International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Syllabus for 4 years B.Sc. Engineering Degree in Electrical & Electronic Engineering

Autumn – 2015

As per recommendations made in the --- Academic Committee meeting of Syllabus Committee of the Department of EEE held on ----, ----

As per recommendation made in the ---meeting of the Committee of Courses of the Department of EEE held on ----September, ----

As per recommendation made in the --- meeting of Faculty of Science and Engineering Committee held on ---- September, ----

As per recommendation of the …. .Academic Council meeting held on ……. and duly approved in the …….. Syndicate meeting held on……

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International Islamic University Chittagong
Faculty of Science and Engineering
Department of Electrical and Electronic Engineering
Syllabus for B. Sc. Engg (E.E.E.), Autumn- 2015

The Department of Electrical & Electronics Engineering (EEE) at the International Islamic University Chittagong works with the mission of providing its students with a high quality education so that they are well prepared to become high caliber Electrical and Electronic engineers and it aspires to grow to the level of gaining global recognition. They are capable of designing modern & advanced circuits with diverse applications ranging from low voltage to extra high voltage applications by their professional ethics and leadership qualities.

To complete the B. Sc. Engg (EEE) program at the International Islamic University Chittagong, normally takes four academic years (i.e.8 Semesters). Each academic year is divided into 2 Semesters (Spring Semester: January-June and Autumn Semester: July -December), each having a duration of 14weeks (5x14=70 working days). There shall be Mid-term Examination after conducting 6 weeks classes. After Mid-term examination and conducting of 8 Weeks classes' Final examination will be held at the end of each semester. In order to graduate, total 161 credit hours to be undertaken and completed by a student during 8 semesters. By registering more number of courses in regular semesters, students may also complete their graduation studies within at least three academic years (i.e. 6 Semesters) of regular studentship. However a student may be allowed to complete their graduation studies in the University within maximum of six academic years (i.e.12 semesters). No student shall ordinarily be admitted after the class starts

1. Attendance (Ref. Faculty of Science and Engineering Ordinance **(FSEO**) article no-11)**:**

In order to be eligible to appear, as a regular candidate, at the semester final examinations, a student shall be required to have attended at least **70%**of the total number of periods of lectures/tutorials/laboratory classes offered during the semester in every **course.** A student whose attendance falls short of **70%** but not below **60%** in any **course** may be allowed to appear at the final examinations **as non-collegiate student**. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the authority for the purpose. Students having **less than 60% attendance** in lecture/tutorial/ laboratory of **any course will be declared dis-collegiate. They will not allow appearing in that course** at the final examinations of the semester. They will get 'F' grade in the semester result. **The basis for awarding marks for class participation and attendance is on the basis of percentage of classes attended during the course.**

2. The Grading System: (Ref. FSEO article 3.1): The letter grade system for assessing the performance of the students is shown in the Table-2:

Table-2

Numerical grade Marks%	**Letter Grade (LG)**	**Grade Point (GP/unit)**	**Remarks/ Status**
80-100	A+	4.00	Excellent
75-79	A	3.75	Very good
70-74	A-	3.50	
65-69	B+	3.25	Good
60-64	B	3.00	
55-59	B-	2.75	Satisfactory
50-54	C+	2.50	
45-49	C	2.25	Pass
40-44	D	2.00	
00-39	F	0.00	Fail

3. Earned Credit (Ref. FSEO article 3.6**):** The courses in which a student has obtained minimum 'D' in 'Theoretical courses' 'Laboratory courses & General Viva-voce' or higher grade will be counted as credits earned by the student. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credit. 'F' grade will not be counted for GPA calculation but will stay permanently on the Grade sheet and transcripts.

4. Distribution of Courses (**Ref. FSEO article 6)**: The study program for the B. Sc. Engg. (EEE) shall carry a total of 161 credit hours. Distribution of courses is shown in Table-3.

Table-3

Course type	Details	Theoretical (Cr.hr)	Laboratory (Cr.hr)	Total
Total non- Departmental Courses		**17**	**0**	**17**
Total Basic Science Courses		**26**	**3**	**29**
Total EEE Courses		**80**	**35**	**115**
Total		**123**	**38**	**161**

5. Semester Work load: Minimum Workload for a regular semester is **12** credit hours or its equivalent and maximum load is up to 28 credit hours. Since IIUC is following the **Open Credit Hour System**, a student may register the expected number of credits with the recommendation of his/ her respective **academic advisor** and the approval of the Head of the Department or the Dean of the Faculty or the Pro-Vice Chancellor as the case may be. But the semester workload must be consistent with the range of GPA. Advisable semester workload for the Faculty of Science and Engineering under Open Credit Hour System (OCHS) based on GPA is given below **(**Ref. FSEO article 5.4**):**

RANGE of GPA	Maximum Load Allowed
3.75-4.00	28Cr.Hrs.
3.50-3.74	26Cr.Hrs.
2.75-3.49	24Cr.Hrs.
2.25-2.74	22Cr.Hrs.
2.00-2.24	20Cr.Hrs.
1.70-1.99	15Cr.Hrs.
Below 1.70 or Repeat Case (Due to very poor performance)	12Cr.Hrs

6. Rules for Promotion (Ref. **FSEO** article -17)**:**

6.1 Criteria for Semester Promotion:

6.1.1 No semester fail status would exist under open credit hour system.

6.1.2 If any student earns 'D' or above grade for any course, the course should be credited .

6.1.3 The students must complete Pre-requisite Courses and previous incomplete or 'F' or 'W' grade courses before registration of advance courses.

6.1.4 Students who will not clear all prescribed courses of 1st& 2nd Semester within the 4th Semester he/she would not be allowed to get promoted/registered in the 5th Semester and students who will not clear all prescribed courses of 3rd& 4th Semester within the 6th Semester he/she would not be allowed to get promoted/registered in the 7th Semester. Student can go for internship in the 7th / 8th Semester.

6. 2 Criteria for Special Examination:

Special Final Examination has been **withdrawn from Spring-2008** for all students of Bachelor programs. If a graduating /last semester/outgoing student has an incomplete course only, he/she can complete the course/s according to the following rules:

6.2.1 If any student could not attend Final Examination in a course only **due to illness, accident or scoring of F grade**, he/she can complete the course by attending Special Final Examination. To get the approval of Special Final Examination, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination within 72 hours of Examination held with necessary documents. After getting approval, the incumbent has to pay the Special Final Examination fee.

6.2.2 If any course remain unregistered or not repeated due to removal of the courses from syllabus or has not been offered in the last a few semesters, the course may be completed under special arrangement. To get approval of special arrangement/Independent Study, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination subject to the availability of course teacher. The application period will be immediate after publication of Semester result. After getting approval, the incumbent has to complete registration by paying **the tuition fee double than that of the normal fees (based on credit hour). There is no scope of special arrangement for the course /s which are offered by the department or center.**

6.3 **Criteria for Repeating Courses**

6.3.1 For 'F' grade holders the course must be repeated within the next 2 consecutive semesters. Pre-requisite courses should be repeated on priority basis.

6.3.2 The final grade will be computed in the Final Transcript and the previous grade /s will be marked with 'R' grade (as intake course) which has no effect on GPA or CGPA. 'R' is deleted from Final Transcript during graduation

6.4 Criteria for Failing in a Course:

6.4.1 A student, who fails in a course within specific requirements of the Faculty and the curriculum of his/her program, may repeat the same course if the course is classified as "CORE" or "REQUIRED" course.

6.4.2 Or, the fail student may replace the course with another one if it is classified as "SUPPORTIVE" or "ELECTIVE" or "OPTIONAL" as determined by the department or the faculty as the case may be.

6..4.3 Notwithstanding any other provisions of these Regulations, a graduating student who obtains the minimum CGPA 2.00, but fails in any course, may be allowed to re-sit for that course subject to the examination rules and approval of the authority concerned.

6.5 Criteria for Improvement of Grade:

6.5.1 The range of grade in that particular course should be "B-" (B minus).

6.5.2 That an application must be submitted to the Controller of Examination through the Head of the Department in order to repeat the course for the purpose of improvement at least two weeks prior to the dead line of registration and it has to be approved by the competent authority.

6.5.3 That the opportunity for improvement of grade shall be availed within two consecutive Semesters.

6.5.4 That payment shall be made in full amount for the course/s on credit hour basis.

6.6 Re-Evaluation of Examination Results:

6.6.1 If the awarding grade is in order but the student wants his/her answer script to be reevaluated, than a prescribed Form (available at ACAD) shall have to be filled in and submitted by the student to the University Board of Appeals through the ACAD.

6.6.2 Per Course a fee (as determined by the University Board Examination) must be deposited along

with the Form.

6.6.3 **An appeal may be made** on any or all of the following grounds:

- If a student strongly believes that he/she deserves higher marks than he/she got in the course in question.
- If a student reasonably believes that the evaluation has been conducted improperly or a portion of his/her marks has not been counted.

7. Eligibility for Examination:

7.1 No student shall be eligible to take part in any Semester Final Examination unless:

7.1.1 He/she is officially registered in such a course; and

7.1.2 He/she has fulfilled the required percentage of attendance and other requirements.

7.2 B**arring from examination**:

7.2.1 A student may be barred from taking examination if he/she fails to meet any of the above requirements (article 21.1) for eligibility to sit for an Examination. In such a case, the student may be given the chance to appeal for exoneration.

7.2.2 Unless otherwise recognized, any student debarred from any examination shall automatically receive a grade "Y" which is equivalent to an "F" for that course irrespective of course performance

7.2.3 In addition, the scholarship or financial assistance of students who are barred from the Semester Final Examination may be withdrawn or reduced by a certain amount as the University authority decides on case–by-case basis.

7.3 **Cheating in Examination**:

7.3.1 A student cheating in examination shall be deemed to have committed an offence and will be liable to disciplinary punishment.

7.3.2 Such punishment may be cancellation of the course in question, drop of the current semester, expulsion for an academic year or expulsion from the University, based on the weight and gravity of the offence.

7.3.3 Student receives the expulsion from the university for cheating in examination can not be readmitted. In addition, the student will be deprived of any financial assistance in the following semester as the university authority decides on case by case basis.

8. Graduation Requirements:

8.1 **Pre-Graduate Requirements:**

8.1.1 One Semester prior to graduation a student should submit a check list to Controller of Examination duly filled in.

8.1.2 Students intending for graduation should submit an application for graduation to Controller of Examination in the terminal semester in the University.

8.2 **Academic Requirements:**

8.2.1 Have passed all required and elective course as per program of curriculum.

8.2.2 Be an acceptable academic standing with a GPA of at least 2.00.

8.2.3 Be free from any negative report from the University authority in general and academic Discipline Committee in particular.

8.2.4 Have fulfilled co-curricular activities.

8.2.5 Have fulfilled other University requirements

8.3 **Transcripts:**

8.3.1 Results of each semester are normally distributed to every student at the beginning of the following semester. The result is for student's reference only and not to be used for any official purposes. The result produces report including the grades of all courses for that semester, the GPA and CGPA.

8.3.2 **Official Transcripts** is issued before graduation and upon written request of a student who has paid up all fees. Partial transcripts may also be issued in the same manner to existing students. However, a fee is charged for partial transcript (or testimonial.) of each semester.

8.3.3 **Final Transcript and Provisional Certificat**e may be withdrawn on payment of fee. Besides, **Original certificate** may be issued on payment of fee only. Charges will be applied for the re-issue of duplicate certificate and transcript also.

8.4 **Release of Student's Record**:

Student's records are considered highly confidential. Therefore, a written consent from the student is needed before releasing information from his personal record to person outside the University. Information may be furnished to a student's parents or sponsor without such written consent. No information concerning a student's grades will be given over telephone.

9. Course Identification Plan:

For course identification, the following code plan has been adapted:

First digit stands for Year, Second digit stands for Semester and Third & Fourth digit stand for the course number (odd number has been assigned to theory course and the even number has been assigned to laboratory course).

10. Programs of Study:

The B. Sc. (Engineering) program in the department of Electrical & Electronic Engineering consist of 74 courses carrying **161 Credit Hours**. There are 9 University Requirement Courses (URC) carrying 9 credit hours, 4 Interdisciplinary Courses carrying 8 credit hours, 12 Basic Science Courses carrying 29 credit hours, 44 core course carrying 88 credit hours and 8 Elective Courses carrying 27 credit hours. Total 161 credit hours have to be undertaken and completed by a student during 8 semesters. Duration of each semester is 6 months. Each course carries 100 marks. Of the total marks allotted to each course, 10 marks for class tests/assignments/oral tests, **10 marks for attendance**, 30 marks for mid-term examination and 50 marks for the final examination. Out of 100 marks for sessional courses, 50 marks is allotted for running assessment and 50 marks is for practical exam, viva, quiz etc at the end of semester final examination

Marks distribution for projects/thesis and general viva-voce is as follows:

1) Project/Thesis evaluation by Supervisor-	35%
2) Project/Thesis evaluation by Examiner-	35%
3) General Viva-Voce-	30%
Total	100%

Summary of Courses

Course type	Details	Theoretical (Cr.hr)	Laboratory (Cr.hr)	Total
Non- Departmental Courses	University Requirement Courses	9	0	9
	Interdisciplinary Courses	8	0	8
Total non- Departmental Courses		**17**	**0**	**17**
Basic Sciences Courses	Mathematics	15	0	15
	Physics	6	2	8
	Statistic	2	0	2
	Chemistry	3	1	4
Total Basic Science Courses		**26**	**3**	**29**
Electrical and Electronic Engineering Courses	EEE Core	59	29	88
	EEE Elective	20	7	27
Total EEE Courses		**79**	**36**	**115**
Total		**122**	**39**	**161**

Semester wise number of courses, credits & contact hours

Semester	No. of Courses	Contact Hours/Week			Credit Hours		
		Theory	Lab	Total	Theory	Lab	Total
1st	7+3	17	8	25	14	3.5	17.5
2nd	6+4	16	10	26	14	4.5	18.5
3rd	6+4	16	11	27	15	5.5	20.5
4th	6+3	17	9	26	17	4.5	21.5
5th	7+3	18	8	26	18	4	22
6th	6+3	15	9	24	15	4.5	19.5
7th	7+4	15	13	28	15	6	21
8th	7+4	15	13	28	14	6.5	20.5
Total	**52+28**	**129**	**81**	**210**	**122**	**39**	**161**

A. University Requirement Courses

Serial No	Course Code.	Course Title	Contact Hours/Week	Credit Hours
			Theory	Theory
1	URAL-1101	Elementary Arabic	2	1
2	UREL--1103	Advanced English	3	1
3	URIS-1101	Islamic Aqidah	1	1
4	URIS-1203	Introduction to Ibadah	1	1
5	URIS-2303	Introduction to Qur'an and Sunnah	2	1
6	URIS--3505	Government & Politics in Islam	1	1
7	URIS-3607	Biography of the Prophet (SAW)	1	1
8	URIH-4701	History of Khilafah and Muslim contribution to world civilization (Up to 1258A.D)	1	1
9	URBS-4802	Bangladesh Studies	2	1
	Total	**9 Courses**	**14**	**9**

B. List of Interdisciplinary Courses

Serial No	Course Code	Course Title	Contact Hours/Week	Credit Hours
1	ACC-2401	Financial and Managerial Accounting	2	2
2	ECON-3501	Principles of Economics	2	2
3	MGT--3601	Industrial Management	2	2
4	LAW- 4721	Law and Professional Ethics	2	2
	Total	**4 Courses**	**8**	**8**

C. Basic Science Courses

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	MATH-1101	Math I (Differential and Integral Calculus)	3	-	3	-	-
2	MATH-1202	Math II (Co-Ordinate Geometry and Higher Trigonometry)	3	-	3	-	Math -1101
3	MATH-2303	Math III (Differential Equations and Partial Differential Equations)	3	-	3	-	Math-1201
4	MATH-2404	Math IV (Complex Variable, Lap laces and Fourier Analysis, Z-transform)	3	-	3	-	Math-2303
5	MATH-3505	Math V (Linear Algebra, Matrices and Vector Analysis)	3	-	3	-	Math 2404
6	STAT-1201	Statistics	2	-	2	-	-
7	PHY-1101	Physics I	3	-	3	-	-
8	PHY-1104	Physics I Sessional		3		1	-
9	PHY-1201	Physics II	3	-	3	-	PHY-1101
10	PHY-1204	Physics II Sessional	-	3	-	1	PHY-1102
11	CHEM-2301	Chemistry	3	-	3	-	-
12	CHEM-2302	Chemistry Sessional	-	2	-	1	-
	Total	12 courses (9+3)	9	3	26	3	29 credits

D. Core Courses

Sl. No	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	CSE--1103	Computer Basic and Programming	2		2		
2.	CSE--1104	Computer Basic and Programming Sessional		2		1	
3.	CSE--1203	Data Structure and Algorithm	2	-	2	-	CSE-1101-
4.	CSE--1204	Data Structure and Algorithm Sesseional	-	2	-	1	-
5.	CSE-2302	Object Oriented Programming		3		1.5	CSE-1203
6.	EEE-2310	Numerical Technique Sessional	-	3	-	1.5	CSE-1101
7.	ME-2301	Fundamentals of Mechanical Engineering	2	-	2	-	-
8.	CE-1201	Engineering Drawing		2		1	
9.	EEE-1101	Electrical Circuits I	3	-	3	-	-
10.	EEE-1102	Electrical Circuits I Sessional		3	-	1.5-	-

11.	EEE--1201	Electrical Circuits II	3	-	3	-	EEE-1101
12.	EEE--1202	Electrical Circuits II Sessional		3		1.5	EEE-1102
13.	EEE-2303	Electrical Machine I	3	-	3	-	EEE-1201
14.	EEE-2402	Electrical Machine Sessional	-	3	-	1.5	EEE-2402
15.	EEE-2415	Transmission & Distribution of Electrical Power	3	-	3	-	EEE-1201
16.	EEE-2401	Electrical Machine II	3	-	3	-	EEE-2303
17.	EEE-3501	Continuous Signals and Linear Systems	3	-	3	-	MATH-2403
18.	EEE-3502	Continuous Signals and Linear Systems Sessional	-	2		1	MATH-2403
19.	EEE-3519	Power System Analysis	3	-	3		EEE-3415
20.	EEE-3520	Power System Analysis Sessional	-	3		1.5	EEE-3415
21.	EEE-2301	Electronics I	3	-	3	-	EEE-1201
22.	EEE-2302	Electronics I Sessional	-	3		1.5	EEE-1201
23.	EEE-2411	Electronics II	3	-	3	-	EEE-2301
24.	EEE-2412	Electronics II Sessional	-	3		1.5	EEE-2301
25.	EEE-2407	Digital Electronics	3	-	3	-	EEE-2411
26.	EEE-2408	Digital Electronics Sessional	-	3		1.5	
27.	EEE-3505	Microprocessor and Interfacing	3	-	3	-	EEE-2407
28.	EEE-3506	Microprocessor and Interfacing Sessinal	-	3		1.5	
29.	EEE-3515	Electrical Properties of Materials	3	-	3	-	EEE-2301
30.	EEE-3607	Solid State Devices	3	-	3	-	EEE-3515
31.	EEE-3603	Digital Signal Processing I	3	-	3	-	EEE-3603
32.	EEE-3604	Digital Signal Processing I Sessional	-	3		1.5	EEE-3603
33.	EEE-3621	Engineering Electromagnetism	3	-	3		EEE-3621
34.	EEE-3610	Electrical Service Design Sessional	-	3	-	1.5	
35.	EEE-3601	Communication Theory	3	-	3	-	EEE-3621
36.	EEE-3602	Communication Theory Sessional	-	3		1.5	EEE-3621
37.	EEE-4701	Control System I	3	-	3	-	EEE-3501
38.	EEE-4702	Control System I Sessional	-	3		1.5	
39.	EEE-4722	Research Methodology	1		1		
40.	EEE-4860	Project/Thesis	-	8	-	4	
41.	EEE-4822	General viva-voice	1		1		
	Total	40 courses			59	29	88

E. Interdisciplinary Optional Courses(one course to be taken)

Sl. No.	Course No.	Course Title	Contact Hours/Week	Credit Hours
1.	FIN-4701	Finance and Marketing for Engineers	2	2
2.	SCO-4703	Sociology	2	2
3.	PSY-4705	Psychology	2	2
4.	GOV-4709	Government	2	2
5.	LAW-4721	Law and Professional Ethics	2	2

F. Elective Courses EEE

	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-47xx	Elective-I	3	-	3	-	
2.	EEE-47xx	Elective-I Sessional	-	3	-	1.5	
3.	EEE-47xx	Elective-II	3	-	3	-	
4.	EEE-47xx	Elective-III	2	-	2	-	
5.	EEE-47xx	Elective-III Sessional		3		1	
6.	EEE-48xx	Elective-IV	3	-	3	-	
7.	EEE-48xx	Elective-IV Sessional	-	3	-	1.5	
8.	EEE-48xx	Elective-V	3		3		
9.	EEE-48xx	Elective-VI	3	-	3		
10.	EEE-48xx	Elective-VI Sessional	-	3		1.5	
11.	EEE-48xx	Elective-VII	3	-	3		
12.	EEE-48xx	Elective-VII Sessional		3		1.5	
	Total	(7+5) Courses	20	15	20	7	
	Total				27 Credit Hours		

13. Semester wise Course Distribution:

FIRST SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE--1101	Electrical Circuits I	3	-	3	-	-
EEE-1102	Electrical Circuits I Sessional	0	3	0	1.5	-
CSE--1103	Computer Basic and Programming	2		2		
CSE--1104	Computer Basic and Programming Sessional		2		1	
MATH--1101	Math I -(Differential and Integral Calculus)	3	-	3	-	-
PHY-1101	Physics I	3	-	3	-	-
PHY--1102	Physics I Sessional	-	3	0	1	-
URIS-1101	Islamic Aqidah	1		1	-	-
URAL-1101	Elementary Arabic	2	-	1	0	-
UREL--1103	Advanced English	3	-	1	0	-
Total	(7+3)	17	8	14	3.5	Total= **17.5CH**

ii. SECOND SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE--1201	Electrical Circuits II	3	-	3	-	EEE-1101
EEE--1202	Electrical Circuits II Sessional & Electrical Workshop	-	3	-	1.5	-
CSE--1203	Data Structure and Algorithm	2	-	2	0	-
CSE--1204	Data Structure and Algorithm Sessional	-	2	-	1	-
PHY-1201	Physics II	3	-	3	-	PHY-1101
PHY--1202	Physics II Sessional	-	3	-	1	-
MATH--1202	Math II -(Co-Ordinate Geometry and Higher Trigonometry)	3	-	3	-	Math-1101
STAT-1201	Statistics	2	-	2	-	-
CE-1201	Engineering Drawing	0	2	0	1	-
URIS-1203	Introduction to Ibadah	3	0	1	0	-
Total	(6+ 4) Courses	16	10	14	4.5	**Total=18.5CH**

iii. THIRD SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2301	Electronics I	3	-	3	-	EEE-1201
EEE-2302	Electronics I Sessional	0	3	0	1.5	
EEE-2303	Electrical Machine I	3	-	3	-	EEE-1201
CSE--2302	Object Oriented Programming		3		1.5	
EEE-2310	Numerical Technique Sessional	0	3	0	1.5	CSE-1101
MATH-2303	Math III -(Differential Equations and Partial Differential Equations)	3	-	3	-	MATH-1201
ME-2301	Fundamentals of Mechanical Engineering	2	-	2	-	-
CHEM--2301	Chemistry	3	-	3	-	-
CHEM-2302	Chemistry Sessional		2		1	-
URIS-2303	Introduction to Qur'an and Sunnah	2	-	1	-	-
Total	(6+ 4) Courses	16	11	15	5.5	**Total=20.5CH**

iv. FOURTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2401	Electrical Machine II	3	-	3	-	EEE-2303
EEE-2402	Electrical Machine Sessional	-	3	-	1.5	-
EEE-2407	Digital Electronics	3	-	3	-	EEE-2301
EEE-2408	Digital Electronics Sessional	-	3	-	1.5	-
EEE-2411	Electronics II	3	-	3		EEE-2301
EEE-2412	Electronics II Sessional and Electronics Workshop	-	3	-	1.5	-
EEE-2415	Transmission & Distribution of Electrical Power	3	-	3	-	EEE-1201
MATH-2404	Math IV- (Complex Variable, Lap laces and Fourier Analysis, Z-transform)	3	-	3	-	MATH-2301
ACC-2401	Financial and Managerial Accounting	2	-	2	-	-
Total	(6+3) Courses	17	9	17	4.5	**Total=21.5CH**

V. FIFTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3501	Continuous Signals and Linear Systems	3	-	3	-	MATH-2403
EEE-3502	Continuous Signals and Linear Systems Sessional		2		1	
EEE-3505	Microprocessor and Interfacing	3	-	3	-	EEE-2407
EEE-3506	Microprocessor & Interfacing Sessional	-	3	-	1.5	-
EEE-3515	Electrical Properties of Materials	3	-	3	-	EEE-2301
EEE-3519	Power System Analysis	3	-	3		EEE-2415
EEE-3520	Power System Analysis Sessional		3		1.5	EEE-2415
MATH-3505	Math V- (Linear Algebra, Matrices and Vector Analysis)	3	-	3	-	MATH-2403
ECON-3501	Principles of Economics	2	-	2	-	-
URIS--3505	Government and Politics in Islam	1	-	1	-	-
Total	(7+ 3) Courses	18	8	18	4	**Total=22 CH**

vi. SIXTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3607	Solid State Devices	3	-	3	-	
EEE-3603	Digital Signal Processing I	3	-	3	-	EEE-3501
EEE-3604	Digital Signal Processing I Sessional	-	3	-	1.5	-
EEE-3610	Electrical Service Design Sessional	-	3	-	1.5	
EEE-3621	Engineering Electromagnetism	3	-	3		MATH-3503
MGT--3601	Industrial Management	2	-	2	-	-
EEE-3601	Communication Theory	3	-	3	-	EEE-3501
EEE-3602	Communication Theory Sessional	-	3	-	1.5	-
URIS-3607	Biography of the Prophet (SW)	1	-	1	-	-
Total	(6+ 3) Courses	15	9	15	4.5	**Total=19.5 CH**

vii. SEVENTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4860	Project/Thesis	-	4	-	2	
EEE-4721	Research Methodology	1		1		
EEE-4701	Control System I	3	-	3	-	EEE-3501
EEE-4702	Control System I Sessional	-	3	-	1.5	-
EEE-47xx	Elective-I	3	-	3	-	
EEE-47xx	Elective-I Sessional	-	3	-	1.5	
EEE-47xx	Elective-II	3	-	3	-	
EEE-47xx	Elective-III	2	-	2	-	
EEE-47xx	Elective-III Sessional		3		1	
URIH-4701	History of Khilafah and Muslim contribution to world civilization (Up to 1258A.D)	1	-	1	-	-
LAW-4721	Law and Professional Ethics	2	-	2	-	
Total	(7+3) Courses	15	13	15	6	**Total 21 CH**

Viii EIGHTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4860	Project / Thesis	-	4	-	2	
EEE-48xx	Elective-IV	3	-	3	-	
EEE-48xx	Elective-IV Sessional	-	3	-	1.5	
EEE-48xx	Elective-V	3	-	3	-	
EEE-48xx	Elective-VI	3	-	3	-	
EEE-48xx	Elective-VI Sessional	-	3	-	1.5	
EEE-48xx	Elective-VII	3	-	3	-	
EEE-48xx	Elective-VII Sessional	-	3	-	1.5	
URBS-4802N2	Bangladesh studies	2	-	1	-	-
EEE-4822	General viva-voice	1		1		
Total	(7+3) Courses	15	13	14	6.5	**Total 20.5 CH**

Grand Total = 161 CH

G. Major in Electrical and Electronic Engineering

There are **four** majors in EEE. Students obtain the degree in EEE taking any one of the following majors (subject to the offering of major).

1. Major in power systems engineering
2. Major in Electronic engineering
3. Major in computer science & engineering
4. Major in communication engineering-

H. Elective Courses

In order to achieve a degree in Electrical and Electronic Engineering from IIUC, a student will have to complete 12 elective courses (5 lab courses and 7 theory courses) of 27 credit hours from any of the following four major disciplines or specialized area:

i. Power systems Engineering
ii. Electronics Engineering
iii. Computer Science and Engineering
iv. Communication Engineering
v. Interdisciplinary Field

A student has to take 2 lab courses and at least 4 (but not more than 5) theory courses from one group as major; at least 2 theory courses from other groups as minor and must take 1 theory course and 1 lab course from interdisciplinary group (Total 12 courses i.e 5 lab courses and 7 theory courses). Any lab course must be followed with the corresponding theory course and vice versa (if any).

Elective-I:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4705	Power Electronics	3	-	3	-	Power &Electronics
EEE-4706	Power Electronics Sessional	-	3	-	1.5	Power & Electronics
EEE-4725	Optical Fiber Communication	3	-	3	-	TE
EEE-4726	Optical Fiber Communication Sessional		3		1.5	TE
EEE-4717	Data Structure and Algorithm	2	-	2		CE
EEE-4718	Data Structure and Algorithm Sessional	-	2		1	

Elective-II:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4711	VLSI Design System	2	-	2		All
EEE-4712	VLSI Design System Sessional	-	2		1	All
EEE-4723	Microwave Engineering	2	-	3		TE
EEE-4719	Software Engineering	3	-	3	-	CE

Elective-III:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4707	Power Plant Engineering	3	-	3		Power
EEE-4709	IC Fabrication Technology	3	-	3	-	EE
EEE-4715	Operating System	3	-	3	-	CE
EEE-4721	Digital Signal Processing II	3	-	3	-	CE

Elective-IV:

Course Code	Course Title	Contact Hours/Week		Credit Hours		
		Theory	Practical	Theory	Practical	
EEE-4801	Power System Protection	3	-	3		Power
EEE-4802	Power System Protection Sessional	-	3		1.5	Power
EEE-4831	Microprocessor System Design	3	-	3	-	CE,EE
EEE-4832	Microprocessor System Design Sessional	-	2	-	1.5	CE,EE
EEE-4815	Computer Networks	3	-	3	-	CE
EEE-4816	Computer Networks Sessional	-	3	-	1.5	CE

Elective-V:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4805	Power System Operation & Control	3		3		Power
EEE-4807	High Voltage Engineering	-	3	3		Power
EEE-4813	Semiconductor Device Theory	3	-	3		EE
EEE-4835	Mobile Cellular Communication	3	-	3	-	TE
EEE-4861	Biomedical Engineering	3	-	3		EE
EEE-4811	Opto-Electronics	3	-	3	-	EE
EEE-4817	Computer Architecture	3	-	3	-	CE
EEE-4819	Multimedia Communication	3	-	3		
EEE-4803	Power System Reliability	3	-	3		
EEE-4837	Telecommunication Engineering	3	-	3		

Elective-VI:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4827	Measurement and Instrumentation	3	-	3	-	EE
EEE-4828	Measurement and Instrumentation		3		1.5	EE
EEE-4823	Control System II	3	-	3	-	Power
EEE-4824	Control System II Sessional	-	2	-	1.5	Power
EEE-4851	Artificial Intelligence	3	-	3	-	
EEE-4852	Artificial Intelligence Sessional		3		1.5	

Elective-VII (Interdisciplinary):

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**
		Theory	Practical	Theory	Practical	
EEE-4843	Renewable Energy System	3	-	3		Power
EEE-4844	Renewable Energy System Sessional		3		1.5	EEE-4842
EEE-4845	Embedded System	3		3		EE
EEE-4846	Embedded System Sessional		3		1.5	EE
EEE-4839	Digital Image processing	3	-	3		CE
EEE-4840	Digital Image Processing Sessional	-	3	-	1.5	EEE-4840
EEE-4825	Numerical Methods	3		3		
EEE-4826	Numerical Methods Sessional	-	3	-	1.5	

Synopsis of the Courses

A. Basic Science Courses

Course Title: **Math I (Differential and Integral Calculus)** **Course Code:** **MATH-1101**
Credit Hours: **3** **Contact Hours:** **3 per Week**
Objectives: In this course student learn about 'Mathematics" in regards to functions, ordinary and partial differentiation, indefinite and definite integral, multiple integral and integration by revolution.

Section –A: (Mid-term Exam: 30 Marks)

Segment:1 Functions: Limit of Functions, continuity and differentiability, physical meaning of derivative of a function, , Indeterminate Form.

Segment:2 Ordinary Differentiation: Differentiation, successive differentiation and Leibniz theorem

Segment:3 Expansions of Functions: Rolle's theorem, mean value theorem, Taylor's and Maclaurian's Formulae

Section –B: Final Exam (50%)

Part –A (20 Marks)

Segment:4 Partial Differentiation: Partial Differentiation, Euler's formulla, Maxima and minima

Segment:5 Indefinite integral: Physical meaning of integration of a function, method of Substitution, Integration by parts, special trigonometric functions and rational fractions different techniques of integration.

Part –B (30 Marks)

Segment:6 Definite integral: Fundamental theorem, general properties, and evaluations of definite integral and reduction formula, definite integral as the limit of a sum, Integration by successive reduction, Gamma and Beta Function

Segment:7 Multiple Integral: Double Integral, Evaluation of double integral, Change of order of integration, triple Integral, Application of double and triple integral.

Segment:8 Integration by Revolution: Determination of length of curves, Areas of plane region and Areas of surfaces of solids of revolution, Volumes of solids of revolution.

Reference Books:

1.	Thomas, Finey	Calculus and analytic geometry
2.	K.A. Stroud	Engineering Mathematics
3.	P. K. Bhattacharjee	Differential Calculus
4.	P. K. Bhattacharjee	Integral Calculus
5.	Howard Anton	Calculus A New Horizon
6.	Erwin Kreyszig	Advanced Engineering Mathematics
7.	Abu Yusuf	Differential Calculus
8.	Das & Mukherjee	Differential Calculus

Course Code: MATH-1201 **Course Title: Math II (Co-Ordinate Geometry and Higher Trigonometry)**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-1101]

Objectives: In this course student will learn about 'Mathematics' in regards to two dimensional and three dimensional geometry as well as solid geometry, De Moivre's theorem and Hyperbolic Functions.

Section –A
(Mid-term Exam: 30 Marks)

1. **Pair of Straight lines:** Change of Axes**, Pair** of straight lines. General equation of second degree representing a pair of straight lines, Properties of Pair of straight lines.
2. **General Equation of Second Degree:** Reduction of General equation of second degree into the standard forms, General equation of circles.
3. **Three-dimensional Geometry**: Rectangular co-ordinate System, Direction cosines, Direction ratios, Projections, Equation of planes, Different forms of planes.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Straight lines:** Equation of straight lines in three dimension, Angle between two lines, Angle between a lines and a plane, coplanar lines and Shortest distance.
5. **Solid Geometry:** Spheres, Plane of contact, Tangent plane, Intersection of two spheres, cylinder, cone, ellipsoids and paraboloids.

Group-B (30 Marks)

6. **DeMoivre's Theorem:** Complex quantity, DeMoivre's Theorem and its applications, Function of complex quantities.
7. **Hyperbolic Functions:** Trigonometric and Exponential functions for complex quantities, Circular Functions, Hyperbolic functions, Inverse circular and hyperbolic functions.
8. **Trigonometric Series:** Power series, Gregory Series, Summation of series, Expansion of series.

Books Recommended:

1	Thomas, Finey	Calculus and analytic geometry
2	K.A. Stroud	Engineering Mathematics
3	P. K. Bhattacharjee	Co-ordinate geometry and vector analysis
4	M. L. Khanna	Solid geometry
5	JT bell	Coordinate Geometry
6	S.L. Loney	Trigonometry
7	A.Sattar	Higher Trigonometry

Course Code: MATH-2301 **Course Title: Math III (Differential Equations and Partial Differential Equations)**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-1201]

Objectives: In this course student learn about 'Mathematics' in regards to first order and higher order differential equations, higher order non-homogeneous differential equations, linear differential equations of second degree, Linear partial differential equations of order one,non-linear partial differential equations of order one and more than one

Section –A
(Mid-term Exam: 30 Marks)

1. **First order differential equation:** Definition, solution of first order and first degree differential equation with initial conditions, Solution of Linear differential Equation, homogeneous equations, Bernoulli Equation, Exact Differential equations, Integrating Factors, Boundary Value Problems.

2. **Higher order Differential equations with constant coefficients**: Solution of higher order homogeneous differential equations, Physical application of higher order homogeneous differential equations.
3. **Higher order Non-Homogeneous Differential Equations:** Solution of non-homogeneous differential equations, Complementary function and particular integral, Physical problems of non-homogeneous differential equations.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Series Solutions:** Solution of Bessel's, Legender's Equation
5. **Linear Differential Equations of second degree:** Linear differential Equation of second degree, Method of variation of parameter, Method of Undetermined coefficients, Physical application of differential equations.

Group-B (30 Marks)

6. **Linear Partial Differential Equations of Order One:** Origin of partial differential equations, Elimination of arbitrary constants and functions, Lagrange's method.
7. **Non-Linear Partial Differential Equations of Order One**: Classification of integrals, Singular integral, General integrals, Charpit's method.
8. **Linear Partial Differential Equations of Order More than One:** Homogeneous partial differential equations with constant coefficients, Complementary function and particular integrals, Short method.

Recommended Books:

1	K.A. Stroud	Engineering Mathematics
2	F. Ayrs	Differential Equation
3	K.A.Stroud	Further Engineering Mathematics.
4	BD.Sharma	Differential Equations
5	Gupta,Kumar,Sharma	Differential Equations

Course Code : MATH 2403 Course Title: Mathematics IV (Complex Variable, Lap laces and Fourier Analysis, Z-transform)
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-2301, Mathematics IV]

Objectives: In this course student will learn about 'Mathematics' in regards to complex variable, complex transformations, complex integration, residue and contour integration, Laplace transforms, convolution, Fourier series and transform**.**

Section-A
(Mid-term Exam: 30 Marks)

1. **Complex variable:** Complex numbers and their properties, functions of a complex variable, Limit, Continuity and differentiability, Differentiation of a complex function, Analytic function, Necessary and sufficient condition to analytic, Cauchy-Riemann Equation.

2. **Complex Transformations:** Orthogonal curves, Harmonic functions, Method of finding conjugate functions, Milne Thomson method, Transformations, Conformal transformations, Bilinear transformations.

3. **Complex Integration:** Complex Integration, Cauchy's integral theorem, Cauchy integral formula, Liouville's theorem, Taylor's theorem.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. **Residue and Contour Integration:** Singular point, Residue, Method of finding residue, Residue theorem, Contour integration.

5. **Laplace transforms**: Definition, Laplace transforms of different functions, inverse Laplace transforms, shifting and change of scale property, Laplace transforms of derivatives.

Group-B

6. **Convolution:** Unit Step Function, Impulse Function, Periodic functions, Ramp Function, Sketch Waveform, convolution theorem.
7. **Fourier series**: Fourier series, Trigonometric form and Complex form of Fourier series and Fourier Integral, Physical Application of Fourier Series.
8. **Transform:** Fourier transforms, Z transforms.

Recommended Books:

1	Glyn James	Advanced Modern Engineering Mathematics
2	Michael D. Greenberg	Advanced Engineering Mathematics
3	K.A.Stroud	Further Engineering Mathematics
4	H. K Das	Advanced Eng. Mathematics
5	M. R Spigel	Advanced Calculus
6	M. R. Spigel	Complex Variable
7	Laplaces Transformation	(SOS)

Course Code: MATH-3503 **Course Title: Math IV (Linear Algebra, Matrices and Vector Analysis)**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-2403, Math IV]

Objectives: In this course student will learn about 'Mathematics' in regards to vector spaces and subspaces , basis and dimension and linear mappings , inner product spaces,matrix and linear system of equations, characteristic equation and diagonalization, vector analysis, del operator, vector integration and vector's theorem.

Section-A
(Mid-term Exam: 30 Marks)

1. **Vector Spaces and Subspaces:** Definition of vector spaces, subspaces, basic theorem, Linear combinations of vectors, spanning set, Linear dependence and independence of vectors.
2. **Basis and Dimension and Linear Mappings:** Basis and Dimensions of Vector spaces, Sums and Direct sums of subspaces.Mappings, Linear mappings, Kernel and image of a linear mapping, Singular and nonsingular mappings, Linear mapping and systems of linear equations.
3. **Inner Product Spaces:** Inner product spaces, Cauchy-Schwarz inequality, Orthonormal sets, Gram-Schmidt orthogonalization process, Application of Linear algebra in electric network.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

1. **Matrix and Linear System of Equations:** Vector presentation by matrix, different types of matrices, algebraic operations on matrices, adjoint and inverse of a matrix, augmented matrix, row operation method, rank of Matrices, some problems, Normal Vector, Ortho normal Vectors,Orthogonality, Echelon form, consistency and inconsistency, solution of homogeneous and non- homogeneous linear system of equations.
2. **Characteristic equation and Diagonalization:** Eigen values and eigenvectors, characteristic polynomial, Caley-Himilton theorem, Diagonalization of matrices and symmetric matrices, Characteristics roots.

Group-B (30 Marks)

1. **Vector analysis**: Scalar and vectors, operation of vectors, vector addition and multiplication - their applications.,Scalar Field, Vector Field, Dot Product, Cross product, Triple Product, Derivative of vectors and problems.
2. **Del operator and Vector Integration:** Del operator, gradient, divergence and curl and their physical significance, Line Integrals, physical significance of Vector integration and Problems.
3. **Vector's Theorem :**Greens, Gauss & Stocks theorem and their applications, Vector components in spherical and cylindrical systems.

Recommended Books:

1	Seymour Lipschutz (SOS)	Linear Algebra
2	Murray R. Spiegel(SOS)	Vector Analysis
3	P.N. Chattarjee	Matrices
4	Seymour Lipschutz (SOS	Linear algebra
5	P.N. Chattarjee	Matrices
6	Richard Bronson	Linear algebra
7	Schaum's Outline Series	Matrices

Course Code: STAT-1201 **Course Title: Statistics**
Credit Hours: 2 **Contact Hours:** 2 per Week

Objectives: In this course student will learn about' Statistics' in regards todefinition of statistics, its necessity, measures of central tendency, dispersion, correlation theory, regression analysis, probability distributions

Section –A
(Mid-term Exam: 30 Marks)

1. **Preliminaries:** Definition of Statistics, Its necessity & importance, Population and Sample, Variable and Constants, Different types of variables, Statistical data, Data Collection and presentation, Construction of Frequency distribution, Graphical presentation of Frequency distribution.
2. **Measures of Central Tendency:** Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean, and Theorems & Problems.
3. **Measures of Dispersion**: Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance, Moments, Skewness and Kurtosis, Theorems & Problems.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

1. **Correlation Theory:** Linear Correlation --- Its measures and significance, Rank Correlation, Theorems & Problems.
2. **Regression Analysis:** Linear and non-linear regression, Least-square method of curve fittings, Theorems & Problems.

Group-B (30 Marks)

1. **Fundamentals of Probability**: Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bay's theorem.
2. **Probability**: Random Variables, Mathematical Expectation and Variance of a random variable, Theorems & Problems
3. **Probability Distributions:** Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.

Recommended Books:

1	S.C. Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics
2	R.N. Shill & S.C. Debnath	An introduction to the theory of Statistics
3	M.G. Mostafa	Methods of Statistics
4	Murry R. Spiegel	Theory and problems of Statistics
5	J.N. Kapoor & H.C. Saxena	Mathematical Statistics
6	Dr. Manindra Kumar Roy	An Introduction to the theory of Probability
7	S.P.Gupta	Advanced Practical Statistics.
8	M.K.Roy	Fundamentals of Probability and Probability Distribution

Course Code: PHY-1101 **Course Title: Physics I (Mechanics, Waves and Thermodynamics)**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course student will learn about 'Physics' in regards to the dynamics of rigid body, gravity and gravitation, elasticity, surface tension, fluid dynamics and viscosity, waves and oscillations, thermodynamics and optics.

Section –A
(Mid-term Exam: 30 Marks)

1. **Dynamics of Rigid Body:** Linear motion of a body as function of time, position and velocity, momentum, conservation theorem of momentum and energy, collision and torque, center of mass of rigid body, rotational kinetic energy, fly wheel, axes theorems and their applications.
2. **Gravity and Gravitation:** Definitions, compound pendulum, gravitational potentials and fields and relation between them, potential due to spherical shell, escape velocity and Kepler's law of planetary motion.
3. **Elasticity:** Hooke's law, relation between different elastic constants, bending of beams, cantilever, determination of Young's modulus and its engineering applications.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Surface Tension:** Definitions, cohesion, adhesion and molecular range, molecular theory of surface tension, capillarity, angle of contact, expression for surface tension, relation between surface energy and surface tension.
5. **Fluid Dynamics and Viscosity:** Stream line and turbulent motion, equation of continuity, energy of a liquid in motion, Bernoulli's theorem, viscosity, coefficient of viscosity, Stoke's law.

Group-B (30 Marks)

6. **Waves and Oscillations:** Waves in elastic media, standing waves , Sound waves, beats and Doppler's effect in sound, simple harmonic motions, total energy and average energy, damped and forced vibration, resonance.
7. **Thermodynamics:** Thermodynamic system, first and second law of thermodynamics and their applications, the thermodynamic temperature scale, Carnot's heat engine, the efficiency of engine, combined first and second law of thermodynamics, entropy and refrigerator.
8. **Optics:** Theories of light, interference of light, Young's double slit experiment, Fresnel and Fraunhoffer diffraction, diffraction of single slit, polarization of light, Production and analysis of polarized light, Brewster's law, Malu's law.

Recommended Books:

1	Robert Resnick & David Halliday	: Physics (Part I)
2	Brij Lal & Subrahmanyam	: Properties of Matter
3	S.D. Mathur	: Mechanics
4	R.A. Jenkins and H.E. White	: Fundamental of Optics
5	Brij Lal & Subrahmanyam	: A Text Book of Sound
6	Brij Lal & Subrahmanyam	: A Text Book of Optics

7	Physics for Engineers-I	:DR. Giasuddin Ahmed

Course Code: PHY-1102 **Course Title: Physics I Sessional**
Credit Hours: 1 **Contact Hours: 3 per Week**
Objectives:. In the course students will perform experiments to verify practically the theories and concepts develop in PHY1101.

1. Determination of the moment of inertia of a flywheel about its axis of rotation.
2. Determination of the value of 'g', acceleration due to gravity by means of a compound pendulum.
3. Determination of the surface tension of water by capillary tube method.
4. Verification of the laws of transverse vibration of strings and to determine the frequency of a tuning fork by Melde's experiment.
5. Determination of the Young's Modulus by the flexure of a beam (Bending Method).
6. Determination of the spring constant and effective mass of a given spiral spring and hence to calculate the rigidity modulus of the material of the spring.
7. Determination of the co-efficient of viscosity of a liquid (Glycerine) using Stokes' law.

Course Code: PHY-1201 Course Title: Physics II (Electromagnetism, Optics and Modern Physics)
Credit Hours: 3 **Contact Hours**: **3 per Week**
[Pre requisite: PHY-1101, Physics I]

Objectives: In this course student will learn about 'Physics' in regards to charge and electric potential, magnetic field, electromagnetic induction, current and resistance, structure of matter, relativity, modern physics and radioactivity

Section –A
(Mid-term Exam: 30 Marks)

1. **Charge and Electric Potential**: Electric charge, conductors and insulators, Coulomb's law, electric field, Electric field strength, Gauss's law and its applications, electric potential and potential function, electric dipole, dielectrics in Gauss' law.
2. **Magnetic Field:** The definition of magnetic field **B,** magnetic force on charge and current, Ampere's law, Biot-Savart law and their application, Lorentz force and its application in CRT.
3. **Electromagnetic Induction:** Faraday's law of electro-magnetic induction, Lenz's law, self and mutual induction, energy density in the magnetic field.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Current and Resistance:** Current and current density, Ohm's law, potential difference, RC circuits, generation of alternating current and e.m.f.
5. **Structure of Matter:** Crystalline and non-crystalline solid, single crystal and polycrystalline solids, unit cell, bonds in solids, Inter atomic distances, calculation of cohesive and bonding energy.

Group-B (30 Marks)

6. **Relativity:** Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy- momentum relation**.**
7. **Modern Physics**: Bohr's atomic model, radius and energy of Hydrogen atom, atomic nucleus and binding energy, photo-electric effect, Compton effect, De-Broglie waves, X-ray diffraction, atomic spectra and Zeeman effect.
8. **Radioactivity:** Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.

Recommended Books:

1	Dr. M.C.Saxena & Dr. V.P. Arora	: Electricity and Magnetism
2	A.K. Rafiqullah, M.S. Huq,	: Concept of Electricity and Magnetism
3	Atomic & Nuclear Physics	: Brij Lal & Subrahmanyam
4	A text book of Optics	:Brij Lal & Subrahmanyam
5	Robert Resnick & David Halliday	: Physics (Part II)
6	Arthur Beiser	:Concepts of Modern Physics
7	Theraja B.L.	: Modern Physics
8	Physics for Engineers-II	: Dr. Giasuddin Ahmed
9	Satya Prakash	**:** Relativistic Mechanics

Course Code: PHY-1202 **Course Title Physics II Sessional**
Credit Hours:1 **Contact Hours:3 per Week**
(Electromagnetism, Optics and Modern Physics)

Objectives: In this students will perform experiments to verify practically the theories and concepts develop in PHY1201.

1. Determination of the end corrections for a meter bridge.
2. Determination of specific resistance of the material of a wire by a meter bridge.
3. Determination of the resistance of a wire by means of post office box.
4. Experimental verification of the laws of series and parallel connections of resistance by means of a post office box.
5. Calibration of a meter bridge wire.
6. Determination of the value of low resistance by the method of fall of potential (Mathiesen and Hockins Method)
7. Determination of the resistance of a galvanometer by half deflection method.
8. Determination of the current sensitivity (figure of merit) of a galvanometer.

Recommended Books:

1. Dr. Giasuddin Ahmad and Md. Shahabuddin : Practical Physics

Course Code: CHEM-2301 **Course Title: Chemistry**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course student will learn about 'Chemistry' in regards toperiodic classification of elements, electronic theory of elements, chemistry of transition elements, electrochemistry, types and properties of solutions, chemical equilibrium, chemical kinetics and surface chemistry and colloids.

Section –A
(Mid-term Exam: 30 Marks)

1. **Periodic Classification of Elements:** Modern periodic table, Periodic law, Periodic system, Correlation of Atomic structure with periodic properties of elements, Ionization potential, Electron affinity, Electromagnetivity, Atomic and ionic radii, Properties of oxides.
2. **Electronic Theory of Elements:** Different types of bonds, ionic, covalent, co-ordinate and hybridization of atomic orbitals, bonding in simple molecules, Elementary idea about MOT.
3. **Chemistry of Transition Elements, Lanthanides and Actinides:** Definitions, Electronic configurations, general properties.

Section-B (Final Exam-50 Marks)
Group-A (20 Marks)

4. Electrochemistry: Electrolytic dissociation, Theory of electrolytic conductance. Ionic mobility and transference number, Simple ideas about electrode potential and reversible cells.

5. **Types and properties of solutions:** Units of concentration, ideal and real solutions, Henry's Law, Distribution of solids between two immiscible liquids, Distribution law, Partition coefficient and solvent extraction, Properties of dilute solutions. .

Group-B (30 Marks)

6. Chemical Equilibrium: Law of mass action, Determination of equilibrium constant, heterogeneous and homogeneous equilibrium, Le Chateilar principle and Van Hoff equation.

7. Chemical Kinetics: Order and molecularity kinetics of first and second order reaction, Determination of order of reactions, Arrhenius equation and energy of activation,

8. Surface Chemistry and Colloids: Adsorption, Langmuir and Gibbs adsorption isotherm, Colloids, Definitions of terms, Electrodialysis, Classification, Preparation and properties of colloids, Elementary idea about emulsions and gels. Importance of colloids,

Recommended Books:

1	R. D. Madan	: Modern Inorganic Chemistry
2	M.M. Haque and M.A. Nawa	: Principles of Physical Chemistry
3	E.S Gilreath	: Fundamental Concepts in Inorganic Chemistry.

Course Code Chem-2302 **Course Title: Chemistry Sessional**
Credit Hours: 1 **Contact Hours: 2 per Week**

Objectives: In this students will perform experiments to verify practically the theories and concepts develop in CHEM2301.

Experiment No. 1: Preparation of standard sodium oxalate solution and standardization of potassium permanganate solution.
Experiment No. 2: Determination of ferrous ion (Fe^{2+}) with standard potassium permanganate solution.
Experiment No. 3: Preparation of standard potassium dichromate solution and standardization of sodium thiosulphate solution.
Experiment No. 4: Determination of copper by iodometrically with standard sodium thiosulphate solution.
Experiment No. 5: Determination of calcium in calcium carbonate.
Experiment No. 6: Estimation of zinc and copper from analysis of brass.

B. Core Courses

Computer Science (CSE)

Course Code: CSE-1101 **Course Title: Computer Fundamentals**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives: In this course student will learn about 'Computer Fundamental' in regards to introduction of computer, basic organization and functional units of computer, number systems, computer codes and arithmetic, computer memory & I/O devices, computer program, software and language, operating system and data processing, data communication and computer network, business data processing, multimedia and Internet.

Section-A
(Mid-term Exam: 30 Marks)

1. **Introduction of computer and its Organization:** Introduction of computer**,** components of computer system, Historical evolution of computers & classification, Computer generations.

2. **Basic organization and functional units of computer:** Basic organization and functional units of computer, Input/ output/storage/arithmetic logic/control and central processing unit, internal structure of CPU.
3. **Number Systems, Computer Codes and Arithmetic:** Non-positional/positional number system, different number systems & their conversion, Fractional numbers, Numeric/alphanumeric data, BCD/EBCDIC/ASCII code, Binary arithmetic (Addition, subtraction, multiplication and division).

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Computer Memory & I/O devices:** Memory location and address, RAM, ROM, PROM, and EPROM, cache memory, Sequential/Direct/Random access device, Magnetic tape and disk, hard disk, floppy disk, CDROM, optical disk, Printers, Keyboard, Mouse, Scanner, and other devices.

5. **Computer program, software and language:** Program planning, algorithms, flow charts, pseudo code, Software and firmware, types of computer software, types of computer language, translator, interpreter, compiler.

Group-B (30-Marks)

6. **Operating System and Data processing:** Evolution of OS, Multiprogramming, Multiprocessing, Time sharing system, Real time system, types of data processing, database concept, and database management system.
7. **Data Communication and Computer Network:** Basic elements of a communication system, Types of communications among computers, characteristics of communication channels, Computer Networks, LAN, MAN, WAN, Network topologies.
8. **Business data processing, Multimedia and Internet:** Goals of office automation, Advantages and threats of office automation, Multimedia concepts and components, WWW, WAP, E-commerce, Internet, Internet services.

Recommended Books:

1	Computer Fundamentals	Dr. M. Lutfar Rahman, Dr. M. Alamgir Hossain
2	Introduction to Computer	Peter Norton
3.	Computer Fundamental	P.K.Sinha

Course Code : CSE-1102 Course Title: Computer Fundamentals Sessional
Credit Hours: 1**Contact Hours:3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts develop in CSE1101. In the second part, students will design simple systems using the principles learned in CSE1101.

1. **Operating System**: Proposed Operating Systems: Windows, Linux, UNIX, Topics: Files, Folders, Basic operations on file/folders, File System, Windows OS Organization and Hierarchy, Searching files and folders.
2. **Operation on Linux:** Files, Folders, Basic operations on file/folders

3. **Word Processing (Microsoft Word)**: Formatting, Table Editing, Picture, Clipart and object, Charts, Drawing, text box and shapes, Hyperlink, Macro, Equation editor etc. Lab Assignment: CV Design, Application: Report writing.

4. **Word Processing (Latex):** What is latex, Scope of latex for scientific research, installing latex in windows, Linux, Application : Scientific paper writing (Formatting, Table Editing, Picture, Equation writing, Columns)

5. **Spreadshee**t Analysis: Proposed Application Software: Microsoft Excel
Topics: Basic idea, Cell formatting, Equation, Function, Different sheet data calculation. Lab Assignment: Grade sheet calculation, Salary Sheet calculation.

6. **Slide Oriented Presentation**: Proposed Application Software: Microsoft Power Point.
Topics: Hyperlinks, Slide window detail, Audio, Video, Animation, Slide transition. Lab Assignment: Simple slide based presentation (topics are free of choice).

7. **Scientific simulation (MatLab):** Syntax rules, Basic Mathematical Analysis

8. **Hardware Trouble Shooting**: Topics: Installing/binding a new computer system, Installing operating system and other software. Formatting and partitioning the hard disk. Precaution, preventive maintenance, troubleshooting hardware and software components.

Recommended Books:

1.	MSDN (Microsoft developer network) library.	Microsoft
2.	Microsoft Office 2000/XP Premium Edn. -	BPB Publications.
3.	Mastering Access 2000, [ISBN: 81-7656-093-6]	BPB Publication
4.	Peter Norton's Complete Guide to MS Windows 2000 Professional	
5.	Complete PC Upgrading & Maintenance (Lab Manual) – BPB Pub, [ISBN: 81-7656241-6]	BPB Publication
6.	Networking Essentials – BPB Publication	BPB Publication
7.	Internet (2^{nd} Edn.) – BPB Publication, [ISBN: 81-7029-053-7]	BPB Publication
8.	Operating system– 7^{th} edition	Andrew S. Tanenbaum

Course Code: CSE-1103 **Course Title: Computer Basic and Programming**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives: In this course student will learn about 'Computer Fundamental' in regards to introduction of computer, basic organization and functional units of computer, number systems, computer codes and arithmetic, computer memory & I/O devices, computer program, software and language, operating system and data processing, data communication and computer network, business data processing, multimedia and Internet.

Section-A
(Mid-term Exam: 30 Marks)

1. **Introduction to Computer Basic:** Introduction of computer, functional units of computer, Non-positional/positional number system, different number systems & their conversion, Fractional numbers, Numeric/alphanumeric data, BCD/EBCDIC/ASCII code, Binary arithmetic (Addition, subtraction, multiplication and division).
2. **Introduction to Computer Programming:** Problem solving techniques, algorithm specification and development. Programming style, debugging and testing, documentation. Program design methodologies, structured and modular program design, Character sets, Identifiers and keywords, data types, constants, variables, statements, symbolic constant

3. **Operators:** arithmetic, unary, relational, logical, assignment, conditional operators; precedence of operators, expressions, type conversions, library functions, **Input and Output**: Managing data input (scanf, getchar, gets etc), Managing data output (printf, putchar, puts etc), formatted input and output.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Control statements:** Branching- *If* and *if... else* statements, nested if, *switch statement*, **Looping-** *while*, *do…while* and *for* looping statements, Jumps in loops, g*oto* statement, *break* and *continue statement.*

5. **Array and function**: defining an array, processing an array, passing arrays to functions, Multidimensional array, String, and Array of Strings, defining a function, accessing a function, function prototypes, passing arguments to a function, Recursions, Storage class

Group-B (30-Marks)

6. **Pointers**: pointer declarations, operations on pointers, Pointers and arrays, Pointers and functions, Dynamic memory allocation,

7. **Structure**: defining a structure, processing a structure, structure and pointers, passing structures to functions, self-referential structure, Union. File: opening and closing a file, creating a file, processing a file
8. **Numerical solution:** Numerical solution of algebraic and transcendental equations, Matrices, Solution of system of linear equations by matrix method, Interpolation, Extrapolation. Solution of differential equation, Integration.

Recommended Books:

1	Byron S. Gottfried	Theory and Problems of Programmin with C.
2	C Kernighan & D.M. Ritchie	The C Programming Language, Prantice-Hall of India, 1994.
3	Herbert Schildtce	Turbo C / C++
4	H. M. Deitel and P. J. Deitel	C How to Program
5	E. Balagurusamy	Programming in ANSI C, 2/e, Tata McGraw-Hill Publishing Company Limited, 1992
6	Dr. M. Lutfar Rahman, Dr. M. Alamgir Hossain	Computer Fundamentals
7	P.K.Sinha	Computer Fundamental

Course Code: CSE 1104 Course Title: Computer Basic and Programming Sessional
Credit Hour: 1 **Contact Hour: 2 per week**

Objectives: In the second part, students will design simple systems using the principles learned in EEE

1. Write a program to create an array of n elements and then display all the elements of the list.
2. Write a program to find the largest number from a given list of integers.
3. Write a program to calculate the roots of the quadratic equation $ax^2 + bx + c = 0$ where a, b and c are known.
4. Write a program to create an array of n elements and then separately write the odd and even elements of the list.
5. Write a program to create an array of n elements and then insert an element to the list.
6. Write a program to create an array of n elements and then delete an element from the list.
7. Write a program to sort n numbers using Bubble Sort algorithm.
8. Write a program to search an element from a list of n numbers using Linear Search algorithm.
9. Write a program to search an element from a list of n numbers using Binary Search algorithm.
10. Write a program to determine whether a number n is prime or not where $1< n < 2^{15}$ by using sieve method.
11. Write a program to write 100 randomly generated integer to a file called RAND.DAT. And then read the contents of the file and display them on the screen.
12. Write a program that will read a positive integer in base ***b*** (2<=b<=16) and convert it into base ***d*** (2<=d<=16). [H]

Project: Write a menu driven program to Process a *sorted* Array. Your program should have the following menu: *Insert, Delete, Search, Display, and Exit*.

13. Write a program to insert a string S into a text T so that S begins in position K of T.
14. Write a program that will read a string (S) and find the index of the first occurrence of a pattern (P) in the string S.
15. Write a program which calculates the no. of occurrence of each letter of an input text.
16. Write a program to implement the following string operation without using any built in functions related to string.
    a) Find the length of a string S
    b) Copy string S2 to S1.
    c) Concatenate string S2 to S1.

d) Compare two strings S1 and S2
e) Reverse a string S. [H]

17. Write a program to interchange the row and column of a matrix.
18. Write a program to add two matrices.
19. Write a program to calculate the multiplication of two matrices.
20. Write a program to calculate the row sum and column sum of a matrix. [H]
21. Write a program to implement the push and pop operation of a stack
22. Write a program to evaluate a Postfix expression.
23. Write a program to convert an Infix expression into its equivalent Postfix expression. [H]
24. Write a program to calculate the Factorial of a number using recursive and non-recursive method
25. Write a program to find the nth term F_n of the Fibonacci sequence using recursive and non-recursive method.
26. Write a program to move n disks for Tower of Hanoi problem.
27. Write a program to implement the *Euclidean Algorithm* for finding the Greatest Common Divisor (GCD) of two given positive integers.
28. Write a program to show the insert and delete operations of a circular queue.
29. Write a program to show the insert and delete operations of a priority queue.
30. Write a program to create a Linked List of n elements and then display the list.
31. Write a program to create a Linked List of n elements and then search an element from the list.
32. Write a program to create a Linked List of n elements and then insert an element to the list.
33. Write a program to create a Linked List of n elements and then delete an element from the list.
34. Write a program to create a Circular Header Linked List of n elements and then display the list.
35. Write a program to create a Two way Linked List of n elements and then display the list.
36. Write a program to sort n numbers using Insertion Sort algorithm.
37. Write a program to sort n numbers using Selection Sort algorithm.
38. Write a program to sort n numbers using Quick Sort algorithm.
39. Write a program to merge two sorted list. [H]
40. Write a program to create a Binary Search Tree of n elements and then display the elements (preorder, inorder and postorder) of the tree.
41. Write a program to create a Binary Search Tree of n elements and then delete an element from the tree.
42. Write a program to create a Maxheap of n elements and then display the elements of the heap.
43. Write a program to create a Maxheap of n elements and then delete an element from the heap.
44. Write a program to traverse a graph using Breadth First Search.
45. Write a program to traverse a graph using Depth First Search.
46. Write a program to find the 100! [H]
47. Write a program to determine the value of the ***n***th Fibonacci number F_n where
    $Fn = F_{n-1} + F_{n-2}$ and $F_1 = F_2 = 1$ and n<=500. [H]

Course Code: CSE 1201 **Course Title: Computer Programming**
Credit Hour: 3 **Contact Hour: 3 per week**

ObjectivesIn this course student will learn about 'Computer Programming' in regards to software classification, Operators, data input and output, control statements, looping, function, array, pointers, structure and computer graphics.

Section-A (Mid-term: 30 Marks)

1. **Introduction:** Definition of software, its classification; Problem solving steps; Flow charts; Introduction of C: history and Characteristics of C, Identifiers and keywords, data types, constants, variables, statements, symbolic constant
2. **Operators:** arithmetic, unary, relational, logical, assignment, conditional operators; precedence of operators, expressions, type conversions, library functions.
   Input and Output: Managing data input (scanf, getchar, gets etc), Managing data output (printf, putchar, puts etc), formatted input and output
3. **Control statements:** Branching- *If* and *if… else* statements, nested if, *switch statement* ;
   Looping- *while*, *do…while* and *for* looping statements, Jumps in loops, g*oto* statement, *break* and *continue statement.*

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **Function:** defining a function, accessing a function, function prototypes, passing arguments to a function, Recursions, Storage class
5. **Array**: defining an array, processing an array, passing arrays to functions, Multidimensional array, String, Array of Strings

Group-B (30 Marks)

6. **Pointers**: pointer declarations, , operations on pointers, Pointers and arrays, Pointers and functions, Dynamic memory allocation
7. **Structure**: defining a structure, processing a structure, structure and pointers, passing structures to functions, self-referential structure, Union. File: opening and closing a file, creating a file, processing a file
8. **Computer Graphics**; Low level programming – bitwise operations, bit fields, Some additional features of C (Enumerations , Command line parameters, Header files, Preprocessors, Macros etc.)

Recommended Books:

1	Byron S. Gottfried	Theory and Problems of Programmin with C.
2	Herbert Schild	Teach Yourself C
3	Robert Lafore	The Waite Group's C Programming using Turbo C++.
4	C Kernighan & D.M. Ritchie	The C Programming Language, Prantice-Hall of India, 1994.
5	Herbert Schildtce	Turbo C / C++
6	H. M. Deitel and P. J. Deitel	C How to Program
7	Steve Summit	C Programming FAQs
8	E. Balagurusamy	Programming in ANSI C, 2/e, Tata McGraw-Hill Publishing Company Limited, 1992
9	Sazzad Hossain and Jahangir Hossain	Programmingin C

Course Code: CSE 1202 Course Title: Computer Programming Sessional
Credit Hour: 1.5 **Contact Hour: 3 per week**

Objectives: In the second part, students will design simple systems using the principles learned in EEE

48. Write a program to create an array of n elements and then display all the elements of the list.
49. Write a program to find the largest number from a given list of integers.
50. Write a program to calculate the roots of the quadratic equation $ax^2 + bx + c = 0$ where a, b and c are known.
51. Write a program to create an array of n elements and then separately write the odd and even elements of the list.
52. Write a program to create an array of n elements and then insert an element to the list.
53. Write a program to create an array of n elements and then delete an element from the list.
54. Write a program to sort n numbers using Bubble Sort algorithm.
55. Write a program to search an element from a list of n numbers using Linear Search algorithm.
56. Write a program to search an element from a list of n numbers using Binary Search algorithm.
57. Write a program to determine whether a number n is prime or not where $1< n < 2^{15}$ by using sieve method.
58. Write a program to write 100 randomly generated integer to a file called RAND.DAT. And then read the contents of the file and display them on the screen.
59. Write a program that will read a positive integer in base ***b*** (2<=b<=16) and convert it into base ***d*** (2<=d<=16). [H]

Project: Write a menu driven program to Process a *sorted* Array. Your program should have the following menu: *Insert, Delete, Search, Display, and Exit*.

60. Write a program to insert a string S into a text T so that S begins in position K of T.
61. Write a program that will read a string (S) and find the index of the first occurrence of a pattern (P) in the string S.
62. Write a program which calculates the no. of occurrence of each letter of an input text.
63. Write a program to implement the following string operation without using any built in functions related to string.
    f) Find the length of a string S
    g) Copy string S2 to S1.
    h) Concatenate string S2 to S1.
    i) Compare two strings S1 and S2
    j) Reverse a string S. [H]

64. Write a program to interchange the row and column of a matrix.
65. Write a program to add two matrices.
66. Write a program to calculate the multiplication of two matrices.
67. Write a program to calculate the row sum and column sum of a matrix. [H]
68. Write a program to implement the push and pop operation of a stack
69. Write a program to evaluate a Postfix expression.
70. Write a program to convert an Infix expression into its equivalent Postfix expression. [H]
71. Write a program to calculate the Factorial of a number using recursive and non-recursive method
72. Write a program to find the nth term F_n of the Fibonacci sequence using recursive and non-recursive method.
73. Write a program to move n disks for Tower of Hanoi problem.
74. Write a program to implement the *Euclidean Algorithm* for finding the Greatest Common Divisor (GCD) of two given positive integers.

75. Write a program to show the insert and delete operations of a circular queue.
76. Write a program to show the insert and delete operations of a priority queue.
77. Write a program to create a Linked List of n elements and then display the list.
78. Write a program to create a Linked List of n elements and then search an element from the list.
79. Write a program to create a Linked List of n elements and then insert an element to the list.
80. Write a program to create a Linked List of n elements and then delete an element from the list.
81. Write a program to create a Circular Header Linked List of n elements and then display the list.
82. Write a program to create a Two way Linked List of n elements and then display the list.
83. Write a program to sort n numbers using Insertion Sort algorithm.
84. Write a program to sort n numbers using Selection Sort algorithm.
85. Write a program to sort n numbers using Quick Sort algorithm.
86. Write a program to merge two sorted list. [H]
87. Write a program to create a Binary Search Tree of n elements and then display the elements (preorder, inorder and postorder) of the tree.
88. Write a program to create a Binary Search Tree of n elements and then delete an element from the tree.
89. Write a program to create a Maxheap of n elements and then display the elements of the heap.
90. Write a program to create a Maxheap of n elements and then delete an element from the heap.
91. Write a program to traverse a graph using Breadth First Search.
92. Write a program to traverse a graph using Depth First Search.
93. Write a program to find the 100! [H]
94. Write a program to determine the value of the ***n***th Fibonacci number F_n where $Fn = F_{n-1} + F_{n-2}$ and $F_1 = F_2 = 1$ and n<=500. [H]

Course Code: CSE -1203 **Course Title: Data Structures and algorithm**
Credit Hours: 2 **Contact Hours: 2 per Week**
[Pre requisite: EEE 2310 Numerical Technique Sessional]

Objectives: In this course student will lean about 'Data Structure' in regards to elementary data organization,linear array, stack,queue,linked list, complexity of algorithms, tree and graph.

Section-A (Mid-term: 30 Marks)

1. Introduction: Elementary Data organization, Information; Data types; Data Structure, Data Structure operations; Algorithm; Time-Space tradeoff of Algorithms. Mathematical notation & Functions; Algorithmic Notation; Control structures; Sub-algorithms. String; String operations; Pattern matching algorithms

2. Linear Array: Linear Array & its representation in memory; Traversing LA, Insertion & Deletion in LA, Bubble Sort, Linear Search & binary Search. 2D Array & its representation in memory; Matrices; Algebra of matrices; Sparse matrices

3. Stack: Its representation & applications; PUSH and POP operation on stack. Polish Notation, reverse polish notation; Evaluation of a postfix expression; Transforming infix expression into postfix expression.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. Queue – Its representation; Insertion & deletion in Queue; Deques; Priority Queues. Recursion [Factorial function, Fibonacci sequence, Ackermann function, Towers of Hanoi]

5. Linked list - Linked list & its representation in memory; Traversing, Searching, Insertion & Deletion operation on Linked list; Header linked lists; Two way lists.

Group-B (30 Marks)

6. **Complexity of algorithms**: Rate of growth, Big O notation; Complexity of Linear Search, Binary search & Bubble sort algorithm. Sorting - Insertion sort, selection sort, quick sort, merge sort; Searching & data modification; Hashing: Hash function, collision resolution

7. Tree- Tree terminology; representation of binary trees in memory; Traversing binary tree; Binary search tree; Insertion & deletion on binary search tree; Heap; Insertion & deletion on heap; Heapsort; B trees; General tree

8. Graph – graph terminology; representation of graphs – adjacency matrix, path matrix, adjacency list; Traversing a graph – BFS & DFSRecommended Books:

1	Seymour Lipschetz	Data Structure
2	Y. Langsam, Augenstein, A. M. Tanenbaum	Data Structures Using C and C++
3	Edward M. Reingold	Data Structures
4	Robert Sedgwick	Algorithms in C
5	Niklaus wirth	Algorithms and Data Structures Program.

Course Code: CSE-1204 Course Title: Data Structures and algorithm Sessional
Credit Hours: 1 Contact Hours: 2per week

Course Code: CSE-2302 Course Title: Object Oriented Programming sessional
Credit Hours: 2 Contact Hours: 2 per week

Programming Using C++: Principles of Programming Languages and Structured Programming Concepts. Variables, Arithmetic Expressions, Data types, Operators and Expressions, Control Flow, Arrays, Pointers, Procedures and Functions, Structures and Unions, String Operations, Dynamic Memory Allocation, File Management System, Graphics, Writing, debugging and running Programs in C++.

Programming Using JAVA: Java foundation, control flow, abstract classes and packages, exception handling, applets, web based java application, multithreading.

Mechanical Engineering and Drawing

Course Code: ME-2301 **Course Title: Fundamental of Mechanical Engineering**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives: In this course student will learn about 'Fundamental of Mechanical Engineering' in regards tofuels, steam generators and turbine, refrigeration and air-conditioning and types of fluid machinery.

Section –A
(Mid-term Exam: 30 Marks)

1. Study of fuels: Steam generation units with accessories and mountings.
2. Study of steam generators and steam turbines. Introduction to internal combustion engines and their cycles.
3. Study of SI engines, CI engines and gas turbines with their accessories.

Section-B (Final Exam-50 Marks)
Group-A (20 Marks)

4. Refrigeration and air conditioning with their applications. Study of different refrigeration methods, refrigerants.
5. Refrigeration equipments: compressors, condensers, evaporators, expansion devices, other control and safety devices.

Group-B (30 Marks)

6. Psychosomatics. Study of air conditioning systems with their accessories.
7. Types of fluid machinery. Study of impulse and reaction turbines. Pelton wheel and Kaplan turbines.
8. Sstudy of centrifugal and axial flow machines; pumps, fans, blowers and compressors. Study of reciprocating pumps.

Recommended Books:

1. **R.S Khurmi** **:** A Text Book of Thermal Engineering.
2. Md. Quamrul Islam : Hydraulic Machines.

Course Code: CE-1202 **Course Title: Engineering Drawing**
Credit Hours: 1 **Contact Hours: 2 per Week**

Objectives: In this course student will learn to sketch (technical) the different view of an object and also learn CAD.

1. **Introduction orthographic projection**: Scale drawing, Sectional view, Top and side view Isometric views, Missing line, Auxiliary view, Pictorial views.
2. **Drawing standard and practices:** Interpenetrating of surface, Development of surfaces, Machine drawings, and Technical sketching.
3. **Introduction to Computer Aided Design (CAD):** Project on Engineering Drawing and CAD using Contemporary packages in engineering drawing.

Recommended Books:

1. F. Giesecke, A. Mitchell, H.C. Spencer, I. L. Hill, Robert O: .Engineering Graphics 3rd Edn.

Electrical & Electronic Engineering (EEE)

Course Code: EEE 1101 **Course Title: Electrical Circuits I**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course student will learn about 'Electrical Circuit' in regards to comprehensive idea of circuit variables and elements, simple resistive circuits, techniques of circuit analysis, network theorems, maximum power theorem, energy storage elements, magnetic quantities and magnetic circuits.

Section-A
(Mid-term Exam: 30 Marks)

1. Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, and resistance., Kirchhoff's current and voltage laws. Ammeter, Voltmeter, Wattmeter & Other meters.
2. **Simple resistive circuits**: Series and parallel circuits, voltage and current division, wye-delta transformation.
3. **Techniques of circuit analysis**: Mesh and node circuit analysis including super node and super mesh. Reduction of complicated networks.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. Network theorems: Source transformation, Thevenin's, Norton's ,Superposition and Millman'stheorems with applications in circuits having independent and dependent sources.
5. **Maximum power Theorem**: Statement, Prove and Condition (both AC and DC), Reciprocity and Substitution theorems.

Group-B (30-Marks)

6. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses.

7. **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.

8. **Magnetic circuits:** Series, Parallel and series-parallel circuits analysis.

Recommended Books:

1	Boylestad	**:**Introductory Circuit Analysis
2	Alexan and -Sadiku	**:**The fundamentals of Electric Circuit
3.	B.Grob	**: Basic Electronics**
4.	J.A. Edminister	**: Electric Circuits**

Course Code: EEE 1102 **Course Title: Electrical Circuit I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objective: In this course students will perform experiments to verify practically about the theories learned in the course **EEE-1101**.

List of Experiment:
1. Introduction to a Multimeter.
2. Color Code of Resistor.
3. Verification of Ohm's Law.

4. Verification of Kirchhoff's Current Law.

5. Verification of Kirchhoff's Voltage Law.

6. Study of Voltage and Current Divider Rule.

7. Study of Super Position Theorem in Circuit Analysis.

8. Study of Thevenin's Theorem in Circuit Analysis.

9. Study of Millman's Theorem in Circuit Analysis.

Course Code: EEE 1201 **Course Title: Electrical Circuits II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 1101 Electrical Circuits I]

Objectives: In this course student will learn about 'Electric Circuit' in regards to comprehensive idea about alternating current, magnetically coupled circuits, three phase balanced and unbalanced load, resonance, filter, a.c. transients and two port analysis

Section-A

(Mid-term Exam: 30 Marks)

1. **Sinusoidal functions**: AC theory, instantaneous current, voltage, power, effective current and voltage, average power, Use of complex quantities in AC circuits
2. **Phasors and complex quantities**: Impedance, real and reactive power, power factor, Vector diagram.
3. **Analysis of single-phase AC circuits:** Series and parallel RL and RC circuits. nodal and mesh analysis,
application of network theorems.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Resonance and Passive filters**: Series and parallel RLC resonance circuits'-value and band width, Properties of Symmetrical networks, Filter fundamentals, Low, High, Band pass and Band stop Filters. Band width and cut-off frequency, Double tuned filter, Design conditions and Uses. Bode plots.
5. **Transients and Magnetically coupled circuits:** Transient in RC, RL and RL circuits. Conductive, Capacitive and Magnetic Coupling, Coefficient of Coupling.

Group-B (30-Marks)

6. **Polyphase systems**: The three phase generator, The Y-connected generator and load, the Wye-Delta system, The Delta connected generator and load, Delta-Delta and Delta-Wye three phase system.

7. **Balanced and unbalanced three phase circuit analysis**: The three and two wattmeter methods, Unbalancedthree –phase four-wire Y-connected load, unbalanced three-phase three wire Y-connected load.
8. **Two-port analysis**: Impedance parameters, Voltage gains, Current gains, Cascaded systems, admittance parameters, Hybrid parameters.

Recommended Books:

1	Alexander &Sadiku	**:**Fundamental of Electric Circuits
2	Kerchner& Corcoran	**:** Alternating Current Circuits, 4th Edition
3	J.D.Ryder	:Networks, line and Fields.
4.	J.A.Edminister	:Electric Circuits
5	R.L.Boylestad	: Introductory Circuit Theory, Prentice-Hall India Pvt. Ltd.

Course Code: EEE 1202 Course Title: Electrical Circuit II Sessional and Electrical workshop
Credit Hours: 1.5 Contact Hours: 3 per week

Objective: In this course students will perform experiments to verify practically electrician's tools, splices, soldering, code practices, electrical and electronics symbols, safety rules, electricity rules and electricity codes, electrical wiring system design ,drawing and estimation for residential and commercial house wiring and industrial installation wiring. Transformer Construction, Grounding, earth resistance measurement using earth resistance tester. Battery charging, Public Systems amplifier

List of the Experiments:

1. Familiarization with the electrical circuit Components
2. Determination of frequency response of an R-C series circuit.
3. Determination of resonance frequency of an R-L-C series circuit.
4. Determination of resonance frequency of an R-L-C Parallel circuit.
5. Measurement of power and power factor in a single phase circuit.
6. Measurement of single phase power using a wattmeter.
7. Measurement of balance three phase power by one wattmeter method.
8. Measurement of balanced three phase power by two wattmeter methods.
9. Study of the relation between line current and phase current of delta connected load.
10. Study of the relation between line Voltage and phase Voltage of Y-connected load.
11. Measurement of unbalanced three phase power by two wattmeter methods.
12. Determination of frequency response of high pass and low pass filter.
13. Determination of power factor correction.

Recommended Books:
Md. Rafiqul Islam - Basic Electricity

Course Code: EEE 2301 **Course Title: Electronics I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 1201 Electrical Circuits II]

Objectives: In this course student will learn about 'Electronics' in regards to the working principle and characteristics of semiconductor diodes and transistors, BJT, MOSFET, Differential and multistage amplifiers.

Section-A

(Mid-term Exam: 30 Marks)

1. **Semiconductor Diodes**: Intrinsic and extrinsic semiconductors, N and P type semiconductor, current-voltage characteristics of a PN junction diode. Simplified dc and ac diode models, dynamic resistance and capacitance.
2. **Diode Circuits**: Half wave and full wave rectifiers, rectifiers with filter capacitor, Voltage doubler, Clippers and clampers circuits. Zener diode and Voltage regulators.
3. **Bipolar Junction Transistors**: Working principle of PNP and NPN transistor, Input and output characteristics of CB,CE, and CC configuration, Load line analysis, Operating point, cutoff and saturation points, Transistor as an amplifier, BJT as a switch. Transistor biasing and stability factor, design of transistor biasing circuit.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Single Stage Transistor Amplifier**: Transistor equivalent circuits (both D.C and A.C). Modeling of Transistor: r_e-model and Hybrid equivalent Model. Small-signal analysis of BJT: Fixed biased, voltage-divider biased and Emitter-Follower Configuration.
5. **Differential and multistage amplifiers**: Description of differential amplifiers, Small-signal operation, differential and common mode gains, RC coupled, Transformer coupled, and Direct Coupled amplifier.

Group-B (30-Marks)

6. **Field-Effect Transistors (FET)**: Construction and classification, Principle of operation, Characteristic curves, Channel conductivity, Channel ohmic and pinch-off region, Characteristic parameters of the FET, Effect of temperature on FET, Common source amplifier, Common drain amplifier,
7. **Metal-oxide-semiconductor field-effect-transistor(MOSFET)**: MOSFET as circuit element, structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect. Current- voltage characteristics of an enhancement MOSFET, MOSFET as a switch.
8. **Biasing and Application of MOSFET**: Biasing discrete and integrated MOS amplifier circuits. VMOS, CMOS inverter. UJT.

Recommended Books:

1	Robert L. Boylestad & Louis Nashelsky	Electronics devices and circuit theory
2	V.K.Mehta & A.K.Mehta	Principle of electronics
3	B.L.Thereja & A.K.Thereja	Basic Electronics solid state
4	Streetman & Banarjee	Solid State electronic device
5	J. J. Milman and C.C.Halkias	Electronics Devices and Circuits

Course Code: EEE 2302 **Course Title: Electronics I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

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

List of Experiment:

2. Study of lead identification and testing of diode, BJT and MOSFE
3. Determination of unknown signal frequency and voltage by using Oscilloscope.
4. Study of the I-V characteristic curves of a diode.
5. Design and construction of a half-wave rectifier circuit and calculation of ripple factor.
6. Design and construction of a full- wave rectifier circuit and calculation of ripple factor
7. Study of clamper and clipper circuits and draw the output waveshape.
8. Study of the input and output characteristics of a transistor.
9. Study of a single stage transistor amplifier and draw its frequency response curve.
10. Study of MOSFET as a switch.
11. Study of cascade amplifier characteristics i.e frequency response curve.

Course Code: EEE 2303 **Course Title: Electrical Machines I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 1201 Electrical Circuits II]

Objectives: In this course students will learn about 'Electric Machine' in regards to working principle, construction, characteristics and maintenance of different types of transformers and motors.

Section-A
(Mid-term Exam: 30 Marks)

1. Transformer: Working principle, Construction, Types- (core type & shell type), Elementary theory for ideal transformer, E.M.F. equation, Transformation ratio, three phase transformer- (Operating principle, Different types of connection).
2. Vector diagram and Equivalent circuit: Transformer with losses but no magnetic leakage, Transformer with winding resistance but no magnetic leakage, Transformer with resistance and leakage reactance, Equivalent circuit of a transformer.
3. Transformer test & Performance: Voltage regulation, Transformer tests- (open-circuit & short-circuit test), Losses in a transformer, Efficiency & condition for maximum efficiency, Instrument transformer- (current & voltage Transformer).

Section-B (Final Exam : 50 Marks)
Group-A (20-Marks)

4. **DC generators**: Working Principle of generators, Different types of DC generators, General Voltage Equation, no-load voltage characteristics and Application of DC generators. Build-up of a self-excited shunt generator, critical field resistance, load-voltage Characteristic..
5. DC generator characteristics: Effect of speed on no-load and load characteristics and voltage regulation. Shunt generator and compound generator. Parallel operation, winding connection of DC generator

Group-B (30-Marks)

6. DC motors: Operating differences between motors and generators, Torque, counter emf, speed and torque-speed characteristics, starting and speed regulation, Uses of DC motors.
7. Induction motor: Theory of operation, Advantage, Disadvantage, Construction, Production of rotating field- (two-phase & three-phase supply) & mathematical proof, Rotation principle, Slip, Frequency of rotor current.
8. Equivalent circuit:Induction motor as a generalized transformer, Equivalent circuit of the rotor, Equivalent circuit of the motor, Determination of G_0 & B_0, No load test, Blocked rotor test.

Recommended Books:

B.L. Theraja & A.K Theraja	A Text Book of Electrical Technology (Volume II)

Course Code: EEE 2410 **Course Title: Numerical Techniques Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**
[Pre requisite: CSE 1201 Computer Programming]

Objectives: In this sessional student will learn about' Numerical Technique solution' in regards to differentiation , integration , transcendental equations, linear and non linear differential equations and partial differential equations.

1. Write a program to round off a number with n significant figures using banker's rule.
2. Write a program to evaluate a polynomial by using Horner's rule.
3. Write a program to find the root of the equation $e^x - 3x = 0$, correct to 3 decimal places, by using the bisection method.
4. Write a program to find the root of the equation $2x - \log_{10} x = 7$, correct to 3 decimal places, by the using fixed point method.
5. Write a program to find the root of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places, by using Newton-Raphson method.
6. Write a program to find the root of the equation $x \log_{10} x - 1.2 = 0$, correct to 3 decimal places, by using false position method.
7. Write a program to find the root of the equation $x^2 - 4x - 10 = 0$, correct to 3 decimal places, by using secant method.
8. Write a program to find the *quotient polynomial* q(x) from a polynomial p(x) by using s*ynthetic division.*
9. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find difference table for the above values.

10. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of y when x = 1.7 by using Newton's forward interpolation formula.

11. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of y when x = 4.7 by using Newton's backward interpolation formula.

12. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of x for which f (x) = 85 by using Lagrange's inverse interpolation formula.

13. The following values of f (x) are given. Prepare the divided difference table for the following data

x	1	3	4	6	10
y = f(x)	0	18	58	190	920

Write a program to find the values of y when x = 2.7 by using Newton's divided difference formula.

14. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the first derivative and the second derivative of the function tabulated above at the point x = 1.

15. Write a program to calculate the approximate area under the curve y = ∫5 log10 x dx by using trapezoidal rule.
16. Write a program to calculate the approximate area under the curve y = ∫ · /2 esinx dx by using Simpson's 1/3 rule
17. Write a program to calculate the approximate area under the curve y = ∫1 x / (1+x2) by using Simpson's 3/8 rule.
18, Write a program to find the determinant of a NXN matrix.
19. Write a program to solve the following system of linear equations by using Matrix inversion method.

    x + y + z = 1
    x + 2y + 3z = 6
    x + 3y + 4z = 6
20. Write a program to solve the following system of linear equations by using Cramer's Rule:

    27x + 6y – z = 85
    6x + 15y + 2z = 72
    x + y + 54z = 110
21. Write a program to solve the following system of linear equations by using Gaussian Elimination method.

    2x + y + z = 10
    x + 4y + 9z = 16
    3x + 2y + 3z = 18
22. Write a program to solve the following system of linear equations by using Gauss-Jordan Elimination method.

    x + 2y + z = 8
    2x + 3y + 4z = 20
    4x + 3y + 2z = 16

23, Write a program to solve the following system of linear equations by using Jacobi's method.

    83x + 11y - 4z = 95
    3x + 8y + 29z = 71
    7x + 52y + 13z = 104

24. Write a program to solve the following system of linear equations by using Gauss-Seidel method.

    $10x_1 + x_2 + x_3 = 12$
    $2x_1 + 10x_2 + x_3 = 13$
    $2x_1 + 2x_2 + 10x_3 = 14$

25, Write a program to find the least square line y = a + bx for the following data

x	-2	1	0	1	2
y	1	2	3	3	4

26. Write a program to find the least square parabola $y = a + bx + cx^2$ for the following data

x	-3	-1	1	3
y	15	5	1	5

27. Write a program to solve the following Differential Equation by using Euler's method.
    $dy / dx = x^3 + y$, y (0) = 1. Compute y (0.02) taking h = 0.01.
28. Write a program to solve the following Differential Equation by using Runge – Kutta method.
    dy / dx = x + y, y (0) = 1. Compute y (0.1) and y (0.2) taking h = 0.1.

Course Code: EEE 2401 **Course title: Electrical Machines II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2303 Electrical Machines I]

Objectives: In this course student will learn about 'Electric Machine' in regards to working principle, construction, operation of AC Machine along with their characteristics and stability.

Section-A
(Mid-term Exam: 30 Marks)

1. Torque and speed: Relation between torque and rotor power factor, Starting torque, Effect of supply voltage on starting torque, Rotor EMF, reactance & torque under running condition & condition for maximum torque, Relation between torque and slip, Effect of change in supply frequency on torque and speed, Torque/Speed curve, Shape of Torque/Speed curve, Relation between starting and full load torque.
2. Power output : Power stages in an Induction motor, Equation of shaft torque, Equation of gross torque, mechanical power & rotor output,
3. Starter and Speed Control induction motor: General principle, Double field revolving theory, Starting of Induction motor- (direct switching, primary resistors & star-delta starter), Making it self-starting (split phase & capacitor start), Equivalent circuit (with & without Cu loss), Speed control of Induction motors..

Section-B (Final Exam : 50 Marks)
Group-A (20-Marks)

4. Synchronous generator: Construction, rotor speed & frequency, EMF generation, excitation systems, equivalent circuit, loads factors affecting voltage regulation, maximum power output. Synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations, parallel operation: Necessary conditions, synchronizing,
5. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting, Circulating current and vector diagram.

Group-B (30-Marks)

6. Universal motor: Introduction, Type, Construction, Operation, Speed/Load characteristics, Applications, Reversal of rotation, Speed control. **Permanent Magnet DC motor:** Introduction, Construction, Operation, Properties of Permanent magnets, Types of permanent magnets used for motor, Performance, Speed control, Advantage, Disadvantage, Application, Elementary theory, Equation for Maximum power. **Brushless DC motor:** Introduction, Disadvantage of Brush, Advantage of BLDC, Disadvantage, Application, Comparison of conventional and brushless DC motor, Drive circuit:- (unipolar & bipolar).
7. Stepper motor: Introduction, Advantage, Step angle, Resolution, Speed, Application, Types: - (variable reluctance, permanent magnet, hybrid), Variable reluctance stepper motor: - (construction, full-step operation, 2-phase on mode, half-step operation).**Permanent Magnet Synchronous motors:** Introduction, Types of magnets used, Classification, Advantage, Application.
8. Synchros: Introduction, Types, Application: - (torque transmission, error detection), Control differential transmitter, Control differential receiver. **Linear motor and traction:** Introduction, Linear induction motor: - (construction, operation, types, disadvantage, application); Magnetic levitation.
.

Recommended Books:

1	B.L. Thereja & A.K.Thereja	: A text book of Electrical technology (Vol-II)-
2	Rosenblat & Friedman	: Direct & Alternating current Devices
3	Stephen J. Chapman	: Electric Machinery Fundamentals

Course Code: EEE 2402 **Course Title: Electrical Machines-II Sessional**
Credit Hours: 1.5 **Contact Hours:** 3 per Week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts develop in EEE 2303 and EEE 2401. In the second part, students will design simple systems using the principles learned in EEE 2303 and EEE 2401.

List of Experiment:

1. Testing of Single Phase Transformer equivalent Circuit : open & short circuit tests.
2. Testing of single phase transformer with no load .
3. Testing of single phase transformer with load.
4. Measurement of three phase transformer open circuit voltage and phase shift between primary and secondary line voltages
5. Connections of three phase transformer: Y- Y, Y- Y, Y- Δ , Δ – Δ
6. Characteristics of single phase induction motor: (i). No load and (ii)Load operating.
7. Characteristics of separately excited dc motors in regards to torque/speed.
8. Characteristics of shunt excited dc motors in regards to torque/speed.
9. Study of DC generator.
10. Operating characteristics of DC series motors.
11. Parallel operation of synchronous machines.
12. Measurement of rotor angle of a synchronous motor.

Course Code: EEE 2407 **Course Title: Digital Electronics**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2301 Electronics I]

Objectives: In this course student will learn about ' Digital Electronics' in regards to introduction to number systems, minimization of Boolean functions, implementation of basic static logic gates in CMOS and BiCMOS, power optimization of basic gates and combinational logic circuits, combinational logic with MSI and LSI, sequential Logic, counter design and register and memory unit.

Section A
(Mid-term Exam: 30 Marks)

1.Introduction to number systems : Binary, Octal, hexadecimal Numbers, Number Base Conversions, Complements, Binary Codes, Basic logic functions, Boolean Algebra, Canonical and standard forms, BCD numbers, Digital logic gates, Digital logic families (DTL,RTL,TTL,ECL,MOS)

2.Minimization of Boolean Functions*:* Forms of Boolean functions, Shannon's theorem, Minimization of Boolean functions using Karnaugh map, Quine Mclusky method, Iterative consensus method, Implementation of switching functions (Using various gates: NOR, NAND, AND - OR- INVERT).

3. Implementation of basic static logic gates in CMOS and BiCMOS: DC characteristics, noise margin and power dissipation; Combinational Logic: Design of combinational circuits (Adders, Subtractors, Code Conversion)

Section B (Final Exam: 50 Marks)
Group A (20 marks)

4. Power optimization of basic gates and combinational logic circuits: Modular combinational Circuit Design; pass transistor, pass gate, Half adder, Full adder, multiplexer, demultiplexer and their implementation in CMOS.

5. Combinational logic with MSI and LSI: Difference between combinational circuits and sequential circuits, Decoder, encoder, comparators, binary arithmetic elements and ALU design; Programmable logic devices: logic arrays, field programmable logic arrays and programmable read only memory.

Group B (30 Marks)

6. Sequential Logic: Difference between combinational circuits and sequential circuits, Types of sequential circuit, Flip-Flops (Basic flip-flop circuit, clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop), Triggering of Flip-flop, Analysis of clocked sequential circuits (state table, state diagram, state equations), state reduction, state assignment.

7.Counter Design: Types of counters, Design of synchronous and asynchronous counter, MOD number, Propagation delay in Ripple counter, ,Ring counter, The Johnson Counter, Asynchronous down counter, Digital clock.

8.*Register and Memory unit*: Basic shift register, Serial In/Serial out shift registers, Serial In/Parallel out shift register, Parallel In/Serial out shift register, Bidirectional shift register, Integrated circuit memory, Magnetic-core memory.

Recommended Books:

1	M. Morris Mano	Digital Logic and Computer Design
2	Md. Mozammel Huq Azad Khan	Digital Logic Design
3	Ronald J Tocci	Digital systems principle and application
4	Stephen Brown, Zvonko Vranesic.	Fundamentals of Digital Logic with Verilog Design, 2nd Edn
5.	V.K.Jain	Switching Theory and Digital Electronics
6.	S.C.Lee	Digital Circuits and Logic Design.

Course Code: EEE-2408 **Course Title: Digital Electronics Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts developed in EEE 2407. In the second part, students will design simple systems using the principles learned in EEE 2407.

List of Experiment:

1. Familiarization with necessary resources of Digital Electronics Sessional.
2. Familiarization with different Logic Gates and Implementation of basic logic gates by diodes, transistors and resistors.
3. Implementation of Boolean function by basic logic gates.
4. Universality test of NAND and NOR gates.
5. Implementation of a Half-adder and Full-adder.
6. Design of traffic control system by combinational logic
7. Familiarization with Seven segment display and BCD to seven segment decoder IC.
8. Implementation of multiplexer and de-multiplexer.
9. Implementation of multiplexer and de-multiplexer.
10. Familiarization with flip-flops.
11. Familiarization with counter circuit.
12. Implementation of Digital Clock.
13. Implementation of Shift Register

Course Code: EEE 2411 **Course Title: Electronics II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2301 Electronics I]

Objectives: In this course student will learn about 'Electronics' in regards to working principle, operational characteristics of operational amplifiers, oscillators, power amplifiers, feedback amplifiers, active filter , optoelectronic and microwave devices**.**

Section-A
(Mid-term Exam: 30 Marks)

1. **Operation Amplifier**: Introduction to operational amplifier, Input signal modes of Op-amp, CMRR, Op-amps with negative feedback, Inverting and Non inverting Amplifier. Frequency response of Op-amp, IC- Op-amp, Application of op-amp (Summing , Differentiator and Integrator)
2. **Negative Feedback**: Properties and topologies of Negative Feedback, Effect of feedback on impedance, Gain, bandwidth, distortion and stabilization.
3. **Power Amplifiers**: Classification of power amplifiers, Collector efficiency, Transformer coupled class A amplifier; Class-B push-pull amplifier, Class-C amplifier, Tuned amplifier, class D, E & S amplifier.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Oscillators**: Introduction to Oscillator, Positive feedback, Condition of Oscillator, Phase Shift Oscillator, The Wein-Bridge Oscillator, Resonant circuit Oscillators. Crystal Oscillator, VCO, Introduction to 555 Timer and its operation, Waveform generator
5. **Low Frequency Amplifier Response** : Amplifier Frequency Response, Effect of Coupling, Internal Capacitances in case of BJT amplifier, Miller's Theorem, Decibel, 0dB References, Bode Plot, The Critical Frequency, Low Frequency Amplifier Response,

Group-B (20-Marks)

6. **High Frequency Amplifier Response**: High Frequency Amplifier Response, Total Frequency Amplifier Response. Amplifier noises. Gain, Bandwidth, Distortion& Stabilization.
7. **Active Filters**: Explanation of Low, High, Band Pass and Band Stop Filter Response, Response Characteristics, Damping Factor, Critical Frequency and Roll-Off Rate, Single Pole Filter, Sallen-Key Low Pass and High Pass filter, Cascaded Filter, Multiple Feedback Band-Pass and Band Stop Filter, State Variable Band-Pass and Band Stop Filter,
8. **Optoelectronic Devices:** PN photodiode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic, Sensors, LED, LCD, Alphanumeric display, Photo couplers, Photodiode, LDR.

Recommended Books:

1	Basic Electronics and Devices	M.Cirovic
2	Electronics devices and Circuits	J.J.Milman and C.C.Halkias
3	Electronic Devices and Circuits	Allen Mottershead
4	Semiconductor Physics and Devices	4Donald A Neaman
5	Solid State Radio Electronics	Krauss
6	Communication Electronics	Louis Frenzel
7	Electronic Principles	Albert Paul Malvino
8	Electronic Devices	Thomas L Floyd
9	Operational Amplifier and Integrated Circuit	Couyhlin

Course Code: EEE 2412 **Course Title: Electronics II Sessional and Electronic Workshop**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts developed in EEE 2411. In the second part, students will design simple systems **using the principles learned in EEE 2411** and will do electronic workshop practices on preventive maintenance, circuit tracing, trouble-shooting fault repairing, soldering and de-soldering of electronic circuits, design of PCB layout, etching, fault finding & servicing: Radio & TV, CD/VCD player, Mobile phone, Computer, etc.

Recommended Books:

1	Keith Mobley, Lindley Higgins & Darrin Wikoff	Maintenance Engineering Handbook
2	Tim Williams	The Circuit Designer's Companion (2nd Ed.)
3	Marcus & Levy	Elements of Radio Servicing
4	Mark I. Montrose	A Handbook for Designers

Course Code: EEE-2413 Course Title: Instrumentation and Measurement
Credit Hour: 3 Contact Hours: 3 per week

Objectives: In this course students will learn about 'Instrumentation and measurement' in regards to instruments & its static and dynamic characteristics, amplifying, transmitting & recording elements, measuring instruments, measurement of electrical non-electrical quantities, acoustic instruments, grounding and cabling techniques.

Section– A
(Mid-Term Exam: 30 Marks)

1. Instruments & its static characteristics: Instrument systems, Functional elements, Classification of instrument, Standards & calibration, Performance parameters, Impedance loading & matching, Specifications of instruments, Selection of instruments.

2. Dynamic characteristics: Formulation of system equations, Dynamic response, Compensation, Transducer elements**,** Analog & digital transducers. Mechanical and Optical traducers.

3. Amplifying, transmitting & recording elements: Amplifying elements, Data transmission elements; indicating, recording, and displaying elements.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. Measuring Instruments: Spring-mass type seismic device, Elastic force device, Torsion dynamometer, Signal Generator, Oscilloscope, Flux meter, Electrometer, Gauss Meter,

5. Measurement of electrical quantities: Current and voltage, power and energy measurement.

Group-B (30 Marks)

6. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque.

7. Acoustic Instruments: Microphones, Loud speaker, Architectural elements, Measurement of reverberation time and its correction, Absorption of sound.

8.Grounding and Cabling Techniques: Noise, methods of noise coupling and eliminating interference, shielding of conductor, capacitive coupling, effect of shield on capacitive coupling, inductive coupling, magnetic coupling, shielding to prevent magnetic radiation, shielding a receiver against magnetic field, and grounding.

Recommended Books:

1	B.C.Nakra & K.K. Choudhury	Instrumentation Measurement and Analysis
2	A. K. Sawhney	Electrical and Elec. Measurement and Instruments
3	J. L. Hunter	Applied Acoustics
4	W. D. Cooper	Electronic Instrumentation & Measurement Technique
5	S. Wolf & R. M. Smith	Student Reference Manual
6	C. S. Rangan, G. R.Sarma, & V. S. Vmani	Instrumentation devices and systems.

Course Code: EEE 2415 Course Title: Transmission & Distribution of Electrical Power System
Credit Hours: 3 **Contact Hours:** 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]

Objectives: In this course student will learn about 'Electrical Power Systems' in regards to network representation, line represent, load flow analysis, fault analysis, unsymmetrical faults, distribution system, D.C. distribution and power flow control**.**

Section– A
(Mid-Term Exam: 30 Marks)

Transmission systems: Types of conductors, resistance, definition of inductance, inductance of conductor due to internal flux, flux linkages between two points external to an isolated conductor, inductance of a single phase two wire line.
Capacitance of transmission lines: Capacitance of a three-phase with equilateral spacing and unsymmetrical spacing, effect of earth on the capacitance of three-phase transmission lines, bundled conductors, parallel-circuit three-phase lines.
Current and voltage relations on a transmission line: Representation of lines, the short transmission line, the medium transmission line the long transmission line, solution of differential equation, interpretation of the equations, hyperbolic form of the equations, the equivalent circuit of a long line, direct current transmission.

Section– B
(Mid-Term Exam: 20 Marks)

General line equation in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks, measurement and advantages of generalized line constants.
Power circle diagram: Receiving and sending end power circle diagrams, transmitted maximum power, universal power circle diagrams, use of circle diagrams.
Voltage and power factor control in transmission systems: Tap changing transformer, induction regulators, moving coil regulators, booster transformer, power factor control, static condensers in series or parallel, synchronous condensers, Ferranti effect.

Section– C
(Mid-Term Exam: 30 Marks)

Insulate d cables: Cables versus overhead lines, insulating materials, electrostatic stress grading, three core cables, dielectric losses and heating, modern developments, oil-filled and gas-filled cables, measurement of capacitance, cable testing.
Insulator of overhead lines: Types of insulators, their constructions and performances, potential distribution, special types of insulators, testing of insulators.
Distribution: Distributor calculation, copper efficiencies, radial ring mains and inter connections.
Mechanical characteristics of transmission lines: Sag and stress analysis, ice and wind loading, supports at different elevations, conditions of erection, effect of temperature changes.

Recommended Books:

1	V.K. Mehta and Rohit Mehta	Principles of Power System
2	Ashfaq Husain(4^{th} Revised edition)	Electrical Power Systems
3	Hadi Saadat (edition-2002)	Power System Analysis
4	J.D. Glover and M.S. Sarma	Power System Analysis and Design",
5	A.R. Bergen and V.J. Vittal	Power System Analysis, Second Edn. N.Y
6	Willam D. Stevenson. Jr	Elements of power system analysis

Course Code: EEE 3501 **Course Title: Continuous Signals and Linear Systems**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-2401 Mathematics IV]

Objectives: In this course student will learn about 'Continuous Signals and Linear Systems' in regards to signals, systems and system representation, impulse response, harmonic representation, Fourier-transform, application of harmonic analysis and analogous systems.

Section-A (Mid-term Exam: 30 Marks)

1. **Signal**: Definitions -Signal, System, Size of signal, Signal Energy, Signal power. Classification of signals. Basic operations on signals. Elementary Signals.

2. **Systems:** Properties of system- Linearity, causality, time invariance, memory, stability, and invariability.
3. **System representation:** Differential Equations, Electrical and Mechanical System representation using Differential Equation, order of the system, Solution Techniques, Zero State and Zero Input Response.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Impulse response:** Convolution integral- determination of system properties; state variable - basic concept, state equation and time domain solution.
5. **Harmonic representation:** Fourier series- Trigonometric Fourier Series, Amplitude and Phase Spectrum, Symmetry Considerations, Exponential Fourier Series and Circuit Applications.

Group-B (30-Marks)

6. **Fourier transform:** Fourier Transform and Inverse Fourier Transform. Properties of Fourier Transform. Circuit Applications of Fourier Transform.
7. **Laplace Transform:** Laplace and Invers Laplace transform, Properties of Laplace Transform. Circuit Applications. Solution of system equations, system transfer function and frequency response.
8. **Applications:** System stability analysis using Laplace Transform, Amplitude Modulation and Demodulation, Time-division and Frequency-division Multiplexing.

Recommended Books:

1	Signals and Systems	Simon Haykin
2	Fundamentals of Electric Circuits	Alexander Sadiku
2	Signal processing and linear systems	B. P. Lathi
3	Analysis of Linear Systems	David Keun Cheng

Course Code: EEE 3502 Course Title: Continuous Signals and Linear Systems Sessional
Credit Hours: 1 Contact Hours: 2 per Week
[Pre requisite: MATH-2401 Mathematics IV]

Lab 1: Introduction to Matlab, Creating vectors**,** Operate with the vectors
Lab2: Flow control; Compare a script and a function
Lab 3: Basic Plotting of Signals: Plotting Continuous-Time Signals, Plotting Discrete-Time Signals, Plotting a Sampled-Signal
Lab 4: Convolution: Using conv Command
Lab 5 and 6: Fourier series**:** The Fourier Series of the Square Wave, Numerical Computation of Fourier series Coefficients, The Time-Shift Property
Lab 7 and 8: Defining a Transfer Function Object, Analyzing a Transfer Function, Transfer Function Manipulations, Systems with Feedback

Course Code: EEE 3503 **Course Title: Power Systems I**
Credit Hours: 3 **Contact Hours:** 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]

Objectives: In this course student will learn about 'Electrical Power Systems' in regards to network representation, line represent, load flow analysis, fault analysis, unsymmetrical faults, distribution system, D.C. distribution and power flow control**.**

Section –A
(Mid-term Exam: 30 Marks)

1. **Network representation:** Single line, reactance and impedance diagram of power system, Per unit calculation: Change of base, Selection of base values, Base quantities in terms of **kV** and **MVA**, per unit load impedance, Advantages of per unit representation.
2. **Line representation:** Short and Medium Lines: Classification of lines, Short single-phase line, Phasor, Short three-phase line, Transmission line as a two-port network, Effect of load on regulation and efficiency; Medium transmission line: Nominal T-model and Π-model of a medium line, Phasor diagram, Calculation of transmission efficiency and regulation of medium line; Long transmission line modeling; Important loading conditions of a long transmission lines, Ferranti Effect.
3. **Load flow analysis:** Bus admittance matrix, power flow equations; Method of load flow solution: Gauss- Siedel and Newton Raphson Methods.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Fault analysis:** Symmetrical Fault: Effect of faults, Sudden short circuit at the armature terminals of a three-phase generator, Current limiting factor; Symmetrical fault calculation method**s:** Fortescues's theorem, ∝-operator, symmetrical components of an unbalanced three-phase system, Component analysis, General nature of zero-sequence currents, Sequence networks for fault calculation.
5. **Analysis of unsymmetrical faults**: system representation, Sequence voltage at a fault point, ; single Line-to-Ground fault, Line-to-Line fault, double Line-to-Ground fault, Comparison of single Line-to –Ground and three-phase fault current.

Group-B (30 Marks)

6. Distribution system: Classification of distribution system, Connection schemes of distribution system, Requirements of a distribution System. A.C. Distribution: A.C. distribution calculations, Method of solving A.C. distribution problems,
7. **D.C. distribution:** Types of D.C. distributions, Distribution calculation: Distributor fed at one end, uniformly loaded at one end, Distributor fed at both ends, uniformly loaded at both ends, Distributor with both concentrated and uniform loading.
8. **Power flow control:** Excitation control, Tap changing transformer, Auto-transformer taps changing, phase shifting, Booster transformer, Induction regulators, shunt capacitor and synchronous condenser.

Recommended Books:

1	V.K. Mehta and Rohit Mehta	Principles of Power System
2	Ashfaq Husain(4^{th} Revised edition)	Electrical Power Systems
3	Hadi Saadat (edition-2002)	Power System Analysis
4	J.D. Glover and M.S. Sarma	Power System Analysis and Design",
5	A.R. Bergen and V.J. Vittal	Power System Analysis, Second Edn. N.Y

Course Code: EEE3505 **Course Title: Microprocessor and Interfacing**
Credit Hours: 3 **Contact Hours:** 3 per Week
[Pre requisite: EEE 2407 Digital Electronics]

Objectives: In this course student will learn about' Microprocessor and Interfacing' in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Section-A
(Mid-term Exam: 30 Marks)

1. Introduction to Microcomputer and Microprocessor: Microcomputer organization, different parts of microcomputer and operation, Microprocessor, Evaluation of Microprocessor, Generalized Microprocessors Architecture and operation, ALU, Register Array, Instruction execution, Bus operation, Memory array design and memory interfacing**.**
2. Introduction of 8086 Microprocessor: Detail Architecture of 8086, Addressing Modes, Assembler directives.
3. Instruction Sets: Data movement instructions, Arithmetic instructions.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. Instruction Sets: Logic Instructions and Program Control Instructions, Assembly Language Programming, system design and interrupt.
5. 8086 Hardware Specifications: Pin functions, clock generator (8284A) operation, Bus buffering and latching, Bus timing.

Group-B (30-Marks)

6. Intel 8086 Interfacing with 8255 PPI: Introduction to Programmable Peripheral Interface (8255), Architecture, Operation, Programming.
7. **Intel 8086 Interfacing with 8254 PIT**: Introduction to Programmable Interval Timer (8254), Architecture, Operation, Programming.
8. Intel 8086 Interfacing with 8259 PIC and Other ICs: Introduction to Programmable Interrupt Controller (8259), Analog to digital converter (ADC0804) interface, Keyboard and Display Interface (8279), Architecture, Operation, DMA.

Recommended Books:

1	Barry B. Brey	The Intel Microprocessors
2	Douglas V Hall	Microprocessor and Interfacing Programming and Hardware
3	Mohammed Rafiquzzaman	Microprocessors and Microcomputer-Based System Design
4	R. Gaonkar	Microprocessors Architecture, Programming and Applications
5	Myke Predka	Programming and customizing 8051 microcntroller

Course Code: EEE 3506 Course Title: Microprocessor and Interfacing Sessional
Credit Hours: 1.5 Contact Hours: 3 per Week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3505. In the second part, students will design simple systems using the principles learned in EEE 3505.

List of experiments:

1. Familiarization with MDA-8086 microprocessor kit and its operation in machine code mode.
2. Loading the machine codes of a sample program to MDA-8086 with execution and verification of the results.
3. Familiarization with serial monitor mode operation of MDA-8086 and verification of arithmetic operations.
4. Logic operations in assembly language.
5. Programing control instructions in assembly language.
6. Interrupt system of 8086 microprocessor.
7. Flashing an LED array by interfacing with PPI 8255A with 8086.
8. Displaying a 7 segment display.
9. Operation of Dot Matrix LED.
10. Interfacing A/D converter with 8086.
11. Basic of Microcontroller programming.

Course Code: EEE 3512 Course Title: Electrical Service Design
Credit Hours: 1.5 Contact Hours: 3 per Week
[Pre requisite: EEE 2301 Electronics I]

Objectives: In this course students will learn about domestic and industrial electrical services.

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

Experiment list:

1) Familiarization with different types of tools and their use.
2) Familiarization with different kinds of wire, wire joint
3) To learn about wire size estimation and calculation.
4) To learn about different types of installation of wiring system.
5) To learn about different types of lighting accessories.
6) To learn about different types of protective devices and their working principle.
7) To learn about electrical earthling and neutral wiring system.
8) Familiarization with the symbol of electrical wiring, fitting and fixture and conduit layout.
9) To learn about a system drawing and load calculation -1
10) To learn about a system drawing and load calculation -2
11) Final project drawing concepts and working schedule.

Course Code: EEE 3515 **Course Title: Electrical Properties of Materials**
Credit Hours:3 **Contact Hours:** 3 per Week
[Pre requisite: EEE 2301 Electronics I]

Objectives; **:** In this course student will learn about 'Electrical Properties of Materials' in regards to crystal structures, classical theory of electrical and thermal conduction, introduction to quantum mechanics, band theory, modern theory of metals, dielectric and magnetic properties of materials, introduction of superconductivity.

Section A
(Mid-term Exam: 30 Marks)

1. **Crystal Structures**: Types of Crystals, lattice and basis, Bravias lattice and Miller indices.
2. **Classical theory of electrical and thermal conduction**: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity.
3. **Introduction to Quantum mechanics**: Wave nature of electrons, Schrodinger equation, one dimentional quantum problems-infinite quantum well, potential step and potential barrier; Heisenberg's uncertainty principle and quantum box, Band theory of solids.

Section- B (Final Exam: 50 Marks)
Group A (20 marks)

4. **Band theory**: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density of states; carrier Statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy.
5. **Modern theory of metals**: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.

Group B (30 Marks)

6. **Dielectric properties of Materials**: Dielectric constant, polarization-electronic, ionic and oriental; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss and piezoelectricity.
7. **Magnetic Properties of Materials**: Magnetic moment, magnetization, relative permittivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.
8. **Introduction of superconductivity**: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

Recommended Books:

1	A.J. Dekker	Electrical Engineering Materials
2	S .O. Kasap	Electrical Engineering Materials

Course Code: EEE 3519 **Course Title: Power System Analysis**
Credit Hours: 3 **Contact Hours: 3 per wee**k
[Prerequisite course: EEE 3515 Power System I]

Objectives: In this course student will learn about 'Power system' in regards to underground transmission lines cables, power system stability, flexible ac transmission system, overhead transmission lines cables, series impedance of transmission lines, line parameters, factors affecting stability and power quality.

Section– A
(Mid-Term Exam: 30 Marks)

System modeling: Review of synchronous machine, the effect of synchronous machine excitation, per unit quantities, changing the base of per unit quantities, per unit impedance in single phase transformer and three phase transformer circuits, per unit impedance of three winding transformers, one-line diagram, impedance and reactance diagram, per unit and percentage method of calculations, advantages and disadvantages of per unit computations.
Network calculations: Node equation, matrix partitioning, node elimination by matrix algebra, bus admittance and impedance matrices, modification of an existing bus impedance matrix, direct determination of a bus impedance matrix.

Section– B
(Mid-Term Exam: 20 Marks)

Load flow solution and control: Classification of buses, specification of bus voltage-power etc, Gauss-Seidel method and Newton-Raphson method of load flow solutions, some principles of load flow control.
Symmetrical three phase faults: Short circuit currents and the reactance of synchronous machines, internal voltages of loaded machines under transient conditions, bus impedance matrix in fault calculations, bus impedance matrix equivalent network, percentage reactance and short-circuit MVA, reactor control of short-circuit currents and location of reactors and their advantages and disadvantages.
Symmetrical components: Symmetrical components of unsymmetrical phasors, sequence impedance and sequence networks, sequence network of unloaded generators, positive and negative sequence networks, zero-sequence networks.

Section– C
(Mid-Term Exam: 30 Marks)

Unsymmetrical faults: Unsymmetrical short-circuits on an unloaded generator, single line-to-ground fault, line-to-line fault, double line-to-ground fault, unsymmetrical faults of power systems, faults through impedance, unsymmetrical open circuits and series impedances.
Power system stability: The stability problem of power system, swing equation, power-angle equation, equal area criterion of stability.
Multi-machine stability studies: Classical representation, step-by-step solution of the swing curve, factors affecting stability, techniques for improving stability.

Recommended Books:

1	V.K. Metha and Rohit Metha	Principle of power system
2	Ashfaq Hussain	Electrical power systems
3	Willam D. Stevenson. Jr	Elements of power system analysis

Course Code: EEE 3520 **Course Title: Power System Analysis Sessional**
Credit Hours: 3 **Contact Hours: 3 per wee**k
[Prerequisite course: EEE 3515 Power System I]

Course Code: EEE 3601 **Course Title: Communication Theory**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 3621]

Objectives: In this course student will learn about 'Communication Theory' in regards to communication systems at a glance,noise,communication systems ,angle and pulse modulation, digital communication system,satellite communication,microwave link & radar

Section A
(Mid Term Exam: 30 Marks)

1. **Communication Systems at a glance**: Basic Principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, and bandwidth and transmission capacity.
2. **Noise:** Source, characteristics of various types of noise and signal to noise ratio, Measure of information, source encoding, error free communication over noisy channel, channel capacity of a continuous system and channel capacity of a discrete memory less system.
3. **Communication systems:** Transmission types-base-band transmission, carrier transmission, AM (information given by the amplitude of the signal), DSB-FC (Double side band - full carrier), Envelope detector DSB-SC (Double side band - suppressed carrier), SSB (single side band), VSB (vestigial side band), Quadrature modulation/multiplexing and reception by Costas loop, Super heterodyne receiver, Automatic Gain Control, spread spectrum, SS7 system. TV-transmitter & Receiver.

Section B (Final Exam: 50 Marks)
Group A (20 Marks)

4. **Angle modulation**: FM-Frequency modulation, PM – phase modulation, Bandwidth calculation (frequency components), 1% bandwidth, Carson's rule, spectral Analysis, Power in FM & PM signals, Demodulation of FM & PM- Phase locked loop, Time domain. Locked loop with loop gain and static phase error, Frequency domain. Transfer function, Frequency response Loop compensation, Second order loop.

5. **Pulse Modulation:** Sampling- sampling theorem, Nyquist criteria, aliasing, instantaneous and natural sampling,Pulse modulation systems, Base band pulse Transmission, Digital pass band transmission

Group B (30 Marks)

6. **Digital Communication System:** Digital modulation technique, PSK, FSK- continuous & discontinuous phase FSK, minimum shift keying., DPSK & QAM, Quadrature PSK, noise performance, M-array modulation techniques, spectrum of digital signals, Digital carriers system, Sources of error in digital communication systems, Error control coding, Nyquist sampling theorem, ISI, Eye diagram, Baseband coding (modulation), Delta Modulation (DM)-principle, adaptive DM.Quantization of analog system, Quantization of noise PAM, PWM, PPM, PCM, LOGPCM.

7. **Satellite Communication:** Introduction, Satellite construction, Orbits, Station keeping, Satellite altitude, Transmission path, Noise considerations, Satellite system, Effective isotropic radiated power, Multiplexing technique- TDM, FDM, CDM- principle, receiver synchronization, frame synchronization, Multiple Access System- TDMA, FDMA, CDMA- principle, benefits, Low orbit satellites for mobile communication, Earth station, Satellite link analysis.

8. **Microwave Link & Rader:** Microwave link and its advantage, Frequency assignment, Transmitting and receiving equipment , repeater , Microwave carrier supply, Basic principle, Radar equation and

range, Power used in Radar , Factors influencing maximum range, MTI & Pulse radar,Duplexer, SONAR

Recommended Books:

1	Wayne Tomasi,	: Modern Communication System
2	B.P. Lathi	: Modern Digital & Analog Communication systems
3	Basely & Miller,	: Modern Electronic Communication
4	Gorge Kennedy & Bernard Devis	: Electronic Communication Systems

Course Code: EEE 3602 Course Title: Communication Theory Sessional
Credit Hours: 1.5 **Contact Hours:** 3 per Week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3601. In the second part, students will design simple systems using the principles learned in EEE 3601.

1. Operation & characteristic study of RF oscillators along with designing, implementation
2. AM Modulation: principle of operation, frequency spectrum study, percentage of modulation calculation.
3. AM Demodulation: principle of operation, implementation of demodulator circuit-diode & product detector
4. FM Modulator: Operation & characteristics study of varactor diode & VCO, VCO controlled FM.
5. FM Demodulation: Basic operation of PLL, Demodulation of FM using PLL, Demodulation of FM signal using discriminator.
6. ASK Modulator & Demodulator: Principle of ASK modulation & demodulation
7. ASK Modulator & Demodulator: Principle of ASK modulation & demodulation
8. PWM Modulator & Demodulator: Principle of PWM modulation & demodulation

Course Code: EEE 3603 **Course Title Digital Signal Processing I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Prerequisite: EEE 3501- Continuous Signals and Linear Systems]

Objectives: In this course student will learn about ' Digital Signal Processing' in regards to introduction to digital signal processing (DSP), impulse response, solution of difference equation, Z-transform, discrete time harmonic analysis, discrete Fourier transform, digital and IIR filters.

Section-A (Mid-term Exam: 30 Marks)

1. **Discrete time signal and system**: signal representation, concept of filter, convolution, stability and causality, random signal

2. **Sampling of signal**: nyquist theorem, aliasing, D/A conversion, ideal sampling/reconstruction, real world system, discrete time decimation and interpolation**, Interpolation and decimation**: seen as a filter design problem, role of FIR filter

3. **DTFT:** Power density spectrum, relationship to Z transform, concept of bandwidth, frequency range of natural signal, properties of DTFT, the wiener-Khintchine theorem

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **The Z transform**: uses, definition, region of convergence, inverse z transform, linearity, shift, convolultion, multiplication, complex conjugation, parsevals relation Input output relationship: System function, pole and zeros, frequency response, filter example, state variables

5. **Discrete time network**: signal flow graph, cascade and parallel network, transpose network stability, linear phase, more filter example

Group-B (30-Marks)

6. **Discrete Fourier Transform**: definition, properties, zero padding, linear convolution, windows, **FFT algorithm:** decimation in time, real valued data, radix 4 FFT, prime factor algorithm,2 decimal DFT, fast convolution, convoluation of a long sequence, overlap and overlap save method

7. **IIR Filter**: mathematical structure, impulse invariance, bilinear transform, design by transform, butterworth, chebyshev, cauer design, recursive implementation, ladder and lattice structure

8. **FIR Filter**: mathematical structure ,filter design by pole zero placement,design by windowning,park_meclellan algorithm,frequency domain design,non recursive implementation Other application application in medical imaging,sppech processing,use of dsp in radar

Recommended Books:

1.	J. G. Proakis& D. G. Manolakis	Digital Signal Processing, 4th Edition
2.	Lawrence R. Rabiner& Bernard Gold	Theory and Application of Digital Signal Processing
3.	Alan V. Oppenheim & Ronald W. Schafer	Digital Signal Processing
4	Richard G. Lyons	Understanding Digital Signal Processing
	William D. Stanley	Digital Signal Processing

Course code: EEE 3604 **Course Title: Digital Signal Processing I Sessional**
Credit Hours: 1.5 **Contact Hours:** 3 per Week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3603. In the second part, students will design simple systems using the principles learned in EEE 3603.

SL. No.	Experiment No.	Experiment Name
1	1	MATLAB basic command for DSP
2	2- (based on Chapter- 1)	Generating Basic sequences in MATLAB
3	3- (based on Chapter-1& 2)	Basic Signal Manipulation
4	4- (based on Chapter-3)	Auto Correlation & Cross Correlation in MATLAB
5	5- (based on Chapter-4)	Z-transform and Inverse Z-transform Analysis
6	6- (based on Chpater-5)	Basic operation of Discrete Fourier Transform (DFT) using MATLAB
7	7- (based on Chapter-6 & 7)	Spectral Analysis using the FFT
8	8- (based on Chapter-8)	Basic Digital Filter Structure
9	9- (based on Chapter-9 & 10)	FIR Filter Design
10	10-(based on Chapter-9 & 10)	IIR Filter Design

Course Code: EEE 3609 **Course Title: Power System II**
Credit Hours:3 **Contact Hours: 3 per wee**k
[Prerequisite course: EEE 3503 Power System I]

Objectives: In this course student will learn about 'Power system' in regards to underground transmission lines cables, power system stability, flexible ac transmission system, overhead transmission lines cables, series impedance of transmission lines, line parameters, factors affecting stability and power quality.

Section-A
(Mid-term Exam: 30 Marks)

1. **Transmission lines cables(Underground**): Construction of cables, Insulating materials of cables, Classifications, Dielectric stress in a single core cable, Most economical conductor size in a cable, grading of cables, capacitance of 3 core cables, Measurement of C_e and C_c, current carrying capacity of UG cables, Types of faults, loop test for location of faults in UG cables

2. **Power System Stability**: Stability limits and power transmission capability, power angle curve, swing equation, M and H constants, equal area criterion stability, multimechine stability system.
3. **Flexible ac transmission system (FACTS**): Basic types of FACTS controllers, static synchoronous generator, SSSC, IPFC,UPFC, TCPST, IPC,TCVL.[2] High voltage DC transmission : advantages of HVDC transmission, economic distance for HVDC transmission, components of HVDC transmission system, limitation of HVDC transmission, application of HVDC transmission.[2]

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Transmission lines cables(Overhead Lines**): Main components, conductor materials, Line supports, Insulators, Types of Insulators, String efficiency, Method of improving string efficiency, Sag in overhead line, Calculation of sag. Corona, skin effect.[1]
5. **Series impedance of transmission lines**: Inductance of a conductor due to internal flux, flux linkage between two points, inductance of a single phase two wire line,flux linkage of one conductor in a group,inductance of composite conductor line, three phase lines with equilateral spacing, three phase lines with unsymmetrical spacing, bundle conductors.[3]

Group-B (30-Marks)

6. **Line parameters**: line capacitance, system conductor, capacitance of two wire line, capacitance of symmetrical three phase line, capacitance of unsymmetrical three phase transposed line, charging current, capacitance of a three phase single circuit untransposed line, effect of earth on line capacitance, effect of earth on line capacitance of single circuit three phase line with transposition.[2]
7. **Factors Affecting stability**: Methods of improving stability,Reactive power compensation,benefits of reactive power control, major types of VAR compansators, step-by-step solution of swing equation.[2][3]
8. **Power quality**: factors affecting power quality, sag and swell, harmonics, effect of harmonics, source of harmonics, mitigation techniques,over voltage, over voltage protection devices.

Recommended Books:

1	V.K. Metha and Rohit Metha	Principle of power system
2	Ashfaq Hussain	Electrical power systems
3	Willam D. Stevenson. Jr	Elements of power system analysis

Course Code: EEE 3607 **Course Title: Solid State Devices**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2403 Electronics II]

Objectives: In this course student will learn about 'Solid State Devices in regards to energy bands in solids, carrier transport processes and excess carrier, PN junction:, forward and reverse bias, bipolar junction and junction field effect transistor, metal –semiconductor, FET and MOS FET

Section-A

(Mid-term Exam: 30 Marks)

1. **Energy Bands in Solids and Carrier Concentrations**: Energy bands, Metals, Semiconductor and Insulators, Electrons and Holes, Effective mass, intrinsic and Extrinsic Semiconductors, The Fermi Level, Electron and Hole concentrations of Equilibrium.
2. **Carrier transport processes and excess carriers**: Conductivity and mobility, Drift and Resistance, The Hall-Effect, Diffusion processes, Diffusion and Drift Carriers, Built -in -field, Diffusion and Recombination, Einstein relations, The continuity and diffusion equations for holes and electrons.;.
3. **PN Junction: Fabrication of PN Junction**: The Contact Potential, Equilibrium Conditions, Equilibrium Fermi Level, Space charge at a junction, Carrier injection, minority and majority carrier currents, Reverse Bias, Zener and Avalanche Breakdown , Time variation of stored charge, Capacitance of PN Junction, Varactor Diode.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. Bipolar Junction Transistor: Basic Principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, Solution of the diffusion equation in the base, Terminal currents, The coupled diode model , Ebers-Moll equations, frequency limitation of transistors.

5. FET: Introduction, qualitative theory of operation, Pinch-off and Saturation, Gate Control, Current-Voltage Characteristics, The GaAs MESFET, HEMET, Energy band diagram of metal semiconductor junction, rectifying and ohmic contact, The Metal –Insulator –Semiconductor FET Basic Operation.

Group-B (30-Marks)

6. MOS FET: The Ideal MOS Capacitor, MOS Output and Transfer Characteristics, Short Channel I-V Characteristics, Threshold Voltage, Qualitative theory of MOSFET operation , Equivalent Circuit of a MOSFET. MOSFET Scaling and Hot Electron Effects.

7. Optical Devices: Optical Absorption, Solar cell- The PN junction solar cell, conversion efficiency and solar concentration, the hetrojunction solar cell, amorphous silicon solar cells, Light Emitting diode, materials for light LED, Laser diodes, Materials for laser diodes

8. Semiconductor Device Simulation: Tools: Introduction and operation of Matlab Device and AMPS-1D Simulation.

Experiment using Matlab:

I. Program to compute Number of atoms/cm3 in cubic crystals of silicon Atom
II. Program to plot f(E) versus Energy for different temperatures
III. Compute & plot Vbi as a function of doping (NA or ND)
IV. Program to generate an energy band diagram of a pn junction
V. Program to construct a plot of a square law relationship (IDsat/IDO versus VG/VP) of FET
VI. Program to construct a plot of the depletion width versus the impurity Concentration

Experiment Using AMPS-1D Simulation

I. Simulation of silicon solar cell
II. Simulation of hetaaro junction solar cell

Recommended Books:

1	Ban G Streetmen & Sanjay Banerjee	Solid State Electronic Devices
2	H.P. Myers. Physics	Introduction to Solid State Physics
3	Floyd	Electronic Devices
4	J. Millman & C.C Halkias	Electronic Devices and Circuit.

Course Code: EEE3617 **Course Title: Solid State Physics and Material Science**
Credit Hour: 3 **Contact Hour: 3 per week**

Objectives: In this course student will learn about'Solid State Physics and Material Science' in regards to band theory of solids, electrical conduction in metals, ferromagnetism and antiferromagnetism.

Section– A
(Mid-Term Exam: 30 Marks)

1. **Crystal Properties and Growth of Semiconductor**: Semiconductor materials, Crystal lattices- Periodic structures, Cubic lattices, Miller indices, Planes and directions, growth of single crystal, Wafer, doping.
2. **Classical theory of electrical and thermal conduction**: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity.
3. **Introduction to Quantum mechanics**: Wave nature of electrons, Schrodinger equation, one dimensional quantum problems-infinite quantum well, potential step and potential barrier; Heisenberg's uncertainty principle and quantum box, Band theory of solids.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Energy Bands in Solids and Carrier Concentrations**: Energy bands, Metals, Semiconductor and Insulators, Electrons and Holes, Effective mass, intrinsic and Extrinsic Semiconductors, The Fermi Level, Electron and Hole concentrations of Equilibrium..
5. **Carrier transport processes and excess carriers**: Conductivity and mobility, Drift and Resistance, Diffusion processes, Diffusion and Drift Carriers, Built -in -field, Diffusion and Recombination, Einstein relations, The continuity and diffusion equations for holes and electrons.

Group-B (30 Marks)

6. **PN Junction:**: The Contact Potential, Equilibrium Conditions, Equilibrium Fermi Level, Space charge at a junction, Carrier injection, minority and majority carrier currents, Reverse Bias, Zener and Avalanche Breakdown, Time variation of stored charge, Capacitance of PN Junction, Varactor Diode.
7. **Bipolar Junction Transistor**: Basic Principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, Solution of the diffusion equation in the base, Terminal currents, The coupled diode model , Ebers-Moll equations, frequency limitation of transistors.
8. **MOSFET**: MOS Output and Transfer Characteristics, Short Channel I-V Characteristics, Threshold Voltage, Qualitative theory of MOSFET operation , Equivalent Circuit of a MOSFET. MOSFET Scaling and Hot Electron Effects.

Recommended Books:

1	C. Kitte	Introduction to Solid State Physics
2	A. J. Dekker	Solid State Physics
3	V. Azarroff & J. J. Brophy	Electronic process in Materials
4	B. S. Saxena, R.C. Gupta and P. N. Saxena:	Fundamentals of Solid State Physics
5	Ali Omar	C. A. Wert and & R. M. Thomson
6	J. C. Anderson, K. D. Leaver,	Materials Science

Course Code: EEE 3621 **Course Title: Engineering Electromagnetism**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 1201 Electrical Circuits II]

Objectives: In this course student will get comprehensive idea about electromagnetism ,Maxwell equation, static electric fields, magneto statics, time varying electric fields, wave guide ,transmission line, behavior of materials in space

Section-A
(Mid-term Exam:30 Marks)

1. **Electrostatic Fields**: Gauss's Law- Maxwell's Equation, Application of Gauss's Law, Electric Potential, An Electric Dipole & Flux Lines, Energy Density in Electrostatic Fields.

2. **Electric Fields in Materials Space**: Polarization in Dielectrics, Dielectric Constant and strength, Linear & Isotropic and Homogeneous Dielectrics, Continuity Equation and Relaxation Time, Boundary Conditions.

3. **Electrostatic Boundary Value Problems**: Poisson's and Laplace's Equations, Uniqueness Theorem, General Procedures for solving Poisson's or Laplace's Equation, Method of Images.

Section-B (Final Exam:50 Marks)
Group-A (20-Marks)

4. **Field Equations**: Field equations based on laws of Coulomb, Ampere and Faraday; Displacement current, Maxwell's equations, Units and dimensions of field vectors, E-H symmetry, Lorenz's lemma, Scalar and vector potentials, Retarded potentials.
5. **Propagation of Electromagnetic Waves**: Wave equations, Plane Wave concept, Plane electromagnetic waves in Free space, Conducting, Dielectric and Ionized media, Poynting vector.

Group-B (30 Marks)

6. **Reflection and Refraction of Electromagnetic Waves:** Boundary conditions, The laws of reflection and Snell's law of refraction, Reflection from dielectrics and conductors, Fresnel's equations, The Brewster angle, Total reflection, Skin effect, Phase and group velocities.
7. **Propagation of Electromagnetic wave in the guided media:** Rectangular wave guides, TM and TEmodes, Wave Propagation in the Guide, Cut-off wave length of a rectangular waveguide, Relation between cut-off wavelength, guide wavelength and free space wavelength.
8. **Transmission Lines:** Transmission line equations and parameters, Input Impedance, Standing Wave Ratio, Smith Chart, Impedance matching, Distortion less line.

Recommended Books:

1.Matthew N.O.SADIKU	Elements of Electromagnetics
2.W.H Hayt & J.A.Buck	Engineering Electromagnetics
3.Cheng	Fields and Wave Electromagnetics
4.D.R. Corson and P.Lorain	Introduction to Electromagnetic Field & Waves
5.A.B. Brownell and R.E.Beam	Theory and Application of Microwave.

Course Code: EEE-4701 **Course Title: Control System I**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 3501Continuous Signals and Linear Systems]

Objectives: In this course student will learn about 'Control System' in regards to linear system models, system block diagrams and signal flow graphs, stability, time response, steady-state error, dynamic compensation, root locus analysis and design, frequency response analysis and design

Section-A
(Mid-term Exam: 30 Marks

1. **Linear System Models**: Introduction to control systems, Design process of feedback control system, Mathematical Models of Systems: transfer function and state-space models, conversion between transfer function and state-space models, Linearization.
2. **Block Diagrams and Signal Flow Graphs**: Block diagrams of systems block diagram reduction, signal flow graphs of systems, Mason's formula, Signal flow graphs of state equations. Effect of adding poles and zeros,
3. **Stability**: Bounded-input bounded-output (BIBO) stability, Routh-Hurwitz stability criterion, Stability in State Space

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Time Response**: Pole-zero plots, first and second order transient responses, higher order system approximation, Laplace transform and time domain solution of State equations.
5. **Steady-state Error**: Steady-state Error for feedback systems, System Type, Sensitivity, and Steady-stat Error for Systems in State Space.

Group-B (30-Marks)

6. **Dynamic Compensation**: Feedback compensation, lead-lag compensation.
7. **Root Locus Analysis and Design**: Definition of root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts the root locus method, rules for root locus plotting and construction of root locus, root locus design.
8. **Frequency Response Analysis and Design**: Frequency response, polar plots, Bode plots and Nyquist diagrams, stability criterion, gain and phase margins, compensator design in the frequency domain. Digital Control System

Recommended Books:

1	N.S. Nise	Control Systems Engineering, 4-th Edition, Wiley, 2004.
2	R.C. Dorf and R.H. Bishop	Modern Control Systems, 11-th Edition, Prentice-Hall, 2008
3	G.F. Franklin, J.D. Powell, and A. Emami-Naeini	Feedback Control of Dynamic Systems, 5-th Edition, Prentice-Hall, 2006.

MATLAB Software

MATLAB is a popular computation and visualization software package developed by the MathWorks, Inc. In this course, MATLAB will be used together with its Control System Toolbox. The best way to learn MATLAB in the control context is through the web-based Control Tutorials for MATLAB (*http://www.engin.umich.edu/class/ctms/*). The tutorials combine explanatory text with sample MATLAB commands and illustrative plots and graphics. The outline of the tutorials closely follows that of most undergraduate control textbooks, and should be a useful on-line tool for all control stream courses.

Course Code: EEE 4702 **Course Title: Control System I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4701. In the second part, students will design simple systems using the principles learn in EEE4701.

List of Experiment:
1. State space representation using MATLAB.
2. Introduction to Matlab simulink.
3. DC Motor position modeling in Simulink.
4. Study about PI, PD and PID controller.
5. DC Motor position modeling using PID controller.
6. Root locus design method for DC Motor speed control.
7. Study about the PIC Microcontroller.
8. Computer based practical control system for DC motor speed control.
9. Stepper motor control using PIC Microcontroller.
10. Introduction to Programmable Logic Controller (PLC).

Course Code: EEE 4722 **Course Title: Research Methodology & Seminar**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objective: The aim of the course is to teach students the systematic approach to doing any research and how to present the results obtained from it in a convincing way.

1. Introduction: Research motivation, research objective, contribution, methodology and research outlines
2. Literature Reviews: Element of research, reviewing of related works, choosing of methodology, comparative method, proposed method
3. Design of Research Methodology: Designing of proposed method
4. Concept of Measurement: Data Collection, data analyzing, compression and discussion
5. Discussion
6. Conclusion
7. Scientific Paper Writing: Abstract, introduction, materials and methods, results, discussion, table, figures, citations, references, format, conference paper, journal paper
8. Seminar and presentation

Reference Books:
1.Kothari, C.R. : Research Methodology, Methods and Techniques (Vishwa Prakashan, New Delhi, 1985)
2.Jerrold H. Zar : Biostatistical Analysis. Pearson education

Course Code: EEE-4860 Course Title: Project / Thesis
Credit Hours: **3**
Study of problems in the field of Electrical & Electronic & Engineering

C. Elective Courses

Course Code: EEE 4705 **Course Title: Power Electronics**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 2411 Electronics II]
Objectives: In this course student will learn about ' Power Electronics' in regards to power semiconductor switches and triggering devices, uncontrolled, single-phase controlled and three-phase controlled rectifiers, 2 DC-DC converters, pulse-width-modulated and resonant pulse inverters , AC voltage controllers**.**

Section-A
(Mid-term Exam: 30 Marks)

1. **Power Semiconductor Switches and Triggering Devices:** BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC
2. **Uncontrolled Rectifiers:** Single-Phase Half-Wave rectifier, Performance parameters, Single-Phase Full-Wave Rectifiers with R load and RL load, Three-Phase Full-Wave Rectifiers with R load and RL load.
3. **Single-Phase Controlled Rectifiers:** Thyristor Characteristics and Applications, Two Transistor model of Thyristor, Thyristor Turn-On and Turn-Off, Thyristor types. Phase Controlled Converter operation, Single-Phase Full Converters with R Load and RL load, Single-Phase Dual Converters and Semiconverters**.**

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Three-Phase Controlled Rectifiers:** Three-Phase Half-wave Converters, Three-Phase Full Converters with R load and RL load, Three-Phase Dual Converters and Semiconverters, Power Factor Improvements, Twelve-Pulse Converters.
5. **2 DC-DC Converters:** Generation of Duty Cycle, Step-Down Converter, Step-Up Converter, Converter Classification, Switching-Mode Regulators: Buck regulators, Boost Regulators. Buck-Boost Regulators, Cuk Regulators.

Group-B (30-Marks)

6. **Inverters**: Principle of Operation, Single-Phase Bridge Inverters, Three-Phase Inverters: 180-Degree Conduction, 120-Degree Conduction, Resonant Pulse Inverters : Series and Parallel Resonant Inverters,
7. **AC voltage Controllers**: Principle of On-Off Control, Principle of Phase Control, Single Phase Controllers with Resistive and Inductive load, Three-Phase Full-Wave Controllers, Three Phase Full-Wave Controllers, Three Phase Bidirectional Delta-Connected Controllers, Single-Phase and Three-Phase Cycloconverters.
8. **AC and DC Drives**: Basic characteristics of DC motors, Single phase drives, Three phase drives, Chopper drives, Induction Motor Drives, Synchronous motor drives.

Recommended Books:

Muhammad H. Rashid	Power Electronics, Circuits, Devices and Applications.(Third Edn.)

Course Code: EEE 4706 **Course Title: Power Electronics Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4705. In the second part, students will design simple systems using the principles learned in EEE 4705

Course Code: EEE 4711 Course Title: VLSI Design System
Credit Hours: 2 Contact Hours: 2 per week
[Prerequisite course: EEE 3607 Solid State Devices]

Objectives: In this course student will learn about VLSI design technique and modeling as well as CMOS circuit design, characteristics and applications.

Section A (Mid Term: 30 Marks)

1. Introduction: Integrated Circuits trends, choice of technology, design approaches, the design process, Mooer`s law, VLSI Design style, overviews of VLSI Design Tools.

2. Introduction to MOS Devices and Basic Circuits: MOS device structure, MOS device mode of operation(cut off, saturation, linear, accumulation, depletion), threshold voltage, body effect, NMOS I-V equations and characteristics, PMOSI-V equations and characteristics, Principle of inverter, NMOS Inverter with resister load, NMOS Inverter with NMOS Enhancement Transistor load, NMOS Inverter with NMOS Depletion Transistor load.

3.CMOS Inverter Design: The CMOS inverter, Transfer characteristics, noise merging, Resistance, capacitance, rise and fall times, delay, switching characteristics, gate transistor sizing and power consumption. [4 lecture]

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks

4. CMOS Fabrication: Introduction to Fabrication, Basic Fabrication Steps, Lithograpy, Diffusion and Ion Implementation, Epitaxy, Etching, Wafer cleaning, Metallization and Passivation, Steps for Fabricating a NMOS Transistor, n-Well CMOS Technology, p-Well CMOS Technology.

5. Design Rule: CMOS Process Layers, Intra-Layer Design Rules (λ), Inter-Layer Design Rules - Transistor Layout (λ), Inter-Layer Design Rules - Contact and Via (λ), Select Layer (λ), CMOS Inverter Layout.

Group B (30 Marks)

6. **MOS Logical Circuit Design:** Combinational and sequential logic, Random logic, Static and Dynamic logic gates, N-MOS Transistor series/ Parallel combination, P-MOS Transistor series/ Parallel combination, DC analysis (NAND, NOR, X-OR, X-NOR), Series Parallel Equivalent Circuits, Pass transistor and Transmission gates

7. Overview of Implementation Approaches: Full Custom and Semi-Custom Design, Cell based design, Array based design, Standard cells design, Programmable Logic Array, FPGA, Stick Diagram, Scaling, Effect of Scaling in Circuit Performance.

8. **Introduction of HDLs and VHDL:** HDLs applications, Range of use, VHDL - overview: VHDL - History, VHDL - Application Field, VHDL benefits, VHDL model components, VHDL architecture bodies, Structural description, Behavioral description.

Recommended Books:

1.	Design of VLSI System	Linda E.M Brackenbury
2.	Basic VLSI Design	Douglas A. Pucknell, Kamran Eshraghian
3.	Modern VLSI Design	Wayne Wolf
4.	Principles of CMOS VLSI Design	Weste&Eshraghian
5.	VHDL	Douglas Perry

Course Code: EEE 4712 Course Title: VLSI Design System Sessional
Credit Hours: 1 Contact Hours: 2 per week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4711. In the second part, students will design simple systems using the principles learned in EEE 4711.

Laboratory works based on EEE4711

Section A

Chapter 1 (1 Lecture**):** Introduction and installation of VLSI Software: Microwind, DSCH2, and ORACAD

Chapter 2 (1 Lecture**):** Simulation of I-V characteristic for nMOS and pMOS transistor

Chapter 3 (2 Lecture**):** Simulation and analysis of CMOS invertor with resistor, Enhancement, depletion and pMOS transistor load.

Section B

Chapter 4 1 Lecture**):** Introduction of Layout design rule: nMOS, pMOS,

Chapter 5 (1 Lecture**):** Layout design for the CMOS inverter

Section C

Chapter 6 (2 Lecture**):** Layout Design for CMOS AND, OR, XOR, NAND2, NOR2, XOR2

Chapter 7 (1 Lecture**):** Design the layout of a standard half adder and full simulation

Chapter 8 (2 Lecture**):** Design of the layout of 6-transistor static RAM and simulation**,** Design of the layout of 4-bit Manchester adder and simulation

Course Code: EEE-4707 Course Title: Power Plant Engineering
Credit Hours: 3 Contact Hours: 3 per week

Objectives: In this course student will learn about 'Power Plant Engineering' in regards basic principle of power plant, steam turbine power plant, gas turbine power plant, hydroelectric power plant, nuclear power plant, magneto hydro dynamic generator, power plant economics and economical problems.

Section-A
(Mid-term Exam: 30 Marks)

1. **Introduction:** Basic principle of power plant, Brief introductions of various Energy sources, present situation of power plants in Bangladesh. Steam Turbine Power Plant: Operating principle, Site selection, Advantages & disadvantages.
2. **Steam Turbine Power Plant:** Pulverized Coal, Main Accessories, Automatic boiler control, Boilers: Water tube and Fire tube boilers, Boiler furnace, Types of Condensers: Surface and Jet Condensers, Super Heater, Economiser, Water treatment Plant.
3. **Gas Turbine Power Plant:** Operating principle, Constituents of GTPP, Terms and definitions, Gas turbine cycles, Compressors, combined cycle gas turbine power plant, Advantages & disadvantages.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Hydro Electric Power Plant:** Operating principle, Constituents of HEPP, Site selection, Types of HEPP, Choice of water turbine, Water hammer & cavitations, Advantages and disadvantages.
5. **Nuclear Power Plant:** Basic idea of nuclear fission and chain reaction, Operating principle of NPP, Details of plant equipments, Fuel of NPP, Types of nuclear reactor, Uranium enrichment, Nuclear waste management, Site selection, Advantages and Disadvantages.

Group-B (30-Marks)

6. **Magneto Hydro Dynamic Generator:** Operating principle, Types of MHD generator, Advantages and disadvantages, Terms and definitions.
7. **Power Plant Economics:** Input-output curve, Heat rate curve, Incremental rate curve.Generation scheduling, Economic load sharing, Tariffs.
8. **Power Plant Instruments:** Classifications of Instruments for Power Plants, Measurement of Pressure, Temperature, Flow and Impurity Measuring Instruments.

Recommended Books:

1. G.R.Nagpal — Power Plant Engineering
2. V.K.Mehta & Rohit Mehta — Principles Of Power Systems
3. William A Vopat,Bernhardt G.A. Skrotzki. — Power Station Engineering & Economy

Course Coode: EEE-4801 **Course Title: Power System Protection**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3503 Power System I]

Objectives: In this course student will learn about 'Power System Protection' in regards to switchgear, fuse & relay, circuit breakers and breaker ratings; transformer, generator, motor, bus and transmission line protection; static, digital and numerical relay

Section-A
(Mid-term Exam:30 Marks)

1. Introduction to Switchgear: Purpose of power system protection, Introduction to Switchgear, circuit interruption and protection. Criteria for detecting faults and requirements of protective devices, Terminologies and general characteristics of relays and circuit breaker
2 Fuse & Relay: Fuse and its types, Relays: over-current, differential, directional, distance. Electromechanical relay.
3. Circuit breakers: control systems, Trip circuit, arc extinction methods, Types of circuit breaker, Different types of protective devices used in Switchgear.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. Circuit breaker ratings: circuit breaker ratings**,** recovery voltage, TRV, Switching in a capacitive circuit, Current chapping. Air, Oil, air blast, SF_6, vacuum and high voltage DC circuit breaker, Selection criteria, testing of circuit breakers.
5. Transformer protection: Different types of faults in Transformer, different types of protection scheme in transformer, Buocholz Relay etc. Integrated HV transmission line protection, Combined Transformer and Bus bar protection.

Group-B (30-Marks)

6. Generator and Motor protection: Introduction, Different types of faults in Generator and motor, different types of protection scheme.
7. **Bus and Transmission line protection**: Bus bar arrangement, Pilot-wire and carrier current protection, different types of Bus and Transmission line protection scheme, Over voltage protection, lightning and lightning arresters, Grounding
8. Static and digital/numerical relay : definition, features, Operation, application, Block diagram and types, Microcontroller and Microprocessor based protection.

Recommended Books

1.	V.K. Mehta	Principles of Power System
2.	J. Lewis Blackburn	Protective Relaying
3.	Sunil S. Rao	Switchgear and protection
4.	B. Ravindranath	Power system protection and Switchgear
5.	T. Davis	Protection of Industrial power systems

Course Code: EEE 4802 **Course Title: Power System Protection Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per two week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4871. In the second part, students will design simple systems using the principles learned in EEE 4801.

List of Experiment

1) Study of protection system using Fuse.
2) Study of protection system using MCB Circuit breaker.
3) Study of different types of circuit breaker.
4) Study of different types of Relay.
5) Introduction to Power world simulator.
6) Contingency analysis of a power system using Power World Simulator.
7) Design of a ten bus power system.
8) Contingency analysis of a ten bus power system using Power World Simulator.
9) Short circuit analysis of a ten power system using Power World Simulator and transmission cost minimization.
10) Differential protection of a transformer and generator.
11) Differential protection of a bus bar.
12) Visit to a substation and protection system of a Industry.

Course Code: EEE 4807 **Course Title: High Voltage Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3503 Power System I]
Objectives: In this course student will learn about 'High Voltage Engineering' in regards to high voltage generators, transformer, insulators, high voltage measuring, testing and switching.

Section –A
(Mid-term Exam: 30 Marks)

1. **High voltage dc**: Rectifier circuits, voltage multipliers, Van-de-Graaf and electrostatic generators.
2. **High voltage ac**: Cascaded transformers and Tesla coils.
3. **Impulse voltage**: Shapes, mathematical analysis, codes and standards,

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Single and multi-stage impulse generators**, tripping and control of impulse generators.
5. **Breakdown in gas**, liquid and solid dielectric materials.

Group-B (30 Marks)

6. **Corona;** High voltage measurements and testing.
7. **Insulation:** Over-voltage phenomenon and insulation coordination.
8. **Lightning** and switching surges, basic insulation level, surge diverters and arresters.

Course Code: EEE-4861 Course Title: Biomedical Engineering
Credit Hours: 3 Contact Hours: 3 per Week
[Pre requisite: EEE 2411 Electronics II]

Objectives: In this course student will learn about 'Biomedical and Analytical Instrument' in regards to human body, measurement of Bio-signals, blood flow measurement and operation and working principles of different types of biological instruments.

Section –A
(Mid-term Exam: 30 Marks)

1. **Human body system*:*** Introduction of Biomedical Engineering, The cell, Body fluid, Musculo-skeletal system, Respiratory system, Gastrointestinal system, Nervous system, **The circulatory system**: The body as a control system, The heart, Bioelectricity, Electro conduction system of heart, Heart problems.
2. **Biomedical Sensors:** Bio potential electrode, Gas sensor, Electro chemical sensor, photometric sensor, bio analytic sensors, biosensor, **Transducers:** Classification, characteristics, pressure transducer.
3. **Bioelectric amplifiers:** Operational amplifier, operational amplifier, basic amplifier configurations, multiple input circuits, differential amplifiers, signal processing circuit.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. **Bio-Signal:** Origin of Biomedical Signals, Classification of Biosignals, The nature of ENG, EMG, ECG, ERG, EEG, MEG Signal, Signal to Noise, measuring noise, analog signal, discrete signal, sort furrier transform(SFT),
5. **Bio-signal Processing**: Variable Time and Frequency Resolution, A Multiresolution Theory: Decomposition of Signals Using Orthogonal Wavelets, Further Developments of the Wavelet Transform, **Applications:** biomedical signal Enhancement, filtering, Segmentation and compression.

Group B. (30 Marks)

6. **Imaging System:** Principal, nature, operation, characteristic, components and visualization of X-ray, CT, Ultrasound, MRI, NMRI, PET and thermal imaging device.
7. **Analytical system:** Medical Diagnostic with chemical test, spectrophotometer, Automatic biochemical Analysis system, Blood gas analyzer, Blood cell counter, Blood pH,PCO2,pO2 Measurements, Blood gas monitoring, A complete blood gas analyzer, LC, HPLC, LC-MA/MS.
8. **Therapeutic system:** Cardiac pacemaker, Cardiac Defibrillator, Surgical diatherphy, Physiotherapy, Hemodialysis mechanics, Lithotripters, kidney dilatation, kidney transplant.

Recommended Books:

1	C. J. Casey	Biophysics concept and mechanism
2	Joseph J Carr & John M Brown	Introduction to Biomedical equipment technology
	Rangaraj M. Rangayyan	Biomedical Signal Analysis
3	R S Khandpur	Handbook of Biomedical Instrumentation

Course Coode: EEE-4805 **Course Title: Power System Operation and Control**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3503 Power System I]

Objectives: In this course student will learn about 'Power System Operation and Control' in regards to evaluation of small network, SCADA, power market, economic operation of power generation, control of voltage and frequency, conventional and competitive electricity market and Power system control.

Section-A
(Mid-term Exam:30 Marks)

1. **Principles of power system operation**: State evaluation of small network, Phasor diagram Method, summation of losses method, two port equation.
2. **State estimation**: Underlying assumption, solution method, SCADA,
3. **Power market**: conventional and competitive environment. Overview of power system operation

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. **Economic Operation**: Economic Load Dispatch (ELD) with the objective being cost minimization as well as environmental emission minimization.
5. **Unit Commitment** with the objective being cost minimization as well as environmental emission minimization.

Group-B (30-Marks)

6. **Overview of optimum power** flow and its application. Static security analysis, dynamic security analysis.
7. **Power system control:** Control of frequency, control of active power generation, spinning reserve.
8. **Automatic generation** control and control of reactive power and Voltage

Recommended Books:

1	Leonard L. Grigsby	Power System Stability and Control", CRC Press, 2007
2	Wood, B.F. Wollenberg	Power Generation Operation and Control", Second Edition, John Wiley and Sons, 1996
3	P. Kundur,	EPR! Power System Engineering Series, MacGraw-Hill Inc., 1994
4	J.D. Glover and M.S. Sarma	Power System Analysis and Design", Third Edition, Brooks/Cole, 2002
5	M. Shahidehpour, H. Yamin, Z. Li,	Market Operations in Electric Power Systems", John Wiley and Sons, 2002
6	Stuart A. Boyer	"SCADA: Supervisory Control and Data Acquisition"

Course Code: EEE-4827 Course Title: Instrumentation and Measurement
Credit Hours: 3 Contact Hours: 3 per week

Objectives: In this course students will learn about 'Instrumentation and measurement' in regards to instruments & its static and dynamic characteristics, amplifying, transmitting & recording elements, measuring instruments, measurement of electrical non-electrical quantities, acoustic instruments, grounding and cabling techniques.

Section– A
(Mid-Term Exam: 30 Marks)

1. Instruments & its static characteristics: Instrument systems, Functional elements, Classification of instrument, Standards & calibration, Performance parameters, Impedance loading & matching, Specifications of instruments, Selection of instruments.

2. Dynamic characteristics: Formulation of system equations, Dynamic response, Compensation, Transducer elements**,** Analog & digital transducers. Mechanical and Optical traducers.

3. Amplifying, transmitting & recording elements: Amplifying elements, Data transmission elements; indicating, recording, and displaying elements.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. Measuring Instruments: Spring-mass type seismic device, Elastic force device, Torsion dynamometer, Signal Generator, Oscilloscope, Flux meter, Electrometer, Gauss Meter,

5. Measurement of electrical quantities: Current and voltage, power and energy measurement.

Group-B (30 Marks)

6. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque..

7. Acoustic Instruments: Microphones, Loud speaker, Architectural elements, Measurement of reverberation time and its correction, Absorption of sound.

8.Grounding and Cabling Techniques: Noise, methods of noise coupling and eliminating interference, shielding of conductor, capacitive coupling, effect of shield on capacitive coupling, inductive coupling, magnetic coupling, shielding to prevent magnetic radiation, shielding a receiver against magnetic field, and grounding.

Recommended Books:

1	B.C.Nakra & K.K. Choudhury	Instrumentation Measurement and Analysis
2	A. K. Sawhney	Electrical and Elec. Measurement and Instruments
3	J. L. Hunter	Applied Acoustics
4	W. D. Cooper	Electronic Instrumentation & Measurement Technique
5	S. Wolf & R. M. Smith	Student Reference Manual
6	C. S. Rangan, G. R.Sarma, & V. S. Vmani	Instrumentation devices and systems.

Course Code: EEE-4828 Course Title: Instrumentation and Measurement Sessional
Credit Hours: 3 Contact Hours: 3 per week

Course Code: EEE 4843 Course Title: Renewable Energy System
Credit Hours: 3 Contact Hours: 3 per week

Objectives: In this course student will learn about ' Renewable Energy System' in regards to solar constants, solar collectors and their characteristics, solar cells, wind energy and other non-conventional energy**.**

Section- A
(Mid-term: Marks 30)

1. Introduction: - World energy, requirements and reserve; Source of non-Conventional energy, solar energy conversion systems. Topics include environmental benefits of solar energy,

2. Solar constant: Solar geometry, Azimuth, Declination, Day length, solar radiation, Measurement of Solar radiation. Solar thermal systems, concentration solar power,

3. Solar collectors: Flat plate collectors; collector efficiency factor; heat removal factor and flow rate factor.

Section –B
(Final Examinaton-50 Marks)
Group-A (20 marks)

4. Radiation characteristics and energy storage: Absorption, transmittance, reflectance, selective surfaces. Types of energy storage, sensible heat storage, latent heat storage.

5. Solar Cells: Characteristics of a solar cell, Optimization of cell design, MIS Solar cells, Amorphous silicon-material properties, hybrid photovoltaic/thermal systems, energy storage, and urban/rural applications.

Group -B (30 marks)

6. Wind Power: Introduction to wind turbine systems including wind energy potential and application to power generation. Topics include wind energy principles, wind site assessment, wind turbine components, power generation machinery, control systems, connection to the electric grid, and maintenance

7. Renewable Energy Penetration on the Power Grid - Introduction to the basic definitions of electrical power, interfacing primary sources, generator/load characteristics, and renewable energy resources. Topics include solar energy grid interfacing, wind energy grid interfacing, battery charging/management, harmonic distortion, voltage sags, and national standards.

8. **Other non-conventional energy**: Biomass, source of biomass, water power, tidal power.

Books Recommended:

1.	G. D. Rai	Solar energy utilization
2	G. D. Rai	Non-conventional source of energy
3	D. Rapp	Solar energy
4	J. A. Duffiee	Solar engineering of thermal process
5	M. A. Green	Solar Cell
6	Magal	Solar Power Engineering
7	Neville	Solar energy conversion: Solar cell
8	Andersion	Fundamental of Solar energy conversion
9	Godfrey Boyle	Renewable energy
10	David Craddock	Renewable energy made easy: free energy from solar, wind,
11	Dan Chiras	Dan Chiras The Homeowner's Guide to Renewable Energy: Achieving Energy Independence Through Solar, Wind, Biomass, and Hydropower

Course Code: EEE 4844 **Course Title: Renewable Energy System Sessional**
Credit Hours: 3 **Contact Hours: 3 per week**

Course Code: EEE-4845 **Course Title: Embedded system**
Credit Hours: 3 **Contact Hours:** 3 per Week

Course Code: EEE-4846 **Course Title: Embedded system sessional**
Credit Hours: 1.5 **Contact Hours:** 3 per Week

List of experiments:

1. Familiarization with necessary resources of embedded system laboratory.
2. Digital write and read operation (I/O operation) by microcontroller.
3. Interfacing DC motor and Electromagnetic Relay with Microcontroller.
4. Interfacing microcontroller with matrix keypad and 7-segment display.
5. Interfacing microcontroller with LCD display.
6. Analog to digital conversion by microcontroller.
7. PWM signal generation by CCP modules embedded with microcontroller.
8. Operation of timer/counter and designing a digital clock.
9. Serial data transmission by microcontroller.
10. Familiarization with FPGA.
11. Implementing a 4-bit counter in FPGA and interfacing with 7-segment display.

Power Engineering

Course Coode: EEE 4803 **Course Title: Power System Reliability**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3503 Power System I]

Objectives: In this course student will learn about 'Power System Reliability' in regards to reliability concepts, Markov process, probabilistic generation and load models, reliability indices, reliability evaluation techniques of single area system.

Section-A
(Mid-term Exam: 30 Marks)

1. Basic Probability Theory:
2. Probability Distribution: Binomial, Poison and Normal
3. Reliability Concepts: Failure rate, outage, mean time to failure, series and parallel systems and redundancy.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. Markov Process: Discrete Markov chains, Continuous Markov processes.
5. Probabilistic generation and load models:

Group-B (30-Marks)

6. Reliability indices: Loss of load probability
7. Reliability indices: Loss of Energy probability and Frequency and duration Method
8. Reliability evaluation techniques of single area system:

Recommended Books:

1	Roy Billinton and Ronald N Allan	*Reliability Evaluation of Engineering Systems*
2	Roy Billinton and Ronald N Allan	*Reliability Evaluation of power Systems*

Electronics Engineering

Course Code: EEE 3611 **Course Title: Analog IC Design**
Credit Hours: 2 **Contact Hours:** 2 per week
[Prerequisite course: EEE 2403 Electronics II]

Objectives: In this course student will learn about 'Analog CMOS Integrated Circuits' in regards to analog IC , MOS device model, single stage amplifiers , differential and feedback amplifiers , noises and current mirror.

Section-A
(Mid-term Exam: 30 Marks)

1. Introduction to Analog IC: Why analog, CMOS and Integration? Design flow of analog IC Design, application, challenges, future of Analog IC design.
2. General Consideration: Type of Transistor, MOSFET as a switch, MOSFET structure, MOSFET symbol, MOS I/V Characteristics : Threshold voltage, Derivation of I/V characteristics, Second order effect
3. MOS Device Model:MOS Device layout, MOS Device Capacitance, MOS small signal Model, MOS SPICE model, NMOS vs PMOS Device, Long Channel vs short channel devices

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. Single stage amplifiers: Basic concept, Common source stage, Source follower, Common gate stage
5. Cascode stage: Cascode stage, Folded cascode, choice of device model

Group-B (30-Marks)

6. Differential amplifiers: Basic differential amplifiers, basic differential pair, common mode response, Differential pair with CMOS load
7. Current mirror: Basic Current mirror, Cascade mirror
8. Active current mirror-: large signal analysis, small signal analysis, common mode properties

Recommended Books:

1	Behzad Razavi	Design of Analog CMOS Integrated Circuits, Mc Graw Hill
2	P.E Hellen, D.R Holberg	CMOS Analog Circuits Design, Oxford University Press
3	R. Bakar, H. Li. D. Boyce	IEEE Press

Course Code: EEE 3612 **Course Title: Analog IC Design Sessional**
Credit Hours:1 **Contact Hours:** 2 per week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE3515. In the second part, students will design simple systems using the principles learned in EEE 3515.

List of Experiments:

1. Analyse and design of I/V characteristics of nMOS transistor
2. Analyse and design of I/V characteristics of pMOS transistor
3. Analysis and design of subrhreshold characteristics of nMOS transistor
4. Analyse and design of Source follower.
5. Analyse and design of current mirror.
6. Project

Course Code: EEE 4709 **Course Title: Digital IC Design**
Credit Hours:3 **Contact Hours: 3 per Week**

Objectives: In this course students will learn about '**Digital Integrated circuit'** in regards to the characteristic and operation of bipolar and MOS switching circuits. Low power high-performance design, techniques layout techniques for complex gates.

Section-A (Mid-term Exam: 30 Marks)

1. **Switching Characteristics of a Transistor**: Diodes-stored charge, turn off transient, storage time, wave-forms, turn-on transient associated with a transistor.

2. **Transistors - charge control parameters**, estimation of turn-off and turn-on delay times.

3. **Operation of Bipolar and MOS Switching Circuits**: Transistor gated, inverters, NAND, NOR and OR gates and compatibility requirements, binary circuits bistable, monostable, astable, Schmitt trigger (BJT & MOS).

Section B. (Final Examination 50 Marks)
Group-A (20 Marks)

4. **Digital Integrated Circuits and Advanced Digital Logic Gates**: TTL, ECL, MOS including CMOS and BiCMOS integrated logic circuits. Interfacing of logic gates.

5. **Low Power High-Performance Design Techniques**: Low-voltage design approach, multi-VDD multi Vth approach, clock gating, etc. Low-power and high-performance design issues & trade-offs.

Group-B(30 Marks)

6. **Analyzing power consumption in CMOS chi**p. Design techniques for low-power high-performance circuits.
7. **Circuit Layout Techniques**-Layout Design Rules: Creating a manufacturable layout. Layer representation, Intralayer Constraints, Interlayer Constraints (transistor, contact, via, well contact, substrate contact).

8. **Layout Techniques for Complex Gates**: Weinberger and standard-cell layout techniques. Power Distribution Network, Parasitics (Sidewall Capacitance, parasitic capacitance, etc.) finger transistors, guard ring, signal shielding, mixing analog and digital building blocks on one chip.etc.

Recommended Books:

1	Jan M. Rabaey	Digital Integrated Circuits: A Design Perspective, Prentice Hall

Course Code: EEE 4710 **Course Title: Digital IC Design Sessional**
Credit Hours: 1 **Contact Hours:** 2 per week

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3611. In the second part, students will design simple systems using the principles learned in EEE 3611

Course Code: EEE 3621 **Course Title: Analog CMOS Integrated Circuit II**
Credit Hours: 2 **Contact Hours:** 2 per Week
[Prerequisite Course: EEE3515Analog CMOS Integrated Circuit **I**]

Objectives: In this course students will learn about 'Digital Integrated circuit' in regards to the frequency response, noise, feedback topologies, operational amplifiers in the analog integrated circuit using CMOS technology.

Section-A
(Mid-term Exam: 30 Marks)

2. **Frequency response**: Frequency response of amplifiers, miller effect, poles with nodes, Common source stage, Source follower, Common gate stage, Cascade stage: Cascade stage
3. **Noise:** Characteristics of noise, type of noise, Representation of Noise in Circuits, Noise in Single-stage amplifier, noise in different pairs, noise bandwidth
4. **Feedback**: Feedback topologies- voltage-voltage, current-voltage,voltage-current, current-current, Effect of loading.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

5. **Operational Amplifier**: one stage operational amplifier, two stage Op Amps, gain boosting, Noise in Op Amps.
6. **Stability and frequency compensation**: Multipole systems, phase Margine, Frequency compensation
7. **Band-gap references:** Supply voltage independent biasing, temperature independent biasing, proportional to absolute temperature current generation and constant transconductance biasing.

Group-B (30-Marks)

8. **Switch capacitor circuits**: Sampling switches, switched capacitor circuits including unity gain buffer, amplifier and integrator.
9. **Short channel effect and device model**: scaling theory, Threshold variation, MOS Device Model: Level- 1,2,3 and other, Charge and capacitance modeling

Recommended Books:

1	Behzad razavi	Design of Analog CMOS Integrated Circuits
2	P.E Hellen, D.R Holberg	CMOS Analog Circuits Design
3	R. Bakar, H. Li. D. Boyce	CMOS Circuit Design, Layout and Simulation

Course Code: EEE 4713 Course Code: Compound Semiconductor and Hetero-junction Devices
Credit Hours: 3 Contact Hours: 3 per week
[Prerequisite course: EEE 2403 Electronics II]

Objectives: In this course student will learn about 'Compound Semiconductor and hetro-junction devices' in regards to the structure of compound semiconductors and characteristics of hetero-junction dvices and their preparation.

Section A (Mid Term: 30 Marks)

1. **Compound semiconductor**: Zinc-blend crystal structures, growth techniques, alloys, band gap, and density of carriers in intrinsic and doped compound semiconductors.
2. **Hetero-Junctions**: Band alignment, band offset, Anderson's rule,
3. **Single and double sided hetero- junctions**,

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Quantum wells and quantization effects**, lattice mismatch and strain and common hetero-structure material systems.
5. **Hetero-junction diode:** Band banding, carrier transport and I-V characteristics.

Group B (30 Marks)

6. **Hetero-junction field effect transistor**: Structure and principle, band structure, carrier transport and I-V
characteristics.
7. **Hetero-structure bipolar transistor (HBT**): Structure and operating principle, quasi-static analysis,
8. **Different Models**: Extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT.

Recommended Books:

1	Donald A. Neamen	Semiconductor Physics and Devices, 3rd Ed., McGraw Hill
2	M.N. Horenstein	Solid State Electronic Device, 3rd Ed., McGraw Hill
3	S. M. Sze	Semiconductor Devices Physics and Technology, John Wiley & Sons

Course Code: EEE-4811 **Course Title: Optoelectronics**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 2403 Electronics II]

Objectives: In this course student will learn about '**Optoelectronics' in regards to** optical properties in semiconductor, LED, Laser, Photo-detectors and solar cells.

Section A (Mid Term: 30 Marks)

1. Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, and minority carrier lifetime, luminescence and quantum efficiency in radiation.
2. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation.
3. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers.

Section B (Final Examinaton-50 Marks)

Group-A (20 Marks)

4. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, and absorption of radiation, optical feedback and threshold conditions.
5. 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.

Group-B (30 Marks)

6. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors.
7. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells.
8. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

Recommended Books:

1	O.Kasap	Optoelectronics and Photonics, Prentice Hall
2	M. A. Parker	Physics of Optoelectronics, CRC, 2005
3	E. Rosencher, B. Vinter, and P. G. Piva	Optoelectronics, Cambridge University Press
4	G. Cardinale	Optoelectronics: Introductory Theory & Experiments, Delmar Cengage Learning

Course Code: EEE 4813 **Course Title: Semiconductor Device Theory**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3607 Solid State Devices]

Objectives: In this course student will learn about 'Semiconductor Device Theory' in regards to band theory of solid, energy bands, lattice vibrations, band structure of semiconductor, scattering theory**.**

Section A (Mid Term: 30 Marks)

1. Band Theory of Solid: Bloch Theorem, Kronig Penny model, Brillouin zones, Fermi energy, Fermi surfaces,
de Haas-Van Alphen effect,
2. Energy bands: Formation energy bands, Density of states, Origin of band gaps, Application of zone theory.
3. Lattice Vibrations: Vibrations of Lattices, Organization of lattice vibrations, acoustic and optical phonons, phonon momentum, lattice heat capacity, thermal expansion and thermal conductivity.

Section B (Final Examinaton-50 Marks)

Group-A (20 Marks)

4. Band structure of semiconductor: Isotropic and anisotropic crystals, band diagrams and effective masses of different semiconductors and alloys.
5. Scattering theory: Review of classical theory, Fermi-Golden rule, scattering rates of different processes, and scattering mechanisms in different semiconductors, mobility.

Group-B (30 Marks)

6. Different carrier transport models: Drift-diffusion theory, ambipolar transport, hydrodynamic model, Boltzman transport equations, quantum mechanical model, and simple applications.
7. **Charge transfer devices**: Dynamic effects in MOS capacitors,, the basic CCD and Application of CCD's.
8. **IC Testing, Bonding and Packaging**: Testing, Wire bonding, Flip-Chip Techniques and Packging.

Recommended Books:

1	Donald A. Neamen	Semiconductor Physics and Devices, 3rd Ed., McGraw Hill
2.	M.N. Horenstein	Solid State Electronic Device, 5th Edition, Prentice Hall
3,	S. M. Sze	Semiconductor Devices Physics and Technology, John Wiley & Sons
4.	B. G. Streetmen &S.Kumer Banerjee.	Solid State Electronic Devices.

Communication Engineering

Course Code: EEE-3615 **Course Title: Random Signals and Processes**
Credit Hours: 3 **Contact Hours: 3 per week**

[Prerequisite course: EEE 3501 Continuous Signals & Linear Systems]

Objectives: In this course student will learn about 'Random Signals and Processes' in regards to probability, expectation, joint distribution and density, process measurements, spectral estimation and mean-square error estimation.

Section- A
(Mid-term: Marks 30)

Probability: Random variables. Distribution and density functions and conditional probability. **Expectation**: Moments and characteristic functions. Transformation of a random variable.
Vector random variables.

Section- B (Final Exam. Marks 50)
Group-A (20 Marks.)

Joint distribution and density. Independence. Sums of random variables. Random Processes. Correlation functions.
Process measurements. Gaussian and Poisson random processes. Noise models. Stationary and Periodicity.

Group-(Marks-3o

Spectral Estimation. Correlation and power spectrum. Cross-spectral densities.
Response of linear systems to random inputs. Introduction to discrete time processes,
Mean-square error estimation, Detection and linear filtering.

Course Code: EEE-3621 **Course Title: Digital Signal Processing II**
Credit Hours:3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3603 Digital Signal Processing I]

Objectives : In this course student will learn about Digital Signal Processing in regards to spectral estimation, periodogram, adaptive signal processing, IR filters, multirate DSP and wavelets**.**

Section- A
(Mid-term: Marks 30)

1. **Spectral estimation**: Nonparametric methods – discrete random processes, autocorrelation sequence,

2. **Periodogram**; parametric method – autoregressive modeling, forward/backward linear prediction,

3. **Algorithm**: Levinson-Durbin algorithm, minimum variance method and Eigen-structure method I and II.

Section –B (Final Examinaton-50 Marks)
Group-A (20 marks)

4. **Adaptive signal processing**: Application, equalization, interference suppression, noise cancellation,

5.**Filters**: IR filters, minimum mean-square error criterion, least mean-square algorithm and recursive least square algorithm.

Group-B (30 marks)

6.**Multirate DSP:** Interpolation and decimation, poly-phase representation and multistage implementation.

7. **Perfect reconstruction filter banks**: Power symmetric, alias-free multi-channel and tree structured filter banks.
8. **Wavelets**: Short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

Recommended Books:

1	Alan V. Oppenheim, Ronald W. Schafer	Digital Signal Processing.
2	Rabiner and Gold. A	Theory and Application of Digital Signal Processing
3	William D. Stanley	Digital Signal Processing –
4	J. G. Proakis and D. G. Manolakis.	Digital Signal Processing: Principles, Algorithms, and Applications
5	Richard G. Lyons.	Understanding Digital Signal Processing

Course Code: EEE-3622 **Course Title: Digital Signal Processing II**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3603 Digital Signal Processing I]

Course Code: EEE 4723 **Course Title: Microwave Engineering**
Credit Hours:3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3601 Communication Theory]

Objectives: In this course the student will learn about '**Microwave Engineering' in regards to** generation and. transmission of microwave energy and microwave devices.

Section- A
(Mid-term: Marks 30)

1. **Transmission Lines*:*** Transmission line equations and parameters; Transmission line configuration and formulae, Transmission line at radio and audio frequency,

2. **Impedance matching**: Line termination, Smith chart, S. W. R. Q and band width, Balanced and unbalanced feeder from transmitter to antenna, Distortion less line.

3. **Wave Guides:** Rectangular and cylindrical wave guides, Cavity resonators, Microstrip lines and their characteristics,

Section –B (Final Examinaton-50 Marks)
Group-A (20 marks)

4. **Microwave Components:** Microwave hybrid circuits, scattering parameters, Wave guide Tees, Directional couplers, Circulators and Isolators, Phase shifter and attenuator,

5. **Solid state microwave devices**. Gunn diode, IMPATT Diode, TRAPATI Diode,

Group-B (30 marks)

6. **Microwave Tubes:** Klystron, Magnetron, TWT.

7. **Microwave Antenna:** Hertzian and half wave dipoles. Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

8. **Microwave Link:** Microwave link and its advantage, Frequency assignment and modulation methods, Transmitting and receiving equipment, Base band repeater, IF repeater, Microwave carrier supply, Auxiliary channels

Recommended Books:

1	D. Raddy & Coolen	Electrical Communication
2	J. D .Ryder	Networks, Lines and Fields
3	Bronwell and Beam	Theory and Application for Microwave
4	J.B.Kraus	Antennas
5	J Reich	Microwave Principle
6	Y. Liao	Microwave Devices and Circuits Devices

Course Code: EEE 4724 **Course Title: Microwave Engineering Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4723. In the second part, students will design simple systems using the principles learned in EEE 4723.

Course Title: EEE 4725 **Course Title: Optical Fiber Communication**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3601 Communication Theory]

Objectives: In this course student will lean about 'Optical fiber Communication' in regards to characteristics optical fiber, light sources and detectors for optical communication, noises, receiver analysis , optical amplifier and multi-channel optical system.

Section- A
(Mid-term: Marks 30)

1. **Introduction**: Principle of light transmission in a fiber, propagation of light in an optical fiber, ray model and wave model.

2. **Optical fiber**: Types and characteristics, transmission characteristics, fiber joints and fiber couplers.

3. **Losses in fibers,** Dispersion, Power and rise time budget, SNR and BER calculations,

Section –B (Final Examinaton-50 Marks)
Group-A (20 marks)

4. **Light sources and detectors**: Light emitting diodes and laser diodes. PIN photo-detector and avalanche photo-detectors, Photo detector connector and splices.

5. **Coherent optical communication**: Introduction, WDM systems, Devices for coherent optical communication , Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises,

6. **Receiver analysis**: Direct detection and coherent detection, noise and limitations.

Group-B (30 marks)

7. **Optical amplifier**: Laser and fiber amplifiers, applications and limitations. Introduction to high speed long distance fiber optic links.

8. **Multi-channel optical system:** Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

Recommended Books:

1	S.E.Miller & A.G. Chynoweth	Optical Fiber Telecommunication
2	Barnoski	Fundamentals of Optical Fiber Communication
3	Chrin	An Introduction to Optical Fiber
4	J. M. Senior	Optical Fiber Communication

Course Code: EEE 4833 **Course Title: Digital Communication**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3601 Communication Theory]

Objectives: In this course student will learn about " Digital Communication' in regards to sampling, multiplexing, information theory, source coding, error control coding, video transmission and storage, system noise as regard to digital communication.

Section- A
(Mid-term: Marks 30)

1. Digital Communication Overview: Electronic Communications; Sources and sinks of information; ADC, Digital Communication; Radio receivers; Signal transmission, Switching and networks; Advantages of digital communication over analogue communication.

2. Sampling, Multiplexing: Introduction, Pulse modulation, Sampling, Analogue pulse multiplexing, Quantised pulse amplitude modulation, Signal to quantisation noise ratio (SNqR), Pulse code modulation, Bandwidth reduction techniques.

3. Baseband Transmission: Introduction, Baseband centre point detection, Error accumulation over multiple hops, Line coding, Multiplex telephony, Digital signal regeneration, Symbol timing recovery, Repeater design.

Section –B (Final Examinaton-50 Marks)
Group A-(20 marks)

4. Information Theory and Source Coding: Introduction, Information and entropy, Conditional entropy and redundancy, Information loss due to noise, Source coding, Variable length coding, Source coding examples.

5. Error Control Coding: Introduction, Hamming distance and codeword weight, (n,k) Block codes, Syndrom decoding, Cyclic codes, Encoding of convolutional codes, Practical coders.

Group B-(30 marks)

6. Video transmission and storage: Introduction, Color representation, Conventional TV transmission systems, High definition TV, Digital video, Video data compression, Compression standards, Packet video**.**

7. Queuing theory and its application in communication: Introduction, The arrival process, the simple server queue, Packet speech transmission.

8. System noise and communications link budgets: Introduction, Physical aspects of noise, System noise calculations, Radio communication link budgets.

Recommended: Books:

1	Ian Glover&Peter Grant	Digital Communications, Prentice-Hall Inc.
2	J.F. Kuross & K. W. Ross	Computer Networking
3	William Stallings	Data & Computer Communication
4	Andrew S. Tanenbaum	Computer Networks

Course Code: EEE-4834 **Course Title: Digital Communication Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4833. In the second part, students will design simple systems using the principles learned in EEE 4833

Course Code: EEE 4835 **Course Title: Mobile Cellular Communication**
Credit Hours:3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3601 Communication Theory]

Section- A
(Mid-term: Marks 30)

1. Cellular Concept: Historical development of Cellular Mobile Communication. A Mobile Wireless to Cellular concept, Frequency reuse and its application for different types of cell design, Co-channel interference and non-co channel interference, other Interferences. Call drops and necessity of Handoffs, types of Handoffs.

2. Capacity Enhancement: Cell design, 4 cell and 7 cell design concept, Cell divisions, Sectoral Antennas for the cell sites for different types of cell design, Types of antennas used in Cell sites,

3. Large scale path loss: Path loss and Path loss models in Mobile Wireless Communications, Foliage loss, Loss due to atmospheric conditions,

Section –B (Final Examinaton-50 Marks)
Group A-(20 marks)

4. Small Scale Path loss: Different types of Fading in Mobile Wireless Communications,

5. GSM Architecture: GSM, specifications for cellular telephony, Difference between GSM and other types of Cellular Mobile Communication system, GSM Architecture, Functions of MSC, BSC, BTS and other functional blocks (subsystems and parts) of a GSM system, Situations and Techniques of Handover in GSM

Group B-(30 marks)

6. GSM Channels and Coding: Different types of Channels and Signaling in GSM, Voice and Control channels of a GSM system, Channel Structure and traffic channels, Control Channel and Burst structure, Speech Coding, Channel coding, modulation and power coding in GSM,

7. Advanced Cellular: Enhancement of GSM for Data transmission, GPRS and EDGE, Brief introductions to 3G and 4G Cellular Mobile Communications Systems.

8. AMPS and CDMA: Introduction to AMPS system. channel assignment, An introduction to CDMA in mobile communication and CDMA 2000,

Recommended Books:

1	Theodor S. Rappaport	Wireless Communications; Principle and Practice
2	WCY Lee	Cellular communication
3	Schiller	Mobile Communication

Course Code: EEE-4837 **Course Title: Telecommunication Engineering**
Credit Hours:3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 3601 Communication Theory]

Objectives: In this course student will learn about 'Telecommunication Engineering' in regards to telephone apparatus, telephone signal and switching, concepts of TDM, traffic engineering, modern telephone services and network as well as cellular mobile telephone

Section- A
(Mid-term: Marks 30)

1. **Introduction and Telephone apparatus:** Principle, evolution, networks, exchange and international regulatory bodies.microphone, speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features.
2. **Switching system**: Principles of common control touch tone dial telephone, Cross point technology, No. 1 ESS, Japanese D-10, Metaconta. digital switching systems – space division switching, blocking probability and multistage switching, time division switching and two dimensional switching.
3. **Signal Switching**: Stored program control, Centralized SPC, Distributed SPC, Software architecture, Application software, Enhanced services, Two-stage network, Three-stage network, n-stage network.

Section –B (Final Examinaton-50 Marks)
Group A-(20 marks)

4. **Concepts of TDM**: Basic time division space switching, Basic time division time switching, Time multiplexed space switching, Time-multiplexed time switching, Combination switching, Three-stage combination switching, n-stage combination switching.
5. **Traffic Engineering:** Network traffic load and parameters, Grade of service and blocking probability, Modeling switching systems, Incoming traffic and service time characterization, Blocking models and loss estimation, Delay system and queuing.

Group B-(30 marks)

6. **Telephone Networks:** Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems. numbering plan Charging plan, Signaling techniques, In channel signaling, Common channel signaling.
7. **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
8. **Cellular Mobile Telephone:** Mobile telephone systems, Trunking efficiency, Basic cellular system, Performance criteria, Mobile radio environment, Operation of cellular systems, Planning a cellular systems, Analog and digital cellular systems.

Recommended Books:

1	N.N. Biswas	Principles of Telephony
2	M.T. Hills	Telecommunication Switching Principles
3	T. Viswanathan	Telecommunication Switching Systems and Networks
4	W.C.Y. Lee	Mobile Cellular Telecommunication
5	J.Y. Bryce	Using ISDN
6	J.C. Bellamy	Digital Telephony

Computer Science & Engineering

Course Code: EEE-3613 **Course Title: Discrete Mathematics**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 2310 Numerical Technique Sessional]

Objectives: In this course student will learn about '**Discrete Mathematics' in regards to** set, logic, function and relation, number theory, mathematical induction, counting principle ,graph and tree.

Section-A (Mid Term Exam.-30 Marks)

1. **Set:** Introduction, Set theory-Set operation, Representation of Sets, Algebraic Properties of set, computer representation of set,
2. **Logic**: Logic-Prepositional Calculus, Logic and bit operation, Predicate and quantifier, translating sentence into logical expressions.
3. **Function and Relation**: Function-Introduction of function, some important function, Properties of function, Sequence and summation, Relation- Representation of Relation, Properties of Relation, Some important Relations, Closures of relation.

Section-B (Final Exam.-50 Marks)
Group-A

4.Number Theory: Fundamental Theorem of Arithmetic, Modular Arithmetic; GCD, LCM, Prime Number Congruence, Application of Congruence. Linear Congruence, Application of Number Theory,
5.Mathematical Induction: Methods of Proof, First and Second principle of Mathematical induction. 6.

Group-B (30 Marks)

6. Counting Principle: Basic Counting principle, Inclusion-Exclusion principle, Application of Sum rule and Product rule, Pigeon hole principle, Permutation Combination, Binomial Theorem.
7. **Graph**: Definition of Graph, Types of graphs, Representation of graph, Euler and Hamilton path, circuit, necessary and sufficient conditions. Graph coloring, Isomorphism of graph,
8.Tree- Comparison of tree and Graph, Spanning tree, algorithm of several trees, Application of trees, Tree Traversal, Trees and sorting.

Recommended Books:

1	Kenneth H.Rosen	Discrete Mathematics and its Applications
2	S. Lipschutz & Marc Laris Lipson	Theory and Problems of Discrete Mathematics
3	J. P. Tremblay and R. P. Manohar	Discrete Mathematical Structures with applications to Computer science
4	Donald F. Stanat and David F. McAllister	Discrete Mathematics in Computer Science
5	B. Kolman, R.C. Busby and S. Ross	Discrete Mathematical Structures.
6	C. L. Liu	Elements of Discrete Mathematics.
7	Olympia Nicodemi	Discrete Mathematics

Course Code: EEE-4715 **Course Title: Operating System**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE 2310 Numerical Technique Sessional]

Objectives: In this course student will learn about 'Operating System' in regards to principle of operating systems and system structure, process coordination and time shearing, memory management, protection and security.

Section-A (Mid-term: 30 Marks)

1.Principle of operating systems and Operating system structure: Definition of operating system, Different kinds of operating systems (Desktop, Multiprocessor, Distributed, Clustered, Real time, Handheld systems), Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines.

2.Process: process management, inter- process communication, Process scheduling, Process Concept, Operations on Processes, Inter process Communication, Communication in Client-Server Systems, Basic Concepts of Process Scheduling, Scheduling Criteria and Scheduling Algorithms.

3.Multiprocessing and time sharing, Process coordination: Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation, Control and scheduling of large information processing systems, Resource allocation; Dispatching; Processor access methods; Job control languages

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4.Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

5.Memory management: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation,

Group-B (30 Marks)

6. Virtual memory: The idea and advantage of virtual memory, Demand Paging, Page Replacement, Page Replacement Algorithms (FIFO, Optimal page replacement, LRU), Thrashing.

7. File systems: File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-System Implementation, Directory Implementation, Allocation Methods.

8.Protection and security: Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Fire walling to Protect Systems and Networks

Recommended Books:

1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne.	Operating System Concepts
2	Andrew S. Tanenbaum	Modern Operating Systems
3	Andrew S. Tanenbaum	Distributed Operating Systems
4	Denis	Mastering LINUX

Course Code: EEE 4719 **Course Title: Software Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 2310 Numerical Technique Sessional]

Objectives: In this course student will learn about 'Software Engineering' computer software processes, requirements, specification, software design, software validation, verification, evolution and management.

Section-A (Mid-term: 30 Marks)

1. Introduction: Software, nature and problems of software, engineering vs. software engineering, state of the art of software engineering, characteristics of software, basic elements of engineering Software, software process model, costs of software engineering, software engineering methods, professional and ethical responsibility of a software engineer.

2.**Software Processes**: Software process and software process model, different software process models: linear sequential, water fall, prototyping, incremental, spiral, advanced software development life cycle and other appropriate models.

3.**Requirements and Specification**: requirement engineering process, software requirements document, requirement validation and evolution, requirement analysis process model, system contest, social and organizational factors, data-flow models, semantic data models, object models, Data dictionaries, requirement definition, requirement specification and non-functional requirements, software Prototyping, Basic concepts of different formal software specification techniques.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4.Software Design: Context of software design, design process, design quality and strategies, system structuring, control models, modular decomposition, domain-specific architecture, data-flow design, structural decomposition, detailed design, JSP, Coupling and Cohesion, attributes of design, object-oriented design and Component-level design, design principles, user-system interaction, information presentation, user guidance, interface evaluation, design for reuse.

5.**Software Validation and Verification**: Verification and validation planning, testing fundamentals, including test plan creation and test case generation, black-box and white-box testing techniques, unit, integration, validation, and system testing, object-oriented testing, inspections.

Group-B (30 Marks)

6. Software Evolution: Software maintenance, characteristics of maintainable software, re-engineering, legacy systems, Software reuse and configuration.

7.Software Management: Cognitive fundamentals, management implications, project staffing, software cost estimation techniques, different models (COCOMO, tree, PNR curve, statistical and Delphi), process quality assurance, Software and documentation standards, software metrics and product quality metrics, Zipf's law, Halstead formula, Fan in/Fan out, information Fan in/Fan out, Henry and Kafura's metric, Card and Glass's Systems Complexity, process and product quality, process (analysis, modeling, measurement, SEI process maturity model and classification).

8. Others: Software reliability metrics, software reliability specification, statistical testing and reliability growth modeling, Use of CASE tools and technological support in engineering software, introduction to unified modeling language–UML

Recommended Books:

1	Ian Sommerville	Software Engineering
2	Roger S. pressman	Software Engineering –A practitioner Approach

Course Code: EEE4717 **Course Title: Computer Networks:**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 2410 Numerical Technique Sessional]
Objectives: In this course student learn about 'Computer Networks' in regards to IP addressing, network model, network protocol, switching and security.

Section-A (Mid-term: 30 Marks)

1. Introduction: Definition, Uses of Computer Networks, Network Topology, Network Media, Network Devices, Different Types of Network: LAN, MAN, WAN etc.
2. IP addressing: Classful IP Addressing, Subnetmask, CIDR, Private IP Address, Public IP Address, Subnetting, VLSM etc.
3. Network Model: OSI Reference Model, TCP/IT Reference Model, ATM Reference Model, Functions of the Layers of different models, Network Protocols working at different layers.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. Data Link Layer Design Issues, Framing: Character Count, Byte Stuffing, Bit Stuffing, Error Detection: Cyclic Redundancy Check, Parity Bit Checking, and Correction: Hamming Code. Windowing Protocols: Go back N ARQ, Selective repeat ARQ, Elementary Data Link Protocols, High-level Data Link Control, Point to Point Protocol, The Medium Access Control Sub-layer.
5. Multiple Access: Random Access; ALOHA, CSMA, CSMA/CD, CSMA/CA,
Channelized Access; CDMA, TDMA, FDMA, Controlled Access; Rservation, Poling, Token Passing. Ethernet, Wireless LANs, and Bluetooth.

Group-B (30 Marks)

6. Network Layer and Transport Layer Protocols: Address Resolution Protocol, Internet Protocol, Internet Control Message Protocol, IPV6, Routing Algorithms,Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol, User Datagram Protocol, Transmission Control Protocol.

7. Network Security: Introduction to different network security threats, Public Key Cryptography: RSA Encryption and Decryption, Authentication Protocol 1.0 to 5.0, Digital Signature, Key Distribution Center, Certificate Authority,

8. Introduction LAN and Servers: Network Devices. Ethernet LAN. DNS, Electronic Mail, World Wide Web, FTP, DHCP etc.

Recommended Books:

1	Andrew S. Tanenbaum,	Computer Networks
2	Behrouz A. Forouzan	Data Communication & Networking
3	James Chellis and Charles Perkins	MCSE Networking Essentials Study Guide"
4	Brenton, Chris	Mastering Network Security
5	5. Anderson, Christa	Mastering Local Area Networks
6	Peter Norton :	Networking
7	CCNA study guide	Network Fundamental

Course Code: EEE-4718 **Course Title; Computer Network Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE4815. In the second part students will design systems using the principles learned in EEE 4815.
1. Cable Configuration, 2. Network Hardware, 3. Network Software, 4. LAN Setup
5. WAN Technologies, 6. Workgroup Setup, 7. Client Server Setup,
8. Administrator's job, 9. Create Active Directories, 10. Router Configuration
11. Protecting Network Environment: security, Virus, Power supply etc.
12. Network Troubleshooting, 13. Planning a Network for Organization
14. To perform also other experiments relevant to this course.

Recommended Books:

1	Andrew S. Tanenbaum,	Computer Networks
2	Behrouz A. Forouzan	Data Communication & Networking
3	James Chellis and Charles Perkins	MCSE Networking Essentials Study Guide"
5	CCNA study guide	Network Fundamental

Course Code: EEE-4817Course Title: Computer Architecture
Credit Hours: 3Contact Hours: 3 per week
[Pre requisite: EEE 3505 Microprocessor & Interfacing]

Objectives: In this course student will learn about 'Computer Architecture' in regards to Instruction and data access methods, Arithmetic Logic Unit, control unit, hazards and memory organization.

Section-A (Mid-term: 30 Marks)

1. Information representation, Performance measurement
2. Instruction and data access methods
3. Arithmetic Logic Unit (ALU): arithmetic and logical operations floating point operations, ALU design.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. The control unit (Single cycle Data path) : hardwired and micro programmed
5. The control unit (Multiple cycle Data path) : hardwired and micro programmed

Group-B (30 Marks)

6. Hazard; Exceptions; Pipelining, pipelined data path and control
7. Memory organization virtual memory; buses; multiprocessors, buses; multiprocessors, type of multiprocessor performance, single bus multiprocessors, clusters.
8. I/O systems, channels, interrupts, DMA

Recommended Books:

1	J. P. Hayes	Computer Architecture and Organization
2	Dr. M. Rafiquzzaman	Fundamentals of Computer System Architecture
3	Romesh S. Gaonkar	Microprocesso
4	John Hennesy, David Patterson	Computer Organization.
5	Shafwat Zaky	Computer Architecture

Course Code: EEE-4819 **Course Title: Multimedia Communication**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 2310 Numerical Technique Sessional]

Objectives: In this course student will learn about 'Multimedia Communication' regard to signal coding and compression, internetworking devices, transport protocol and multimedia applications**.**

Section-A (Mid-term: 30 Marks)

1. Multimedia systems introduction: Types of media, Multimedia signal characteristic, sampling, digital representation, signal formats.
2. Signal coding and compression: entropy coding, transform coding, vector quantization. Architecture issues in multimedia
3. Coding standards: H.26x, LPEG, MPEG.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Multimedia communication networks: Network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM.
5. Internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia. Quality-of service guarantees, resource reservation, traffic specification, shaping and monitoring, admission control

Group-B (30 Marks)

6. Entertainment networks: Cable, satellite and terrestrial TV networks, ADSL and VDSL, high speed modems.
7. Transport protocols: TCP, UDP, IP, Ipv4, Ipv6, FTP, RTP and RTCP, use of MPLS and WDMA. Multimedia synchronization, security, QOS and resource management.
8. Multimedia applications: The WWW, Internet telephony, teleconferencing, HDTV, email and e-commerce, audio and video conferencing, video on demand, voice over IP

Recommended Books:

1	John Villamil-Casanova, Louis Molina	Multimedia. An Introduction
2	John Villamil-Casanova, Leony Fernandez-Elias	Multimedia. Graphics
3	John Villamil-Casanova, Louis Molina	Multimedia Sound and Video

Course Code: EEE 4831 **Course Title: Microprocessor System Design**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE 3505 Microprocessor & Interfacing]

Objectives: In this process student will learn about ' microprocessor system design' in regards to instructions and data access methods in a 32-bit microprocessor, instruction formats, processor design, control unit design and VLSI implementation of a microprocessor.

Section-A (Mid-term: 30 Marks)

1. Review of 80x86 family of microprocessors. Evolution of Microprocessors, Computer generations and classifications,.
2. Instructions and data access methods in a 32-bit microprocessor; Pin-out diagram and pin description, Architecture, Instruction and data flow, addressing modes, Instruction fetch & execute, machine cycles.
3. Representation of operands and operators.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

4. Instruction formats; Designing Arithmetic Logic Unit;
5. Processor design: Single bus, multi-bus architecture;

Group-B(30 Marks)

6. Control Unit Design: hardwired, micro-programmed and pipe line;
7. VLSI implementation of a microprocessor
8. Part of a microprocessor design.

Recommended Books:

1	Barry B. Brey	The Intel Microprocessors
2	Douglas V Hall	Microprocessor and Interfacing Programming and Hardware
3	Mohammed Rafiquzzaman	Microprocessors and Microcomputer-Based System Design
4	R. Gaonkar	Microprocessors Architecture, Programming and Applications
5	Myke Predka	Programming and customizing 8051 microcntroller

Course Code: EEE 4832 **Course Title: Microprocessor System Design Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objective: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4831. In the second part, students will design simple systems using the principles learned in EEE 4831.

Course Code: EEE 4823 **Course Title: Control System II**
Credit Hours:3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 4701 Control system I]

Objectives: In this course student will learn about 'Control System' in regards to compensation using pole placement technique, Solution of discrete state equations, time domain analysis and microprocessor control

Section –A
(Mid-term Exam: 30 Marks)

1. Compensation using pole placement technique.
2. State equations of digital systems with sample and hold, state equation of digital systems, digital simulation and approximation.
3. Solution of discrete state equations: by Z transform, state equation and transfer function, state diagrams, state plane analysis.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. Stability of digital control systems. Digital simulation and digital redesign.
5. Time domain analysis. Frequency domain analysis.

Group-B (30 Marks)

6. Controllability and observability. Optimal linear digital regulator design.
7. Digital state observer. Microprocessor control.
8. Introduction to neural network and fuzzy control, adaptive control. H. Control, nonlinear control.

Recommended Books:

1	N.S. Nise	Control Systems Engineering, 4th Edition, Wiley, 2004.
2	R.C. Dorf and R.H. Bishop	Modern Control Systems, 11-th Edition, Prentice-Hall, 2008
3	G.F. Franklin, J.D. Powell, and A. Emami-Naeini	Feedback Control of Dynamic Systems, 5-th Edition, Prentice-Hall, 2006.
4	Katshuhisu Owgata	Modern Control System Engineering, 5th Edition, 2006.

Course Code: EEE-4824 **Course Title: Control System II Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objective: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4823. In the second part, students will design simple systems using the principles learned in EEE 4823.

Course Code: EEE-4825 **Course Title: Numerical Methods**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2310 Numerical Technique Sessional]
Objectives: In this course student will learn about 'Numerical Methods' numerical errors calculation, solution of lon-linear equation, interpolation, numerical differentiation and integration curve fitting and solution of differential equation.

Section-A (Mid-term: 30 Marks)

1. Errors in numerical calculations: What is numerical methods, It's areas, Exact & Approximate numbers, Significant figures, Banker's rounding rule, Sources of errors – Inherent errors, Roundoff errors, Truncation errors; Absolute, Relative & Percentage errors, Error propagation.

2. **Solution of non-linear equations:** Intermediate value theorem, Bisection method, False position method, Direct substitution method, Newton-Raphson method, Secant method, Evaluation of polynomials, Newton's Binomial expansion formula, Horner's rule, Synthetic division, Finding multiple roots using bisection method and Newton-Raphson method.

3. **Interpolation:** Definition, Finite Differences – Forward difference, Backward difference, Central differences; Shift operator, Averaging operator; Divided difference; Error propagation in a difference table; Newton's Forward and Backward interpolation formula; Central difference interpolation formulas – Gauss Forward, Gauss Backward, Starling's formula, Bessel's formula; Interpolation with unequal intervals – Lagrange's interpolation formula, Newton's general divided difference formula; Inverse interpolation- Lagrange's inverse interpolation formula, method of successive approximation.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Numerical differentiation: Definition, Derivatives using Newton's Forward and Backward difference and Central difference interpolation formulas, Maximum and minimum values of a tabulated function.

5**. Numerical Integration**: Definition, General Quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Boole's rule.

Group-B (30 Marks)

6. System of linear equations: Definition, Review of Matrix, Matrix inversion method, Gauss Elimination method, Gauss-Jordan method, Cramer's rule, Dolittle LU method, Iterative method - Jacobi's method, Gauss-Seidel method, Eigen vector and Eigen value problem.

7. Curve fitting: Definition, importance of curve fitting, Least square method, Fitting a straight line, Non-linear curve fitting.

8. Numerical Solution of ordinary differential equations: Review of Differential equation, Taylor's series method, Euler's method, Heun's method, Runge-Kutta method**.**

Recommended Books:

1	E. Balagurusamy	Numerical methods, Tata McGraw-Hill, Inc., 2002.
2	G. Shanker Rao	Numerical Analysis, 1st edition, New Age International (P).
3	S. S. Sastry.	Introductory Methods of Numerical Analysis,.
4	S.B.Rao&C.K. Shantha	Numerical Methods with Programs in BASIC, FORTRAN and Pascal,
5	V. Rajaraman	Computer Oriented Numerical Methods,.
6	J. B. Scarborough	Numerical Mathematical Analysis,
7	K. Sankara Rao	Numerical Methods for Scientists and Engineers,.
8	R. W. Daniels	An Introduction to Numerical Methods and Optimization Techniques,
9	F. Scheid	Theory and Problems of Numerical Analysis,
10	Steven C. Chapra & Raymond P. Canale	Numerical Methods for Engineers,
11	Curtis F. Gerland and Patric O. Wheatly	Applied Numerical Analysis, , 1998.
12	A.R. Vasishtha and Vipin Vasistha	Numerical Analysis, 4th edition, Kedarnath Ram Nath, 1999.

Course Code: EEE-4826 **Course Title: Numerical Methods Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: Students will perform experiments to verify practically the theories and concepts learned in EEE 4825.

1. Write a program to round off a number with n significant figures using banker's rule.
2. Write a program to evaluate a polynomial by using Horner's rule.
3. Write a program to find the root of the equation $e^x - 3x = 0$, correct to 3 decimal places, by using the bisection method.
4. Write a program to find the root of the equation $2x - \log_{10} x = 7$, correct to 3 decimal places, by the using fixed point method.
5. Write a program to find the root of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places, by using Newton-Raphson method.
6. Write a program to find the root of the equation $x \log_{10} x - 1.2 = 0$, correct to 3 decimal places, by using false position method.
7. Write a program to find the root of the equation $x^2 - 4x - 10 = 0$, correct to 3 decimal places, by using secant method.
8. Write a program to find the *quotient polynomial* q(x) from a polynomial p(x) by using s*ynthetic division.*
9. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find difference table for the above values.
10. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of y when x = 1.7 by using Newton's forward interpolation formula.
11. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of y when x = 4.7 by using Newton's backward interpolation formula.
12. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the values of x for which f (x) = 85 by using Lagrange's inverse interpolation formula.
13. The following values of f (x) are given. Prepare the divided difference table for the following data

x	1	3	4	6	10
y = f(x)	0	18	58	190	920

Write a program to find the values of y when x = 2.7 by using Newton's divided difference formula.
14. The following values of f (x) are given.

x	1	2	3	4	5
y = f(x)	1	8	27	64	125

Write a program to find the first derivative and the second derivative of the function tabulated above at the point x = 1.
15. Write a program to calculate the approximate area under the curve $y = \int 5 \log 10\ x\ dx$ by using trapezoidal rule.
16. Write a program to calculate the approximate area under the curve $y = \int \cdot /2\ esinx\ dx$ by using Simpson's 1/3 rule
17. Write a program to calculate the approximate area under the curve $y = \int 1\ x / (1+x2)$ by using Simpson's 3/8 rule.
18, Write a program to find the determinant of a NXN matrix.

19. Write a program to solve the following system of linear equations by using Matrix inversion method.
    $x + y + z = 1$
    $x + 2y + 3z = 6$
    $x + 3y + 4z = 6$
20. Write a program to solve the following system of linear equations by using Cramer's Rule:
    $27x + 6y - z = 85$
    $6x + 15y + 2z = 72$
    $x + y + 54z = 110$
21. Write a program to solve the following system of linear equations by using Gaussian Elimination method.
    $2x + y + z = 10$
    $x + 4y + 9z = 16$
    $3x + 2y + 3z = 18$

22. Write a program to solve the following system of linear equations by using Gauss-Jordan Elimination method.
    $x + 2y + z = 8$
    $2x + 3y + 4z = 20$
    $4x + 3y + 2z = 16$

23, Write a program to solve the following system of linear equations by using Jacobi's method.
    $83x + 11y - 4z = 95$
    $3x + 8y + 29z = 71$
    $7x + 52y + 13z = 104$

24. Write a program to solve the following system of linear equations by using Gauss-Seidel method.
    $10x_1 + x_2 + x_3 = 12$
    $2x_1 + 10x_2 + x_3 = 13$
    $2x_1 + 2x_2 + 10x_3 = 14$

25, Write a program to find the least square line $y = a + bx$ for the following data

x	-2	1	0	1	2
y	1	2	3	3	4

26. Write a program to find the least square parabola $y = a + bx + cx^2$ for the following data

x	-3	-1	1	3
y	15	5	1	5

27. Write a program to solve the following Differential Equation by using Euler's method.
    $dy / dx = x^3 + y$, $y(0) = 1$. Compute $y(0.02)$ taking $h = 0.01$.

28. Write a program to solve the following Differential Equation by using Runge – Kutta method.
    $dy / dx = x + y$, $y(0) = 1$. Compute $y(0.1)$ and $y(0.2)$ taking $h = 0.1$.

Course Code: EEE-4871 **Course Title: Biomedical Instrumentation**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE 2411 Electronics II]

Objectives: In this course student will learn about 'Biomedical and Analytical Instrument' in regards to human body, measurement of Bio-signals, blood flow measurement and operation and working principles of different types of biological instruments.

Section –A
(Mid-term Exam: 30 Marks)

9. **Physics of human body*:*** The cell, Body fluid, Musculo-skeletal system, Respiratory system, Nervous system, The circulatory system, The body as a control system, The heart, Bioelectricity, Work done by heart, blood pressure and its measurements, Membrane potentials, Electrical activity of excitable cells, Molecular basis of muscle contraction, Basic electrical signals from the muscles.
10. **Interaction of wave and radiation with human body**: Body's detector and matter wave, speech noise, physiological effects of intense matter waves, Interaction of electromagnetic radiation on living mater, penetration of ray's into tissue. Biological effects of ionizing radiation***:*** Dosimetry, primary effects, Biophysical effects of whole body irradiation, radiation measurement and protection.
11. **Biopotentials electrodes and amplifiers*:*** Biopotential electrode, Sensors, Transducers and bioelectric amplifiers, Electromagnetic interference of medical electronic equipment, ENG, EMG, ECG, ERG, EEG, MEG.

Section-B (Final Exam: 50 Marks)
Group-A (20 Marks)

12. **Ultrasonography*:*** Physics of ultrasonic wave, Ultrasonic transducers, Absorption and attenuation of ultrasound, Scan modes, scan pattern and scanning systems, Doppler imaging, Echocardiography, Ultrasonic flow meter, Ultrasonic blood pressure measurement.
13. **X-ray:** X-ray production, X-ray image formation and contrast, Contrast types, Effects of photon energy, Area contrast, Fluoroscopic imaging system, computed tomography.

Group B. (30 Marks)

14. **Magnetic resonance imaging**: Nuclear magnetic resonance, Image characteristics, Gamma camera.
15. **Analytical and Medical Laboratory Instruments:** Blood components, Colorimeter, spectrophotometer, Blood cell counter, pH/Blood gas analyzer, chromatograph, Auto analyzer, Atomic absorption and atomic emission spectroscopy.
16. **Therapeutic and Prosthetic Devices:** Cardiac pacemaker, Hemodilysis, Defibrillator, Surgical diathermy.

Recommended Books:

1	C. J. Casey	Biophysics concept and mechanism
2	Joseph J Carr & John M Brown	Introduction to Biomedical equipment technology
3	John G Webster	Medical Instrumentation
4	Physical principles of medical imaging	Physical principles of medical imaging
5	J. G. Skofronick	Medical Physics :

Course Code: EEE 4881 **Course Title: Biomedical Instrumentation Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4827. In the second part, students will design simple systems using the principles learned in EEE 4827.

Course Code: EEE 4827Course Title: Measurement and Instrumentation
Credit Hours: 3Contact Hours: 3 per Week
[Pre requisite: EEE 2411 Electronics II]
Objectives: In this course students will learn about 'Measurement and Instrumentation' in regards to measurement system, measuring instruments, measurement of electrical non-electrical quantities, transducers and data transmission.

Section-A
(Mid-term Exam: 30 Marks)

1. **I**ntroduction: Applications, Methods, functional elements of a measurement system and classification of instruments.
2. Measurement of electrical quantities:
3. Current and voltage, power and energy measurement. Instrument Transformer: Current and Potential Transformer.
4. Transducer: Mechanical, Electrical and Optical.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

5. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque.
6. Data Transmission and Telemetry: Methods of data transmission, dc/ac telemetry system and digital data transmission.

Group-B (30-Marks)

7. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization.
8. Converters: A/D and D/A converters, sample and hold circuits.

Recommended Books:

: 1	B.C.Nakra & K.K. Choudhury	:Instrumentation Measurement and Analysis
2	A. K. Sawhney	Electrical and Elec. Measurement and Instruments
3	J. L. Hunter	Applied Acoustics
4	W. D. Cooper	:Electronic Instrumentation & Measurement Technique
5	S. Wolf & R. M. Smith	Student Reference Manual
6	C. S. Rangan, G. R.Sarma, & V. S. Vmani	Instrumentation devices and systems.

Course Code: EEE 4828 **Course Title: Measurement and Instrumentation Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4829 in the second part, students will design simple systems using the principles learned in EEE 4829.

Course Code : EEE-4839 **Course Title: Digital Image processing**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: Math 2401, Linear Algebra.)]

Objectives: In this course student will learn about 'Digital Image processing' in regards to digital image fundamentals, intensity transformation and spatial filtering, image restoration and reconstruction, color image processing, image compression, morphological image processing and image segmentation.

Section A
(Midterm Exam: 30 Marks)

1. Digital Image Fundamentals: Human visual system, Sampling and Fourier analysis
2. Intensity Transformation and Spatial Filtering: Histogram Processing, Spatial Filtering
3. Filtering in Frequency Domain: Preliminary Concept, Extension to function of two variables, Image smoothing, Image Sharpening

Section B
Group -A (Marks 20)

4. Image Restoration and Reconstruction: Noise Models, Noise Reduction, Inverse Filtering, MIMSE Filtering
5. Color Image Processing: Color Models, Color Transforms, Image segmentation based on color

Group -B (Marks 30)

6. Image Compression: Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.
7. Morphological Image Processing: Erosion, dilation, Opening, Closing, Basic morphological algorithms: hole filtering, connected component, thinning, skeletons
8. Image Segmentation: Point, line, edge detection, thresholding, Region based segmentation

Recommended Books:

1.	R. C. Gonzalez, R. E. Woods	Digital Image Processing R. E. Woods .
2.	R.C. Gonzalez, R.E. Woods, S.L. Eddins	Digital Image Processing Using MATLAB, Pearson Prentice Hall, 2004

Course Code: EEE 4840 **Course Title: Digital Image processing Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objective: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4839. In the second part, students will design simple systems using the principles learned in EEE 4839.

D. University Requirement Courses

Total 10 Courses 18 Contact Hours with 12 Credit Hours

Course Title: Islamic ‘Aqidah
Course Code: URIS – 1101
Credit Hour: 01 C.H.
Contact Hour: 01 C.H. (per week)

Objectives:
This course is designed

1. To provide the students with proper knowledge about the Islamic way of life.
2. To make them aware of the existing religious misconceptions & traditional superstitions contradicting with the basic faith & tenants of Islam.
3. To give them a clear concept about the all-embracing view of ‘Ibadah in Islam.

Course Outline:

Section-A (Mid-term Exam: 30 Marks)

Chapter- 1 Islam: an Introduction:
- a. Importance of Islamic ‘Aqidah and the relation between Iman and Islam.
- b. Historical Background of Islam.
- c. Islam as a Complete Code of Life.

Chapter- 2 Belief in The Articles of Faith:
- a. The Unity of Allah (Tawheed)
- b. Belief in the Attributes of Allah
- c. Impact of Tawheed on human life.

Chapter- 3 The Shirk and its Consequences.
- a. Different types of Shirk
- b. Divine Unity in Practice.
- c. Nifaq: Its meaning, Signs and Consequences.

Section-B (Final Exam: 50 Marks)

Chapter- 4 Belief in Allah’s Angels (Malaikah):
- a. Angels - their Nature and Functions.
- b. Virtues of belief in Angels.
- c. Can they assume any Human Form?

Chapter- 5 Belief in the Books of Allah:
- a. Are all Scriptures remaining presently in their Original Form?
- b. The Qur’an: The last and unchanged Divine Book.
- c. The position of Qur’an amongst other Revealed Books.

Chapter- 6 Belief in Allah’s Prophets:
- ধ. Believing in all the Prophets is equally essential for being a Muslim.
- ন. Contributions of the Prophets towards the Humanity.
- প. Muhammad (SAAS), the Greatest, the Best and the Last among all the Prophets.

Chapter- 7 Belief in the Life After Death:
- ধ. The logic behind believing in the Life after Death.
- ন. Impact of Belief in the Life after Death on Human Life.

প. Inevitability of Akhirah and its Stages.

Chapter- 8 Belief in Qadr (Fate) and divine decree:

ধ. Man's Freedom of Will.
ন. Fate: No excuse for Sinners.
প. Evil: Not attributable to Allah.

Reference:

1. Al-Jazaeeri, Abu Bakr, Minhajul Muslim, Cairo, Darul Kutub As- Salafiyah.
2. Rafique Dr. Abu Bakr, Islam The Ultimate Religion (Book one) Islamic 'Aqidah', Chittagong: ABC Publications, 2002.
3. Sabiq, Assayed, Al-`Aqaeed Al- Islamiyah, Cairo, Al-Fathu Lil-Ielamil Arabi, 10th edition-2000.
4. Farid, Ahmed, An Encounter with Islam, Dhaka: Islamic Foundation, Baitul Mukarram, Dhaka, 1995.
5. Abdalati, Hammuda, Islam in Focus, Islamic Teaching course. Vol. 1
6. Badawi, Dr. Jamal, Islamic Teachings vol. 1
7. Mawdudi, S.A.A, Towards Understanding Islam, Kwait, International Islamic Book Center, ND.
8. AL–Gazali, Mohammad, Aqidatul Muslim.

Course Title: Introduction to '*Ibadah* **Course Code:** URIS-1202

Credit Hour: 01 (One) C.H. **Contact Hour:** 01 (One) C.H. **(per week)**

Objective:

This course deals about the pillars of Islam. It tries to present Islam as a complete and comprehensive code of conduct for all human being from the Islamic and rational point of view. The course offers the Students a clear understanding of the fundamental belief of Islam. It also presents the impact of belief on human life.

Section: A (Mid-Term Examination: 30 marks)

Chapters	Topics
Chapter-01	***'Ibadah*: Its introduction:** (a) Meaning of '*Ibadah* (b) concept and significance of '*Ibadah* (c) Scope of '*Ibadah* (d) The best '*Ibadah* (e) Objectives of '*Ibadah*. (f) Conditions of '*Ibadah*.
Chapter-02	**Characteristics of '*Ibadah* in Islam:** (a) Free from Intermediaries (b) Not being confined to specific places (c) All-Embracing View.
Chapter-03	**Signs of '*Ibadur Rahman* according to the holy Qur'an.**

Section: B (Final Examination: 50 marks)

Chapters	Topics
Chapter-01	***Salah* (Prayer): Its significance, teaching & some basic rules:** (a) Definition (b) Importance (c) Impact (d) *Shurutus-Salah*: Conditions for Prayer (e) *Arkanus-Salah:* Pillalrs of *Salah* (f) *Mufsidatus-Salah*: Things that invalidate the prayer (g) *Sajdatus-Sahu: Sajdah* that makes prayer correct (h) *Salatul-Jumu'ah*: *Friday sermon* (i) *Salatul-Janazah*: The funeral prayer (j) *Salatul-Musafir*: Prayer of the traveler (k) *Salatul-'Eid*: '*Eid* prayer and (l) How to perform the *Salah* in detail (practically)?
Chapter-02	***Zakah* (poor due) : Its significance, teaching & some basic rules:** a) Definition (b) Importance (c) Impact/benefits (d) kinds of property on which *Zakah* is obligatory (e) Who should give *Zakah* (f) Due recipients of *Zakah* (g) *Zakah* as a means to elevate poverty from society.
Chapter-03	***Sawm* (Fasting): Its significance, teaching & some basic rules:** (a) Definition (b) Importance (c) Impact (d) *Mufsidatus-Sawm*: Things which invalidate the fast (e) Who must fast? (f) Exemption from fasting (g) Recompense of mistake.
Chapter-04	***Hajj* (pilgrimage): Its significance, teaching & some basic rules:** (a) Definition (b) Importance (c) Impact (d) How to perform *Hajj* in detail?
Chapter-05	**Jihad:** Definition, significance (misconception), importance, classification from various aspects.

Reference:

1. Mahmudul Hasan, Dr. Syed, *ISLAM*, Dhaka: Islamic Foundation, Baitul Mukarran, Dhaka, 1980
2. Abdalati, Hammudah, *Islam in Focus*, The Dept. of Islamic Affairs, The Ministry of Awqaf and Islamic Affairs, State of Qatar, 1995/ Islamic Teaching Course. Vol.-1
3. Al-Quardawi, Dr. Yousuf, *Al-Ibadah in Islam*, Wahba publication, Etypt, 24th edition, 1995.
4. Didat, Dr. Ahmad, *Concept of Ibadah in Islam*, Transmitted by Ali Usman, Al-Mukhtar Al-Islami publication, Egypt.
5. Alkhuli, Muhammad Ali, *The Light of Islam*, E 4, Riyad: Al Farazdak Press, 1983.

6. Journal, '*A Study of the Qur'an and its teaching,* Published by: IQRA International Education Foundation, Chicago, 1999
7. Mawdudi, S.A.A, *Towards Understanding Islam,* Kwait, International Islamic Book Center, ND.
8. Zarqa, Mustafa Ahmed, Translated by Dr. Zafr Ishaq Ansary, *The Islamic Concept of Worship* (*'Ibadah*), (Printed Copy)
9. *Islamic Education*, IQRAA CHARITABLE SOCIETY, Jeddah- Saudi Arabia Book 1-8
10. Sarwar, Ghulam, *Islam: Beliefs and Teachings,* London: The Muslim Educational Trust, 1980.

Course Title: Dealings and Behavior in Islam	**Course Code:** URIS- 2303
Credit Hours: 01 C.H.	**Contact Hours:** 01 C.H. **(per week)**

Objective: To bring up the students with Islamic manners for the sake of being dutiful towards Allah the Almighty and His creatures.

Course Outlines:

Section-A (Mid-term Exam: 30 Marks)

Chapter-1 Dealings and Behavior in Islam (*Mu'amalah*): Its Meaning, Definition and Scope.

Chapter-2 **Family life in Islam*:***
(a) Role of Marriage as the basis of Islamic Family.
(b) Status of women in Islam, comparison with other religion.
(c) Rights and duties of women in Islam.
(d) Husband-wife relations (Duties and obligations to each other)
(e) Rights of children in Islam.
(f) Duty towards Parents.

Chapter-3 **Principles of Islamic Economic System:**
(a) Earning and expenditure by *Halal* means.
(b) Right to own property and individual liberty.
(c) System of *Zakah*.
(d) Prohibition of interest (*Riba*).
(e) Law of Inheritance (*Mirath*).

Section-B (Final Exam: 50 Marks)

Chapter-4 Islamic law regarding Business**.**

Chapter-5 Dress code in Islam for male and female

Chapter-6 Duties and obligations towards: Relatives, Neighbors, Guests, Needy and Orphan.

Chapter-7 **Basic virtues and Islam,** Duties of the Muslims to each other
(1) Honesty (2) Truthfulness (3) Kindness (4) Perseverance (5) Firmness against evil (6) Tolerance (7) Punctuality (8) Courage (9) Trustworthiness (10) Forgiveness (11) Chastity for women (12) Intention (13) Modesty (14) Charity (15) Gifts (16) Thankfulness (17) Visiting the sick.

Chapter-8 **Social Manners:** (1) Brotherhood (2) Greetings (3) Co-operation (4) Meetings (5) Talking (6) Keeping promise (7) Asking permission before entering someone's house

***Book References*:**

1. Hamidullah, *Introduction to Islam,* Lahore, Published by: Sh. Muhammad Ashraf.
2. Al-Qaradawi, Dr. Yusuf, *Introduction to Islam,* Islamic inc. Publishing & Distributing.
3. Sarwar, Golam, *Islam: Beliefs and Teachings,* IIUI, Pakistan.
4. Abdul Hannan, Shah, *Social Laws of Islam,* BIIT, Dhaka, 1995.
5. Zino, Muhammad bin Jamil, *Islamic Guidelines,* Darusalam, Riyadh, 1996.

6. Mawdudi, Abul A`la, *Human Rights in Islam*, Lahore, Islamic Publications (Pvt.) Limited, 2nd Edition-1995.
7. Abdalati, Hammudah, (1977), "*The Family Structure in Islam*", American Trust Publications. USA.
8. Abdalati, Hammudah, (1996) "*Islam in Focus'',* Second edition, Islamic teaching centre, U.S.A & Canada.
9. Al-Kaysi, Aarwan, (1986), "*Morals and Manners in Islam, A Guide to Islamic 'Adab*" The Islamic Foundation, London.
10. Islahi, Amin, ***Tadabbur-i-Qur'an*** (1st ed.), Lahore: Faran Foundation
11. Aijaz, S. Zakir, *Muslim Children: How to Bring Up?* Karachi, Pakistan: International Islamic Publishers, 1989.
12. Al-Minawi, Kawther M, *The Child Rights in Islam.* Riyadh: Dar al-Amal Publishing House, 1993
13. Shoaib, Adil, Mohammad, *"Islamic Rights of Children."* Hamdard Islamicus 22 (April-June 1999): 90-91
14. Umer, Chapra, *Islam and the Economic Challenge*. Leicester, UK: Islamic Foundation and Virginia, USA: the International Institute of Islamic Thought, 1992.
15. Nejatullah, Siddiqi, Muhammad, *Role of the State in the Economy: An Islamic Perspective.* Leicester, U.K: The Islamic Foundation,1996.
16. Nejatullah, Siddiqi, Muhammad, *Muslim Economic Thinking : A Survey of Contemporary Literature*. Leicester, UK: The Islamic Foundation, 1981.
17. Taqi, Usmani, M., *An Introduction to Islamic Finance.* Karachi, Pakistan: Idaratul Ma'arif, 1998.

Course Title: Advanced English **Course Code:** LIAE - 2303
Credit Hours: 2 (two) Hours. **Contact Hours:** 3 (three) Hours. **(Per week)**

Objectives

I. To prepare the students for the forthcoming courses, which will be conducted using English as medium of instruction.
II. To enrich students' vocabulary so that they can be able to overcome their difficulties in comprehending the text books which are written in English.
III. To make the students confident enough in their use of English by enriching their knowledge of English grammar.

Total Marks: 100 (30-Midterm, 20-Class tests, attendance and assignments, 50-final examination)

Section: A (Midterm Examination: 30 marks)

Chapter - Grammar: 15 marks

1. Tenses & their Aspects. (Use of verbs to be, to have and to do, use and structure of tenses with oral and written exercises which include dialogue, paragraph writing, filling up the gaps, using verbs in correct forms and tense based corrections)
2. Subject & Verb Agreement (Exercises will include use of verbs in correct numbers and choosing correct verbs out of two options)
3. Use of Pronouns (Discussions and Exercises will focus on different types of pronouns, identifying nouns indicated by certain pronoun, subjective, objective and possessive forms of personal pronouns, difference between possessive adjective and possessive pronoun, difference between reflexive and emphatic pronouns, difference between relative and interrogative pronoun, correct use of relative pronoun, joining sentences with relative pronouns, formation of question using interrogative pronouns and so on)
4. Modal auxiliary and modal + perfectives (Exercises will include use of different models, correction based on the use of modals, use of 'should have done, 'may have done', 'could have done' and 'must have done')

Chapter-2 Reading: 10 marks

Prescribed book: Six Tales from Shakespeare (Retold by E.F. Dodd)
First two stories are to be read for mid-term. They are: 1. *The Merchant of Venice* and 2. *The Taming of the Shrew*.
N.B. Students are also suggested to read the following books: (as the first half to be the syllabus of the mid-term)

1. Jane Eyre- Charlotte Bronte
2. Pilgrim's Progress- John Banyan
3. A Tale of Two Cities- Charles Dickens

Chapter-3 Writing: 05 marks

4. Paragraph (guided and free)
5. Comprehension (summarizing a given passage and writing sentences with words and phrases contained in the paragraph)

Section: B Final Examination (50 marks)

Chapter - 4	**Grammar: 25 marks** 1. Conditional Sentences (Discussion will focus on the use of three conditional structures. Exercises will include use of right forms of verbs given within the

	bracket or choosing correct form of verb out of two/three options) 2. Active and Passive Voice (Practical use passive structures, change of voice, correction relating voice, Exercises will also include using verbs in correct form given in sentences using both active and passive structures)
Chapter - 5	3. Direct and Indirect Narration (Discussion will focus on the uses of both direct and indirect speeches, change of narration of detached sentences) 4. Preposition & Conjunction (identifying preposition and conjunctions, classification of preposition and conjunction, use of appropriate preposition and conjunction.
Chapter - 6	5. Causative Verbs (Discussions will focus of on the use of causative verbs. Exercises will include use of correct forms of verbs after a causative verb) 6. Participle and Gerund (Discussion will focus on the uses of gerund and participle, joining sentences using present participle form of a verb. Exercises will include identifying participle and gerund from the given sentences, joining sentences with present participle)
Chapter - 7	**Reading: 15 marks** Prescribed book: Six Tales from Shakespeare (Retold by E.F. Dodd) Last four stories are to be read for final exam. They are: 1. *The Tempest* 2. *Macbeth*, 3. *King Lear*, 4. *Julius Caesar*, ***N.B.*** Students are also suggested to read the following books: (as the last half to be the syllabus of the final examination) 1. Jane Eyre- Charlotte Bronte 2. Pilgrim's Progress- John Banyan 3. A Tale of Two Cities- Charles Dickens
Chapter - 8	**Writing: 10 marks** 1. Dialogue 2. Personal and official letter or e-mail

Books Recommended:

1. Raymond Murphy, *Intermediate English Grammar*, Foundation Books, 2/19 Ansari Road, Daryaganj, New Delhi-110002, Manas Saikia, 1995. (Published by arrangement with Cambridge University Press, The Edinburgh Building, Shaftsbury Road, Cambridge CB2 2RU, U.K.)
2. Wren & Martin, *High School English Grammar and Composition*-,New Delhi, S. Chand & Company Ltd. 2002
3. Thomson & Martinet, *Practical English Grammar*, Oxford University Press, Walton Street, Oxford OX2 6DP, 1993 (reprinted in India by arrangement with Oxford University Press, Oxford)
4. Michael A. Pyle and Mary Ellen Munoz, *Cliffs TOEFL Preparation Guide*, New Delhi, BPB Publications, B-14, Connaught Place, New Delhi-110001, 1992
5. Bruce Rogers, *Peterson's TOEFL Success*, Princeton, New Jersey, Peterson's, 2000
6. AS Hornby, Oxford *Advanced Learner's Dictionary of Current English*, Oxford University Press, 2002-2003
7. Chowdhury & Hossain, *Advanced English*, Dhaka, Sayma Chowdhury and Halima Chowdhury, 2004.

Course Title: Introduction to *Qur'an & Sunnah*	**Course Code:** URIS-2401
Credit Hour: 01 (One) C.H.	**Contact Hour:** 02 (two) C.H. **(per week)**

Objectives:
The main objectives of this course are as follows:

1. To make the students familiar with the *Qur'an* & *Sunnah* as they are the main sources of Islamic *Shari'ah*.
2. To achieve the main goal of the University in Islamization of Knowledge through enlightening the students with revealed knowledge of the *Qur'an* and *Sunnah*.

Course Outline:

Section-A (Mid-term Exam: 30 Marks)

Chapter-1

a) Introduction to *Qur'an:*

1. **Definition of the *Qur'an*** Literally and Terminologically.
2. **The various Names of the *Qur'an.***
3. **Wahy (Revelation) of the Holy *Qur'an*:**
   The concept of *Wahy*, the Meaning of *Wahy*, the Procedure of *Wahy*, the Revelation of the Qur`an to the Angels, the Revelation of the Qur`an to the Prophet from *Jibreel*, Gradual Revelation: The Stages of Revelation, The wisdom behind the Gradual Revelation. The First and The Last Revelation.

Chapter-2

4. **Characteristics of the Holy *Qur'an*.**
5. Central Subject Matter & the Main Themes of the Holy ***Qur'an***.
6. **The necessity of the Holy *Qur'an*.**

Chapter-3

7. **The Verses (*Aayah*) of the Qur`an:** Meaning of *Aayah*, The Number of Verses, The Arrangement of the Verses, The Number of Words and Letters.
8. **The *Surahs* of The Quran:** Definition of *Surah*, The Arrangement of *Surahs*, The classification of *Surahs*.

Section-B (Fianl Exam: 50 Marks)

Chapter-4

9. ***Makki*** & ***Madani* Revelations:**
The Definition of *Makki* and *Madani*, The Characteristics of *Makki* and *Madani* Revelations, The benefits of knowing *Makki* and *Madani*.

Chapter-5

10. **The Causes of Revealtion (Asbabunnuzul) :** The Definition of *Asbabunnszul*, The classification of *Asababunnuzul*, The benefits of Knowing *Asbanunnuzl*.
11. **Preservation & Compilation of the Holy *Qur'an*.**

Chapter-6

12. **Abrogation (*Al-Naskh*) in the Holy *Qur'an*** : Definition of *Naskh*, The proof of *Naskh*, The conditions of *Naskh*, The Categories of *Naskh*, The blessings of *Naskh*, The benefits of knowing *Nasikh* and *Mansukh*.
13. **The Miraculous Nature of The Qur'an (*I'jaz Al-Qur'an*** : Definition of *I'j*az, The Proof for *I`jaz*, The Quran as the Miracle of the Prophet, The Types of *I`jaz*)

Chapter-7

b) Introduction to *Sunnah*

1. ***Sunnah*:** Its definition & the difference between *Sunnah* & *Hadith*.
2. The importance of *Sunnah* in Islamic *Shari'ah*.
3. Explanation of some important terms of *Sunnah*.
4. The authority of *Sunnah* in *Islam*.
5. Collection & Compilation of *Sunnah*.
6. Method of distinguishing a genuine *Sahih Hadith* from a spurious *Da'if Hadith* .

a) The science of *Dirayah*.
b) The science of *Riwayah.*

Chapter-8 **7. The classification of *Hadith* and the rulings concerning the various kinds of *Hadith*.**

a) According to the reference to a particular authority.
b) According to the links in the *Isnad*.
c) According to the number of narrators involved in each stage of the *Isnad*.
d) According to the number of narrators by which the *Hadith* is reported.
e) According to the reliability and memory of the narrator.

References:

1. Denffer, Ahmad, vol. *'Ulum Al-Qur'an: An Introduction to the Sciences of the Qur'an,* The Islamic Foundation, UK, reprinted by – A.S. Noordeen, Kuala Lumpur. 1983.
2. Ushama, Dr. Thameem, *Sciences of the Qur'an: An Analytical Study,* International Islamic University Malaysia, Cooperative Limited, Kuala Lumpur. 1998.
3. Bucaille, Dr. Maurice, *The Bible The Qur'an & Science*, Thinkers Library, Selangor Darul Ehsan. Malaysia, 1996.
4. Al-Azami, Dr Mohammad Mustafa, *Studies in Early Hadith Literature*, American Trust publication, Indiana, 1978.
5. Hasan, Dr. Suhaib, An Introduction to the Science of Hadith,London, AL-Quran Society, 1994.
6. Marhribi, Al-Hassan, Introduction to the Study of the Hadith, Roshmee, South Africa, Roshmee Islamic School, 1994.
7. Salih, Muhammad Adeeb, Lamahat fee Usul al-Hadeth, Damascus, 1393 AH.
8. Siddiqi, Muhammad Zubayr, Hadith Literature: its Origin, Development & Special Features, Cambridge, Islamic Texts Society, 1993.

Course Title: Biography of the Prophet (SAAS.) **Course Code:** URIS – 3505
Credit Hours: 02 (two) C.H. **Contact Hours:** 02 (two) C.H. **(per week)**

Objective: This course aims to achieve the following objectives:

- To develop a clear understanding of the Prophet's mission and teaching amongst the students and equipped them with the knowledge about our beloved Prophet (SAAS.).
- To bring home the understanding to the students that the Prophet *(*SAAS.) is the last and final Messenger of Allah *(SWT)* among all the other Prophets of Allah and therefore, Prophet's teaching is the sole guidance as to be followed by the entire mankind.
- To activate the students to know the meaning and significance of the Prophethood of the Prophet (SAAS.) so that the learners can better be able to examine their own position in the touchstone of the teachings of the Noble Prophet (SAAS.).

Course outlines:

Section 0A: (Mid-Term Examination: 30 Marks)

Chapter-1 An introduction to *Siratunnabi* (SAAS.), *Sirah* and its literally and technical meaning, Selection of Arabia as the birthplace of the Final Prophet *(*SAAS.*)*, Socio-Political and Religious condition of pre-Islamic Arabia: an Overview.

Chapter-2
The Prophet from the birth to the Prophethood: Birth and Childhood, Business trip to Syria with his uncle *Abu Talib*, Battle of *Fujjar* and *Hilful-Fudul*, Contribution of Mohammad (SAAS.*)* in the business of Khadijah, Marriage with Khadijah, Rebuilding of *Al-Ka'bah,* Search for the truth.

Chapter-3 Life and Teachings of the Prophet (SAAS.):
Early life of Muhammad (SAAS.)*:*
Birth and Childhood, Business trip to Syria with his uncle Abu Talib.
Teenager, Battle of *Fujjar*, *Hilful Fudul*, Shephardhood.
Youthhood, Contribution of Muhammad (SAAS.) in the business of Khadijah. Marriage of Muhammad (SAAS.) with Khadijah. Rebuilding of *Al-Ka'bah,* Search for the Truth, Receiving the Truth.
Prophet (SAAS.) at *Makkah*: (From first revelation to the emigration to Abyssinia): Prophethood, First revelation and its impact.
Propagation of Islam Begins in secret, The early Muslims, End of the First Phase.
Islamic Movement becomes public, The Prophet on the Mount of *Safa*.
Oppositions from the Quraysh Begin, Qur'anic approach towards Quraysh Oppositions.
Migration to Abyssinia.

Section 0B: (Final Examination: 50 Marks)

Chapter-4 Prophet *(SAAS.)* at *Makkah*: (From emigration to Abyssinia to the migration to *Madinah*)-
Boycott and Confinement of the Prophet (SAAS.) and Banu Hashim by the

Quraish, The Year of sorrow.

Chapter-5 *Taif*- the most difficult day, *Mi'raj* of the Prophet. Covenants of *Al-Aqabah*. *Hijrah* of the Prophet (SAAS.).

Chapter-6 The Prophet (SAAS.)at *Madinah*: (From migration to *Hudaybiyah*) Construction of the Mosque, The Charter of Madinah, Important Battles till the agreement of *Hudaybiyah*- The Battle of *Badr*, The Battle of *Uhud*, Battle of *Ahzab*, Campaigns against the Jews of *Madinah*, *Hudaybiyah* Agreement.

Chapter-7 Letters of the Prophet (SAAS.) to the kings beyond Arabia, Battle of *Muta*, Battle of *Hunayun*, The conquest of *Makkah*.

Chapter-8 The Farewell Pilgrimage, The Farewell Address of the Prophet (SAAS.) and its lessons, Departure of the Prophet (SAAS.), Contributions of the Prophet (SAAS.) as a reformer and as a nation builder and as an Idle for the all.

***Book References*:**

1. Nadwi, Saiyid Sulaiman, *Muhammad The Ideal Prophet: A Historical, Practical, Perfect Model for Humanity*. Translated by Mohiuddin Ahmad. Islamic Book Trust K.L.N.D.
2. Mowdudi, *S.A.A: The Message of the Prophets Seerat*. Hindustan Publications, Delhi, N.D.
3. Abbott, Nabia. *Aishah: The Beloved of Mohammad.* London: Al-Saqi, 1998.
4. Andrae, Tor. *Mohammed: The Man and His Faith.* London: George Allen & Unwin, 1936.
5. Armstrong, Karen. *Muhammad: A Biography of the Prophet.* San Francisco, CA:
6. Asad, Muhammad. *The Message of the Quran.* Gibraltar: Dar al-Andalus, 1980.
7. Forward, Martin. *Muhammad: A Short Biography.* Oxford, UK: Oneworld, 1997.
8. Guillaume, Alfred. *The Life of Muhammad: A Translation of Ibn Ishaq's Sirat Rasul Allah.* London: Oxford University Press, 1955.
9. Kahn, Muhammad Zafrulla. *Muhammad, Seal of the Prophets.* New York: Viking Press, 981.
10. Lings, Martin. *Muhammad: his life based on the earliest sources.* New York: Inner Traditions International, 1983.
11. Motzki, Harald, ed. *The Biography of Muhammad: The Issue of the Sources.* Leiden: E.J. Brill, 2000.
12. Nasr, Seyyed Hossein. *Muhammad: Man of God*. Chicago, IL: Kazi Publ., 1995.
13. Ramadan, Tariq. *In the Footsteps of the Prophet: Lessons from the Life of Muhammad.* New York: Oxford University Press, 2009.
14. Robinson, Neal. *The Sayings of Muhammad*. London: Duckworth, 1991.
15. Rodinson, Maxime. *Muhammad.* New York: Pantheon Books, 1980 ed.
16. Rubin, Uri. *The Eye of the Beholder: The Life of Muhammad as Viewed by the Early Muslims.* Princeton, NJ: Darwin Press, 1995.
17. Rubin, Uri, ed. *The Life of Muhammad*. Aldershot: Ashgate, 1998.
18. Warraq, Ibn, ed. *The Quest for the Historical Muhammad.* Amherst, NY: Prometheus Books, 2000.
19. Watt, William Montgomery. *Muhammad at Mecca*. Oxford, UK: Clarendon Press, 1953.
20. Watt, William Montgomery. *Muhammad at Medina.* Oxford, UK: Clarendon Press, 1956.
21. Watt, William Montgomery. *Muhammad: Prophet and Statesman.* London: Oxford University Press, 1961.

Course Title: Bangladesh Studies. **Course Code:** URBS – 3606
Credit Hours: 2 (two) C.H. **Contact Hours:** 2 (two) C.H. (per week)

Objective:
The objectives of this study is to create awareness among the students about the History, Geography, Economics, Sociology, Politics, Language, Literature, Philosophy, Art and Culture of Bangladesh and such other subject as are significantly related to the life and society of Bangladesh with a view to develop patriotism among the learners.

Section A (Mid-term Examination: 30 Marks):

Chapter 1 Introduction to the course and its objectives.
Chapter 2 **Outline study of Bangladesh Geography**: Location, Area, Boundary, Physiography, River System, Forest and Climate. The People of Bangladesh.
Chapter 3 **History and Society of Bengal under Muslim Rule (1204-1757):** Advent of Islam in Bengal and the Muslim conquest, its impact on the people-origin of the Muslim of Bengal, formation of Muslim society under the Bengal Sultanate, impact of Sufism in Bengal, educational development under the Muslims and socio-religious reform movements in Muslim Bengal.

Section B (Final Examination: 50 Marks):

Chapter 4 **History and Society of Bengal under British Rule (1757-1947):** The British policy towards economy and education of the people. A brief discussion on the struggles for freedom from the British Colonialism, Intellectual Movements, development of Bengali Prose Literature, new trend of nationalism and the creation of Pakistan.
Chapter 5 **History and Society of Bangladesh during Pakistan Rule (1947-1971):** Language Movement of 1952, Political Mobilization and Events Leading to the Mass Upsurge of 1969, War of Independence & the Emergence of Bangladesh in 1971.
Chapter 6 **Politics and Constitutional Development of Bangladesh:** The Constitution of Bangladesh, Characteristics, State Principles, Amendments. Formation and Role of Major Political Parties in Bangladesh.
Chapter 7 Economic condition of Bangladesh.
Chapter 8 Socio-cultural problems and prospects of Bangladesh.

Resources:

1. Islam, Sirajul, (ed.), *Banglapedia: National Encyclopedia of Bangladesh,* Vol- 1-10, Asiatic Society of Bangladesh, Dhaka, 1998.
2. Rashid, Harun Er, *Geography of Bangladesh*, University Press Limited, Dhaka, Bangladesh, 1991.
3. Ali, Mohar, *History of the Muslims of Bengal.* Vol – 1-3, Islamic Foundation Bangladesh, Dhaka, 2003.
4. Karim, Abdul, *Social History of the Muslims of Bengal*, Baitush Sharaf Islamic Research Institute, Chittagong, Bangladesh, 1985.
5. Huq, Dr. Enamul, *A History of Sufism in Bengal*, Bangla Academy, Dhaka, 1975.
6. Board of Researchers, *Islam in Bangladesh through Ages*, Islamic Foundation Bangladesh, 1995.
7. Ahmed, Sufia, *Muslim Community in Bengal (1884-1912)*, Oxford University Press, Dhaka, 1974.

8. Rahim, M.A., *The Muslim Society and Politics in Bengal*, University of Dhaka, Bangladesh, 1978.
9. Khan, Prof. Dr. Muinuddin Ahmed, *Islamic Revivalism*, Bangladesh Institute of Islamic Thought (BIIT), 2010.
10. Khan, Dr. Muinuddin Ahmed, *Muslim Struggle for freedom in Bengal,* Islamic Foundation Bangladesh, 1983.
11. Huq, Dr. Muhammad Inamul, *Varoter Musalman O Shwadinota Andolan*, Bangla Academy, Dhaka, 1995.
12. Mallick, Azizur Rahman, *British Policy and the Muslims in Bengal*, Asiatic Society of Pakistan, Dhaka, 1961.
13. Rahim, Dr. M.A., and others, *Bangladesher Itihash*, Nowroz Kitabistan, Dhaka, Bangladesh, 1994.
14. Khan, Abbas Ali, *Banglar Musalmander Itihash*, Bangladesh Islamic Center, Dhaka, 2002.
15. Islam, Sirajul, *History of Bangladesh*, Vol – 1-3, Asiatic Society of Bangladesh, Dhaka, 2008.
16. Asad, Abul, *Eksho bochorer Itihas*, Bangladesh Co-operative Book Society, Dhaka, 1997.
17. Barnik, M.A., *Rasthra Bhasha Andoloner Itihas,* AHDPH.
18. Ahad,, Oli, *Jatiyo Rajniti 1945-1975*, Bangladesh Co-operative Book Society, Dhaka, 2004.
19. Ahmad, Abul Mansur, *Amar Dekha Rajniteer Poncash Bochor*, Srijon Prokashoni Ltd. Dhaka, 1988.
20. Ahmed, Kamruddin, *Social History of East Pakistan*, Dacca, Crescent Book Center, 1967.
21. Salik, Siddiq, *Witness to Surrender,* The University Press Ltd., 1997.
22. Ahmed, Moudud, *Bangladesh: Constitutional Quest for Autonomy*, The University Press Ltd., 2003.
23. Khan, Akbar Ali, *Discovery of Bangladesh*, The University Press Ltd., 2009.
24. Maniruzzaman, Talukdar, *Bangladesh Revolution and its Aftermath*, University Press Ltd., 1992.
25. Khan, Shamsul I., *Political Culture, Political Parties and the Democratic Transition in Bangladesh*, The University Press Ltd., 2008.
26. The Constitution of the People's Republic of Bangladesh.
27. Halim, Md. Abdul, *Constitution, Constitutional Law and Politics: Bangladesh Perspective*, Dhaka, 1998.

Useful web links:

http://www.bangladesh.gov.bd
http://www.bangladesh.com
http://www.banglapedia.org
http://www.ru.ac.bd/ibs/
http://www.bbs.gov.bd

Course Title: *Qur'an* Studies in Texts & Translation **Course Code:** URQS -4701

Credit Hours: 01 (One) Hour **Contact Hours:** 02 (Two) Hours **(per week)**

Outlines of the course:

Section (A) (Mid-term Examination: 30 marks): (Total lectures = 6 X 2= 12, 6 weeks)
Selected Texts

Chapter -1
1. An Introduction to the Holy Qur'an. (1 lecture).
2. The introductory chapter of the Qur'an (*Suratul Fatihah*). (1 lecture).
3. *Iman*, Islam & '*Amal al-Saleh*: (3 lectures).
   3: a. Selected Text on *Iman*: 2: 1-5 (1lecture).
   (Additional references: 2: 285, 18: 107- 110, 23: 1-11).
   3: b. Selected Text on Islam: 3:19-22 (1lecture).
   (Additional references: 3: 85, 5: 3, 6: 175).
   3: c. Selected Text on *'Amal al- Saleh* 4:103(1lecture).
   (Additional references: 4: 124, 17: 9, 18: 107 -110).

Chapter -2
4. Fundamental of Islamic Belief (*Tawheed*, *Risalah* & *Akhirah*) (3 lectures).
   a. Selected Text on *Tawheed*: 112 (1lecture).
   (Additional references: 2: 163, 3: 4 23:91).
   b. Selected Text on *Risalah*: 4:163(1lecture).
   (Additional references: 3:84, 7: 158, 61:6).
   c. Selected Text on *Akhirah: 27:* 1-5 (1lecture).
   (Additional references: 2: 4, 3:145, 23: 74)

Chapter -3
5: *Salah* , Zakah, *Sawom* & Hajj – 4 lectures
   a. Selected Text on *Salah* = 9:71-72 (1 lecture).
   (Additional references: 22:41, 24: 56, 27:1-3)
   b. Selected Text on *Zakah* =27:1-5 (1 lecture).
   (Additional references: 3:92, 2:254, 63:10-11).
   c. Selected Text on *Sawom*: 2: 183-84 (1 lecture).
   (Additional references: 2:185)
   d. Selected Text on Hajj: 3: 96- 97 (1 lecture).
   (Additional references: 2: 196- 197).

Total = 12 lectures before mid- term Exam.

Section (B) (Final Examination: 50 marks):

Total lectures 8x2= 16 (One lecture on every topic, 8 weeks).

Selected Texts

Chapter -4
1. Selected Text on *Taharah* : 5:6.
   (Additional references: 4: 43, 9: 108)
2. Selected Text on creation of mankind and its vicegerency on the earth: 38:71. (Additional references: 20:30-32, 6: 165, 35:39)
3. Selected Text on subjugation of all that are in the universe for the mankind. 16: 12-15. (Additional references 31: 20, 45: 12-13)

Chapter -5
4. Selected Text on position of the Muslim *Ummah*= 2:143.
   (Additional references: 3:110)
5. Selected Text on objectives of human life = 6: 162, 51:56.

(Additional references: 67:2)

6. Selected Text on obligations of calling to the way of Allah.= 16: 125
(Additional references: 3: 104, 110, 41:33)

Chapter -6

7. Selected Text on 0ur duties and obligations towards Allah = 3:102, 61:11. (Additional references: 4:36, 22:77)
8. Selected Text on duties and obligations towards Allah's Messenger = 3:31-32, (Additional references: 4:65 , 59:7)
9. Selected Text on duties and obligations towards the parents= 17:22-24 (Additional references:29:8, 31:14, 46:15)

Chapter -7

10. Selected Text on duties and obligations towards spouses to each Other = 4: 34-35. (Additional references:4:19, , 30:21)
11. Selected Text on duties and obligations towards relatives. 17:26, 16:90. (Additional references:4: 8, 30:38)
12. Selected Text on shirk and its consequences= 4:48, 5:72 (Additional references: 4:116, 31: 13, 22: 31).

Chapter -8

13. Selected Text on *Kufr* and its consequences= 2:161,162 (Additional references :2:6-7, 3:10, 91, 4: 56)
14. Selected Text on *Nifaq* and its consequences= 9:67, 68 (Additional references: 4: 142-145).
15. Selected Text on characteristics of ideal Servants of Allah (*'Ibadur Rahman*) as depicted in the Qur'an= 25: 63-76
16. Selected Text on the components of loss and destruction for the mankind and how to get rid of the loss : *Suratul 'Asr*

Reference books:

1. Kathir, Ibn, ***Tafsirul Qur'anal-'Azim***, published by Dar Ihyaul Katubul 'Arabiayh , Cairo.
2. Qurtubi, ***Al-Jami-'li-Ahkamil Qur'an***, Published by Barul kutub Al-Masriyah, Cairo.
3. Maududi, S.A.A, ***Tafhimul Qur'an***, Published by Ahunik Prokashoni, Dhaka, Third addition-2005.
4. Sabuni, ***Safwatat Tafasir***, published by Dar As-Sabuni. Cairo, 9th addition-1989.
5. Tabari, ***Jami'ul Bayan fi Tafsir al Qur'an***, Published by Dar Al-Ma'rifah, 3rd addition, Beirut.
6. Saheeh International, ***The Qur'an Arabic Text with Corresponding English Meanings***, Jeddah, Saudi Arabia, 1997.
7. Ahmed, Brig.(R) Zahoor, ***Essential of Arabic Grammar for Learning Qur'anic Language***, Darussalam Publications and Distributors, Pakistan , 2008.

Course Title: Islamic World View **Course Code:** URIW- 4700
Credit Hours: 2 C.Hs **Contact Hours:** 2 C.Hs **(per week)**

The objective of the course:

- To make the students understand the Islamic and Western World Views and their characteristics.
- To give the students an exposure to the main foundations of the Islamic World View and its implications to knowledge, personality and behaviors in the current context of Bangladesh and the world.
- To provide the students with the necessary knowledge and tools for better understanding and application of the Islamic World View.
- To concretize the students about the Islamic Culture & Heritage across the globe.

Course Outline in details:

Section-A (Mid-term Exam: 30 Marks)

Chapter- 1 **Islamic World View: Definition, characteristics and elements.**

i) Islam its meaning & message.
ii) *Tawheed* and its Implication for Thought and Life.
iii) *Risalah* (the Prophethood) of Muhammad (SAAS) in the context of Islamic World View.
iv) *Akhirah* or the life Hereafter and its Importance in the perspective of Islamic World View.

Chapter- 2 ***'Ibadah*** **(worship): Its definition nature and scope in the context of Islamic World View**

The nature of man & his status in the perspective of Islamic World View.

Chapter- 3 **The Qur'an: Its message to the mankind.**

Section-B (Final Exam: 50 Marks)

Chapter- 4 **The *Sunnah:* The most authentic source of the Prophetic life & source of Islamic law.**

Chapter- 5 **Classification of World Views:**

i) The Scientific approach
ii) The philosophical approach
iii) The Religions approach

Chapter- 6 **Islam and Concept of Morality and Ethics:**

i) Formation of Islamic Morality
ii) Principles of *Halal* (the lawful) and *Haram* (the prohibition) in Islam.

Chapter- 7 **Islam and some contemporary challenges:**

i) Islam and Secularism
ii) Islam and Terrorism.
iii) Islam and Fundamentalism.
iv) Islam and Nationalism
v) Islam and Globalization.

Chapter- 8 **Islamic World and its Future.**

***Book References*:**

1. Kamal Hassan, M, (1994), ``*The Islamic Worldview''. In Abdul Monir Yaakob (ed). Towards a positive Islamic Worldview: American Malaysian Perspective.* Kuala Lumpur:IKIM11-33
2. Al-Attas, Syed Muhammad al-Naquib, (1992), *Islam: The concept of Religion and the Foundation of Ethics and Morality,* Dewan Bahasa and Pustaka,KL, Malaysia
3. Abdalati, Hammuda, (1993), *Islam in Focus*. Kuwait, Amanah Publications, Beltsville, Maryland
4. Al-Faruqi, Ismail Raji, (1998), *Towhid: Its implications for Thought and Life*, IIIT, Herndin,Viginia, USA.
5. Naugle, David K, (2002), *Worldview: The History the Concept,* w.b. Erdamns Pub. Grand Rapids
6. Qutub, Sayyid, (1984). *The Islamic concept and Its Characteristics,* Hindustan Publications Delhi, India
7. Rahman, Fazlur (1994), *Major Themes of the Qur'an*. Minneapolis, Bibliotheca Islamica
8. Rahman, Fazlur, (1982) *Islam and Modernity: The Transformation of An Intellectual Tradition*. Chicago: the University of Chicago Press.
9. Karim, Fazlul, *The Religion of Man*
10. Al-Faruqi, Ismail Raji, *Islam and other faiths*
11. Al- Qardawi, Dr. Yusuf, *Lawful and unlawful things in Islam*
12. Articles in *The American Journal of Islamic Social sciences*, vol. 24, spring, 2007

Course Title: *Hadith* Studies in Texts & Translation **Course Code:** URIS -4802

Credit Hours: 01 (One) Hour **Contact Hours:** 02 (Two) Hours **(per week)**

Objective of the course:

- To get the students acquainted with the prophetic *Hadith* and its importance.
- To bring the students in direct contact with the prophetic *Hadiths.*
- To help the students in getting guidelines from the prophetic *Hadiths.*
- To highlight before the students the meanings and message of the sayings of the Prophet (SAAS.) in some basic issues of their life.
- Encouraging the students to follow the teachings of the prophet (SAAS.) in every walk of their life.
- To create an interest among the students in studying the prophetic *Hadiths* regularly which can help them lead an ideal Islamic life.

Outcome of the course:

- After studying this course the following result is expected to be attained:
- This course will make the student informed about the nature, scope and importance of the prophetic *Hadith.*
- This course will enlighten the students through providing them with basic knowledge of the prophetic *Hadiths.*
- This course will make the students guided by the teachings and message of the Prophetic Tradition *(Hadith).*
- It will create special love and affection to the Prophet (SAAS.) which is the basic requirement for being a Muslim in true sense.
- This course will help the students to further their studies in the Prophetic tradition as part of their daily life.
- This course will help them in attaining the success in this life and salvation in the Hereafter.
- This course will create an atmosphere to enlighten the mental faculty of the students with the wisdom of the prophetic Tradition *(Hadith).*
- The course will pave the way for the students for following the commandment of the Prophet (SAAS.), abstaining from those disliked by him and to make decision in different issues based on knowledge and confidence.

Outlines of the course:

- This course will consist of 31 sayings of the Prophet (SAAS.) on different important issues related to different aspects of the life of every Muslim.

- The teacher shall project a *Hadith* of the Prophet (SAAS.) through Over Head Projector (OHP) along with its English translation. One or two students who can read the text in Arabic shall be asked to read it correctly, if he commits any mistake the teacher shall make necessary correction of the mistake, them the teacher shall translate it into English in two stages: Firstly word for word translation and secondly translation of the text as a whole. Explain the important words literally and terminologically as well where needed. Shall ask the students to repeat the meaning of the words and explanation thereof.

- Finally, the teacher shall highlight the lesson of this particular *Hadith* and discuss how to implement its teachings in our daily life.

Topic-wise arrangement of *Hadiths*:

Section (A) (Mid-term Examination: 30 marks)

Chapter-1

Topic-1: Importance of the Intention [H/2 – L/2]
a) Rewards for good deeds depends on sincerity of intention
b) Intention for a good deed deserves one for reward however intention for bad deed does not lead to punishment.

Topic-2: Firmness of belief [H/1 – L/1]

Topic-3: Importance of *Taqwa* (God fearing and Piety) [H/1 – L/1]

Chapter-2

Topic-4: Pillars of Islam [H/3 – L/3]

a) Five pillars of Islam
b) Prime importance of *Salat* (Prayer) and *Sawm* (Fasting)
c) *Salat* is the first thing about which a person will be accountable in the Day of Resurrection

Topic-5: Sincere obedience to the Prophet is needed [H/1 – L/1]

Chapter-3

Topic-6: Basic Islamic Characters [H/4 – L/4]

a) The beauty of Muslim's true Islam.
b) Like for your Brother which you like for you.
c) Speaking good, honoring the neighbors and the guests.
d) To control one's temperament.
e) Importance of cleanliness and some other important characters.

Section (B) (Mid-term Examination: 50 marks)

Chapter-4

Topic-7: Islamic Behavior [H/2 – L/1]

a) Relation between the Muslims and their expected behavior
b) Total abstinence from harmful activities

Topic-8: Responsibility of a Muslim towards the wrong [H/1 – L/1]

Topic-9: Identification of righteousness and sinfulness [H/1 – L/1]

Topic-10: Correct attitude towards Allah's injunctions and His exemptions [H/1 – L/1]

Chapter-5	**Topic-11:** Way to exercising the act of *Sadaqah* or Charity in daily life [H/1 – L/1] **Topic-12:** How to gain Allah's pleasure and love from the people [H/1 – L/1] **Topic-13:** How to be a true Muslim [H/1 – L/1]
Chapter-6	**Topic-14:** Symptoms of a hypocrite [H/1 – L/1] **Topic-15:** Exemption from punishment if a sinful act is done out of mistake, out of forgetfulness or under compulsion [H/1 – L/1] **Topic-16:** Consequence of *Shirk* (Associating with Allah) [H/1 – L/1]
Chapter-7	**Topic-18:** Benefits of devotion to Allah [H/1 – L/1] **Topic-19:** Benefits of depending upon Allah sincerity [H/1 – L/1] **Topic-20:** Importance of sincere well wishing as an integral requirement of religion [H/1 – L/1]
Chapter-8	**Topic-21:** Standard attitude of a true Muslim toward the world [H/1 – L/1] **Topic-22:** The way to get rid of the conspiracy of *Iblees* (Satan) [H/1 – L/1] **Topic-23:** The branches of *Iman* [H/1 – L/1]

Total 10 Courses 18 Contact Hours with 12 Credit Hours

E. Interdisciplinary Courses

Course Code: ACC-2301 **Course Title: Financial and Managerial Accounting,**
Credit Hours: 2 **Contact Hours: 2 per week**

Objectives: In this course student will learn about 'Financial and Managerial Accounting' in regards to accounting and financial statement. book keeping system ,errors correction in the trial balance, bank reconciliation statement, budget and planning.

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Section –A
(Mid-term Exam. 30 Marks)

1. **Preliminaries:** Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles & ethics, Accounting Equation & Transaction Analysis.
2. **Introduction to Financial Statements**: Recording Business Transactions, The Accounts & their types.
3. **Double-Entry Book keeping System**; Invoice, discount from purchase price, purchase return and allowances, Sale of inventory, sales discount, sales returns and allowances; Journals, ledger & Trial balance.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. **Correcting errors in the trial balance:** The Adjusting and Closing Procedure: The adjusting process, Accrual versus cash basis Accounting, Preparation of Adjusted trial balance and financial statements, Closing entries & Reversing entries.

5. **Using accounting information in decision-making**. Accounting in practice, Worksheet. Purchase book, sales book, cashbook, patty cashbook, etc. Control accounts and subsidiary accounts. Bank reconciliation statement.

Group-B (30 Marks)

6. **Cost In General: C**ost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.

7. **Marginal & Relevant costing**: Marginal costing tools and techniques, cost-volume-profit analysis.
8. **Guidelines for Decision-Making**: Budget, Capital budgeting; Planning, evaluation & control of capital expenditures.

Recommended Books:

1	Charles T. Horngren & walter T. Harrison	Accounting.
2	Adolph Matz & Milton F. Usry	Cost Accounting- Planning and Control
3	Sankar Prasad Basu & Monilal Das.	Practice in Accountancy
4	Jerry J. Weygandt, D E. Kieso & Paul D. Kimmel.	Accounting Principles :
5	Jay M Smith & K Fred Skousen	Intermediate Accounting.

Course Code: ECON-3501 **Course Title: Principles of Economics**
Credit Hours: 2 **Contact Hours:** 2 per week

Objectives: In this course student will learn about 'Principle of Economics' in regards to the basic idea in micro and macroeconomics, production and market , economic policy, economics of development and planning.

Section –A
(Mid-term Exam: 30 Marks)

1. Introduction: Definition of economics, Scope and utility of studying economics.

2. Micro-economics: The theory of demand and supply and their elasticity, Price determination, Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis,

3. Production: Production function, types of productivity, The nature of Isoquants and Isocosts, Rational region of production of an engineering firm. Euler's theorem.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. Market: Concepts of market and market structure. Cost analysis and cost function. Small scale production and large-scale production, Optimization, Theory of distribution.

5. Macroeconomics: Savings, investment, employment, National income analysis, Inflation.

Group-B (30 Marks)

6. Economic Policy: Monetary policy, Fiscal policy and trade policy with reference to Bangladesh.

7. Economics of development: Dimensions of development, Relevance of theory, the employment problem, Human resource development

8. Economics of planning: Planning and market, Policy models, Planning experience.

Recommended Books:

1.	Richard Leftwich	The Price System and Resource Allocation
2.	P.A. Samuelson	Economics
3.	P.A. Samuelson & Nordhaus	Economics
4.	G.J. Stigler	The Theory of Price
5.	McConnell & L.Brue	Economics(Principles, Problems and Policies)

Course Code: MGT-3601 **Course Title: Industrial Management**
Credit Hours: 2 **Contact Hours:** 2 per week

Objectives: In this course student learn about 'Industrial Management' in regards to the importance of management, manpower planning and development, cost & financial management, marketing and production management, industrial law and professional practice**.**

Section –A
(Mid-term Exam: 30 Marks)

1. Preliminaries: Definition, Importance of management, Evolution, Functions of management, Introduction to Industry & organizational management.
2. Organization and it's Environment: Environmental context of the Organization.
3. Organizing & stuffing: Theory & structure, Co-ordination, Span of control, Authority delegation, Formal & Informal Groups, Committee and task force, Manpower planning & Development.

Section- B (Final Exam: 50 Marks)
Group- A (20-Marks)

4. Cost & Financial Management: Investment analysis, benefit-cost analysis & it's implications in decision making. Cost planning & Price Control, budget &budgetary control, development planning process.
5. Marketing management: Concepts, strategy, sales promotion, Transportation & Storage. Technology management: Management of innovation & changes, technology lifecycle.

Group-B (30 Marks)

6. Production Management: Designing operations system in production and service-oriented industry. Product layout, process layout, & fixed position layout. Organizational technologies: automation, computer-assisted manufacturing, flexible manufacturing system, and robotics. TQM, bench marking, ISO 9000, SQC.
7. Industrial law: Law of contract, sale of goods, Hire and purchase, Negotiable instrument Act, patent right and validity. Factories act, Industrial relations ordinance, workmen's compensation act.

8. Professional Practice: Tender documentation, General conditions of tender, Tech. Specification, Purchase & procurement rules-2004, Technical evaluation, Copyright, Intellectual property right.

Recommended Books:

1	Ricky W. Griffin	Management
2	Heinz Weihrich & Harold Koontz	Management A Global Perspective
3	W.J. Stevenson	Management Science
4	Terry & Frankin	Principle of Management
5	Edwin B. Flippo	Personnel Management.
6	Arun Monappa	Industrial Relations
7	Naceur Jabnoun	Islam & Management
8	F.R. Faridi	Islamic Principles of Business Organization and Management
9	Leon G. Schiffman & L.L. Kanuk	Consumer Behavior
10	W.J. Stevenson	Management Science
11	Herold Koontz	Management

Course Code: LAW-4721 **Course Title: Law and Professional Ethics**
Credit Hours: 2 **Contact Hours:** 2 per week

Objectives: In this course student learn about ‘ Law and Professional Ethic’ in regards to nature and concept of law, company law, labour law, history and development of engineering ethics, ethical expectations and cyber law.

Section-A
(Mid-term Exam: 30 Marks)

1.Law Basics: Nature and concept of law. Schools of Jurisprudence: Analytical, Historical, Philosophical, Sociological & Natural. Administration of Justice: Theories of punishment. Sources of Law: Custom, Precedent and Legislation. Rights and Duties. Legal Personality. Ownership and Possession. Definition and theories of Law, Principles of law of contract, agency, partnership, sale of goods negotiable instruments, insurance and insolvency.
2.Company law: The companies act with special reference to the amendments and ordinances applicable to Bangladesh. Law regarding formation, Incorporation, Management and winding up of companies.
3.Labor Law: The scope and sources of labor law. Law in relation to wages, hours, health, safety and other condition to work. The legislation effecting employment in factories. The trade union legislation arbitration, the policy of the state in relation to labor. Elementary principles of labor law.

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)

4. History and Development of Engineering Ethics: Study of Ethics in Engineering. Applied Ethics in engineering. Human qualities of an engineer. Obligation of an engineer to the clients and to other engineers. Measures to be taken in order to improve the quality of engineering profession.
5. Ethical Expectations: Employers and Employees inter-professional relationship, maintaining a commitment of Ethical standards. Desired characteristics of a professional code. Institutionalization of Ethical conduct.

Group-B (30-Marks)

6. Cyber Law Introduction : The need for Cyber Law , Regulation of Technology and Internet , The Internet and the Problems of Geography and Sovereignty , Freedom of Expression on the Internet,
7. The Relationship between Legal and Technological Regulation: Intellectual Property: Copy rights, Trade Marks, Industrial Designs. Electronic and Digital Signature. Embedding Law into Technology. Electronic Contract.
8. Liability of Internet Intermediaries: Defamatory Content, Privacy, Copy right, Infringement. Liabilities relating to electronic financial transaction. Nature and scope of cybercrime, Regulation of Cyber Crime. Offences and Punishment of Technology Crimes. B

Recommended Books:

1	A. K. Sen	A Hand Book of Commercial Law.
2	A. A. Khan	Labour and Industrial Law.
3	J. D. Mabboth	An Introduction to Ethics
4	Stacey L. Dogan	Copyright in Cyberspace: An Introduction
5	A. B.Siddique	The Law of Contract.
6	Emile Durkheim	Professional Ethics and Civics Morals
7	Jonathan L. Zittrain,	Internet Law: Technological Complements to Copyright
8	Coopers	Outline of Industrial Law.
9	A. Zulfiquar	V A Text Book on the Bangladesh Labour Act-2006.
10	P. Narayanan	Intellectual Property Law.
11	A. R. Khan	Business Ethics
12	G. E. Moore:	Principia Ethicia
13	*M. Radar*	Ethics and the Auman Community