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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING



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Preface to Calendar 2007

The review of the Bulletin 2005 has been taken in hand with a view to update and incorporate elements of emerging and frontier technologies keeping in view the syllabus of the Department of Electrical and Electronic Engineering, BUET and some foreign countries. Since the establishment of the university in 1995, the course structure and course contents are being thoroughly reviewed and updated from time to time by an expert committee to introduce dynamism in curricula in order to ensure education of international standard. It is hoped that the new Bulletin 2006 would provide an insight to the long regular academic courses to help develop human resources of the country in the fields of Electrical, Electronics and Communication Engineering.

Head

Department of Electrical and Electronic Engineering
Ahsanullah University of Science and Technology

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The Department of Electrical and Electronic Engineering of Ahsanullah University of Science and Technology (AUST) is offering a four-year undergraduate degree program since the establishment of AUST in the year 1995. The degree program is spread over eight semesters with two semesters per academic year. The present intake of the students per calendar year is 200 students in four sections, each of 50 students. The class size has been limited to 50 students in the interest of effective teaching. There are now about 800 students studying in the department. Nine batches of students have graduated and are employed in different technical organizations in home and abroad.

There are now 26 full time teachers of the department together with about 30 part time teachers. Part time teachers are senior teachers of Bangladesh University of Engineering and Technology (BUET).

The aim of engineering education is to impart to the students up-to-date theoretical and practical knowledge of the particular branch of engineering. Consequently the undergraduate courses offered to the students have been designed considering the courses offered in BUET and some foreign universities, keeping in view the ever-increasing horizon of Electrical and Electronic Engineering. It may be mentioned here that a number of students of EEE Department of AUST got transferred to US Universities with credit transfer of courses taken at AUST.

The department has already developed its own laboratories in such areas as Electrical Circuits, Electronics, Digital Electronics, Electrical Machines, Telecommunications, Control Systems, Switchgear and Protection, Power Systems, Microwaves, Microprocessors, VLSI Design and Digital Signal Processing.

The department favors interaction between University and industry and, in this connection, some of the activities of the department are:

- Education tour of students to industry, power stations and telecommunication centers etc.
- Seminars: Resource persons are invited to speak on selected topics of interest.

- Project display of final year students.
- Job Fair: Prospective employers are invited to speak on job opportunities in their organizations.

2.1 Admission

There are two semesters in every year (Fall and Spring). Admission for 1st year, 1st semester is open in every semester. Notice for admission in Bachelor Degree Programs is published in local dailies.

2.2 Working weeks of a semester

The semester is of 20 working weeks which may be divided into classes, preparatory leave and semester final examinations as follows:

Classes					15 weeks
Preparatory examination	leave	and	semester	final	5 weeks
Total					20 weeks

Apart from the 20 working weeks, the University remains open for clearance/improvement/carryover examinations, result, admission of students in the 1st semester of 1st year and for works related to industrial training etc.

2.3 Medium of Instruction

The medium of instruction in Bachelor Degree programs is English and as such proficiency in English is a prerequisite for the candidates to get admission in the degree programs.

2.4 Examinations, Grading System and GPA Requirements for Bachelor Degree Programs

The performance of a student in a theoretical course will be based on:

- (i) Continuous assessment (attendance, class performance, quizzes and/or assignments etc.).
- (ii) Semester final examination.
- (iii) Clearance examination (for clearance of the course(s) not passed in the current semester or in the previous semester(s), if any)

(iv) Improvement examination, if any.

The performance of a student in a sessional/practical subject will be based on attendance, class performance, quizzes, assignment, viva, reports, practical examination etc.

The continuous assessment and the semester final examination will form regular examination system while the clearance examination and the improvement examination will provide additional opportunities to the students.

The distribution of marks between the continuous assessment and the semester final examination will be as follows:

i. Class participation (i.e. attendance, class performance etc.)	10%
ii. Quizzes and/or assignments	20%
iii. Semester final examination	70%
<hr/>	
Total	100%

The number of quizzes and/or assignments in a course of study shall ordinarily be $n + 1$, where n is the number of credits of the course. Evaluation of the performance will be on the basis of the best n quizzes and/or assignments.

Clearance examination in a course will be held only for those students obtaining a grade 'F' (failed the course) in the course in regular examinations. Clearance examinations will be held over a period of 1 to 2 weeks at the end of each semester.

Clearance examination in a course will carry 70% of the total marks assigned to the course, the rest 30% will be entered from the record of continuous assessment secured earlier by the student when he/she attended the classes. Whatever is the total mark, the maximum attainable grade in the clearance examination is 'C'.

A student obtaining 'F' grade in a maximum of 2 (two) theoretical courses in any semester will also be promoted to the next higher semester with carry over in the failed theory courses provided that he/she has passed in the rest of the theoretical and

practical/sessional courses of the semester. But the maximum allowable cumulative number of such carryover courses of the present and the previous semester(s) of the student concerned for promotion is 4 (four). The students can clear the backlog of the carry over course(s) in the clearance examinations of the relevant semester of the successive batches. The examination & grading of the carry over examinations will be in the same manner as clearance examination.

If the number of carry over courses of a student exceeds the allowable limit, the student will not be promoted to the subsequent semester. The student can proceed to the next higher semester only after reducing the number within the allowable limit. Meanwhile, he/she can appear in the relevant clearance examination with a view to clear the backlog of the carry over course(s) of the previous semester(s). For appearing in the carry over examinations, the students are required to apply for enrollment within due time in the prescribed form available in the examination section of the University.

A student can re-register by a written application in the course(s) (both theoretical & practical) of the previous semester he/she failed. The student may also be allowed on a written application to re-register for any or all course(s) of the semester in which he/she secured any passing grade(s) in the course(s). However, the grade(s) in the re-registered course(s) will be considered for result and Grade Point Average (G.P.A.) and the previous grade(s) will be recorded in the transcript/grade card only for chronological sequence. The students are required to apply in the prescribed application form available in the office of the Registrar for re-registration. The application form duly filled in will be submitted to the office within 2 weeks of the commencement of the classes.

For the purpose of grade improvement, a student obtaining a grade lower than 'B' in a course can sit in the relevant Improvement examination by canceling his/ her earlier passing grade of the course. The improvement examination in a course will carry 70% of the total mark assigned to the course and like the clearance examination the rest of the mark will be entered from the record of the continuous assessment secured earlier by

the student. Whatever is the total mark of the improvement examination, a student will be allowed to earn at best a grade 'B' for the course. And the previous grade will be recorded in the transcript/grade card only for chronological sequence. Whatsoever, a student in a 4-year degree program can try to improve his/her grades in a maximum of 4 (four) courses while a student of Architecture who goes through a 5-year program can do the same in a maximum of 5 (five) courses in his student career in the AUST.

All 4-year degree programs at the AUST will require completion of all degree requirements within a maximum period of 7 academic years. The 5-year bachelor degree program of Architecture will require completion of all degree requirements within a maximum period of 8 academic years. Failure to complete all degree requirements within the given time frame may disqualify a student from continuation of his study at the AUST.

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

Letter	% of Marks	Credit points
A+	80% or above	4.00
A	75% to less than 80%	3.75
A-	70% to less than 75%	3.50
B+	65% to less than 70%	3.25
B	60% to less than 65%	3.00
B-	55% to less than 60%	2.75
C+	50% to less than 55%	2.50
C	45% to less than 50%	2.25
D	40% to less than 45%	2.00
F	Less than 40%	0 (FAIL)
E	Exempted	-
W	Withheld	-

2.5 GPA / CGPA Calculation

$$GPA = \frac{\text{Sum of [Product of Weightage} \times \text{Credit]}}{\text{Total Credit}}$$

There are 5 theoretical and 4 laboratory courses in the first semester for EEE students. Let a student earns following grades for his first semester courses:

Course	Grade	Weightage for grades	Credit	Total Point
EEE 1101	A+	4.00	3.0	$4.00 \times 3 = 12$
EEE 1102	A-	3.50	1.5	$3.50 \times 1.5 = 5.25$
ME 1101	A	3.75	3.0	$3.75 \times 3 = 11.25$
ME 1102	D	2.00	1.5	$2.00 \times 1.5 = 3.00$
PHY 1105	B+	3.25	3.0	$3.25 \times 3 = 9.75$
PHY 1106	A	3.75	1.5	$3.75 \times 1.5 = 5.625$
MATH 1103	B-	2.75	3.0	$2.75 \times 3 = 8.25$
CHEM 1107	B	3.00	3.0	$3.00 \times 3 = 9.00$
CHEM 1108	C+	2.50	1.5	$2.50 \times 1.5 = 3.75$
Total Point Earned				67.875

Then, his GPA for the first semester = $\frac{\text{Total point earned}}{\text{Total Credit}}$

$$= \frac{67.875}{21} = 3.23 \text{ on a scale of 4.}$$

CGPA stands for Cumulative GPA. If a student, after second year (after 4 semesters) earns the following points:

Semester	Credit	Points earned
I	21	67.875
II	19.5	75.125
III	21	80
IV	21	78
Total Credit = 82.5		Total Point = 301

Then CGPA of that student = $(301 / 82.5) = 3.65$ on a scale of 4.

Students will be considered to be making normal progress towards a degree if their cumulative or overall GPA for all works attempted is not less than 2.20. Students who fail to maintain this minimum rate of progress may be placed on academic probation. A minimum Cumulative GPA (CGPA) of 2.20 on a scale of 4 will be required for the award of the Degree.

The status of academic probation is a reminder/warning to the student that satisfactory progress towards graduation is not being made. The minimum period of probation is one semester but the usual period is one academic year. The probation may be extended for additional semesters until the student achieves an overall GPA of 2.20 or better.

A student on academic probation who fails to maintain at least a GPA of 2.20 during two consecutive academic years may be suspended from the University. If it is the first suspension, it may be withdrawn by the concerned Head of the Department on receipt of an application from the student and on being satisfied that the student will make every effort from then on to improve his/her grade but this can only be done after the student has gone through at least a full semester of suspension. However, a second suspension will be regarded as final and absolute.

In all bachelor degree programs, the students are required to attend 60% of the classes held in each subject in a semester failing which they will not be allowed to sit for the Semester Final Examination & Clearance Examination. THE GUARDIANS ARE REQUESTED TO MONITOR THE ATTENDANCE AND PERFORMANCE OF THEIR WARDS THROUGH THE UNIVERSITY AT LEAST ONCE IN THE MIDDLE OF THE SEMESTER. However, the authority may condone the shortage of requisite percentage on grounds acceptable to the authority.

A student failing in any sessional/practical work will have to repeat the semester.

The Full Free Tuition Award is offered to 5% of the students in every semester on the basis of the grade points earned in all of the courses (except Project & Thesis) of the immediate previous semester. The authority may also offer Half-Free Tuition Award to the students whose results are considered to be equally brilliant.

If two students of the same parents study concurrently in this University, one of them will get Half Free Tuition Award.

Graduating students securing a CGPA (Cumulative Grade Point Average) of 3.75 or above will be included in the Dean's List of Honor.

Head

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Visiting Professor

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18. Muhammad Jakaria Rahimi, B.Sc. Engg. (BUET)

4.1 Introduction and Course Identification

The undergraduate students of different years of this department have to follow the course schedule given. The letter prefix in any course number indicates the department offering the courses or the discipline viz. EEE for Electrical and Electronic Engineering, ARCH for Architecture, CSE for Computer Science and Engineering, CE for Civil Engineering, ME for Mechanical Engineering, CHEM for Chemistry, PHY for Physics, MATH for Mathematics and HUM for Humanities.

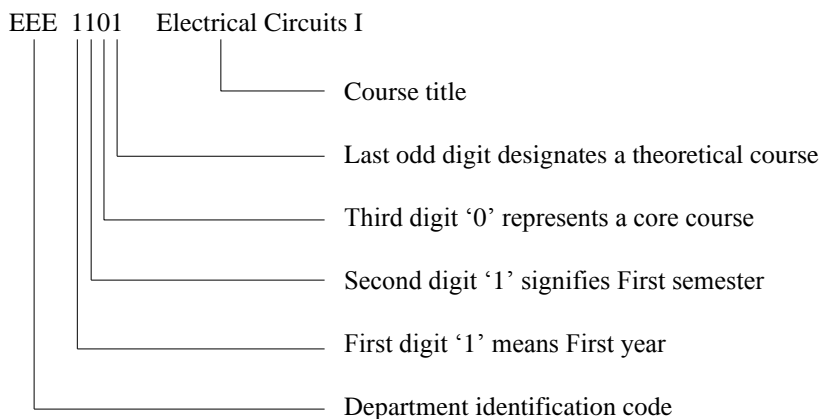
Each course is designated by a two to four letter word identifying the department (details described earlier) which offers it followed by a four digit number with the following criteria:

- a) The first digit corresponds to the year in which the course is taken by the student.
- b) The second digit represents the semester in which the course is taken by the student.
- c) The third digit is reserved for departmental use for such things as to identify different areas within a department.
- d) The last digit is 'odd' for a theoretical course and 'even' for a laboratory or sessional course.

The third digit of the course number has the following meaning:

Digit	0 and 1 is for Core courses
	2 for Interdisciplinary group
	3 and 4 for Electronics group
	5 and 6 for Power group
	7 and 8 for Communication group
	9 for Computer group

The course designation system is illustrated by the following example:



The minimum hours to be completed for obtaining the degree of B.Sc. Engineering in Electrical and Electronic Engineering is 207 of which 117 hours (Each course 3 Contact hours/week) are for theoretical courses and 90 hours for laboratory courses (Each course 3 contact hours/week) with a total credit of 162.0.

The semester-wise distribution of credits of different years is listed below:

Year	Semester	Theory Hour	Lab Hour	Total Hour	Total Credit
1	1	15	12	27	21
1	2	15	9	24	19.5
2	1	15	12	27	21
2	2	15	12	27	21
3	1	15	12	27	21
3	2	15	9	24	19.5
4	1	15	12	27	21
4	2	12	12	24	18
Total		117	90	207	162

4.2 Core 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 semesters.

4.2.1 Core Courses (EEE)

Sl. No.	Course Number	Course Title	Credit Hour
1	EEE 1101	Electrical Circuits I	3.0
2	EEE 1102	Electrical Circuits I Lab.	1.5
3	EEE 1201	Electrical Circuits II	3.0
4	EEE 1202	Electrical Circuits II Lab.	1.5
5	EEE 1210	Electrical Circuit Simulation Lab.	1.5
6	EEE 2103	Electronics I	3.0
7	EEE 2104	Electronics I Lab.	1.5
8	EEE 2105	Energy Conversion I	3.0
9	EEE 2106	Energy Conversion I Lab.	1.5
10	EEE 2109	Programming Language	3.0
11	EEE 2110	Programming Language Lab.	1.5
12	EEE 2203	Electronics II	3.0
13	EEE 2204	Electronics II Lab.	1.5
14	EEE 2205	Energy Conversion II	3.0
15	EEE 2206	Energy Conversion II Lab.	1.5
16	EEE 2207	Electromagnetics	3.0
17	EEE 2210	Electronic Circuit Simulation Lab.	1.5
18	EEE 2211	Measurement and Instrumentation	3.0
19	EEE 2212	Measurement and Instrumentation Lab	1.5
20	EEE 3103	Digital Electronics I	3.0
21	EEE 3104	Digital Electronics I Lab.	1.5
22	EEE 3105	Power System I	3.0
23	EEE 3106	Power System I Lab.	1.5

Sl. No.	Course Number	Course Title	Credit Hour
24	EEE 3107	Signals and Linear Systems	3.0
25	EEE 3110	Numerical Technique Lab.	1.5
26	EEE 3113	Electrical Properties of Materials	3.0
27	EEE 3100	Electrical Service Design	1.5
28	EEE 3207	Communication Theory	3.0
29	EEE 3208	Communication Theory Lab.	1.5
30	EEE 3209	Microprocessor, Interfacing and System design	3.0
31	EEE 3210	Microprocessor, Interfacing and System design Lab.	1.5
32	EEE 3217	Digital Signal Processing I	3.0
33	EEE 3218	Digital Signal Processing I Lab.	1.5
34	EEE 4100	Project and Thesis	3.0
35	EEE 4103	Solid State Devices	3.0
36	EEE 4105	Control System I	3.0
37	EEE 4106	Control System I Lab.	1.5
38	EEE 4200	Project and Thesis	3.0
Total			87.0

4.2.2 Core Courses (Humanities)

Sl. No.	Course Number	Course Title	Credit Hour
1	HUM 2109	English and Sociology	3.0
2	HUM 2110	Developing English Skills Lab.	1.5
3	HUM 3109	Accounting and Economics	3.0
4	HUM 3209	Industrial Management	3.0
Total			10.5

4.2.3 Core Courses (Mathematics)

Sl. No.	Course Number	Course Title	Credit Hour
1	MATH 1103	Mathematics I	3.0
2	MATH 1203	Mathematics II	3.0
3	MATH 1213	Mathematics III	3.0
4	MATH 2103	Mathematics IV	3.0
5	MATH 2203	Mathematics V	3.0
Total			15.0

4.2.4 Core Courses (Physics)

Sl. No.	Course Number	Course Title	Credit Hour
1	PHY 1105	Physics I	3.0
2	PHY 1106	Physics I Lab.	1.5
3	PHY 1205	Physics II	3.0
Total			7.5

4.2.5 Core Courses (Chemistry)

Sl. No.	Course Number	Course Title	Credit Hour
1	CHEM 1107	Chemistry	3.0
2	CHEM 1108	Chemistry Lab.	1.5
Total			4.5

4.2.6 Core Courses (CE)

Sl. No.	Course Number	Course Title	Credit Hour
1	CE 1201	Mechanics of Materials	3.0
2	CE 1202	Engineering Drawing	1.5
Total			4.5

4.2.7 Core Courses (ME)

Sl. No.	Course Number	Course Title	Credit Hour
1	ME 1101	Mechanical Engineering Fundamentals	3.0
2	ME 1102	Mechanical Engineering Fundamentals Lab.	1.5
Total			4.5

4.3 Elective Courses

From Year-3, Semester-2, Department of EEE starts offering elective courses under 4 groups viz. Power, Electronics, Communication and Computer. Besides these, one elective course is to be chosen from interdisciplinary group.

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

1. Students will be assigned one of the four groups as major and another as minor by taking written options from the students. For regular students, this will be done in Year-3, Semester-1.
2. Maximum number of students in any group as major will be $N/4$, where N is the number of students in a batch. Similarly the maximum number of students in any group as minor will also be $N/4$.
3. Major and minor group assignment will be based on options and CGPA of first four terms from Year-1, Semester-1 to Year-2, Semester-2.
4. A student will have to take 4 or 5 elective theory course from the respective major group and remaining 3 or 2 elective theory courses from the respective minor group. A student must also take one theory course along with its corresponding sessional from the interdisciplinary group.
5. Students will be assigned their Year-4 projects/ theses from the area of their respective major group.

6. If a student fails in an elective theory course that has a sessional, the student may take the theory course again or may take another theory course together with its corresponding sessional.
7. Maximum class size of an elective course for regular students will be $(N/4 + 5)$. However, a student who has previously failed in an elective course will be allowed to re-regular regardless of the class size.
8. Elective courses to be offered in a term will be distributed in the preceding term.
9. A student will be allowed to chose a course from his/her major group regardless of his/her CGPA. After distribution of the elective courses among the students of the respective major groups, remaining seats of the elective courses will be distributed among the students who have chosen the subject's group as their minor. The distribution among the minor students will be based on their written options for their courses and CGPA at the time of the distribution.
10. In case of any unforeseen situation or ambiguity, the Department will take an appropriate decision.

The numbering system of the courses in elective groups will follow the rule described earlier. The third digit of a course number will define the group of the course according to the following criteria:

- Digit 2 for Interdisciplinary group
 3 and 4 for Electronics group
 5 and 6 for Power group
 7 and 8 for Communication group
 9 for Computer group

4.3.1 Power Group

Sl. No.	Course Number	Course Name	Credit Hour
1	EEE 3251	Power System II	3.0
2	EEE 4151	Energy Conversion III	3.0

Sl. No.	Course Number	Course Name	Credit Hour
3	EEE 4153	Power Electronics	3.0
4	EEE 4154	Power Electronics Lab.	1.5
5	EEE 4155	Power Plant Engineering and Economy	3.0
6	EEE 4251	Power System Protection	3.0
7	EEE 4252	Power System Protection Lab.	1.5
8	EEE 4257	High Voltage Engineering	3.0
9	EEE 4258	High Voltage Engineering Lab.	1.5
10	EEE 4253	Power System Reliability	3.0
11	EEE 4255	Power System Operation and Control	3.0

4.3.2 Electronics Group

Sl. No	Course Number	Course Name	Credit Hour
1	EEE 3231	Digital Electronics II	3.0
2	EEE 4131	Processing and Fabrication Technology	3.0
3	EEE 4133	VLSI I	3.0
4	EEE 4134	VLSI I Lab.	1.5
5	EEE 4135	Analog Integrated Circuit	3.0
6	EEE 4231	VLSI II	3.0
7	EEE 4232	VLSI II Lab.	1.5
8	EEE 4233	Optoelectronics	3.0
9	EEE 4235	Compound Semiconductor and Hetero-Junction Devices	3.0
10	EEE 4237	Semiconductor Device Theory	3.0

4.3.3 Communication Group

Sl. No.	Course Number	Course Name	Credit Hour
1	EEE 3271	Random Signals and Processes	3.0
2	EEE 4171	Digital Signal Processing II	3.0
3	EEE 4173	Microwave Engineering	3.0

Sl. No.	Course Number	Course Name	Credit Hour
4	EEE 4174	Microwave Engineering Lab.	1.5
5	EEE 4175	Optical Fiber Communication	3.0
6	EEE 4271	Digital Communication	3.0
7	EEE 4272	Digital Communication Lab.	1.5
8	EEE 4273	Mobile Cellular Communication	3.0
9	EEE 4275	Telecommunication Engineering	3.0

4.3.4 Computer Group

Sl. No.	Course Number	Course Name	Credit Hour
1	CSE 4191	Multimedia Communications I	3.0
2	EEE 4193	Microcontroller based System Design	3.0
3	EEE 4194	Microcontroller based System Design Lab.	1.5
4	EEE 4195	Real Time Computer System	3.0
5	CSE 4291	Computer Networks	3.0
6	CSE 4292	Computer Networks Lab.	1.5
7	CSE 4293	Computer Architecture	3.0
8	EEE 4295	Multimedia Communications II	3.0

4.3.5 Interdisciplinary Courses

Sl. No.	Course Number	Course Name	Credit Hour
1	EEE 4221	Control System II	3.0
2	EEE 4222	Control System II Lab.	1.5
3	EEE 4223	Biomedical Instrumentation	3.0
4	EEE 4224	Biomedical Instrumentation Lab.	1.5
5	EEE 4225	Numerical Methods for Engineering	3.0
6	EEE 4226	Numerical Methods for Engineering Lab.	1.5

5.1 Course Distribution

Courses are offered to the students as per following arrangement:

Year-1 Semester-1

Course No.	Course Title	Credit
EEE 1101	Electrical Circuits I	3.0
EEE 1102	Electrical Circuits I Lab.	1.5
ME 1101	Mechanical Engineering Fundamentals	3.0
ME 1102	Mechanical Engineering Fundamentals Lab.	1.5
PHY 1105	Physics I	3.0
PHY 1106	Physics I Lab.	1.5
MATH 1103	Mathematics I	3.0
CHEM 1107	Chemistry	3.0
CHEM 1108	Chemistry Lab.	1.5
Total		21.0

Year-1 Semester-2

Course No.	Course Title	Credit
EEE 1201	Electrical Circuits II	3.0
EEE 1202	Electrical Circuits II Lab.	1.5
EEE 1210	Electrical Circuit Simulation Lab.	1.5
PHY 1205	Physics II	3.0
MATH 1203	Mathematics II	3.0
MATH 1213	Mathematics III	3.0
CE 1201	Mechanics of Materials	3.0
CE 1202	Engineering Drawing	1.5
Total		19.5

Year-2 Semester-1

Course No.	Course Title	Credit
EEE 2103	Electronics I	3.0
EEE 2104	Electronics I Lab.	1.5

Course No.	Course Title	Credit
EEE 2105	Energy Conversion I	3.0
EEE 2106	Energy Conversion I Lab.	1.5
EEE 2109	Programming Language	3.0
EEE 2110	Programming Language Lab.	1.5
MATH 2103	Mathematics IV	3.0
HUM 2109	English and Sociology	3.0
HUM 2110	Developing English Skills Lab.	1.5
Total		21.0

Year-2 Semester-2

Course No.	Course Title	Credit
EEE 2203	Electronics II	3.0
EEE 2204	Electronics II Lab.	1.5
EEE 2205	Energy Conversion II	3.0
EEE 2206	Energy Conversion II Lab.	1.5
EEE 2207	Electromagnetics	3.0
EEE 2210	Electronic Circuit Simulation Lab.	1.5
EEE 2211	Measurement and Instrumentation	3.0
EEE 2212	Measurement and Instrumentation Lab	1.5
MATH 2203	Mathematics V	3.0
Total		21.0

Year-3 Semester-1

Course No.	Course Title	Credit
EEE 3103	Digital Electronics I	3.0
EEE 3104	Digital Electronics I Lab.	1.5
EEE 3105	Power System I	3.0
EEE 3106	Power System I Lab.	1.5
EEE 3107	Signals and Linear Systems	3.0
EEE 3110	Numerical Technique Lab.	1.5
EEE 3113	Electrical Properties of Materials	3.0
EEE 3100	Electrical Service Design	1.5
HUM 3109	Accounting and Economics	3.0
Total		21.0

Year-3 Semester-2

Course No.	Course Title	Credit
EEE 3207	Communication Theory	3.0
EEE 3208	Communication Theory Lab.	1.5
EEE 3209	Microprocessor, Interfacing and System design	3.0
EEE 3210	Microprocessor, Interfacing and System design Lab.	1.5
EEE 3217	Digital Signal Processing I	3.0
EEE 3218	Digital Signal Processing I Lab.	1.5
HUM 3209	Industrial Management	3.0
EEE ****	Elective I	3.0
Total		19.5

Year-4 Semester-1

Course No.	Course Title	Credit
EEE 4100	Project and Thesis	3.0
EEE 4103	Solid State Devices	3.0
EEE 4105	Control System I	3.0
EEE 4106	Control System I Lab.	1.5
EEE ****	Elective II	3.0
EEE ****	Elective II Lab.	1.5
EEE ****	Elective III	3.0
EEE ****	Elective IV	3.0
Total		21.0

Year-4 Semester-2

Course No.	Course Title	Credit
EEE 4200	Project and Thesis	3.0
EEE ****	Elective V	3.0
EEE ****	Elective VI	3.0
EEE ****	Elective VI Lab.	1.5
EEE ****	Elective VII	3.0
EEE ****	Elective VIII	3.0
EEE ****	Elective VIII Lab.	1.5
Total		18.0

5.2 Elective Course divisions

Eight elective courses (Elective I - Elective VIII) are offered to the students according to the following list. Elective I is offered at Year- 3, Semester-2, Elective II - Elective IV are offered at Year-4, Semester-1 and Elective V - Elective VIII are offered to the students of Year-4, Semester-2.

Elective I

Group	Course Number	Course Title	Credit Hour
Electronics	EEE 3231	Digital Electronics II	3.0
Power	EEE 3251	Power System II	3.0
Communication	EEE 3271	Random Signals and Processes	3.0

Elective II

Group	Course Number	Course Title	Credit Hour	
			Indiv.	Total
Electronics	EEE 4133	VLSI I	3.0	4.5
	EEE 4134	VLSI I Lab.	1.5	
Power	EEE 4153	Power Electronics	3.0	4.5
	EEE 4154	Power Electronics Lab.	1.5	
Communication	EEE 4173	Microwave Engineering	3.0	4.5
	EEE 4174	Microwave Engineering Lab.	1.5	
Computer	EEE 4193	Microcontroller based System Design	3.0	4.5
	EEE 4194	Microcontroller based System Design Lab.	1.5	

Elective III

Group	Course Number	Course Title	Credit Hour
Electronics	EEE 4131	Processing and Fabrication Technology	3.0
Power	EEE 4151	Energy Conversion III	3.0
Communication	EEE 4171	Digital Signal Processing II	3.0
Computer	CSE 4191	Multimedia Communications I	3.0

Elective IV

Group	Course Number	Course Title	Credit Hour
Electronics	EEE 4135	Analog Integrated Circuit	3.0
Power	EEE 4155	Power Plant Engineering and Economy	3.0
Communication	EEE 4175	Optical Fiber Communication	3.0
Computer	EEE 4195	Real Time Computer System	3.0

Elective V

Group	Course Number	Course Title	Credit Hour
Electronics	EEE 4233	Optoelectronics	3.0
Power	EEE 4253	Power System Reliability	3.0
Communication	EEE 4273	Mobile Cellular Communication	3.0
Computer	CSE 4293	Computer Architecture	3.0

Elective VI

Group	Course Number	Course Title	Credit Hour	
			Indiv.	Total
Electronics	EEE 4231	VLSI II	3.0	4.5
	EEE 4232	VLSI II Lab.	1.5	
Power	EEE 4251/ EEE 4257	Power System Protection/ High Voltage Engineering	3.0	4.5
	EEE 4252/ EEE 4258	Power System Protection Lab./ High Voltage Engineering Lab.	1.5	
	EEE 4271	Digital Communication	3.0	
Communication	EEE 4272	Digital Communication Lab.	1.5	4.5
	CSE 4291	Computer Networks	3.0	4.5
Computer	CSE 4292	Computer Networks Lab.	1.5	

Elective VII

Group	Course Number	Course Title	Credit Hour
Electronics	EEE 4235/ EEE 4237	Compound Semiconductor and Hetero-Junction Devices/ Semiconductor Device Theory	3.0
	EEE 4255	Power System Operation and Control	3.0
Communication	EEE 4275	Telecommunication Engineering	3.0
Computer	CSE 4295	Multimedia Communications II	3.0

Elective VIII

Group	Course Number	Course Title	Credit Hour	
			Indiv.	Total
Interdisciplinary	EEE 4221	Control System II	3.0	4.5
	EEE 4222	Control System II Lab.	1.5	
	EEE 4223	Biomedical Instrumentation	3.0	4.5
	EEE 4224	Biomedical Instrumentation Lab.	1.5	
	EEE 4225	Numerical Methods for Engineering	3.0	4.5
	EEE 4226	Numerical Methods for Engineering Lab.	1.5	

6.1 Core Courses offered by the Department of EEE

Year-1 Semester-1

EEE 1101 Electrical Circuits I 3 Credits, 3 hours/week

Circuit Variables and Elements:

Voltage, current, power, energy, independent and dependent sources, resistance.

Basic Laws of Electrical Circuits:

Ohm's law, Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL).

Simple Resistive Circuits:

Series and parallel circuits, voltage and current division, Source transformation, wye-delta transformation.

Techniques of Network Analysis:

Nodal and Mesh analysis including supernode and supermesh.

Network Theorems:

Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem.

Energy Storage Elements:

Inductors and capacitors, their characteristics, series-parallel combination of inductors and capacitors.

Responses of RL and RC Circuits:

Natural and step responses.

Magnetic Quantities and Variables:

Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve, Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Series, parallel and series-parallel magnetic circuits.

EEE 1102 Electrical Circuits I Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 1101.

Year-1 Semester-2

EEE 1201 Electrical Circuits II
3 Credits, 3 hours/week

Alternating Current Basics:

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, Resonance in AC circuits, Series and parallel resonance. Q of a circuit, nodal and mesh analysis, application of network theorems in AC circuits. Circuits with non-sinusoidal excitations, transients in AC circuits, passive filters. Magnetically couple circuits.

Analysis of Poly Phase Circuits:

Poly phase supply, 3-phase conditions, balanced and unbalanced circuits, power calculation.

EEE 1202 Electrical Circuits II Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 1201.

EEE 1210 Electrical Circuit Simulation Lab.
1.5 Credits, 3 hours/week

Simulation laboratory based on EEE 1101 and EEE 1201 theory courses. Verification of the theories and concepts learned in EEE 1101 and EEE 1201 using simulation software like PSPICE and MATLAB.

Year-2 Semester-1**EEE 2103 Electronics I**
3 Credits, 3 hours/week**P-N Junction as a Circuit Element:**

Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, biasing of diode, current-voltage characteristics of a diode, simplified DC and AC diode models, dynamic resistance and capacitance.

Diode Circuits:

Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, Zener shunt regulator, clamping and clipping circuits.

Bipolar Junction Transistor (BJT):

Current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch.

BJT Amplifier Circuits:

Voltage and current gain, input output impedance of common base, common emitter and common collector amplifier circuits, multistage amplifiers.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET):

Structure and physical operation of an enhancement MOSFET, threshold voltage, body effect, current-voltage characteristics of an enhancement MOSFET, biasing discrete and integrated amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch.

Junction Field-Effect-Transistor (JFET):

Structure and physical operation of JFET, transistor characteristics, pinch-off voltage.

EEE 2104 Electronics I Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2103.

EEE 2105 Energy Conversion I
3 credits, 3 hours/week

Transformer:

Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its V-connection; Vector group of three phase transformers.

Three Phase Induction Motor:

Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control.

Single Phase Induction Motor:

Theory of operation, equivalent circuit and starting.

EEE 2106 Energy Conversion I Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2105.

EEE 2109 Programming Language
3 credits, 3 hours/week

Introduction to digital computers. Programming languages, algorithms and flow charts. Structured programming using C: Variables and constants, operators, expressions, control statements, functions, array, pointer, structure union, user defined data types, input-output files.

Object oriented programming using C++: Introduction, classes and objects; polymorphism; function and operator overloading; inheritance.

EEE 2110 Programming Language Lab.
1.5 credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2109.

Year-2 Semester-2**EEE 2203 Electronics II**
3 Credits, 3 hours/week**Frequency Response of Amplifiers:**

Poles, Zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers.

Operational Amplifiers (Op-Amp):

Properties of ideal OP-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, Electronic Analog computation Schmitt trigger, Differential Amp, Differential and Common gain, comparator, effects of finite open loop gain and bandwidth on circuit performance, logic operation of Op-Amp, DC imperfections. DC analysis, small-signal analysis of different stages, gain and frequency response of 741 OP-Amp

Feedback Amplifier:

Properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation.

Active Filters:

Different types of filters and specifications, transfer functions, realization of first and second order low, high and band pass filters using OP-Amps.

Stability and Oscillators:

Sinusoidal oscillators, Phase shift oscillator, resonant circuit oscillator, general form of oscillator circuit, wein-bridge oscillator, crystal oscillators.

Power Amplifiers:

Classification of output stages, Class A, B and AB output stage, Class C and Class D.

EEE 2204 Electronics II Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2203.

EEE 2205 Energy Conversion II
3 credits, 3 hours/week

Synchronous Generator:

Windings, excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance methods of predicting voltage regulation and its limitations. Parallel operation: necessary conditions, synchronizing, circulating current and vector diagram.

Synchronous Motor:

Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting.

DC Generators:

Types, no-load voltage characteristics, build up of a self excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation.

DC Motor:

Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation. Introduction to wind turbine generators. Construction and basic characteristics of solar cells.

EEE 2206 Energy Conversion II Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2205.

EEE 2207 Electromagnetics
3 Credits, 3 hours/week

Review of Vector Analysis:

Coordinate Systems, Vector algebra, gradient, divergence and curl.

Static Electric Field:

Postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, force, field intensity, flux density, Gauss's law and its applications, electric potential due to

charge distribution, conductors and dielectrics in static electric field, boundary conditions; capacitance- electrostatic energy and forces, energy in terms of field equations, capacitance calculations of different geometries; boundary value problems- Poisson's and Laplace's equations in different co-ordinate systems, method of images, graphical field mapping.

Static Magnetic Field:

Postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity, permeability, boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries.

Time Varying Fields and Maxwell's Equations:

Faradays law of electromagnetic induction, Maxwell's equations- differential and integral forms, boundary conditions, potential functions; time harmonic fields and Poynting theorem, depth of penetration, internal impedance, power loss.

Plane Electromagnetic Wave:

Plane wave in lossless media- Doppler effect, transverse electromagnetic wave, Polarization of plane wave; plane wave in lossy media- low loss dielectrics, good conductors; transmission line analogy- reflection coefficient, transmission coefficient, characteristics impedance, standing wave ratio, group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

**EEE 2210 Electronic Circuit Simulation Lab.
1.5 Credits, 3 hours/week**

Simulation Laboratory based on EEE 2103 and EEE 2203 theory courses. Verification of the theories and concepts learned in EEE 2103 and EEE 2203 using simulation software's like PSPICE and MATLAB.

EEE 2211 Measurement and Instrumentation
3 Credits, 3 hours/week

Introduction:

Applications, functional elements of a measurement system and classification of instruments.

Measurement of Electrical Quantities:

Current and voltage, power and energy measurement. Current and voltage, power and energy measurement Current and potential transformer.

Transducers:

Mechanical, electrical and optical transducers.

Measurement of Non-Electrical Quantities:

Temperature, pressure, flow, level, strain, force and torque, earthquake, speed, frequency, phase difference.

Basic Elements of DC and AC Signal Conditioning:

Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits.

Data Transmission and Telemetry:

Methods of data transmission, DC/AC telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.

EEE 2212 Measurement and Instrumentation Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2211.

Year-3 Semester-1

EEE 3103 Digital Electronics I
3 Credits, 3 hours/week

Analysis and Synthesis of Digital Logic Circuits:

Number system and codes. Boolean algebra, De Morgan's law, logic gates and truth tables, combinational logic design, minimization techniques, implementation of basic static logic

gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and combinational circuit design.

Programmable Logic Devices:

Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.

Sequential Circuits:

Different types of latches, flip-flops and their design using ASM approach, timing analysis, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: Shift registers, counters and their applications.

**EEE 3104 Digital Electronics I Lab.
1.5 credits, 3hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 3103. Design of simple systems using the principles learned in EEE 3103.

**EEE 3105 Power System I
3 Credits, 3 hours/week**

Inductance and Capacitance of overhead power line. Line representation : equivalent circuit of short, medium and long line. Network representation: single line and reactance diagram of power system and per unit representation. Load flow studies : Gauss - seidel method. Control of voltage, real power and reactive power. Reactive power compensation. Fault analysis: Symmetrical fault calculation, symmetrical components, sequence impedance and sequence networks, different unsymmetrical fault calculation. Introduction to different kinds of relays and circuit breakers. Typical layout of substation equipment.

**EEE 3106 Power System I Lab.
1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 3105.

EEE 3107 Signals and Linear Systems
3 Credits, 3 hours/week

Classification of Signal and Systems:

Signals- classification, basic operation on signals, elementary signals, representation of signal using impulse function; systems-classification.

Properties of Linear Time Invariant (LTI) Systems:

Linearity, causality, time invariance, memory, stability, invertibility.

Time Domain Analysis of LTI Systems:

Differential equations- system representation, order of the system, solution techniques, zero state and zero input response, System properties: impulse response - convolution integral, determination of system properties; state variable- basic concept, static equation and time domain solution.

Frequency Domain Analysis of LTI Systems:

Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion less systems.

Applications of Time and Frequency Domain Analysis:

Solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing.

Laplace Transformation:

Properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

Analogous Systems:

Electrical, mechanical and electro-mechanical systems.

EEE 3110 Numerical Technique Lab.
1.5 Credits, 3 hours/week

Laboratory on numerical techniques using computer solution of differentiation and integration problems, transcendental equations, linear and non-linear differential equations and partial differential equations.

EEE 3113 Electrical Properties of Materials
3 Credits, 3 hours/week

Atoms and Aggregates of Atoms:

Bohr atomic model, shell model.

Bonding and Types of Solids:

Primary bonding, secondary bonding, mixed bonding.

Crystal Structures:

Types of crystals, lattice and basis, Bravais lattice and Miller indices.

Classical Theory of Electrical and Thermal Conduction:

Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity.

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:

Polar and nonpolar dielectrics, dielectric constant, polarization-electronic, ionic and orientational; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependency of dielectric constant, dielectric loss, piezoelectricity, ferroelectricity.

Magnetic Properties of Materials:

Magnetic moment, magnetization and relative permeability, different types of magnetic materials, origin of ferromagnetism and magnetic domains, coercive force, polycrystalline and permanent magnetic materials, introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

Band Theory of Solids:

Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density of states.

Quantum Mechanics:

Wave nature of electrons, Schrödinger's equation, one dimensional quantum problems- infinite quantum well, potential

step and potential barrier; Heisenberg's uncertainty principle and quantum box.

Carrier Statistics:

Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy.

EEE 3100 Electrical Service Design
1.5 Credits, 3 hours/week

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

Year-3 Semester-2

EEE 3207 Communication Theory
3 Credits, 3 hours/week

Overview of Communication Systems:

Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity.

Noise:

Source, characteristics of various types of noise and S/N ratio.

Information Theory:

Measure of information, source encoding, error free communication over a noisy channel, channel capacity of a continuous system and channel capacity of a discrete memoryless system, communication entropy, data compression.

Communication Systems:

Analog and digital communication, carrier, baseband, bandpass and broadband communication; broadcast- and point to point-mode of communication.

Continuous Wave Modulation:

AM- DSB, SSB, VSB, QAM, spectral analysis of each type, envelope and synchronous detection; angle modulation- instantaneous frequency, FM, PM, spectral analysis, demodulation of FM and PM.

Pulse Modulation:

Sampling- sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; PAM principle, bandwidth requirements; PCM- quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, demodulation of PCM, DPCM and DM principle, adaptive DM; line coding formats and bandwidths.

Digital Modulation:

ASK principle, bandwidth requirements, detection, noise performance; PSK principle, bandwidth requirements, detection, DPSK, QPSK- noise performance, FSK- principle, continuous and discontinuous phase FSK, detection of FSK, MSK- bandwidth requirements.

Multiplexing:

TDM- principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; FDM- principle, demultiplexing; WDM, multiple access network- TDMA, FDMA, CDMA- spread spectrum multiplexing, coding technique and constraints of CDMA.

Communication Systems Design:

Design parameters, channel selection criteria and performance simulation

Brief Introduction to Some Communication Systems:

Mobile cellular communication system, Fiber optic communication system, Microwave communication system and Satellite communication system.

EEE 3208 Communication Theory Lab.**1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 3207. Design of simple systems using the principles learned in EEE 3207.

EEE 3209 Microprocessor, Interfacing and System design
3 Credits, 3 hours/week

Fundamental Concepts:

Microprocessor: A programmable device; microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM, microprocessor instructions.

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.

I/O Controller Programming:

Port definition and read/write instructions, parallel I/O programming using 8255, serial I/O programming using 8251, display programming using 8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8253 PIT controller.

Interrupt Structure:

Interrupt terminologies, hardware and software interrupt, multiple interrupt management.

Data Conversion Algorithm:

Number system and BCD arithmetic, BCD2BIN conversion, BIN2BCD conversion, binary multiplication, binary division.

System Design (8086 based digital weighing machine: DWM)

Topdown/Bottomup design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display, cost computation and processing and display.

Advanced Microprocessors and Microcontrollers:

History of the evolution of MPU/MCU, multitasking systems, PVAM operation of Intel high performance architecture, overview of 80286 architecture, instruction and programming; overview of 80386 architecture, instruction and programming; overview of CISC and RISC microcontrollers, instruction and programming.

EEE 3210 Microprocessor, Interfacing and System design Lab.**1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 3209. Design of simple systems using the principles learned in EEE 3209.

**EEE 3217 Digital Signal Processing I
3 credits, 3 hours/week****Introduction to Digital Signal Processing (DSP):**

Discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete time systems, difference equation, convolution, transient and steady state response.

Discrete Transformations:

Discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform, Z-transformation-properties, transfer function, poles and zeroes and inverse Z-transform.

Correlation:

Circular convolution, auto correlation and cross correlation.

Digital Filters:

FIR filters- linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters- specifications, design using impulse variant, bi-linear z-transformation, least square methods and finite precision effects.

**EEE 3218 Digital Signal Processing I Lab.
1.5 credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 3217. Design of simple systems using the principles learned in EEE 3217.

Year-4 Semester-1**EEE 4100 Project and Thesis**
3 Credits, 6 hours/week

The students are required to undertake a project in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references etc.

EEE 4103 Solid State Devices
3 Credits, 3 hours/week**Semiconductors in Equilibrium:**

Electronic model of semiconductors and solids, valance band model, valance band, energy gap, conduction band, Energy bands, filling the energy band levels by electrons, energy band diagram of semiconductors, E-K, E-x, intrinsic and extrinsic semiconductors, Fermi levels, concept of holes, electron and hole concentrations, mass action law, charge neutrality conditions, temperature dependence of carrier concentrations and invariance of Fermi level.

Carrier Transport Processes and Excess Carriers:

Drift and diffusion, lattice scattering and impurity scattering generation and recombination of excess carriers, built-in-field. Electric field dependence of mobility Einstein relations, Boltzman relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level. Trapping and Tunneling.

PN Junction:

Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, DC electrical characteristics of p-n junction, energy band diagram of a biased p-n junction, Shockley diode equation, charge control switching analysis of p-n junction. Space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance turn on and turn off transients, metal semiconductor diode, band diagram.

Bipolar Junction Transistor:

Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll equations and circuit synthesis, switching transients, deviation from ideal behavior.

Metal-Semiconductor Junction:

Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts.

MOS Structure:

MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, charge control modes, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET.

Junction Field Effect Transistor:

Introduction, qualitative theory of operation, pinch off voltage and current-voltage relationship.

EEE 4105 Control System I
3 credits, 3 hours/week**Introduction to Control Systems:**

Linear system models- transfer function, block diagram and signal flow graph (SFG).

State Variables:

SFG to state variables, transfer function to state variable and state variable to transfer function.

Feedback Control System:

Closed loop systems, parameter sensitivity, transient characteristics of control systems, effect of additional pole and zero on the system response and system types and steady state error. Routh stability criterion.

Analysis of Feedback Control System:

Root locus method and frequency response method.

Design of Feedback Control System:

Controllability and observability, root locus, frequency response and state variable methods.

Digital Control Systems:

Introduction, sampled data systems, stability analysis in Z-domain.

EEE 4106 Control System I Lab.

1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4105.

Year-4 Semester-2**EEE 4200 Project and Thesis**

3 Credits, 6 hours/week

The students are required to undertake a project in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references etc.

6.2 Elective Courses offered by the Department of EEE**6.2.1 Interdisciplinary Group****EEE 4221 Control System II**

3 credits, 3 hours/week

Compensation using pole placement technique. State equations of digital systems with sample and hold, state equations of digital systems, digital simulation and approximation. Solution of discrete state equations: by Z-transform, state equation and transfer function, state diagrams and state plane analysis. Stability of digital control systems. Digital simulation and digital redesign. Time domain analysis. Frequency domain analysis.

Controllability and observability. Optimal linear digital regulator design. Digital state observer. Microprocessor control. Introduction to neural network and fuzzy control, adaptive control, H_∞ control, nonlinear control.

EEE 4222 Control System II Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4221

EEE 4223 Biomedical Instrumentation
3 credits, 3hours/week

Human Body:
Cells and physiological systems.

Bioelectricity:
Genesis and characteristics.

Measurement of Bio-Signals:
Ethical issues, transducers, amplifiers and filters.

Electrocardiogram:
Electrocardiography, phonocardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator.

Blood Pressure:
Systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring.

Blood Flow Measurement:
Plethymography and electromagnetic flow meter.

Measurement and Interpretation:
Electroencephalogram, cerebral angiograph and cronical X-ray, brain scans, elecromayogram (EMG).

Tomograph:
Positron emission topography and computer tomography, magnetic resonance imaging, ultrasonogram, patient monitoring system and medical telemetry, effect of electromagnetic fields on human body.

EEE 4224 Biomedical Instrumentation Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4223

EEE 4225 Numerical Methods for Engineering
1.5 Credits, 3 hours/week

Introduction:

Motivation and errors in numerical techniques, Taylor series.

Finite Difference Calculus:

Forward, backward, divided, and central difference and difference of a polynomial.

Interpolation and Extrapolation:

Newton's formula, lagrange, spline, chebyshev and inverse; extrapolation.

Nonlinear Equations:

Iteration, bisection, false position, Raphson, Secant and Muller's methods.

Simultaneous Linear Algebraic Equations:

Cramer's rule, inversion of matrices, Gauss elimination, Gauss-Jordan method, factorization and Gauss-Siedel iteration methods.

Curve Fitting:

Linear and polynomial regression, fitting power, exponential and trigonometric functions, ordinary differential equations: initial value problem, Taylors series method, Picard's method of successive approximation, Euler's method and Runge Kutta method. Boundary value problems.

Numerical Integration:

General quadrature formula, trapezoidal rule and Simpson's rule; numerical differentiation.

EEE 4226 Numerical Methods for Engineering Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4225.

6.2.2 Power Group

EEE 3251 Power System II **3 Credits, 3 hours/week**

Design and constructional features of overhead power transmission lines and underground cables. Stability: Swing equation, power angle equation, equal area criterion, multi-machine system, step-by-step solution of swing equation, factors affecting transient stability. Flexible AC transmission system. High voltage DC transmission system. Power system harmonics.

EEE 4151 Energy Conversion III **3 credits, 3 hours/week**

Special Machines:

Series universal motor, permanent magnet DC motor, unipolars and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drives circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors.

Acyclic Machines:

Generators, conduction pump and induction pump.

Magneto Hydrodynamic Generators:

Fuel cells, thermoelectric generators, flywheels, vector control, linear motors and traction.

Photovoltaic Systems:

Stand alone and grid interfaced.

Wind Turbine Generators:

Induction generator, AC-DC-AC conversion.

EEE 4153 Power Electronics **3 Credits, 3 hours/week**

Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching

buck, buckboost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: single phase and three phase current and voltage source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

EEE 4154 Power Electronic Laboratory
1.5Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4153. Design of simple systems using the principles learned in EEE 4153.

EEE 4155 Power Plant Engineering and Economy
3 Credits, 3 hours/week

Power Plants

General layout and principles, steam turbine, gas turbine, combined cycle, hydro and nuclear. Plant performance and operation characteristics,

Selection of Location

Technical, economical and environmental factors, load forecasting.

Generation Scheduling

Deterministic and probabilistic generation, load curves- demand factor, diversity factor, load duration curve, energy load curves, load factor, capacity factor, plant factor, electricity tariff formulation and type.

EEE 4251 Power System protection
3 credits, 3 hours/week

Purpose of power system protection. Criteria for detecting faults: over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Electromechanical, electronic and digital relays: basic modules, over current, differential, distance and directional. Trip circuits. Different protection schemes for generator, transformer, motor, bus bar, transmission lines. Protection of ring mains and radial

feeders. Miniature circuit breakers and fuses. Circuit breakers: principle of arc extinction, selection criteria and ratings of circuit breakers, types-air, oil, SF6 and vacuum.

EEE 4252 Power System protection Lab.
1.5 credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4251.

EEE 4257 High voltage Engineering
3 Credits, 3 hours/week

High voltage DC: Rectifiers circuits, voltage multipliers, Van-de-Graaf and electrostatic generators. High voltage AC: Cascaded transformers and Tesla coils. Impulse voltage: Shapes, mathematical analysis, codes and standards, single and multi-stage impulse generators, tripping and control of impulse generators. Breakdown in gas, liquid and solid dielectric materials. Corona. High voltage measurements and testing. Over-voltage phenomenon and insulation coordination. Lightning and switching surges, basic insulation level, surge diverters and arresters.

EEE 4258 High voltage Engineering Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4257. Design of simple systems using the principles learned in EEE 4257.

EEE 4253 Power system Reliability
3 Credits, 3 hours/week

Review of probability concepts. Probability distribution: Binomial, Poission, and Normal. Reliability concepts: Failure rate, outage, mean time to failure, series and parallel systems and redundancy. Markov process. Probabilistic generation and load models. Reliability indices: Loss of load probability and loss of energy probability. Frequency and duration. Reliability evolution techniques of single area system.

EEE 4255 Power system Operation and Control
3 Credits, 3 hours/week

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

6.2.3 Electronics Group

EEE 3231 Digital Electronics II
3 Credits, 3 hours/week

TTL:

TTL NAND gate operation, current-sourcing and current-sinking action, totem pole output circuit, TTL NOR gate, standard TTL characteristics, supply voltage and temperature range, voltage levels, power dissipation, propagation delay, fan out, introduction to improved TTL series, TTL loading and fan out, other TTL characteristics, connecting TTL outputs together, open collector output, Tri-state, TTL driving CMOS, problem with TTL.

ECL:

Basic ECL circuit, ECL OR/NOR gate, ECL characteristics, fan out, speed of operation.

CMOS Logic Families:

Introduction to the working principle of enhancement type NMOS, PMOS and depletion MOS. Comparison of NMOS and PMOS with respect to speed. Design of NOMS inverter with resistive load, with NMOS enhancement load and with NMOS depletion load. Egde time and speed calculation for NMOS inverter with depletion load. CMOS inverter: Circuit diagram, operation, transfer characteristic and noise margin. Design of basic CMOS gates (NAND gate and NOR gate) with specified parameters (rise time and fall time). Circuit implementation from logic equations. NMOS pass transistors and CMPS pass gate. Implementation of multiplexer by NMOS and CMOS pass gate. Buffer circuit. CMOS gates driving TTL gates and comparison of CMOS logics with TTL logics. Design of basic logic gates using CMOS and BiCMOS.

Interfacing Data Converters:

Digital to Analog Converters (D/A):

The binary weighted resistor D/A converter. The R/2R ladder D/A converter. The inverted ladder D/A converter. Specification for D/A converters (resolution, linearity, settling time and accuracy).

Analog to Digital Converters (A/D):

Flash converters, Successive approximation converter and Dual slope converter. A/D converter specifications (analog input voltage, input impedance, accuracy, conversion time etc.). A comparison of converter types. Sample and hold circuit (S/H), interconnecting the S/H circuit and the A/D converter.

**EEE 4131 Processing and Fabrication Technology
3 Credits, 3 hours/week****Monolithic Fabrication Processes and Structures:**

Substrate materials: Crystal growth and wafer preparation. Basic MOS process, Basic Bipolar process, Photolithographic process, pattern generation, pattern transfer, mask alignment, soft and hard baking, Photomask fabrication. Thermal oxidation, oxide quality, oxide thickness characterization.

Cleaning:

Surface cleaning, organic cleaning and RCA cleaning.

Diffusion:

Mathematical model, constant source diffusion, limited source diffusion, two-step diffusion, sheet resistance. Diffusion systems: Boron, Phosphorous, Ion implementation.

Etching:

Wet chemical etching, silicon and GaAs etching, anisotropic etching, selective etching, dry physical etching, ion beam etching, sputtering etching and reactive ion etching.

Film Deposition:

Evaporation, sputtering, CVD, Epitaxy.

Isolation:

p-n junction isolation, mesa isolation and oxide isolation, BJT based microcircuits, p-channel and n-channel MOSFETs, complimentary MOSFETs and silicon on insulator devices. Testing, bonding and packaging.

Interconnection, contacts, packaging and testing.

EEE 4133 VLSI I
3 Credits, 3 hours/week

VLSI Technology:

Top down design approach, technology trends and design styles. Verilog coding of electronic devices.

Review of MOS Transistor Theory:

Threshold voltage, body effect, I_V equations and characteristics, latch-up problems, NMOS inverter, CMOS inverter, pass-transistor and transmission gates. CMOS circuit characteristics and performance estimation: Resistance, Capacitance, rise and fall times, delay, gate transistor sizing and power consumption.

CMOS Circuit and Logic Design:

Layout design rules and physical design of simple logic gates.

CMOS Subsystem Design:

Adder, multiplier and memory system, ALU.

VLSI Design Styles:

FPGA, Standard cell based design, Full custom design.

EEE 4134 VLSI I Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4133. Design of simple systems using the principles learned in EEE 4133.

EEE 4135 Analog Integrated Circuit
3 Credits, 3 hours/week

Introduction:

Review of FET amplifiers, passive and active loads and frequency limitation. CMOS circuit modeling: Large signal model, model parameters, second order model effects.

Current Sink and Source, Current Mirror:

Basic, cascode and active current mirror and current amplifiers. Differential Amplifier: Introduction, large and small signal analysis, common mode analysis and differential amplifier with

active load. Op-amp design methodology, two stage Op-amp design, cascade Op-amp. Current and voltage references. Band-gap references: Supply voltage independent biasing, temperature independent biasing, proportional to absolute temperature current generation and constant transconductance biasing.

Noise:

Introduction to noise, types, representation in circuits, noise in single stage and differential amplifiers and bandwidth.

Switch Capacitor Circuit:

Sampling switches, switched capacitor circuits including unity gain buffer, amplifier and integrator.

Phase Locked Loop (PLL):

Introduction, basic PLL and charge pumped PLL.

EEE 4231 VLSI II
3 Credits, 3 hours/week

VLSI MOS System Design:

Layout extraction and verification, Full and semi-full custom design styles and logical and physical positioning.

Design Entry Tools:

Schematic capture and HDL. Logic and switch level simulation. Static timing. Concepts and tools of analysis, solution techniques for floor planning, placement, global routing and detailed routing. Application specific integrated circuit design including FPGA.

EEE 4232 VLSI II Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4231. Design of simple systems using the principles learned in EEE 4231.

EEE 4233 Optoelectronics
3 Credits, 3 hours/week

Optical Properties of Semiconductor:

Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation.

Properties of Light:

Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation.

Light Emitting Diode (LED):

Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers.

Stimulated Emission and Light Amplification:

Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions.

Semiconductor Lasers:

Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers.

Photo Detectors:

Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors.

Solar Cells:

Solar energy and spectrum, silicon and Schottkey solar cells.

Modulation of Light:

Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices, introduction to integrated optics.

EEE 4235 Compound Semiconductor and Hetero-Junction Devices
3 Credits, 3 hours/week

Compound Semiconductor:

Zinc-blend crystal structure, growth techniques, alloys, band gap, density of carriers in intrinsic and doped compound semiconductors.

Hetero- Junctions:

Band alignment, band offset, Anderson's rule, single and double sided hetero-junctions, quantum wells and quantization effects, lattice mismatch and strain and common hetero-structure material systems.

Hetero-Junction Diode:

Band banding, carrier transport and I-V characteristics.

Hetero-Junction Field Effect Transistor:

Structure and principle, band structure, carrier transport and I-V characteristics.

Hetero-Structure Bipolar Transistor (HBT):

Structure and operating principle, quasi-static analysis, extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT.

EEE 4237 Semiconductor Device Theory
3 Credits, 3 hours/week

Lattice Vibration:

Simple harmonic model, dispersion relation, acoustic and optical phonons.

Band Structure:

Isotropic and anisotropic crystal, band diagram and effective masses of different semiconductor and alloys.

Scattering Theory:

Review of classical theory, Fermi-Golden rule, scattering of different processes, scattering mechanism in different semiconductors, mobility.

Different Carrier Transport Models:

Drift-diffusion theory, ambipolar transport, hydrodynamic model, Boltzman transport equations, quantum mechanical model, simple application.

6.2.4 Communication Group**EEE 3271 Random Signals and Processes**

3 Credits, 3 hours/week

Probability and Random Variables:

Distribution and density functions and conditionals probability.

Expectation:

Moments and characteristic functions. Transformation of a random variable. Vector random variables. Joint distribution and density. Sum of random variables.

Random Processes:

Correlation functions. Process measurements. Gaussian and Poisson random processes. Noise models. Stationary and Ergodicity. Special Estimation. Correlation and power spectrum. Cross spectral densities. Response of linear systems to random inputs.

Introduction to Discrete Time Processes:

Mean square estimation, detection and linear filtering.

EEE 4171 Digital Signal Processing II

3 Credits, 3 hours/week

Spectral Estimation:

Nonparametric methods- discrete random processes, autocorrelation sequence, periodogram. Parametric methods- autoregressive modeling, forward/backward linear prediction, Levinson-Durbin algorithm, minimum variance method and Eigenstructure method I and II.

Adaptive Signal Processing:

Application, equalization, interference suppression, noise cancellation, FIR filters, minimum mean-square error criterion,

least mean-square algorithm and recursive least square algorithm.

Multirate DSP:

Interpolation and decimation, poly-phase representation and multistage implementation.

Perfect Reconstruction Filter Banks:

Power symmetric, alias-free multi-channel and tree structured filter banks.

Wavelets:

Short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

**EEE 4173 Microwave Engineering
3 Credits, 3 hours/week****Transmission Lines:**

Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, smith chart, impedance matching and lossy transmission lines.

Waveguides:

General formulation, modes of propagation and losses in parallel plate, rectangular and circular waveguides, transit time effect, velocity modulation, space charge wave.

Microstrips:

Structure and characteristics.

Rectangular Resonant Cavities:

Energy storage, losses and Q.

Radiation:

Small current element, radiation resistance, radiation pattern and properties, Hertzian and half wave dipoles.

Antennas:

Mono pole, horn, rhombic and parabolic reflector, antenna, array and Yagi-Uda antenna.

Microwave tubes:

Klystron amplifier, multicavity klystron amplifier, Reflex Klystron oscillator, magnetron, TWT amplifier, BWO.

EEE 4174 Microwave Engineering Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 4173. Design of simple systems using the principles learned in EEE 4173.

EEE 4175 Optical Fiber communication
3 Credits, 3 hours/week

Light Propagation through Optical Fiber:
Ray optics theory and mode theory.

Optical fiber:

Types and characteristics, transmission characteristics, fiber joints and fiber couples.

Light Sources:

Light emitting diodes and laser diodes.

Detectors:

PIN photo detector and avalanche photodetectors.

Receiver Analysis:

Direct detection and coherent detection, noise and limitations.

Transmission Limitation:

Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises.

Optical Amplifier:

Laser and fiber amplifiers, applications and limitations.

Multi-Channel Optical System:

Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

EEE 4271 Digital communication
3 Credits, 3 hours/week

Introduction:

Communication channels, mathematical model and characteristics, probability and stochastic process.

Source Coding:

Mathematical models of information, entropy, Huffman code and linear predictive coding.

Digital Transmission System:

Base band digital transmission, inter-symbol interference, bandwidth, power efficiency, modulation and coding trade-off.

Receiver for AWGN Channels:

Correlation demodulator, match filter demodulator and maximum likelihood receiver.

Channel Capacity and Coding:

Channel models and capacities and random selection of codes.

Block Codes and Conventional Codes:

Linear block codes, convolution codes and coded modulation, Spread spectrum signals and system.

**EEE 4272 Digital communication Lab.
1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 4271. Design of simple systems using the principles learned in EEE 4271.

**EEE 4273 Mobile Cellular communication
3 Credits, 3 hours/week****Introduction:**

Concept, evolution and fundamentals, analog and digital cellular systems.

Cellular Radio System:

Frequency reuse, co-channel interference, cell splitting and components

Mobile Radio Propagation:

Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna.

Frequency Management and Channel Assignment:

Fundamentals, spectrum utilization, fundamentals of channel assignment, traffic and channel assignment.

Handoffs and Dropped Calls:

Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate.

Diversity Techniques:

Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance.

Digital Cellular Systems:

Global system for mobile, time division multiple access and code division multiple access. GSM, AMPS, GPRS, EDGE, W-CDMA, 3rd generation of mobile communication, Packet switching and data communication

**EEE 4275 Telecommunication Engineering
3 Credits, 3 hour/week****Introduction:**

Principle, evolution, networks, exchange and international regularly bodies.

Telephone Apparatus:

Microphone. Speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features.

Switching System: Introduction to analog system, digital switching system-space division switching, blocking probability and multistage switching, time division switching and two dimensional switching, SPC, TST, STS.

Traffic Analysis:

Traffic characterization, grades of service, network blocking probabilities, delay system and queuing.

Modern Telephone Services and Network:

Internet telephony, facsimile, integrated services digital network; asynchronous transfer mode and intelligent networks, introduction to cellular telephony and satellite communication.

6.2.5 Computer Group

EEE 4193 Microcontroller based System Design **3 Credits, 3 hours/week**

Review of 8 bit/ 16 bit CISC/RISC microcontrollers: Hardware architecture, First access register file, instruction pipelining. System design: Digital taximeter, prepaid energymeter, VVVF driven and the like, advances in system design.

EEE 4194 Microcontroller based System Design Lab. **1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 4193. Design of simple systems using the principles learned in EEE 4193.

EEE 4195 Real Time Computer System **3 Credits, 3 hours/week**

Introduction to real time system; Classification of real time process; Real time scheduling; Real time programming; Implementation; Operating systems; Real Time I/O. Real time design methodologies. Modeling for real time systems. Reliable and safe design for critical applications. Review of Microprocessor fundamentals and programmable input/output devices and systems for PC. Application examples- digital controls, robotics, on line systems, communication with real world signals and automatic control using feedback, feed-forward and adaptive control, control algorithm implementation.

6.3 Courses offered by other departments to EEE students

6.3.1 Department of Computer Science and Engineering

CSE 4191 Multimedia Communications I **3 Credits, 3 hours/week**

Types of media, Multimedia signal characteristic: sampling, digital representation, signal formats. Signal coding and compression: entropy coding, transform coding, vector quantization. Coding

Standards: H.26x, LPEG, MPEG. Multimedia communication networks: network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM, internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia. Entertainment networks: cables, satellite and terrestrial TV networks. ADSL and VDSL, high speed modems. Transport protocols: TCP, UDP, IP, Ipv4, Ipv6, FTP, RTP, and RTCP, use of MPLS and WDMA. Multimedia synchronization, security, QoS and resource management. Multimedia applications: The www, Internet telephony, teleconferencing, HDVT, e-mail and e-commerce.

CSE 4291 Computer Networks
3 Credits, 3 hours/week

Switching and multiplexing; ISO, TCP-IP and ATM reference models. Different data communication services: Physical layer-wired and wireless transmission media. Cellular radio: Communication satellites; Data link layer: Elementary protocols, sliding window protocols. Error detection and correction, HDLC, DLL of internet, DLL of ATM; Multiple Access protocols, IEEE.802 protocols for LANs and MANs, switches, Hubs and Bridges; High speed LAN; Network layer: Routing, Congestion control, internetworking, Network layer in internet: IP protocol, IP addresses, ARP; NI in ATM transport layer: transmission control protocol. UDP, ATM adaptation layer; Application layer: Network security; Email, Domain name system; Simple network management protocol; HTTP and World Wide Web.

CSE 4292 Computer Networks Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in CSE 4291. Design of simple systems using the principles learned in CSE 4292.

CSE 4293 Computer Architecture
3 Credits, 3 hours/week

Instructions and data access methods; Arithmetic Logic Unit (ALU) design: arithmetic and logical operations, floating point

operations; Process design: data paths single cycle and multi cycle implementations; Control Unit Design: hardware and micro programmed Pipeline- pipeline data path and control, hazards and exceptions. Memory Organization: cache, virtual memory, buses, multiprocessor, type of microprocessor performance, single bus multiprocessors, clusters.

CSE 4295 Multimedia Communications II
3 Credits, 3 hours/week

Course content will be decided later.

6.3.2 Department of Civil Engineering

CE 1201 Mechanics of Materials
3 Credits, 3 hours/week

Stresses in members subjected to tension, compression, shear and temperature changes; Bending moment & shear force diagrams; Flexural & shear stresses in beams; torsional stresses in shaft; helical spring; thin & thick cylinders; principal stresses; deflection of beams; Columns.

CE 1202 Engineering Drawing
1.5 Credits, 3 hours/week

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

6.3.3 Department of Mechanical Engineering

ME 1101 Mechanical Engineering Fundamentals
3 Credits, 3 hours/week

Introduction to Sources of Energy:

Steam generating units with accessories and mountings; steam turbines, condensers, vapor cycles.

Internal Combustion Engine:

Introduction to internal combustion engines & their cycles, gas turbines.

Refrigeration and Air Conditioning:

Applications; refrigerants, different refrigeration methods.

Fluid Machinery:

Fluid flow, measurements of flow, friction in flow, centrifugal pumps, fans, blowers & compressors.

Fundamental of Conduction, Convection and Radiation:

One dimensional steady state conduction in plated pipes; Critical thickness of insulation.

**ME 1102 Mechanical Engineering Fundamentals Lab.
1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in ME 1101. Design of simple systems using the principles learned in ME 1101.

6.3.4 Department of Related Subjects

6.3.4.1 Physics

**PHY 1105 Physics I
3 Credits; 3hours/week**

Waves and Oscillations:

Simple harmonic motion, Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, spring mass system, torsional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, vibrations of membranes and columns, progressive wave, power and intensity of wave, stationary wave, energy calculation of progressive and stationary wave, group and phase velocities, sound waves- Doppler Effect, Sabines formula, architectord acoustics.

Optics:

Defects of images: Spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration, theories of light, Huygen's principle; Interference of light: Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference in thin film, Newton's rings, interferometers; Diffraction: Diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; Polarization: production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, polarimeters, optics of crystal optical effect in crystal, laser, nonlinear optics.

Thermal Physics:

Heat and work, Zeroth law of thermodynamics, thermometer, thermocouple, the first law of thermodynamics and its applications; Kinetic theory of gases-kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, work done by gas, isothermal and adiabatic relations, vander waal's equation of state, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnot's theorem, entropy, thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

PHY 1106 Physics I Lab.
1.5 Credits; 3hours/week

Laboratory experiments based on theory and concepts learnt in PHY 1105.

PHY 1205 Physics II
3 Credits, 3 hours /week**Atomic Structure:**

Rutherford scattering, atomic structure (Bohr model, Thomson model, Rutherford model), Zeeman effect.

Structure of Matter:

Classification of solids, crystal structure of solids, Bragg's law, distinction between metal, insulator and semiconductor.

Modern Physics:

Galilean relatively and Einstein's special theory of relativity; Lorentz transformation equations, Length contraction, time dilation and mass-energy relation, photoelectric effect, Compton effect, De'Broglie matter waves.

Nuclear Physics:

Constituent of atomic nucleus, Nuclear binding energy, different types of radioactivity, radioactive decay law; Nuclear reactions, nuclear fission, nuclear fusion.

Mechanics:

Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of the momentum principle; Angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of Universal Gravitation, the motion of planets and satellites.

Introductory Quantum Mechanics:

Wave function, uncertainty principle, postulates, Schrödinger time independent equation, expectation value, probability, particle in a Zero potential, calculation of energy.

6.3.4.2 Chemistry**CHEM 1107 Chemistry
3 Credits, 3 hours/week**

Atomic Structure, quantum numbers, Pauli's exclusion principle, electronic configuration, periodic table, properties and uses of noble gases, different types of chemical bonds and their properties, molecular structures of compounds, selective organic reactions. Different types of solutions and their compositions. Phase rule, phase diagram of monocomponent system. Properties of dilute solutions. Thermochemistry, chemical kinetics, chemical equilibrium. Ionization of water and pH concept. Electrical properties of solution.

**CHEM 1108 Chemistry Lab.
1.5 Credits, 3 hours/week**

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

6.3.4.3 Mathematics

MATH 1103 Mathematics I 3 Credits, 3 hours/week

Differential Calculus:

Limits, continuity and differentiability. Successive differentiation of various types of functions. Leibnitz's theorem, Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorems in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainders. Expansion of functions, evaluations of indeterminate forms of L'Hospital's rule. Partial differentiation. Euler's theorem. Tangent and normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of maximum and minimum values of functions. Curvature, Asymptotes, curve tracing.

Integral Calculus:

Definition, Integration by the method of substitution, integration by parts. Standard Integrals. Integration by successive reduction. Definite Integrals, its properties and use in summing series. Walli's formulae. Improper integrals. Beta function and Gamma function, Area under a plane curve and area of a region enclosed by two curves in Cartesian and polar co-ordinates, Trapezoidal and Simpson's rule, Volumes and surface areas of solids of revolution.

MATH 1203 Mathematics II 3 Credits, 3 hours/week

Ordinary Differential Equations:

Degree and order of ordinary differential equations, formation of differential equations by various methods, solution of first order differential equations. Solution of general linear equations of second and higher orders with constant coefficients, applications. Solution of homogeneous linear equations of the higher order when the dependent or independent variables are absent. Solution of differential equations by the method based on the

factorization of the operators. Frobenious method. Legender and Bessel's function.

Partial Differential Equations:

Introduction. Linear and non-linear first order equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solution with boundary and initial conditions.

MATH 1213 Mathematics III**3 Credits, 3 hours/week****Complex Variable:**

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

Vector Analysis:

Scalars and vectors, equality of vectors, addition and subtraction of vectors, geometrical interpretation. Multiple product of vectors. Linear dependence and independence of vectors. Differentiation and Integration of vectors together with elementary applications. Line, Surface and volume integrals. Gradient of a scalar functions, divergence and curl of a vector function, various formulae. Integrals form of gradient, divergence and curl. Divergence theorem, Stoke's theorem, Green's theorem and Gauss's theorem

MATH 2103 Mathematics IV
3 Credits, 3 hours/week**Linear Algebra:**

Introduction to systems of linear equations. Gaussian elimination. Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of matrix. Factorization, Determinants. Quadratic forms. Matrix polynomials. Euclidean n -space. Linear transformation from \mathbb{R}^n to \mathbb{R}^m . Properties of Linear transformation from \mathbb{R}^n to \mathbb{R}^m . Real vector spaces and subspaces. Basis and dimension. Rank and nullity. Inner product spaces. Gram-Schmidt process and QR-decomposition. Eigenvalues and eigenvectors. Diagonalization. Linear transformations. Kernel and Range. Application of linear algebra to electric networks.

Laplace Transformation:

Definition, Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. Some special theorems on Laplace transforms. Partial fraction. Solution of differential equations by Laplace transforms. Evaluation of improper integrals.

MATH 2203 Mathematics V
3 Credits, 3 hours/week**Fourier Analysis:**

Real and complex forms. Finite Fourier transforms. Fourier integral. Fourier transforms and their uses in solving boundary value problems.

Statistics:

Introduction. Frequency distribution. Mean, median, mode. Standard deviation, moments, skewness and kurtosis. Sets and Probability. Random variable and its probability distributions. Treatment of grouped sampled data. Some discrete probability distributions. Normal distribution. Binomial, poisson and negative binomial. Sampling theory. Estimation theory. Tests of hypotheses. Regression and correlation. Analysis of variance.

6.3.4.4 Humanities

HUM 2109 English and Sociology
3 Credits, 3 hours/week

English:

General Discussion:

Introduction, various approaches of learning English.

Grammatical Problems:

Construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction.

Reading Skill:

Discussion readability, scan and skin reading, generating ideas through purposive reading, reading of selected stories.

Writing Skill:

Principles of effective writing; Organization, planning and development of writing; Composition, précis writing, amplification.

General Strategies for Writing Process:

Generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing.

Approaches to Communication:

Communication today, business communication, different types of business communication.

Listening Skill:

The phonemic systems and correct English pronunciation.

Speaking Skill:

Practicing dialogue; Story telling; Effective oral presentation.

Report Writing:

Defining a report, classification of reports, structure of a report, writing of reports.

Sociology:

Scope. Some basic concepts. 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

and industrialization, Urban ecology. Co-operative and Socialist movements. Rural Sociology.

HUM 2110 Developing English Skills Lab.
1.5 Credits, 3 hours/week

Grammar:

Tense, article, proposition, subject-verb agreement, clause, conditional and sentence structure.

Vocabulary Building:

Correct and precise diction, affixes, level of appropriateness. Colloquial and standard, informal and formal.

Developing Reading Skill:

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

Developing Writing Skill:

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

Developing Listening Skill and Note Taking:

Listening to recorded texts and class lectures and learning to take useful notes based on listening.

Developing Speaking Skill:

Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complains, apologies, describing people and places, narrating events.

HUM 3109 Accounting and Economics
3 Credits, 3 hours/week

Financial Accounting:

Objectives and importance of accounting, branches of accounting, accounting as an information system, computerized system and applications in accounting. Recording system: Double entry mechanism, accounts and their classification, accounting

equation, accounting cycle journal, ledger, trial balance. Preparation of financial statements considering adjusting and closing entries. Accounting concepts and conventions. Financial statements analysis and interpretation: ratio analysis- tests for profitability, liquidity, solvency and overall measure.

Costs and Management Accounting:

Cost concept and classification. Segregation and mixed cost. Overhead cost: meaning and classification, allocation of overhead cost, overhead recovery method. Job order costing: preparation of job cost sheet and quotation price. Inventory valuation: absorption costing and variable costing technique. Cost volume profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis, short-term investment decisions: Relevant and differential cost analysis; Linear programming. Long-term investment decisions: Capital budgeting, various techniques of evaluation of capital investment, investment appraisal under uncertainty, risk management, capital rationing. Concept of working capital, need for working capital, management of cash, stock debtors.

Economics:**Introduction:**

Definition of Economics. Economics and Engineering.

Micro-Economics:

The theory of demand and supply and their elasticities. Price determination. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis. Production, production function, types of productivity. Rational region of production of an engineering firm. concepts of market and market structure. Cost analysis and cost function. Small scale production and large scale production. Optimization. Theory of distribution.

Macro-Economics:

Savings, investment, employment, National income analysis. Inflation. Monetary policy, fiscal policy and trade policy with reference to Bangladesh. Economics of development and planning.

HUM 3209 Industrial Management
3 Credits, 3 hours/week

Introduction:

Evolution, management function, organization and environment.

Operational Management:

Production planning, types of production systems, forecasting, ABC analysis, inventory control, work study.

Organization:

Theory and structure, coordination, span of control, authority delegation, groups, committee and task force, manpower planning.

Personnel Management:

Scope, importance, need hierarchy, motivation, job redesign, leadership, participative management, training, performance appraisal, wages & incentives, informal groups, organizational change and conflict.

Cost and Financial Management:

Elements of costs of products, depreciation, break-even analysis, investment analysis, benefit cost analysis.

Marketing Management:

Concepts, strategy, sales promotion, patent laws.

Technology Management:

Management of innovation and changes, technology life cycle. Case studies.

7.1 Equivalence of EEE Courses

Course(s) of Old Syllabus		Course(s) of New Syllabus	
EEE 101	Basic Electrical Engineering	EEE 1101/ EEE 1201	Electrical Circuits I/ Electrical Circuits II
EEE 102	Basic Electrical Engineering Lab.	EEE 1102/ EEE 1202	Electrical Circuits I Lab./ Electrical Circuits II Lab.
EEE 103	Electrical Circuits	EEE 1201	Electrical Circuits II
EEE 104	Electrical Circuits Lab.	EEE 1202	Electrical Circuits II Lab.
EEE 105	Electronic Circuits-I	EEE 2103	Electronics I
EEE 106	Electronic Circuits-I Lab.	EEE 2104	Electronics I Lab.
EEE 200	Electrical Design and Drafting	EEE 3100	Electrical Service Design
EEE 201	Electrical Machines-I	EEE 2105	Energy Conversion I
EEE 202	Electrical Machines-I Lab.	EEE 2106	Energy Conversion I Lab.
EEE 203	Electronic Circuits-II	EEE 2203	Electronics II
EEE 204	Electronic Circuits-II Lab.	EEE 2204	Electronics II Lab.
EEE 205	Electrical Machines-II	EEE 2205	Energy Conversion II
EEE 206	Electrical Machines-II Lab.	EEE 2206	Energy Conversion II Lab.
EEE 215	Mathematical Methods for Engineering	EEE 4225	Numerical Methods for Engineering
EEE 225	Digital Electronics-I	EEE 3103	Digital Electronics I

Course(s) of Old Syllabus		Course(s) of New Syllabus	
EEE 226	Digital Electronics-I Lab.	EEE 3104	Digital Electronics I Lab.
EEE 300	Electronics Shop		
EEE 301	Linear Systems	EEE 3107	Signals and Linear Systems
EEE 303	Electrical Machines-III	EEE 4151	Energy Conversion III
EEE 307	Electromagnetic Fields and Waves	EEE 2207	Electromagnetics
EEE 311	Measurement and Instrumentation	EEE 2211	Measurement and Instrumentation
EEE 312	Measurement and Instrumentation Lab.	EEE 2212	Measurement and Instrumentation Lab.
EEE 309	Electrical Power Transmission and Distribution	EEE 3105/ EEE 3251	Power System I/ Power System II
EEE 313	Control Systems	EEE 4105	Control Systems I
EEE 314	Control Systems Lab.	EEE 4106	Control Systems I Lab.
EEE 317	Semiconductor Devices-I	EEE 4103	Solid State Devices
EEE 325	Digital Electronics-II	EEE 3231	Digital Electronics II
EEE 326	Digital Electronics-II Lab.		
EEE 400	Project and Thesis	EEE 4100	Project and Thesis
EEE 431	Renewable Energy Systems		
EEE 403	Power System Analysis	EEE 3105	Power System I
EEE 404	Power System Analysis Lab.	EEE 3106	Power System I Lab.
EEE 405	Power Station	EEE 4155	Power Engineering and Economy

Course(s) of Old Syllabus		Course(s) of New Syllabus	
EEE 407	Science of Materials	EEE 3113	Electrical Properties of Materials
EEE 409	Industrial Electronics	EEE 4153	Power Electronics
EEE 410	Industrial Electronics Lab.	EEE 4154	Power Electronics Lab.
EEE 411	Telecommunication Engineering	EEE 3207/ EEE 4275	Communication Theory/ Telecommunication Engineering
EEE 412	Telecommunication Engineering Lab.	EEE 3208	Communication Theory Lab.
EEE 413	Switchgear and Protection Relays	EEE 4251	Power System Protection
EEE 414	Switchgear and Protection Relays Lab.	EEE 4252	Power System Protection Lab.
EEE 415	Microwave Engineering	EEE 4173	Microwave Engineering
EEE 416	Microwave Engineering Lab.	EEE 4174	Microwave Engineering Lab.
EEE 417	Advanced Electronics		
EEE 418	Advanced Electronics Lab.		
EEE 419	Semiconductor Devices-II		
EEE 421	Digital Signal Processing	EEE 3217	Digital Signal Processing I
EEE 423	Digital and Satellite Communication Engineering	EEE 4271/ EEE 4275	Digital communication/ Telecommunication Engineering
EEE 424	Digital and Satellite Communication Engineering Lab.	EEE 4272	Digital communication Lab.
EEE 425	VLSI Circuits	EEE 4133	VLSI I
EEE 426	VLSI Circuits Lab.	EEE 4134	VLSI I Lab.

Course(s) of Old Syllabus		Course(s) of New Syllabus	
EEE 427	Biomedical Electronics	EEE 4223	Biomedical Instrumentation
EEE 429	Power system operation and reliability	EEE 4253	Power System Reliability
EEE 430	Power system operation and reliability Lab.		
EEE 450	Project and Thesis	EEE 4200	Project and Thesis

7.2 Equivalence of Non-Departmental Courses

Course(s) of Old Syllabus		Course(s) of New Syllabus	
PHY 105	Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillation, and Physical Optics)	PHY 1105	Physics I
PHY 107	Modern Physics	PHY 1205	Physics II
PHY 106	Physics Lab.	PHY 1106	Physics I Lab.
CHEM 105	Chemistry	CHEM 1107	Chemistry
CHEM 106	Inorganic Quantitative Analysis	CHEM 1108	Chemistry Lab.
MATH 105	Mathematics-I (Differential Calculus and Co-ordinate Geometry)	MATH 1103	Mathematics I
MATH 107	Mathematics-II (Integral Calculus, and Ordinary Differential Equations)	MATH 1103/ MATH 1203	Mathematics I/ Mathematics II

Course(s) of Old Syllabus		Course(s) of New Syllabus	
MATH 207	Mathematics-III (Complex Variables, Laplace Transforms and Statistics)	MATH 1213/ MATH 2103/ MATH 2203	Mathematics III/ Mathematics IV/ Mathematics V
MATH 209	Mathematics-IV (Matrices, Vectors, and Fourier Analysis)	MATH 1213/ MATH 2103/ MATH 2203	Mathematics III/ Mathematics IV/ Mathematics V
HUM 101	English and Economics	HUM 2109/ HUM 3109	English and Sociology/ Accounting and Economics
HUM 201	Accounting and Sociology	HUM 3109/ HUM 2109	Accounting and Economics/ English and Sociology
HUM 301	Industrial Management	HUM 3209	Industrial Management
ME 105	Basic Mechanical Engineering	ME 1101	Mechanical Engineering Fundamentals
ME 106	Basic Mechanical Engineering Lab.	ME 1102	Mechanical Engineering Fundamentals Lab.
ME 205	Mechanics of Materials	CE 1201	Mechanics of Materials
ME 204	Engineering Drawing	CE 1202	Engineering Drawing
CSE 223	Programming Language-I	EEE 2109	Programming Language
CSE 224	Programming Language-I Lab.	EEE 2110	Programming Language Lab.
CSE 327	Computer Networks	CSE 4291	Computer Networks
CSE 328	Computer Networks Lab.	CSE 4292	Computer Networks Lab.

Course(s) of Old Syllabus		Course(s) of New Syllabus	
CSE 441	Microprocessors	EEE 3209	Microprocessor, Interfacing and System design
CSE 442	Microprocessors Lab.	EEE 3210	Microprocessor, Interfacing and System design Lab.

8.1 Department of Architecture**ARC 3125 Building Sciences and Services III
(Electrical Equipment)****2 hours per week, 2 Cr.**

Introduction to electrification in buildings; Electrical equipments and electrical installations in buildings; Standard practices and precautions.

8.2 Department of Civil Engineering**EEE 1131 Basic Electrical Technology
3 Credits, 3 hours/week****DC Circuits:**

Electrical units and standards; Electrical network and circuit solution: Series, Parallel and mesh current methods; Measurement of electrical quantities: current, voltage, resistance. Measuring instruments: ammeter, voltmeter, wattmeter and millimeters.

AC Circuits:

Instantaneous Current, voltage and power, effective current and voltage, average power; Phasor algebra; Introduction to electrical wiring for residential and commercial loads.

Electrical Machines:

Familiarization with different types of electrical machines such as DC generator and motors, AC alternator, motors, transformers; working principal of transformers, induction motors; Introduction to electronic principles with simple application.

EEE 1132 Basic Electrical Technology Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 1131.

8.3 Department of Computer Science and Engineering

EEE 1241 Basic Electrical Engineering
3 Credits, 3 hours/week

DC Circuits:

Fundamental electrical concept and measuring units; DC voltage, current, resistance and power; Laws of electrical circuits and methods of network analysis; Principles of DC measuring apparatus; Laws of magnetic fields and method of solving simple magnetic circuits.

Alternating Current:

Instantaneous and rms current, voltage and power; average power for various combinations of R, L and C circuits; phasor representation of sinusoidal quantities, Introduction to three phase circuits.

EEE 1242 Basic Electrical Engineering Lab.
1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 1241.

EEE 2141 Electronic Device and Circuits
3 Credits, 3 hours/week

Semiconductor Diode:

Junction diode characteristics; Operation and small signal models of diodes.

Bipolar Transistor:

Characteristics; BJT biasing and thermal stabilization; CE, CB, CC configurations; Small signal low frequency h-parameter models and hybrid- π model.

Introduction to JFET, MOSFET and CMOS:
Biasing and application in switching circuits.

Oscillators:

Hartley, Colpitts and Wien-bridge oscillators.

Power Electronic Devices:

SCR, TRIAC, DIAC, UJT characteristics and application; Introduction to rectifiers, active filters, regulated power supply; Introduction to IC fabrication techniques.

**EEE 2142 Electronic Device and Circuits Lab.
1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 2141.

**EEE 2241 Electrical Drives and Instrumentation
3 Credits, 3 hours/week**

Alternators; Single phase transformer; Principle of operation of DC, Synchronous, Induction, Universal and stepper motors ; Thyristor and microprocessor based speed control of motors. Voltage and current amplifiers; Operational amplifiers; Instrumentation amplifier; Basic differential amplifiers; Logarithmic amplifiers; Temperature compensation of logarithmic amplifiers; Antilog amplifier; Chopper stabilized amplifier; Frequency and voltage measuring using digital techniques: Digital frequency meter, digital voltmeter, Recorders and display device: Oscilloscope; Spectrum analyzers and logic analyzers; Data acquisition system and interfacing to microprocessor based system; Transducers: terminology, types, principles and application of piezoelectric , photovoltaic, thermoelectric, variable reactance and opt-electronic transducers; noise reduction in instrumentation.

**EEE 2242 Electrical Drives and Instrumentation Lab.
1.5 Credits, 3 hours/week**

Laboratory experiments based on theory and concepts learnt in EEE 2241.

8.4 Department of Textile Technology

EEE 2261 Elements of Electrical Engineering and Electronics

3 Credits, 3 hours/week

Basic Electrical Engineering:

DC fundamentals; Generators and their characteristics, motors and their characteristics; Speed control process.

AC Current and Devices:

AC fundamentals; Flow of AC through coils; Inductance and resistance in series and parallel, Flow of AC through capacitance; Inductance, resistance and capacitance in series and parallel, Power in AC circuits; Power factor and power factor improvement; Resistance circuit; Transformer; Poly phase circuits; Induction motors.

Substation:

Purpose; Substation equipments (HT, LT Switch gear etc.); Distribution board and sub distribution board.

System Network:

Typical distribution circuits; Cables and wiring systems and selection.

System Protection:

Types of faults; principles of protection; protective devices circuit breaker, switches.

Electrical Hazards:

Protection against shock and fire, Farthing and its importance, Procedure to be adopted when a person is in contact with alive conductor.

Electronics:

Amplifiers; rectifiers and Transistors, Diodes and their uses, Voltage amplification, power amplification, Photo sensor and transducers, Integrated Circuit (IC).

EEE 2262 Elements of Electrical Engineering and Electronics Lab.

1.5 Credits, 3 hours/week

Laboratory experiments based on theory and concepts learnt in EEE 2261.

Chapter 9**New courses offered by
Department of EEE in this
Syllabus**

Course Group	Course no.	Course Title	Credit
Core	EEE 1210	Electrical Circuit Simulation Lab.	1.5
Core	EEE 2210	Electronic Circuit Simulation Lab.	1.5
Core	EEE 3110	Numerical Technique Lab.	1.5
Core	HUM 2110	Developing English Skills Lab	1.5
Electronics	EEE 4131	Processing and Fabrication Technology	3.0
Electronics	EEE 4135	Analog Integrated Circuit	3.0
Electronics	EEE 4231	VLSI II	3.0
Electronics	EEE 4232	VLSI II Lab.	1.5
Electronics	EEE 4233	Optoelectronics	3.0
Electronics	EEE 4235	Compound Semiconductor and Hetero-Junction Devices	3.0
Electronics	EEE 4237	Semiconductor Device Theory	3.0
Power	EEE 3251	Power System II	3.0
Power	EEE 4257	High Voltage Engineering	3.0
Power	EEE 4258	High Voltage Engineering Lab.	1.5
Communication	EEE 3271	Random Signals and Processes	3.0
Communication	EEE 4171	Digital Signal Processing II	3.0
Communication	EEE 4175	Optical Fiber Communication	3.0
Communication	EEE 4273	Mobile Cellular Communication	3.0

Course Group	Course no.	Course Title	Credit
Computer	CSE 4191	Multimedia Communications	3.0
Computer	EEE 4193	Microcontroller based System Design	3.0
Computer	EEE 4194	Microcontroller based System Design Lab.	1.5
Computer	EEE 4195	Real Time Computer System	3.0
Computer	EEE 4293	Computer Architecture	3.0
Computer	CSE 4295	Multimedia Communications II	3.0
Interdisciplinary	EEE 4221	Control System II	3.0
Interdisciplinary	EEE 4222	Control System II Lab.	1.5

Chapter 10

Memorandum

Memorandum of Understanding Between

Ahsanullah University of Science and Technology &

The University of Wyoming

Considering that the one of the principal duties of modern institutions of higher education is to enable students to acquire an international experience, and that this experience is a valuable element in the preparation of their professional life;

Considering that an exchange of faculty between two institutions would be fruitful for the persons participating in the exchange, their research and their teaching;

Considering that institutions of higher education should have documentation and regular information on scientific progress, economic realities and technological advances in the countries chosen as privileged partners;

The following between Ahsanullah University of Science and Technology and The University of Wyoming is agreed upon:

Within the limitation of available funds, a program of mutual cooperation between the two institutions will be initiated which may include any or all of the following:

- An exchange of students with a special emphasis on Ahsanullah University of Science and Technology upper division students being permitted to enroll in appropriate University of Wyoming degree programs,
- An exchange of faculty,
- An exchange of documentary resources,
- Cooperation in potential joint technical assistance activities,
- Cooperation in research projects and or programs, and
- Sponsorship of international workshops and or symposia.

Specific activities will be documented in addenda to this memorandum or in specific cooperative agreements.

Yusuf Bagzy
For the University of Wyoming

11 Dec., 1996

Muhammad Hussain Khan
For Ahsanullah University of Science
and Technology

11/1996, 1996



Memorandum of Cooperation

Drexel University
Philadelphia, PA, U.S.A.

and

Ahsanullah University of Science and Technology
Dhaka, Bangladesh

June, 1998



Whereas Drexel University and Ahsanullah University of Science and Technology share a common ethic, interest, motivation and commitment to excellence in education, research and technology development, and



Whereas Drexel University and Ahsanullah University of Science and Technology will continue to meet, to discuss program planning in view of their shared interests, priorities and objectives, and



Whereas Drexel University and Ahsanullah University of Science and Technology are committed to a shared vision that builds on the expertise of their respective institutions for the benefit of both institutions and society at large.



Be it therefore resolved that Drexel University and Ahsanullah University of Science and Technology admit and acknowledge a mutual commitment to work toward joint programs, shared activities and mutually beneficial efforts including student transfer, staff exchange and research programs, and



Be it further resolved that as Drexel University and Ahsanullah University of Science and Technology work together toward shared goals and understandings, they commit to a relationship, while not exclusive, that is exceptional in purpose and effort.

Drexel University

Constantine Papadakis

Constantine Papadakis
President

**Ahsanullah University of
Science and Technology**

M.H. Khan

M.H. Khan
Vice-Chancellor

MEMORANDUM OF AGREEMENT (MOA)**Between****Washington State University
Pullman, WA, USA****And****Ahsanullah University of Science and Technology
Dhaka, Bangladesh****Article I. Parties and Purpose**

Ahsanullah University of Science and Technology (AUST) and Washington State University (WSU) conduct programs and activities of basic and applied research, education and training, technology and information transfer, and economic development. The AUST and WSU have capabilities and expertise and conduct programs and activities of interest and potential benefit to the other. The AUST and WSU agree to establish and conduct mutually agreed upon cooperative and collaborative projects, programs, and/or activities, which will enhance the programs of each.

Article II. Areas of Cooperation and Collaboration

The AUST and WSU agree to establish and conduct projects, programs and/or activities in one or more of the following general areas. Specific details of each will be defined by mutual agreement in writing as *International Agreements*. Potential areas of cooperation/collaboration include but are not limited to:

1. Collaborative educational programs and activities;
2. Conducting research and other scholarly activities in disciplines and on subjects of mutual interest and benefit;
3. Implementing faculty, staff and student exchanges, training and related activities;
4. Developing and implementing extension and technology transfer activities;
5. Implementing economic development projects, programs and activities;
6. Carrying out planning and institutional development;
7. Preparing and submitting grant, contract and other proposals to obtain resources to support collaborative activities; and
8. Other activities as may be mutually agreed.

Article III. Implementation of Collaborative/Cooperative Projects, Programs and Activities

Specific details of any cooperative/collaborative activities to be conducted will be described and agreed upon in writing as *International Agreements*. *International Agreements* will include the specific activities to be conducted; responsibilities of cooperating parties; personnel who will participate; sources, allocation and amount of sources; time; implementation procedures; and other details.

Article IV. Cooperation with Third Parties

Since other universities, institutes, centers and organizations may have capabilities and conduct activities, which will benefit and support this collaboration, the AUST and WSU may identify other cooperators for joint participation in mutually agreed upon projects and activities. The activities, responsibilities and other details of the participation of such cooperators will be defined and agreed in writing by the AUST, WSU and the third party institution in an *International Agreement*. This section does not in any way exclude or preclude either the AUST or WSU from individually executing agreements and conducting cooperative and collaborative research, education, economic development and other activities with other organizations independent of this Agreement and of each other.

Article V. Support and Resources

The amount and source of resources and other requirements for cooperative activities will be defined in the *International Agreements*. The AUST and WSU may jointly or individually seek funding and other support from third parties for the conduct of collaborative projects, programs and/or activities. This Agreement does not obligate either the AUST or WSU to provide funds and/or other resources from its own or other sources unless agreed in writing.

Article VI. Duration, Termination and Modification of Agreement

This Agreement shall take effect when signed by the official representatives of the institutions involved and will remain in effect for an initial period of five (5) years and may be extended by mutual agreement in writing for additional five (5) year periods. This Agreement may be terminated by either party with six (6) months written notice of intent to terminate. In the event of termination, each party will assume financial and other responsibilities for the completion of required and agreed activities or as such responsibilities may be modified by mutual written agreement. Any modification shall require the written approval of the President of Washington State University and the Vice-chancellor of Ahsanullah University of Science and Technology or their designees.

Article VII. Resolution of Disputes

The parties are committed to the informal and expeditious resolution of any dispute that arises between them related to or arising from any aspect of this Agreement or either party's performance of this

Agreement. If a dispute arises which the parties cannot resolve themselves, the matter shall be determined in the following way. Either party can request this process.

The parties shall form a dispute resolution panel consisting of three members. Each party shall choose one member and those two members shall mutually choose the third member in a manner that they determine. The panel shall determine its procedures. The guiding principal shall be an expeditious resolution of the dispute. There shall be no charge to any party for these services. The three members shall issue a written decision explaining the basis for their decision. The written decision shall be final and binding on the parties.

Article VIII. Contact Persons

Ahsanullah University of Science and Technology

M. H. Khan
Vice-chancellor
20 West Testuri Bazar Road, Tejgaon
Dhaka 1215, Bangladesh
Phone: 880-2-9130508
Fax:
E-mail:

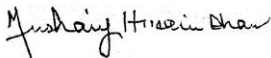
Washington State University

Md. Akram Hossain
Associate Professor
Civil and Environmental Engineering
Richland, WA 99352-1671
Phone: (509) 372-7314
Fax: (509) 372-7471
E-mail: ahossain@tricity.wsu.edu

Article IX. Signatures

Ahsanullah University of Science and Technology

Approved by:



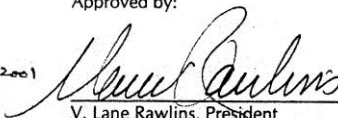
M. H. Khan, Vice-chancellor

Feb, 1, 2001

Date

Washington State University

Approved by:



V. Lane Rawlins, President

Date

MEMORANDUM OF AGREEMENT

between

University of Houston
Cullen College of Engineering

and

Ahsanullah University of Science and Technology
Dhaka, Bangladesh

This **MEMORANDUM OF AGREEMENT (MOA)** is entered into by and between the University of Houston, Cullen College of Engineering (UH), which is a component of a state-supported institution of higher education that is located in Houston, Texas, U.S.A., and Ahsanullah University of Science and Technology (AUST), which is an institution of higher education that is located in Dhaka, Bangladesh. UH and AUST shall be known collectively as "the Parties" and singularly as "a Party" or "the Party."

RECITALS

WHEREAS, cordial relations exist between UH and AUST; and

WHEREAS, AUST and UH have discussed mutual goals regarding academic opportunities for students and faculty; and

WHEREAS, UH and AUST desire to establish a program for the benefit of students and faculty of their respective institutions.

NOW, THEREFORE, the Parties enter into this Memorandum of Agreement, in order to memorialize fundamental concepts regarding the program.

UNDERSTANDING OF THE PARTIES

In contemplation of establishment of the program, the Parties agree as follows:

ARTICLE I

Areas of Cooperation and Collaboration

- A. **Research Programs.** UH and AUST agree to cooperate in research programs in areas of mutual interest and benefit. The cooperation will be initiated by faculty members and research professionals (research associates, graduate students, etc.) working in areas of mutual interest, and be approved by the appropriate authorities in the two institutions. The details of each research project, as well as the arrangement of activities, will be discussed and agreed upon by the interested research groups. Financial support of a project and the individuals involved will be determined by the appropriate authorities of each institution for their respective participants.
- B. **Educational Assistance Programs.** According to the needs and opportunities available, UH and AUST agree to invite faculty members and research and other academic professionals to teach courses in each other's institution. These courses can be at the undergraduate or graduate (post graduate) level, and for a period of one semester or limited period of time according to the arrangement to be made between the interested departments. The host institution will initiate the invitation to the guest engineer or professor and be responsible for the necessary registration of students interested in the course. The financial compensation for teaching the course will be the responsibility of the home institution of the guest faculty member or professional.
- C. **Exchange of Scholars.** According to the needs of research programs, researchers from each institution may spend a period of time to participate in an ongoing research project at the other institution. The arrangement for

such exchange of scholars is to be administered by the departments involved, following appropriate guidelines and procedures of each institution. The authorities at each institution agree to encourage and support such exchange of scholars, to the extent possible based upon available funds and resources.

- D. **New Initiatives.** As the relationship of the Parties develops, new initiatives may be identified for mutual cooperation and collaboration. The authorities at each institution agree to encourage and support such development of new initiatives, as governed by their respective institutional guidelines and procedures.

ARTICLE II
Implementation and Understanding of the Parties

- A. UH and AUST agree to lend needed support to the implementation of this agreement and to encourage their departments to participate in the activities encompassed by it.
- B. ~~This MOA~~ does not obligate either Party to provide funds and/or other resources from its own or other sources unless agreed in writing.
- C. This MOA shall become effective upon the date of execution. It will remain in effect unless terminated by one of the Parties, upon written notice.
- D. This MOA contains the entire understanding of the Parties at this time. If either Party is unwilling or unable to continue with plans for the program, that Party may do so by sending a written notice of regret to the other Party.

IN WITNESS, WHEREOF, the Parties have caused their fully authorized representatives to execute this Memorandum of Agreement on this, the ____ day of _____, 200__.

UNIVERSITY OF HOUSTON:

AHSANULLAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY:

By: Edward P. Sheridan
Dr. Edward P. Sheridan
Vice President for Academic Affairs/Provost

By: Muhammad Husein Khan
Dr. M.H. Khan
Vice-Chancellor

Date: 4/23/02
By: Art Valias
Dr. Art Valias
Vice President of Research

Date: 4/23/02
By: Raymond W. Flumerfelt
Dr. Raymond W. Flumerfelt
Dean, Cullen College of Engineering

Date: 3-27-02
By: Dennis P. Duffy
Mr. Dennis Duffy
University Counsel

Date: 9/22/2002