control.

Exp. 09: Study on Peripherals and Interfacing Experiment using A/D and D/A interface and Waveform Generation.

Exp. 10: Study on 8×8 LED ARRAY or DOT MATRIX ARRAY by programming 8255 PIO controller.

Course Code: EEE-3324; Course Title: Electrical Services Design

Credit Hour: 01; 3rd Year *Semester III*

Pre-requisite: EEE-1213, EEE-1214

Rationale: In this laboratory course some theoretical concept and practical design with implementation will be taught. The concept of electrical wiring and home appliance will be developed here. Some widely discussed incidents like as, fault, electrical shock, grounding are

deeply studied in this course. In addition, the students will be introduced with AUTOCAD a prominent designing software.

Course Objectives: This course is designed to help students –

- understand the concept of electrical wiring and home appliance
- learn to calculate several terms and conditions for wiring.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Design a complete wiring both for miniature and large scale model
- develop skill on AUTOCAD a prominent designing software.

Contents: Electrical wiring, Estimating and Costing. Design for illumination and lighting. Electrical installations system design: substation, BBT and protection, air-conditioning, heating and lifts. Design of security systems including CCTV, fire Alarm, smoke detector, burglar alarm, and sprinkler system. A design problem on a multi-storied building.

Course Code: EEE-3325; Course Title: Electrical Properties of Materials

Credit Hour: 02; 3rd Year *Semester III*

Pre-requisite: PHY-2213, MATH-1315

Rationale: The aim here is to equip the student with knowledge of solid state physics, modern physics and quantum mechanical statistical distribution for the purpose of studying electrical, thermal, and magnetic properties of metal, semiconductor, and dielectric materials.

Course Objectives: This course is designed to help students –

- Understand the structure of solid, and planes, directions, and defects in solid crystals.
- Understand the electrical and thermal conduction in metal and metallic alloy.
- Understand the use of modern physics for dielectric and semiconductor materials.
- Understand classical and quantum statistical distributions
- Understand the states and electronic motion in different quantum mechanical structures.
- Understand dielectric properties, polarization of matter.
- Understand the magnetization in matter, and concept of superconductivity.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Identify different structure of solid, planes, directions and defects in solid structure.
- Apply Schrodinger equation for various quantum mechanical structure.

- Apply fundamental postulates and principles of quantum mechanics for various electronic structure.
- Use the modern band theory of solid, and other principles of solid state physics.
- Classify the magnetic materials, and their response to magnetic field.
- Apply the concept of superconductivity.

Contents: Crystal structures: Types of crystals, lattice and basis, Bravais lattice and Crystal Plane and direction, Miller indices. Crystal defect 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, and 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.

Course Code: EEE–3327; Course Title: Digital Communication

Credit Hour: 03; 3rd Year *Semester III*

Pre-requisite: EEE-3217

Rationale: The course will enable the students to understand the basics of digital communication system. Students will be familiarized with different encoding, modulation and detection techniques related to baseband signaling and bandpass signaling in digital communication system. This course will also help to enhance the students' knowledge in the subsequent related course.

Course Objectives: This course is designed to help students –

- understand digital communication system.
- learn data transmission and reception techniques for both baseband and bandpass signaling.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the concepts of digital communication system.
- explain sampling theorems and baseband transmission.
- generate different PCM waveforms.
- illustrate baseband modulation and demodulation techniques.
- define information theory.

Contents: Introduction to digital communication system: classifications of signals, spectral density, auto correlation. Sampling: sampling theorem, Nyquist criterion, impulse sampling, natural sampling, flat-topped sampling. Pulse modulation: PAM, PWM, PPM. Pulse code modulation (PCM): quantization principle, quantization noise, uniform and non-uniform quantization, sources of corruption, signal to quantization noise ratio, differential PCM. Delta modulation (DM): principle, adaptive DM; line coding: formats and bandwidths. Digital modulation and demodulation: ASK, FSK, BPSK, DPSK, QPSK, QAM, MSK. Multiplexing: TDM, FDM, CDMA, OFDM and beyond. Information theory: Discrete message, average information, entropy, information rate, Shanon's theorem, channel capacity.

Course Code: EEE- 3328; Course Title: Digital Communication Lab

Credit Hour: 03; 3rd Year *Semester III*

Pre-requisite: EEE-3218

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in digital communication, EEE-3327. Students will understand the practical use of different encoding, modulation and detection techniques related to baseband signaling and band pass signaling in digital communication system.

Course Objectives: This course is designed to help students –

- This course provides practical knowledge about the basics & properties of digital communication systems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the concepts of digital communication system.
- understand sampling theorems and baseband transmission.
- generate different PCM waveforms.

- understand baseband and band pass modulation and demodulation techniques.

Contents:

Exp. 01: Study of Sampling: natural and sample-and-hold.

Exp. 02: Study of Aliasing and reconstruction of sampled signal.

Exp. 03: Study of Pulse Amplitude Modulation (PAM) and Demodulation.

Exp. 04: Study of Pulse Code Modulation (PCM) and demodulation.

Exp. 05: Study of Amplitude shift keying modulation and demodulation.

Exp. 06: Study of Frequency shift keying modulation and demodulation.

Exp. 07: Study of Phase shift keying modulation and demodulation.

Exp. 08: Study of Delta modulation and demodulation.

Exp. 09: Study of QPSK using MATLAB.

Exp. 10: Study of DPSK modulation and demodulation using MATLAB.

Course Code: EEE-3329; Course Title: Digital Signal Processing I

Credit Hour: 02; 3rd Year *Semester III*

Pre-requisite: EEE-3327

Rationale: This course will introduce the students to the concept of analyzing discrete time signals & systems in the time and frequency domain. It will help to acquire knowledge about the conversion of analog to digital signals, behaviors of discrete-time systems, convolution, correlation of the signals and Z-transform. This course will also enlighten the students about Filter designing and DFT in frequency domain sampling.

Course Objectives: This course is designed to help students –

- To understand the basics, techniques and ways to process digital signal.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- classify signals and systems and its mathematical representation,
- analyze the discrete time systems,
- understand various transformation techniques and computation,
- design FIR and IIR filters.

Content: Basic elements of a digital signal processing system, Advantages of digital signal processing; Types of digital signals, Concept of frequency in continuous-time and discrete-time

signals; Analog to digital and digital to analog signal conversion; Classification of discrete-time signals, block diagram representation; Classification of discrete-time systems: Static/Dynamic, Linear/Nin-linear, Causal/ Non-causal, Time-variant/Time invariant, Stable/Unstable systems ; Analysis of discrete-time linear time-invariant systems: convolutional sum & its properties; Analytical convolution; Constant coefficient difference equations and solutions; Correlation of discrete-time signals: cross-correlation & auto-correlation; Z-transform and its properties; Poles and Zeros, pole location and time domain behavior of causal signals; Inverse Z-transform, Analysis of linear time-invariant systems in the Z-domain; Frequency domain sampling: DFT, DFT as a linear transformation; Properties of DFT, magnitude and phase representation; Use of DFT in linear filtering; Circular convolution using DFT; FFT and its applications; FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics; IIR design: Analog filter design Butterworth and Chebyshev approximations.

Course Code: EEE-3330; Course Title: Digital Signal Processing I Lab

Credit Hour: 01; 3rd Year *Semester III*

Pre-requisite: EEE-3328

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in Digital signal processing, EEE-3329. Students will understand the practical use of the convolution, correlation, Z-transform and DFT on signal. This course will help students to design FIR and IIR filters.

Course Objectives: This course is designed to help students –

- To gain practical knowledge and experience for processing digital signal

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- acquire knowledge on different discrete signals
- transform a continuous-time signal to discrete-time signal
- convolute two signals
- design IIR filters
- design FIR filters

Contents:

Exp. 01: Study of discrete time signals: sine, cosine, unit step & impulse function.

Exp. 02: Study of the properties of the discrete time signals.

Exp. 03: Study of the quantization process of the discrete time signals.

Exp. 04: Study of the convolution process of the discrete time signals.

Exp. 05: Study of the correlation process of the discrete time signals.

Exp. 06: Study of Z-transform of a signal.

Exp. 07: Study of the properties of the Z-transform of a signal.

Exp. 08: Study of the DFT and IDFT computation.

Exp. 09: Design of IIR filter (Butterworth method).

Exp. 10: Design of FIR filters (window (any one) method).

ELECTIVE COURSES
COMMUNICATION GROUP

Course Code: ECE- 4117; Course Title: Optical Fiber Communication

Credit Hour: 03; 4th Year *Semester I*

Pre-requisite: EEE-3327

Rationale: The course will enable the students to acquire knowledge about the fundamentals and basic principles of optical fiber communication. This course covers topics in principles of optical fiber, different types of fiber, dispersion and optical detectors. This course will also elaborate the basics and principles of optical link design.

Course Objectives: This course is designed to help students –

- understand various fundamentals and principles of optical fiber communication.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- know ray theory,
- understand electromagnetic theory for optical propagation,
- know the principles, types and losses of optical fiber,
- design an optical link.

Contents: Introduction to Optical Fiber, Ray Theory: Reflection, Refraction, Diffraction, Total Internal Reflection, Acceptance angle, Numerical aperture, Electromagnetic Theory for optical propagation: Electromagnetic waves, Modes, Phase shift, Transmission characteristic of Optical fiber: Attenuation, Material absorption loses, Linear and nonlinear scattering loses, Fiber band loses, Dispersion, Single Mode and Multi-mode fibers: Mode coupling, Step index fiber, Graded index fiber, Optical sources: The Light emitting diode, The Laser, Different types of Laser, Optical detectors: Detection principles, p-i-N and avalanche photodetectors, Optical fiber connections: joints and couplers: Fiber alignment and joint loss, Fiber splices, Fiber connectors, Fiber couplers. Transmission link analysis: point to point and point to multi point links, system configuration, link power budget, rise time budget and line coding schemes. Optical data buses, optical network, fiber distributed network (SONET), Optical frequency division multiplexing, wavelength division multiplexing.

Course Code: ECE- 4221; Course Title: Cellular Mobile and Satellite Communication

Credit Hour: 03; 4th Year *Semester II*

Pre-requisite: EEE-3327

Rationale: The course will enable the students to acquire knowledge about the fundamentals and basic principles of cellular mobile and satellite communication. This course covers topics in analog and digital cellular system, Cellular Radio System, Mobile radio propagation, handoffs and dropped calls. This course will also elaborate the basics and principles of Digital cellular systems and satellite communication.

Course Objectives: This course is designed to help students –

- To understand various fundamentals and principles of cellular mobile and satellite communication

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand the operation of satellite communication
- understand evolution of cellular system
- learn cellular radio system, call operations
- gain knowledge on different wireless systems & standards

Contents: Introduction: evolution and fundamentals, analog and digital cellular system, Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile

radio propagation: Propagation characteristics, models for radio propagation antenna at sell cite and mobile antenna. Frequency management and channel assignment: Fundamentals, spectrum utilization fundamental of channel assignment fixed channel assignment, non-fixed channel assignment traffic and channel assignment: Handoffs and Dropped Calls: reason and types forced handoffs mobile assisted handoffs and dropped call rate, diversity techniques: concept of diversity paths 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. Orbital Aspects, Tracking and control of communication satellite, Launch vehicle: space shuttle, propagation characteristics: Attenuation and noise, frequency bands, satellite transponders: Intermediation low noise amplifiers, satellite antenna, earth station configuration, high power amplifiers antenna, LNA: Link design, multiple access, Spot beam antenna, INTELSATs, INSAT.

ELECTIVE COURSES
POWER GROUP

Course Code: EEE – 4011; Course Title: Power System II

Credit Hour: 03; 4th Year *Semester I*

Pre-requisite: EEE-3115

Rationale: The course will help students understand how power systems are modeled both at the distribution and transmission levels. The course covers long-distance transmission of electric power with emphasis on per-unit systemadmittance and impedance modeling of components and system, power-flow studies and calculations, symmetrical and unsymmetrical fault calculations, economic operation of large-scale generation and transmission systems. Emphasis is on applications of computer-based methods to power-system problems.

Course Objectives: This course is designed to help students –

- learn how to calculate power flow in a power systems network,

- understand about voltage stability and reactive power control in power systems.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- build basic understandings on modern power system operation and protection,
- define the power flow analysis,
- illustrate symmetrical and unsymmetrical fault calculations,
- generate the basic modeling technics for power system analysis.

Contents: Power network representations: single line diagram, impedance and reactance diagram, per unit system of calculations, reactance of asynchronous generators and its equivalent circuit, voltage characteristics of loads, power and reactive power flow in simple systems. Load flow analysis: Admittance bus, Nodal Analysis, bus elimination methods, load flow studies of large systems using the Gauss-Seidal methods, Newton-Rapshon Method, control of voltage, power and reactive power, use of network analyzers and digital computers. Symmetrical faults: Transient in RL series circuits, short circuit currents and the reactance of synchronous machines, bus impedance matrix in fault calculation, limitations of short circuit current using regulators. Symmetrical components: positive, negative and zero sequence networks of generators, Fortescue's theorem transformers and lines, sequence network of systems. Unsymmetrical fault: single-line to-ground fault, double-line to-ground fault calculations Power system stability: involving two machine systems, methods of improving stability swing equation, equal area criterion of stability and its applications, solution of swing equation, factors affecting transient stability.

Course Code: EEE- 4113; Course Title: Energy Conversion III

Credit Hour: 03; 4th Year *Semester I*

Pre-requisite: EEE-2213

Rationale: The course will enable students to learn about special purpose machines. These types of machines are widely used in home appliance as well as in research purpose. In this course they will familiar with single phase induction motor, synchronous motor and other special motors. Machines construction, design, application and performance analysis will be discussed here.

Course Objectives: This course is designed to help students –

- understand the special purpose machines.

- learn the operation and construction of the special purpose machines.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Solve mathematical and practical problems related to these machines.
- Design robotic parts using these machines.
- Explain the necessity of these machines in research fields.

Content: Synchronous Motor: Working principle, method of starting, power flow within a synchronous motor, equivalent circuit, power developed by synchronous motor, different excitations, different types of torques, power developed by a salient pole synchronous motor, effects of excitation on armature current and power factor, power stages, construction of V curves, comparison between synchronous motor and induction motor, applications of synchronous motor. Special Machines: Different types of single-phase induction motor, universal motor, and speed control of universal motor, stepper motor, permanent-magnet dc motor, permanent-magnet synchronous motor (PMSM), servomotors.

Course Code: EEE- 4115; Course Title: Power Electronics

Credit Hour: 03; 4th Year *Semester I*

Pre-requisite: EEE-2315

Rationale: The course will enable the students acquire knowledge the principles and practices of Power System Control and Conversion System, both at the Switching and triggering devices, designing and Implementation of various conversion and control System.

Course Objectives: This course is designed to help students –

- learn various fundamentals of methods and techniques require to control and conversion of Power system,
- design and implementation of several circuitries for competent controlling and conversion of whole system.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand Power Electronics,
- understand of Switching and Triggering devices,
- understand AC-DC Converters,
- understand DC-AC Converters,

- understand DC-DC Converters,
- understand cyclo-converter,
- understand Various Industrial Heating Systems.

Contents: Power Electronics Concept: Control and Conversion of Power System, Concept of Switching and Triggering devices and design methodology; Switching and Triggering devices: Power diode, Power transistor, thyristor SCR, TRIAC, DIAC, UJT, GTO and IGBT; AC-DC Converters: Single Phase Control and Uncontrolled Rectifier, Three Phase Controlled and Uncontrolled Rectifier, Single Phase and Three Phase Dual Converter; DC-AC Converters : Inverter Concept, Bridge Inverter, Push-Pull Inverter, Current Source and Voltage Source Inverter; DC-DC Converters: Unregulated Converter and Regulated Converter: Switching Mode Power Supply (SMPS): Buck, Boost, Buck-Boost and CUK Converters; Cyclo-converter: Basic Concept of Single Phase Cyclo-Converter, Low Frequency to High Frequency and High Frequency to Low Frequency Conversion, Speed Control of Motor Using Cyclo-Converter; Industrial Heating Systems: Di-electric heating, Induction heating and micro-wave heating.

Course Code: EEE- 4116; Course Title: Power Electronics Lab

Credit Hour: 01; 4th Year *Semester I*

Pre-requisite: EEE-2316

Rationale: In this course, the students will perform experiments to verify practically the theories and concepts learned in Power Electronic, EEE-4116. After being acquainted with different Switching and triggering devices, students will design and implement different conversion and control system and sequential circuits in the laboratory.

Course Objectives: This course is designed to help students –

- manipulate different power electronics devices and kits,
- observe functions and operations of different power electronics devices.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- acquire first-hand experience on seven different Switching devices,
- implement triggering devices,
- design and implement different conversion system circuits,
- design and implement different controlling system circuits.

Contents:

Exp. 01: Introduction to KL-500-L-5 module.

Exp. 02: Study of a full wave bridge rectifier by KL-500-L-5 module.

Exp. 03: Study on SCR DC Motor Forward/Reverse Control.

Exp. 04: Determination of characteristics curve of a UJT.

Exp. 05: Study of SCR Control by UJT triggering circuit.

Exp. 06: Study of Single Phase Half wave controlled rectifier.

Exp. 07: Study of Single Phase Full wave controlled rectifier.

Exp. 08: Study of Three Phase Half wave controlled rectifier.

Exp. 09: Study of Three Phase Full wave controlled rectifier.

Exp. 10: Study on IGBT characteristics and speed control.

Course Code: EEE- 4117; Course Title: Power Plant Engineering

Credit Hour: 03; 4th Year *Semester I*

Pre-requisite: EEE-4011

Rationale: The course will enable students to learn about conventional and renewable power plants. Detail construction and operation will be discussed in the course. Besides, complete knowledge of load terms and factor as well the power economics will be taught here. In addition, students can learn the way of calculating tariff and efficiency by completion of this course.

Course Objectives: This course is designed to help students –

- understand the conventional and renewable power plants
- learn the necessity of renewable sources.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the principle and operation of conventional and renewable power plants
- determine plant efficiency and load factor
- explain load scheduling of plant according to generation.

Content: Planning of power plant: generating capacity and selection of power plants, types of load and their effects. Plant location: site selection for different plants, plant performance. Station performance: efficiency, heat rate and incremental rate, load division between generating units for economy. Generation scheduling, conventional power plant: hydro and thermal power plant, generating cost, nuclear power plant, non-conventional power plant, power plant economy.

Different kinds of renewable energy, solar energy, wind energy Principle of solar cell, PV performance, cost effectiveness, solar radiation, Air mass. Solar cell performance, efficiency limits, Losses and measurements, Modules and Arrays, mismatch of PV cell, Protection of PV cell shading effect, MPPT-PV, Wind power, Wind Turbine & its component.

Course Code: EEE- 4119; Course Title: Renewable Energy Conversion

Credit Hour: 02; 4th Year *Semester I*

Pre-requisite: EEE-2213

Rationale: The course will enable students to learn about renewable and sustainable power plants. The necessity of renewable sources and their durability will be brought in the discussion. Detail construction and operation will be discussed in the course. Some practical models of wind and solar plant will be taught here. In addition, students can analysis the transit condition for these renewable power plants.

Course Objectives: This course is designed to help students –

- learn the necessity of renewable sources.
- understand the operation and construction of renewable power plants.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- describe the principle and operation of renewable power plants
- describe grid integration.
- solve mathematical and pragmatic problems associated with renewable sources.

Course Content: Different kinds of renewable energy, solar energy, wind energy Principle of solar cell, PV performance, cost effectiveness, solar radiation, Air mass. Solar cell performance, efficiency limits, Losses and measurements, Modules and Arrays, mismatch of PV cell, Protection of PV cell shading effect, MPPT-PV, Wind power, Wind Turbine & its component.

Course Code: EEE- 4229; Course Title: Switchgear and Protection

Credit Hour: 03; 4th Year *Semester II*

Pre-requisite: EEE-4011

Rationale: This is a course which describes the entire power system protection from the generator unit to load unit. In this course students will be familiar will basic switchgear components, their

use, construction and applications. Significance of fault will broadly discuss in the course. Moreover, many practical protection schemes like as, transformer and line protection will be introduced here. The course involves many critical problems and practical situation, which are hot topic for the recent research as well.

Course Objectives: This course is designed to help students –

- understand fault in power system.
- learn the concept of switchgear components and protection scheme.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- Identify the fault and necessary protecting components.
- Distinguish between the operations and effectiveness of fuse, circuit breaker and rely for different conditions.
- Design a practical protection scheme for any protective area.

Course Content: Circuit Breakers: Types, Ratings, Constructions and Selections, arc extinction Maintenance, testing and recovery voltage. Fuse: Commercially available fuses, their constructions, characteristics and applications. Relays: Types, construction, principle and operating characteristics of over current, IDMT, reactance, directional, power and impedance relays, balanced current relaying of parallel line, ground fault relaying, pilot relaying principles, protection relay schemes for generators, transformers, line feeders, busses, motor, generator and power systems, reactors, lighting arresters, surge absorbers, ground wire, generator grounding, co-ordination of over current relay. Bus bar protection.

Course Code: EEE- 4230; Course Title: Switchgear and Protection Lab

Credit Hour: 01; 4th Year *Semester II*

Pre-requisite: EEE-2214

Rationale: In this laboratory course very basic switchgear and protection components will be discussed. Here, students will observe the operation and performance of various relay and circuit breaker. They will attain the operating skill on especially on over current and over/under voltage relay. Moreover, many high voltage measuring equipment will be demonstrated in this laboratory.

Course Objectives: This course is designed to help students –

- understand the significance of fuse and Circuit breakers.
- learn about high voltage measuring equipment like as CT, VT etc.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- define relay terms like as time setting multiplier, current setting multiplier
- explain several protection schemes.
- design and control power system protection devices.

Contents:

Exp.01: Introductory class: switchgear testing kits.

Exp.02: Study on Fuse, MCB & their testing.

Exp.03: Study on Current transformer and Potential transformers.

Exp.04: To draw the operating characteristics of IDMT relay.

Exp.05: Study on over current relay.

Exp.06: Study on over voltage/ under voltage relay.

Exp.07: Over current protection of a transformer.

Exp.08: Over/ under voltage protection of an alternator.

Exp.09: Over Current Protection of a synchronous Generator.

Exp.10: Over Current Protection of a Three Phase Power Transformer.

ELECTIVE COURSES

ELECTRONICS GROUP

Course Code: EEE- 4127; Course Title: VLSI I

Credit Hour: 02; 4th Year *Semester I*

Pre-requisite: EEE-2315

Rationale: This course provides an introduction to the design and implementation of VLSI circuits for complex digital systems. The focus is on CMOS technology. In this course, students will study the fundamental concepts and structures of designing digital VLSI systems include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies, VLSI architecture.

Course Objectives: This course is designed to help students –

- understand and Experience VLSI Design Flow,
- learn Transistor-Level CMOS Logic Design,
- understand VLSI Fabrication and Experience CMOS Physical Design,
- study High-Level Digital Functional Blocks,
- visualize CMOS Digital Chip Design.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- explain mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components,
- illustrate models of moderately sized CMOS circuits that realize specified digital functions,
- design CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects,
- design digital systems using MOS circuits.

Content: Defining VLSI, evolution and history. VLSI technology: Top down design approach, technology trends and design styles. CMOS logic and basic inverter design.CMOS Fabrication and layouts. 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. Ideal and non-ideal MOS capacitor Inverter with different types of load and their analysis. Band diagrams. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. Ratioed and ratioless design. CMOS subsystem design: Adders, multiplier and memory system, and arithmetic logic unit. Programmable logic arrays. I/O systems. VLSI testing. VLSI MOS system design: Layout extraction and verification, full and semi-full custom design styles and logical and physical positioning. Introduction to Ga-As Technology: Ultra-fast VLSI circuits and systems.

Course Code: EEE- 4128; Course Title: VLSI I Lab

Credit Hour: 01; 4th Year *Semester I*

Pre-requisite: EEE-2316

Rationale: The course introduces the concepts of CMOS VLSI design and practical knowledge performing in lab. Students can perform experiments to verify practically the theories and concepts learned in the following theory course as well as students will be able to design simple systems using the principles learned in this course.

Course Objectives: This course is designed to help students –

- Understand complex chips and for designing the advanced processes required to manufacture those chips.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- design half adder and full adder,
- design inverter using Microwind and PSpice,
- perform to design inverter using Dsch2.

Content:

Exp. 01: Design half adder and full adder using verfilog gate.

Exp. 02: Design MUX using verfilog gate.

Exp. 03: Design a one and two input inverter using Microwind.

Exp. 04: Design a three and four input inverter using Microwind.

Exp. 05: Design a one input inverter using PSpice.

Exp. 06: Design a two input inverter using PSpice.

Exp. 07: Design a three input inverter using PSpice.

Exp. 08: Design a four input inverter using PSpice.

Exp. 09: Design a five input inverter using PSpice.

Exp. 10: Design an inverter using Dsch2.

Course Code: EEE- 4345; Course Title: Measurement and Instrumentation

Credit Hour: 01; 4th Year *Semester III*

Pre-requisite: EEE-1213

Rationale: This course will introduce the students to the concept of measurement and instrumentation systems. It will help to acquire knowledge about different measurement units, use of different types of amplifiers, noise in measurements, dc null & ac null measurements. This course will also help students to measure different electrical measurements.

Course Objectives: This course is designed to help students –

- learn various fundamentals of instrumentation and methods to measure electrical/other measurements.

Intended Learning Outcomes (ILOs): After studying the course, students will be able to –

- understand measurement systems,
- understand analog signaling,
- convolute two signals,
- gain knowledge on Noise and Coherent Interference in Measurements and DC Null Measurements,
- gain knowledge on AC Null Measurements and Sensor Input Mechanisms,
- measure different electrical measurements.

Contents: Measurement System Architecture, Standards Used in Measurements; Differential Amplifiers, Operational Amplifiers; Analog Active Filter Applications Using Conventional Op-amps ; Instrumentation Amplifiers; Charge Amplifiers, Phase Sensitive Rectifiers; Random Noise in Circuits, Spot Noise Factor and Figure; Calculation of the Noise Limited Resolution of Certain Signal Conditioning Systems; Coherent Interference and its Minimization: Sources of Coherent Interference; Coherent Interference and its Minimization: Cures for Coherent Interference; Wheatstone Bridge Analysis, The Anderson Constant Current Loop; Inductor Equivalent Circuits, Capacitor Equivalent Circuits; AC bridges: Bridges Used to Measure Capacitance, Bridges Used to Measure Inductance and Mutual Inductance; Resistive Sensors, Voltage Generating Sensors; Fiber Optic Sensors, D'Arsonval DC Voltmeters; Electrostatic Voltmeter, Electrodynamometer Meter; Electronic DC Voltmeters, Electronic DC Ammeters; Electromechanical DC Ammeters; Analog Electronic AC Voltmeters; Magnetic Field Measurements, Phase Measurements; Resistance, Capacitance and Inductance Measurement.