International Islamic University Chittagong
Department of Electrical and Electronic Engineering

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

Engineering

AUTUMN – 2011

As per recommendations made in the 108th meeting of the Faculty of Science and Engineering Committee held on October 27, 2011

As per recommendations made in the 143th meeting of Academic Committee of the Department of EEE held on October 25, 2011

As per recommendations made in the meeting of Course Committee of the Department of EEE   held on

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Faculty of Sciences & Engineering
Department of Electrical & Electronic Engineering

Undergraduate Courses for Electrical & Electronic Engineering (EEE)

Course Plan in EEE

The following section gives a course plan in EEE with four major as listed below.

- Major in **communication engineering**
- Major in **electronics engineering**
- Major in **power systems engineering**
- Major in **computer science & engineering**

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).

Programs of Study:

The B. Sc. (Engineering) program in the department of Electrical & Electronic Engineering consist of 73 courses carrying 161 Credit Hours. There are 10 University Requirement Courses (URC) carrying 13 credit hours, 4 Interdisciplinary Courses carrying 8 credit hours, 48 Core Courses carrying 111.5 credit hours and 11 Elective Courses carrying 28.5 credit hours. In the Core Courses there are 29 theory courses carrying 83 credit hours and 19 practical courses carrying 28.5 credit hours. In the elective courses there are 8-theory course carrying 24 credit hours and 3 practical courses carrying 4.5 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, 20 marks are for class tests/assignments/oral tests, 30 marks for mid-term examination and 50 marks for the final examination. Out of 100 marks for Laboratory 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

Types of Courses	No. of Courses	Credit Hours
University Requirement Courses	9	9
Interdisciplinary Courses	4	8
Core Courses Theory	28	81
Core Courses Practical	20	27.5
Elective Courses Theory	8	24
Elective Courses Practical	3	4.5
Thesis	1	6
Board Viva	1	1
Total	**74**	**161**

Semester wise Summary of Courses

Semester	No. Of Courses	Contact hours/Week			Credit Hours		
		Theory	Lab	Total	Theory	Lab	Total
1st	10	18	8	26	14	3.5	17.5
2nd	9	15	9	24	15	4	19
3rd	9	16	8	24	15	3.5	18.5
4th	10	17	12	29	17	6	23
5th	10	15	12	27	15	6	21
6th	9	18	6	24	18	3	21
7th	9	15	10	25	15	6	21
8th	9	14	10	24	13	7	20
Total	**75**	**128**	**75**	**203**	**123**	**38**	**161**

* Here thesis has not been counted as it has been counted in 7th semester

A. List of University Requirement Courses

Serial No	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	URAL-1101	Elementary Arabic	3		1		
3	UREL-1103	Advanced English	3		1		
4	URIS-1101	Islamic Aqidah	1		1		
5	URIS-1203	Introduction to Ibadah	1		1		
6	URIS-2303	Introduction to Qur'an and Sunnah	2		1		
8	URIS-3505	Government & Politics in Islam	1		1		

Serial No	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
9	URIS-3609	Biography of the Prophet (SAW) & History of Khalifah	1				
		History of khulafa-al-Rashedin	1		1		
10	URBS-4802	Bangladesh Studies	2		2		
	Total	10 Courses	15		9		

B. List of Interdisciplinary Courses

Serial No	Course No.	Course Title	Contact Hours/Week	Credit Hours	Prerequisite Courses
1	ACC-3501	Financial and Managerial Accounting	2	2	
2	ECON-2401	Principles of Economics	2	2	
3	MGT-3601	Industrial Management	2	2	
4	XXX- 47xx	Option-I (One optional course)	2	2	
	Total	4 Courses	8	8	

C. Core Courses

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	Math-1101	Differential and Integral Calculus	3		3		
2	Math-1201	Co-Ordinate Geometry & Higher Trigonometry	3		3		Math -1101
3	Math-2301	Ordinary and Partial Differential Equation	3		3		Math-1201
4	Math 2401	Matrices, Linear System of Equations and Vector Analysis	3		3		Math-2301

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
5	Math-3501	Complex Variable, Fourier Analysis & Z-transform	3		3		Math 2401
6	Stat-2301	Statistics	2		2		
7	PHY-1103	Physics I (Mechanics, Waves, Heat & Thermodynamics)	3		3		
8	PHY-1104	Physics I Sessional		3		1	
9	PHY-1203	Physics II (Electromagnetism, Optics & Modern Physics)	3		3		Phy-1103
10	Phy-1204	Physics II Sessional		3		1	
11	Chem-2301	Chemistry	3		3		
12	Chem2302	Chemistry Sessional	3			1	
13	ME-1201	Fundamentals of Mechanical Engineering	3		2		
14	CE-2301	Engineering Drawing Sessional		2		1	
15	CSE-1101	Computer Fundamentals	2		2		
16	CSE-1102	Computer Fundamentals Sessional		2		1	
17	CSE-1201	Computer Programming	3		3		
18	CSE-1202	Computer Programming Sessional		3		1.5	
19	EEE-1101	Electrical Circuits I	3		3		
20	EEE-1102	Electrical Circuits I Sessional		3		1.5	
21	EEE-1201	Electrical Circuits II	3		3		EEE-1101
22	EEE-1202	Electrical Circuit II Sessional		3		1.5	
23	EEE-2301	Electronics I	3		3		EEE-1201
24	EEE-2302	Electronics I Sessional		3		1.5	
25	EEE-2303	Electrical Machine I	3		3		EEE-1201

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
26	EEE-2401	Electrical Machine II	3		3		EEE-2303
27	EEE-2402	Electrical Machine Sessional		3		1.5	
28	EEE-2405	Engineering Electromagnetism	3		3		EEE-1201
29	EEE-2407	Digital Electronics	3		3		EEE-2301
30	EEE-2408	Digital Electronics Sessional		3		1.5	
31	EEE-2410	Numerical Technique Sessional		3		1.5	
32	EEE-2411	Electronics II		3		1.5	EEE-2301
33	EEE-2412	Electronics II Sessional		3		1.5	CSE-1201
34	EEE-3501	Continuous Signals & Linear Systems	3		3		Math 2401
35	EEE-3503	Power System I	3		3		EEE-1201
36	EEE-3504	Power System I Sessional		3		1.5	
37	EEE-3505	Microprocessor & Interfacing	3		3		EEE-2407
38	EEE-3506	Microprocessor & Interfacing Sessional		3		1.5	
39	EEE-3510	Circuit Simulation Sessional		3		1.5	EEE-2301
40	EEE-3512	Electrical Services Design Sessional		3		1.5	
41	EEE-3601	Communication Theory	3		3		EEE-3501
42	EEE-3602	Communication Theory Sessional		3		1.5	
43	EEE-3603	Digital Signal Processing I	3		3		EEE-3501
44	EEE-3604	Digital Signal Processing I Sessional		3		1.5	
45	EEE-3605	Electrical Properties of Materials	3		3		EEE-2301
46	EEE-3607	Solid State Devices	3		3		EEE-2403
47	EEE-4701	Control System I	3		3		EEE-3501
48	EEE-4702	Control System I Sessional		3		1.5	

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
49	EEE- 4800	Thesis		8		6	
50	EEE-4822	Board Viva			1		
	Total	49 courses (28 + 21)	81	67	80	27.5	

Optional Courses (one course to be taken)

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	**Practical**	**Theory**	**Practical**	
FIN-4701	Finance and Marketing for Engineers	2		2		
SCO-4703	Sociology	2		2		
PSY-4705	Psychology	2		2		
LAW-4707	Business and Cyber Law	2		2		
GOV-4709	Government	2		2		

Elective Courses

In order to achieve a degree in Electrical and Electronic Engineering from IIUC, a student will have to complete 11 elective courses (3 lab courses and 8 theory courses) of 28.5 credit hours from any of the following five major disciplines or specialized areas:

- Communication Engineering
- Electronics Engineering
- Power Systems Engineering
- Computer Science & Engineering
- Interdisciplinary Fields

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 11 courses (3 lab courses and 8 theory courses)]. Any lab course must be followed with the corresponding theory course and vice versa (if any).

(i) Communication Engineering

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3631	Random Signals & Processes	3		3		EEE-3501
2	EEE-4731	Digital Signal Processing II	3		3		EEE-3603
3	EEE-4733	Microwave Engineering	3		3		EEE-3601
4	EEE-4734	Microwave Engineering Sessional		3		1.5	
5	EEE-4735	Optical Fiber Communication	3		3		EEE-3601
6	EEE-4831	Digital Communication	3		3		EEE-3601
7	EEE-4832	Digital Communication Sessional		3		1.5	
8	EEE-4833	Mobile Cellular Communication	3		3		EEE-3601
9	EEE-4835	Telecommunication Engineering	3		3		EEE-3601

(ii) Electronics Engineering

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3551	Analog Integrated Circuit	3		3		EEE-2403
2	EEE-3651	Digital Integrated Circuit	3		3		EEE-2301
3	EEE-4751	Processing & Fabrication Technology	3		3		EEE-3607
4	EEE-4753	VLSI Design Technique and Modeling	3		3		EEE-3607
5	EEE-4754	VLSI Design Technique and Modeling Sessional		3		1.5	
6	EEE-4755	Compound Semiconductor & Heterojunction Devices	3		3		EEE-2403
7	EEE-4851	VLSI II	3		3		EEE-4753
8	EEE-4852	VLSI II Sessional		3		1.5	
9	EEE-4853	Opto-electronics	3		3		EEE-2403
10	EEE-4855	Semiconductor Device Theory	3		3		EEE-3607

(iii) Power Systems Engineering

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3671	Power System II	3		3		EEE-3503
2	EEE-4771	Energy Conversion III	3		3		EEE-2401
3	EEE-4773	Power Electronics	3		3		EEE-2403
4	EEE-4774	Power Electronics Sessional		3		1.5	
5	EEE-4775	Power Plant Engineering	3		3		
6	EEE-4871	Power System Protection	3		3		EEE-3503
7	EEE-4872	Power System Protection Sessional		3		1.5	
8	EEE-4873	Power System Reliability	3		3		EEE-3503
9	EEE-4875	Power System Operation & Control	3		3		EEE-3503
10	EEE-4877	High Voltage Engineering	3		3		EEE-3503
11	EEE-4878	High Voltage Engineering Sessional		3		1.5	

(iv) Computer Science & Engineering

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3691	Discrete Mathematics	3		3		EEE-2410
2	EEE-4791	Operating System	3		3		EEE-2410
3	EEE-4793	Data Structure	3		3		EEE-2410
4	EEE-4794	Data Structure Sessional		3		1.5	
5	EEE-4795	Software Engineering	3		3		EEE-2410
6	EEE-4891	Computer Networks	3		3		EEE-2410
7	EEE-4892	Computer Networks Sessional		3		1.5	
8	EEE-4893	Computer Architecture	3		3		EEE-3505
9	EEE-4895	Multimedia Communication	3		3		EEE-2410
10	EEE-4897	Microprocessor System Design	3		3		EEE-3505
11	EEE-4898	Microprocessor System Design Sessional		3		1.5	

(v) Interdisciplinary Fields

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4821	Control System II	3		3		EEE-4701
2	EEE-4822	Control System II Sessional		3		1.5	
3	EEE-4823	Numerical Methods	3		3		EEE-2410
4	EEE-4824	Numerical Methods Sessional		3		1.5	
5	EEE-4825	Biomedical Instrumentation	3		3		EEE-2403
6	EEE-4826	Biomedical Instrumentation Sessional		3		1.5	
7	EEE-4827	Measurement & Instrumentation	3		3		EEE-2403
8	EEE-4828	Measurement & Instrumentation Sessional		3		1.5	

Semester wise Course Offerings:

The semester wise course distributions are as follows:

FIRST SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-1101	Electrical Circuits I	3	0	3	0	
EEE-1102	Electrical Circuits I Sessional	0	3	0	1.5	
CSE-1101	Computer Fundamentals	3	0	2	0	
CSE-1102	Computer Fundamentals Sessional	0	2	0	1	
Math-1101	Differential and Integral Calculus	3	0	3	0	
PHY-1103	Physics I (Mechanics, Waves, Heat & Thermodynamics)	3	0	3	0	
PHY-1104	Physics I Sessional	0	3	0	1	
UREL-1103	Advanced English	3	0	1	0	
URIS-1101	Islamic Aqidah	1	0	1	0	
URAL-1101	Elementary Arabic	1		1		
Total	(7+3) Courses	19	8	13	3.5	17.5

SECOND SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-1201	Electrical Circuits II	3	0	3	0	EEE-1101
EEE-1202	Electrical Circuits II Sessional	0	3	0	1.5	
CSE-1201	Computer Programming	3	0	3	0	
CSE-1202	Computer Programming Sessional	0	3	0	1.5	
PHY-1203	PhysicsII (Electromagnetism, Optics & Modern Physics)	3	0	3	0	Phy-1103
PHY-1204	Physics II Sessional	0	3	0	1	
MATH-1201	Co-Ordinate Geometry & Higher Trigonometry	3	0	3	0	Math-1101
ME- 1201	Fundamentals of Mechanical Engineering	2		2		
URIS-1203	Introduction to Ibadah	1	0	1	0	
Total	(6+ 3) Courses	15	9	15	4	19

THIRD SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2301	Electronics I	3	0	3	0	EEE-1201
EEE-2302	Electronics I Sessional	0	3	0	1.5	
EEE-2303	Electrical Machine I	3	0	3	0	EEE-1201
MATH-2301	Ordinary and Partial Differential Equation	3	0	3	0	MATH-1201
CE -2301	Engineering Drawing Sessional	0	2	0	1	
STAT-2301	Statistics	2		2		
CHEM-2301	Chemistry	3	0	3	0	
CHEM-2302	Chemistry Sessional		3		1	
URIS-2303	Introduction to Qur'an and Sunnah	2	0	1	0	
Total	(6+ 3) Courses	16	8	15	3.5	18.5

FOURTH SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2401	Electrical Machine II	3	0	3	0	EEE-2303
EEE-2402	Electrical Machine Sessional	0	3	0	1.5	
EEE-2405	Engineering Electromagnetism	3	0	3	0	EEE-1201
MATH-2401	Linear Algebra, Matrices and Vector Analysis	3	0	3	0	MATH-2301
EEE-2407	Digital Electronics	3	0	3	0	EEE-2301
EEE-2408	Digital Electronics Sessional	0	3	0	1.5	
EEE-2410	Numerical Technique Sessional	0	3	0	1.5	CSE-1101
EEE-2411	Electronics II	3		3		EEE-2301
EEE-2412	Electronics II Sessional		3		1.5	
ACC2401	Financial and Managerial Accounting	2	0	2	0	
Total	(6 + 4) Courses	17	12	17	6	23

FIFTH SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3501	Continuous Signals & Linear Systems	3	0	3	0	MATH-2401
EEE-3503	Power System I	3	0	3	0	EEE-1201
EEE-3504	Power System I Sessional	0	3	0	1.5	
EEE-3505	Microprocessor and Interfacing	3	0	3	0	EEE-2407
EEE-3506	Microprocessor & Interfacing Sessional	0	3	0	1.5	
EEE-35XX	Elective I	-	-	-	3	
Math-3501	Complex Variable, Fourier Analysis and Z-transform	3	0	3	0	MATH-2401
ECON-3501	Principles of Economics	2	0	2	0	
URIS-3505	Government and Politics in Islam	1	0	1	0	
Total	(6 + 3) Courses	15	12	15	6	21

SIXTH SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3601	Communication Theory	3	0	3	0	EEE-3501
EEE-3602	Communication Theory Sessional	0	3	0	1.5	
EEE-3603	Digital Signal Processing I	3	0	3	0	EEE-3501
EEE-3604	Digital Signal Processing I Sessional	0	3	0	1.5	
EEE-3605	Electrical Properties of Materials	3	0	3	0	EEE-2301
EEE-3607	Solid State Devices	3	0	3	0	EEE-2403
EEE-36XX	Elective II	3	0	3	0	
MGT-3601	Industrial Management	2	0	2	0	
URIS-3607	Biography of the Prophet (SW)	1	0	1	0	
Total	(7+ 2) Courses	18	6	18	3	21

SEVENTH SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4800	Project/ Thesis	0	4	0	3	
EEE-4701	Control System I	3	0	3	0	EEE-3501
EEE-4702	Control System I Sessional	0	3	0	1.5	
EEE-47XX	Elective III	3	0	3	0	
EEE-47XX	Elective IV	3	0	3	0	
EEE-47XX	Elective IV Sessional	0	3	0	1.5	
EEE-47XX	Elective V	3	0	3	0	
URIS-4701	History of khulafa-al-Rashedin	1	0	1	0	
LAW-4701	Law and Professional Ethics	2		2		
Total	(6 + 3) Courses	15	10	15	6	21

EIGHTH SEMESTER

Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4800	Project / Thesis	0	4	0	3	
EEE-48XX	Elective VI	3	0	3	0	
EEE-48XX	Elective VI Sessional	0	3	0	1.5	
EEE-48XX	Elective VII	3	0	3	0	
EEE-48XX	Elective VIII	3	0	3	0	
EEE-48XX	Elective IX	3	0	3	0	
EEE-48XX	Elective IX Sessional	0	3	0	1.5	
EEE-4822	Board Viva	1	0	0	1	
URBS-4802	Bangladesh studies	2	0	1	0	
Total	(5 + 4) Courses	14	10	13	7	20

Grand Total   161

Semester wise Elective Courses:

Elective I (5th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3510	Circuit simulation sessional		3		1.5	EEE-2301
2	EEE-3551	Analog Integrated Circuits	3		3		EEE-2403
3	EEE-3512	Electrical Service Design Sessional		3		1.5	

Elective II (6th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-3631	Random Signals & Processes	3		3		EEE-3501
2	EEE-3651	Digital Integrated Circuits	3		3		EEE-2403
3	EEE-3671	Power System II	3		3		EEE-3503
4	EEE-3691	Discrete Mathematics	3		3		EEE-2410

Elective III (7th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4731	Digital Signal Processing II	3		3		EEE-3603
2	EEE-4751	Processing Fabrication Technology	3		3		EEE-3607
3	EEE-4771	Energy Conversion III	3		3		EEE-2401
4	EEE-4791	Operating System	3		3		EEE-2410

Elective IV (7th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4733	Microwave Engineering	3		3		EEE-3601
2	EEE-4734	Microwave Engineering Sessional		3		1.5	
3	EEE-4753	VLSI I	3		3		EEE-3607
4	EEE-4754	VLSI I Sessional		3		1.5	
5	EEE-4773	Power Electronics	3		3		EEE-2403
6	EEE-4774	Power Electronics Sessional		3		1.5	
7	EEE-4793	Data Structure	3		3		EEE-2410
8	EEE-4794	Data Structure Sessional		3		1.5	

Elective V (7th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4735	Optical Fiber Communication	3		3		EEE-3601
2	EEE-4755	Compound Semiconductor & Hetero-Junction Devices	3		3		EEE-2403
3	EEE-4775	Power Plant Engineering	3		3		
4	EEE-4795	Software Engineering	3		3		EEE-2410

Elective VI (8th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4831	Digital Communication	3		3		EEE-3601
2	EEE-4832	Digital Communication Sessional		3		1.5	
3	EEE-4851	VLSI II	3		3		EEE-4753
4	EEE-4852	VLSI II Sessional		3		1.5	
5	EEE-4871/ EEE-4877	Power System Protection / High Voltage Engineering	3		3		EEE-3503
6	EEE-4872/ EEE-4878	Power System Protection Sessional / High Voltage Engineering Sessional		3		1.5	
7	EEE-4891/ EEE-4897	Computer Networks/ Microprocessor System Design	3		3		EEE-2410/ EEE-3505
8	EEE-4892/ EEE-4898	Computer Networks Sessional/ Microprocessor System Design Sessional		3		1.5	

Elective VII (8th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4833	Mobile Cellular Communication	3		3		EEE-3601
2	EEE-4853	Opto-electronics	3		3		EEE-2403
3	EEE-4873	Power System Reliability	3		3		EEE-3503
4	EEE-4893	Computer Architecture	3		3		EEE-3505
5	EEE-4885	Renewable Energy	3		3		

Elective VIII (8th Semester)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4835	Telecommunication Engineering	3		3		EEE-3601
2	EEE-4855	Semiconductor Device Theory	3		3		EEE-3607
3	EEE-4875	Power System Operation & Control	3		3		EEE-3503
4	EEE-4895	Multimedia Communication	3		3		EEE-2410

Elective IX (8th Semester, Interdisciplinary)

SL. No.	Course Number	Course Name	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	EEE-4821	Control System II	3		3		EEE-4701
2	EEE-4822	Control System II Sessional		3		1.5	
3	EEE-4823	Numerical Methods	3		3		EEE-2410
4	EEE-4824	Numerical Methods Sessional		3		1.5	
5	EEE-4825	Biomedical Instrumentation	3		3		EEE-2403
6	EEE-4826	Biomedical Instrumentation Sessional		3		1.5	
7	EEE-4827	Measurement & Instrumentation	3		3		EEE-2403
8	EEE-4828	Measurement & Instrumentation Sessional		3		1.5	
9	EEE-4829	Digital Image Processing	3		3		
10	EEE-4830	Digital Image Processing Sessional		3		1.5	

Synopsis of the Courses

A. University Requirement Courses

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Course Code: URAL -1101
Course Title: Elementary Arabic
1(one) Credit with 3 (three) Contact Hours (Per week)
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This course has been provided to the student for basic knowledge of Arabic scripts. How to write scripts in Arabic word and Arabic writing. It also aims to provide about at least 500 normal using words to the students make in order to sentence construction by using which they can be able to communicate with others orally in various situation.

Generally, there are two main areas of concentration:

Firstly, the course aims at helping the student to acquire the level of proficiency that will enable them understand the texts and contents of Al-Qur'an and Sunnah of Prophet (SAW) from the original Arabic text.

Secondly, to enable the student acquire the skills of understanding the Arabic lecture. Talking notes and proficiency in writing answer script in Arabic language, and using the original sources written in the Arabic language and with the course to help the students acquire proficiency with competence on communication in Arabic which is widely used within Muslim Ummah particularly.

Reference:

- Abdur Rahim Dr. F., *Arabic Teaching For Non-Arabic*, Islamic University Modinah, K.S.A.
- دروس اللغة العربية لغير الناطقين بها . للدكتور/ ف. عبد الرحيم . الجامعة الإسلامية بالمدينة المنورة .

Note: The syllabus should be arranged in the light of 4 language skills e.g. reading, writing, understanding and speaking etc.

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Course Code: URQS -1101
Course Title: *Qur'an* **Studies in Texts & Translation**
1 (one) Credit with 3 (three) Contact Hours (per week)
Total Contact Hours 42
===================

- **Objectives of the course:**
- To make students capable of understanding the *Qur'an* as well as learning the basic of Arabic language.
- To inspire students and make them interested in reading the holy *Qur'an,* the greatest book, the last divine scripture and the complete code of life.
- To make students familiar with *Ayats* of Ahkam of the holy *Qur'an* so that they can lead their life enlightened with them.
- To go towards achieving the goal of the university in Islamization of knowledge.

- **Main Points of Course Explanation:**

The course will be comprised with the following main points:

- The meaning of the significant words & expression mentioned in the text.
- Central theme and subject matter of the text.
- General meaning of the text.
- Teachings and implication of the text.
- Comparison between the requirements of *Ayats* and the reality of our life.

- **Description of selected texts:**
    - Surah Al-Fatihah.
    - Surah Al-Baqarah: Ayats: 1-5, 30, 51-59, 186, 238, 246-249, 358-359.
    - Surah Al-Imran: 38-41.
    - Surah Al-Nisa: 11, 19, 94, 110, 147-148, 174.
    - Surah Al-Ma'idah: 13, 27-31, 96, 110.
    - Surah Al-An'am: 160.
    - Surah Al-A'raf: 113, 137, 143, 148.
    - Surah Al-Anfal: 34-35.
    - Surah Al-Tawbah: 96.
    - Surah Yunus: 84-85.
    - Surah Huud: 43, 58, 118-119, 123.
    - Surah Yusuf: 1-5.
    - Surah Al-Ra'd: 41.
    - Surah Ibrahim: 23.
    - Surah Al-Hijr: 9.
    - Surah Al-Nahl: 14, 24, 30, 66, 68-69.
    - Surah Al-Isra: 45, 64, 82, 85.
    - Surah Al-kahf: 18, 63, 83.
    - Surah Maryam: 24, 65.
    - Surah Taha: 13, 18, 27, 48-52,120.
    - Surah Al-Anbya: 47, 78.
    - Surah Al-Hajj: 73.
    - Surah Al-Mu'minun: 10-11, 15.
    - Surah Al-Nun: 15.
    - Surah Al-Furqan: 11-12. 77.
    - Surah Al-Shu'ara': 62, 128-129.
    - Surah Al-Naml: 18, 22-23.
    - Surah Al-Qasas: 7.
    - Surah Al-Ahzab: 59,72.
    - Surah Saba: 14.
    - Surah Yasin: 10-12.
    - Surah Al-Saffat: 142-144.
    - Surah Sa-d: 20-22.
    - Surah Al-Zumar: 24-30.
    - Surah Al-Gafir: 28.

- *Reference books:*

    - Kathir, Ibn, *Tafsirul Qur'anal-'Azim,* published by Dar Ihyaul Katubul 'Arabiayh , Cairo.

- Qurtubi, *Al-Jami-'li-Ahkamil Qur'an,* Published by Barul kutub Al-Masriyah, Cairo.
- Maududi, S.A.A, *Tafhimul Qur'an,* Published by Ahunik Prokashoni, Dhaka, Third addition-2005.
- Sabuni, *Safwatal Tafasir,* published by Dar As-Sabuni. Cairo, 9th addition-1989.
- Tabari, *Jami'ul Bayan Fi Tafsiral Qur'an,* Published by Dar Al-Ma'rifah, 3rd addition, Beirut.

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Course Code: URAL-1202
Course Title: Intermediate Arabic
(1 Credit with 3 Contact hours)
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Objectives of the Course: Intermediate Arabic course is designed for 2nd semester students of all faculties other than Shariah. The Arabic language course is offered by the university to orient the students with the language of the holy Qur'an and Sunnah and let them be enlightened with the guidance of Islam. It will make them eligible to co-operate with the Arabian world. Begin familiar with Arabic language will enable them to be benefited by the original Islamic references also.

Course out line: URAL – 1202 course has been provided for those who have become familiar with Arabic alphabet along with the basic words and foundations of it. Any language course should go through listening, speaking, reading and writing. In order to fulfill this demand Intermediate Arabic course prescribes the following contents:

- Introduction to the course and its objectives   - 1(one) Lecture

- **Dialogue between two persons:** (15 Lessons) – Word meanings and making sentences – reading and listening. Practice – understanding the meaning of the dialogue, question and answer – practicing on prepared structures, making new dialogue.   – 25 (Twenty five) Lectures.

- **Grammatical Part:** (15 Lessons) – Hand writing practice, filling the blanks with appropriate words – making sentences by arranging words – joining sentences and usages of verbs.   - 16 (Sixteen) Lectures.

References:

- Abdur Rahman Dr. Fuad, *Durusul lugatil Arabia li gairinnatiqeena biha* (Lessons of Arabic Language for the non speakers).

- *Al- Arabia Al-Mayassarah (Easy Arabic),* King Saud University, Published by - Arabic Language Institute,

- *Al-Arabiatu Lil Hayat (Arabic For daily life),* King Saud University, Published by - Arabic Language Institute.

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Course Code: URHS-1202
Course Title: *Hadith* Studies in Texts & Translation

1 (one) Credit with 3 (three) Contact Hours (per week)
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- **Objectives of the course:**
- To make students capable of understanding the *Hadith* as well as learning the Arabic language.
- To inspire students and make them interested in reading the *Hadith as* the second main source of Islamic *Shari'ah* as well as the only reliable explanation of the holy *Qur'an*, the last divine scripture and the complete code of life.
- To make students familiar with the ideal life of the holy Prophet (*Saw*) so that they can lead their life enlightened with his life.
- To go towards achieving the goal of the university in Islamization of knowledge.

- **Main Points of Course Explanation:**

The course will focus on the following main points:
- The meaning of the significant words & expression mentioned in the text.
- Central theme and subject matter of the text.
- General meaning of the text.
- Teachings and implication of the text.
- Comparison between the requirements of *Hadith* and the reality of our life.

- **Description of selected texts:**

The Text is divided into four sections, and each section will contain some topics as follows:

Section (A)
Duties and Obligations

- Duty towards Parents
- Duty towards Children
- Duty towards Neighbors
- Duty towards Guests
- Duty towards Husband and Wife
- Love of the Prophet (*Saw*)
- Duty towards Orphan and the Needy

Section (B)
Basic Qualities of Every Individual

- Intention *(Niyyah)*
- *Iman*, *Islam* and *Ihsan*
- Learning
- *Salah* and *Taharah*
- Truthfulness
- Keeping Promises
- Tolerance
- Politeness
- Contentment (Satisfaction)
- Kindness
- Thankfulness
- Charity
- Repentance (*Tawbah*)

14. Visiting the sick

Section (C)
Good Manners

- Talking
- Meeting
- Eating and Drinking
- Clothing
- Greeting
- Steadfastness (*Al-Istiqamah*)

7. Gifts

Section (D)
Bad Conducts

- Lying
- Back-biting
- Suspicion
- Jealousy
- Anger
- Pride
- Hypocrisy
- Taunting
- Robbery
- Extravagance

- **Reference books***:*
  - *Al-Bukhari, Abu* 'Abdillah Muhammad bin Ismail, Sahih Al-Bukhari, Darul Kutub al-Islamiyah, Beirut.
  - An-Nisaburi, Muslim bin Hajjaj, *Sahih Muslim,* Darul Hadith, Cairo, 1991.
  - An-Nawawi, Abu Zakariah Yahiya bin Sharaf, *Riyadh al-Salehin,* Dar al-Thaqafah al-'Arabia, Riyadh, 1991.
  - Al-Ahadith al-Qudsiyah, *Ministry of Auqaf,* 10th Edition, Cairo, 1997.
  - Abu Daud, Sulaiman Ibnul Asha'th, *Sunan Abi Daud,* Darul Fikr.
  - Ash-Shaukani, Muhammad Ibn 'Ali, *Nailul Autar,* Dar al-Jeel, Beirut, 1973.
  - Al-Hisami, Ali Ibn Abi Bakr, *Majmauz Zawaid,* Dar al-Raiyan, Cairo, 1407 A.H.

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Course Code: UREL -1103
Course Title: Advanced English
1(one) Credits with 3 (three) Contact Hours (per week)
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Grammar:
- Tenses & their Aspects (Structures, uses, right uses of verbs, correction)
- Subject-Verb Agreement.
- Practical use of Pronouns (personal, demonstrative, relative, interrogative, distributive, reflexive, indefinite & reciprocal)
- Modal Auxiliaries (Structures in active and passive voice)

- Conditional Sentences.
- Active and Passive Voice (Practical use of passive structure, change of voice, correction relating voice)
- Speech (detached sentence)
- Preposition (simple & phrase with emphasis on filling up the gaps, using common nouns/verbs/adjectives with their usual prepositions & correction relating preposition)
- Causative Verbs.
- Infinitive, Participle, Gerund & Verbal Nouns (identification, their uses & Joining sentences with them, changing participle phrase into clause)
- Use of Conjunction (classification, uses, filling up the gaps, showing difference between Preposition and conjunction)

Writing:
- Paragraph Writing (open/guided)
- Comprehension
- Letter/e-mail (personal)

4. Dialogue (based on a subject).

Reading:
- Jane Eyre- Charlotte Bronte
- Pilgrim's Progress- John Banyan
- A Tale of Two Cities- Charles Dickens
- Bacon's Essays: Francis Bacon.
- Six Tales from Shakespeare – Retold by E.F Dodd.

Books Recommended:
- 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.)
- Wren & Martin, *High School English Grammar and Composition*-, New Delhi, S. Chand & Company Ltd. 2002
- Thomson & Martinet, *Practical English Grammar*, Oxford University Press, Walton Street, Oxford OX2 6DP, 1993 (reprinted in India by arrangement with Oxford University Press, Oxford)
- Michael A. Pyle and Mary Ellen Munoz, *Cliffs TOEFL Preparation Guide*, New Delhi, BPB Publications, B-14, Connaught Place, New Delhi-110001, 1992
- Bruce Rogers, *Peterson's TOEFL Success*, Princeton, New Jersey, Peterson's, 2000
- AS Hornby, *Oxford Advanced Learner's Dictionary of Current English*, Oxford University Press, 2002-2003.
- Chowdhury & Hossain, *Advanced English*, Dhaka, Sayma Chowdhury and Halima Chowdhury, 2004.

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Course Code: URIS – 1101
Course Title: Islamic '*Aqidah*
1(one) Credit with 1(one) Contact Hour (per week)
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Objectives:
This course is designed
- To provide the students with proper knowledge about the Islamic way of life.
- To make them aware of the existing religious misconceptions & traditional superstitions contradicting with the basic faith & tenants of *Islam.*
- To give them a clear concept about the all-embracing view of '*Ibadah* in Islam.

- *Islam*: an Introduction:
  - Meaning of *Islam*.
  - Historical Background of *Islam*.
  - *Islam* as a complete code of life.
  - Importance of Islamic '*Aqidah* and relation between *Iman* and *Islam*.
- **The Articles of Faith:**
  - The Unity of Allah *(Tawheed)*
  - Impact of *Tawheed* on human life.
  - The *Shirk* and its consequences.
  - Different types of *Shirk*
  - *Nifaq:* Its meaning, Signs and consequences.
- **Belief in Allah's Angels** *(Malaikah):*
  - Angels - their nature and functions
  - Virtues of belief in Angels.
- **Belief in the Books of Allah:**
  - The *Qur'an:* The last and unchanged Divine Book.
- **Belief in Allah's Prophets:**
  - Prophets and Messengers are human being.
  - Muhammad (SAW) the Greatest, the Best and the Last among all the prophets.
  - Duties & Responsibilities of the Prophet.
  - Love of the Prophet.
- **Belief in the Life After Death:**
  - Impact of belief in the life after death on human life.
  - Inevitability of *Akhirat* and its stages.
- **Belief in *Qadr* (Fate) and divine decree:**
  - Man's Freedom of will.
  - Fate: No excuse for sinners.
  - Evil: Not attributable to Allah.

Reference:
- Rafique Dr. Abu Bakr, *Islam The Ultimate Religion (Book one) Islamic 'Aqidah',* Chittagong: ABC Publications, 2002.
- Farid, Ahmed, *An Encounter with Islam,* Dhaka: Islamic Foundation, Baitul Mukarram, Dhaka, 1995.
- Abdalati, Hammuda, *Islam in Focus, Islamic Teaching course. Vol. 1*

- Badawi, Dr. Jamal, *Islamic Teachings* vol. 1
- Mawdudi, S.A.A, *Towards Understanding Islam,* Kwait, International Islamic Book Center, ND.
- Sarwar, Ghulam, *Islam Belief and Teachings*.
- AL–Gazali, Mohammad, *Aqidatul Muslim*.
- Hamidullah, *Introduction to Islam.*
- Ahmed Khurshid: *Islam its Meaning and Message.*

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Course Code: URIS – 1203
Course Title: Introduction to '*Ibadah*
1(one) Credit with 1(one) Contact Hour (per week)
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Objectives:
This course deals about the pillars of Islam. It tries to present Islam as a complete and comprehensive code of conduct for all human beings 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 these beliefs on human life.

Course Outline:
- *'Ibadah*: Its meaning & significance in Islam.
- Scope of '*Ibadah* in Islam.
- Objectives of '*Ibadah*.
- Conditions of '*Ibadah*.
- Characteristics of '*Ibadah* in Islam:
  - Free from Intermediaries.
  - Not being confined to specific places.
  - c) All-Embracing view.
- Position of specific rituals, its significance & teaching:
  - *Salah* (Prayer).
  - *Sawm* (Fasting).

c) *Hajj* (Pilgrimage).
- *Jihad:* Its definition, significance, importance, classification from various aspects.
- Islam & asceticism.

References:

- Hasan, Syed Mahmudul, *Islam,* Islamic Foundation Bangladesh.
- Ahmed, Khurshid, *Islam its meaning & message,* UK. London, The Islamic Foundation, 1992.
- *What A Muslim is Required to Know About His Religion,* 1399 H. Muslim World Legue Macca Mukarama
- AL-Qaradawi, Dr. Yusuf, *The Lawful and The Prohibited in Islam*, Islamic Book Trust, K.L. 1995.
- Natiq, Abdul Qayyum, *Sirat-e-Mustaqim.*

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Course Code: URIS – 2303
Course Title: Introduction to *Qur'an & Sunnah*
1(one) Credit with 2 (two) Contact Hours (per week)
===================
Objectives:
The main objectives of this course are as follows:
- To make the students familiar with the *Qur'an* & *Sunnah* as they are the main sources of Islamic *Shari'ah*.
- 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:
a) Introduction to *Qur'an*
- Definition of the ***Qur'an*** (Literally and Terminologically)
- Revelation wahy of the Holy ***Qur'an***.
- Preservation & Compilation of the Holy ***Qur'an***.
- Characteristics of the Holy ***Qur'an***.
- Central subject matter & the Main Themes of the Holy ***Qur'an***.

- The necessity of the Holy *Qur'an*.
- *Qur'an* the best source of Islamic *Shari'ah*.
- The Superiority of the *Qur'an* as a Scripture.
- *Makki* & *Madani* Surahs & their characteristics.
- Abrogation (*Naskh*) in the Holy *Qur'an* & its classification.
- Inimitability *'I'jaz'* of the Holy *Qur'an*.
- Asbabunnuzul & its benefits.

b) Introduction to *Sunnah*

- *Sunnah***:** Its meaning definition & the difference between *Sunnah* & *Hadith*.
- The importance of *Sunnah* in Islamic *Shari'ah*.
- Explanation of some important terms of *Sunnah*.
- The authority of *Sunnah* in *Islam*.
- Collection & Cpmpilation of *Sunnah*.
- Method of distinguishing a genuine *Sahih Hadith* from a spurious *Da'if Hadith*
    - The science of *Dirayah*.
    - The science of *Riwayah.*
- The classification of *Hadith*:
    - According to the reference to a particular authority.
    - According to the links in the *Isnad*.
    - According to the number of narrators involved in each stage of the *Isnad*.
    - According to the number of narrators by which the *Hadith* is reported.
    - According to the reliability and memory of the narrator.

References:

- 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.
- Ushama, Dr. Thameem, *Sciences of the Qur'an: An Analytical Study,* International Islamic University Malaysia, Cooperative Limited, Kuala Lumpur. 1998.
- Bucaille, Dr. Maurice, *The Bible The Qur'an & Science*, Thinkers Library, Selangor   Darul Ehsan. Malaysia, 1996.
- Al-Azami, Dr Mohammad Mustafa, *Studies in Early Hadith Literature*, American Trust publication, Indiana, 1978.

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Course Code: URIW- 2401
Course Title: Islamic World View
 2 (Two) credits with 2 (two) contact hours (per week)
(Only for ELL 4th Semester)
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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.

Learning outcomes:
At the end of this course the students will able to:
- Demonstrate understanding of the meaning, Characteristics and significance of both Islamic and Non-Islamic World Views.
- Explain the elements of Islamic World View and its impact on individual behavior and social life.
- Identify some of the challenges faced by the mankind and society and suggest solutions from perspective of Islamic

World View Topics

1) Meaning, characteristics and elements of Islamic World View:
 i) Religion and its nature, its relevance today
 ii) Islam its meaning & message,
 iii) Tawheed and its impact on the life of a believer
 iv) Risalah (the prophethood), the prophethood of Muhammad (saw) in the context of Islamic World View
 v) The nature of man & his status in the perspective of Islamic World View
 vi) Akhira or the life Heareafter and its importance in the perspective of Islamic World View

2) Ibadah (worship) its definition nature and scope in the context of Islamic World View

3) The Quran and its message to the mankind

4) The Sunnah as the most authentic resources of the Prophetic life & source of Islamic law

 5) Islamic World View VS other World Views.
- The Scientific approach
- The philosophical approach
- The Religions approach (Hinduism, Bhoddhism, Jewish, Christianity and Taoism).

6) Islam and Concept of Morality and Ethics:
- Formation of Islamic Morality
- Islam and concept of Human rights, Justice, Brotherhood, Ihsam and Taqwa.
- Principles of Halal and Haram in Islam.

7) Islam and some contemporary challenges:
- Islam and Jihad.
- Islam and Terrorism.
- Islam and Fundamentalism.
- Islam and Women's Rights.
- Islam and Globalization.

8) Islamic World and its Future.

Include the following books:
- Islam the Way of Revival. Edited by Riza Muhammad and Delwar Hussain, Revival Publication, Markfield, U.K.
- Islam Meaning and Message, Lahore.
- Islam its Foundation and Concepts. D. Muhammad B. Abdullah al-Suhaym. Darussalam, Riyadh, Sedah, Lahore, London.

Book References:
- Kamal Hassan,M.(1994), ``*The Islamic Worldview''.In Abdul Monir Yaakob (ed). Towards a positive Islamic Worldview: American Malaysian Perspective.* Kuala Lumpur:IKIM11-33
- Al-Attas, Syed Muhammad al-Naquib,(1992), *Islam: The concept of Religion and the Foundation of Ethics and Morality,* DewanBahasa and Pustaka,KL, Malaysia
- Abdalati, Hamuda.(1993), *Islam in Focus.* Kuwait,Amanah Publications,Beltsville,Maryland
- Al-Faruqi, Ismail Raji. (1998),*Towhid: Its imlications for Thought and Life*, IIIT, Herndin,Viginia, USA.
- Naugle, David K.(2002), *Worldview: The History the Concept,* w.b. ErdamnsPub. Grand Rapids
- Qutub Sayyid.(1984). *The Islamic concept and Its Characteristics,* Hindustan Publications Delhi, India
- Rahman, Fazlur.(1994),*Major Themes of the Qur'an.* Minneapolis, Bibliotheca Islamica
- Rahman, Fazlur(1982),*Islam and Modernity: The Transformation of An Intellectual Tradition.* Chicago: the University of Chicago Press.
- Karim, Fazlul. *The Religion of Man*
- Al-Faruqi,Ismail Raji.*Islam and other faiths*
- Qardawi, Yusuf. *Lawful and unlawful things in Islam*
- Articles in *The American Journal of Islamic Social sciences*, vol. 24, spring, 2007

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Course Code: URIS – 2405
Course Title: Dealings and Behavior in Islam
1 (one) Credit with 1(one) Contact Hour (per week)
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Objective: To bring up the students with Islamic manners for the sake of being dutiful towards Allah the Almighty and His creatures.

- **Muʻamalah: Its Meaning, Definition and Scope:**

- **Family Life of Islam:**
    - Role of Marriage as the basis of Islamic Family.
    - Status of women in Islam, comparison with other religion.
    - Rights and duties of women in Islam.
    - Husband-wife relations (Duties and obligations to each other)
    - Rights of Children in Islam.
    - Duty towards Parents.

- **Economic System of *Islam*:**
    - Earning and expenditure by *Halal* means.
    - Right to own property and individual liberty.
    - System of *Zakah*.
    - Prohibition of interest (*Riba*).
    - Law of Inheritance (*Mirath*).

- **Islamic Law regarding Business. Dress and Special relations.**

- **Duties and obligations:** Duty towards Parents, Relatives, Neighbors, Guests, Needy and Orphan. Duties of the Muslims to each other.

- **Social Manners:** (1) Brotherhood (2) Greetings (3) Co-operation (4) Meetings (5) Talking (6) Keeping promise (7) Asking permission before entering someone's house.

- **Basic virtues and Islam:**

(1) Honesty (2) Truthfulness (3) Kindness (4) Perseverance (5) Firmness against evil (6) Tolerance (7) Punctuality (8) Courage (9) Trust worthiness (10) Forgiveness (11) Chastity for women (12) Intention (13) Promise (14) Modesty (15) Charity (16) Gifts (17) Thankfulness (18) Visiting the sick.

References:
- Sarwar, Golam, *Islam: Beliefs and Teachings,* IIUI, Pakistan.
- Abdul Hannan, Shah, *Social Laws of Islam,* BIIT, Dhaka, 1995.
- Zino, Muhammad bin Jamil, *Islamic Guidelines,* Darusalam, Riyadh, 1996.
- Islamic Business Ethics- R. Isan Beekun
- Business Ethics in Islam- Khaleq Ahmed
- Islamic Economics- Umer Chapra
- Halal and Haram in Islam: Yousuf al-Quradwi.

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Course Code: URIS – 3505
Course Title: Government and Politics in Islam
1 (one) Credit with 1 (one) Contact Hour (per week)
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Objective:
This course has been designed with an objective to students the basic information about the Political System of *Islam* with its concept, characteristics and the basic information about principles (With special emphasis on sovereignty of *Allah*, *Shura* and *Khilafah*)

Course Outlines:
- Government and Politics: (Meaning and Organs).
- Islamic Political System:(Meaning, Importance and Principles)
- *Shari'ah* (Islamic Law): [Meaning, Sources and Differences]
- Constitution: (Meaning, Islamic Constitution and Special Features)
- The Executive (Head of the state): [Conception and Qualifications]
- Legislative (*Al-Shura*): [Meaning, Importance, Example and Functions]
- The Judiciary (*Al-Qada*): [Meaning, Importance, Nature and Implementation]
- Citizenship (Nationality): [Meaning, Types, Rights]

References:

- Mawdudi, Syed Abul A'la, *Principles of Islamic State,* Islamic Publications, 1987.
- Matin, Abdur Rashid and Sirajul Islam, *Political Science: An Islamic Perspective.*
- Mawdudi, Syed Abul Al'a, *Islamic Law and Constitution.*
4. Avãyi inxg gynv¤ § `, *Avj ‡ KviAv ‡ b ivó ͣ I miKvi|*
5. Hasan, Prof. Masudul, *Reconstruction of Political Thought in Islam,* Islam Publications (Pvt. Limited, Lahore, Pakistan, 1988.
6. Muhammad, Al-Buraey, *Administration Development: Islamic Perspective.*
7. Asad, Mohammad, *Basic principles of state and Government in Islam* (California; Southern California

University Press, evsjvq Abyev` Aa¨vcK kv ‡ n` Avjx, BmjvwgK dvD ‡ Ûkb|
8.   Watt, Montgomery, *The Majesty That was ISLAM*.
   * Ibni Taymiah, *Public Duties in Islam*, Mokhter Holland translated.
   * Ali, Sk. Ansar, *Islamic Legal System.*
   * Matin, Abdur Rashid and Sirajul Islam, *Introduction to Political Science.*

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Course Code: URIH– 3607 or URIH– 3609
Course Title: Biography of the Prophet (SAW)) & History of Khulafa-al-Rashedin
2 (two) Credits with 2 (two) Contact Hours (per week)
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Objectives: This course aims at achieving 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 (SAW).
   * To bring home the understanding to the students that the Prophet (SAW) is the last and final Messenger of Allah among all the other Prophets of Allah and therefore; Prophet's teaching is the sole guidance and to be followed by the entire mankind.
   * To activate the students to know the meaning and significance of the Prophethood of the Prophet (SAW) so that the learners can better be able to examine their own position in the touchstone of the teachings of the Prophet (SAW).
   * This course also aims at making the students acquainted with special reference to study the glorious contribution of the Pious Khalifas towards the development of justice, administration, advancement of civilization and education and their great services towards humanity at large.

<u>**Course outline in details:**</u>

Pre Islamic Arabia: Condition of Arabia at the advent of Islam: Political, Economical, Cultural, Religious, Social.
Early life of Muhammad (SAW): Birth, Childhood-Business trip to Syria with his uncle Abu Talib, Teenage-Hilful fudul and Youth hood–   Rebuilding of Al-Ka'bah, His contributions in Business/Business activities, Marriage   with Khadiza, Search for the Truth.

The Prophet at Makkah:
   * Prophet hood- Receiving the Truth, Preaching of Islam and hostility of the Quraysh-Propagation of Islam remain silently; The early Muslims and end of the first Phase, Islamic Movement Becomes public- The Prophet on the mount of Safa; Opposition faced from the Quraysh; Qur'anic approach towards Movement, First and Second emigration to Abbyssiniya of his followers, Boycott and Confinement, The year of sorrow, Taif- the most difficult day, Miraj of Prophet (SAw), First and second pledge of Al-Aqabah,
   * The Hijrat/Migration of prophet to Madinah.

The Prophet (SAW) at Madinah:

   * The Hijrat/Migration of prophet to Madinah.
   * Charter of Medina**:** First written constitution of the world, Position of Prophet (SAW) in Charter of Madina.
   * Conflict between Muslim and Non Muslim: Battle of Badr, Battle of Ohud, Battle of Ditch (khandaq), Battle of Mutah, Battle of Hunaun, Campaign of Tabuk and other battles.
   * Treaty of Hudaybiah, Relation between the prophet and the Jews.
   * The conquest of Makkah.

- The Farwell pilgrimage- the speeches of prophet at Arafah, Character of the prophet, Contribution of Prophet- as a reformer, as a Nation Builder.
- Administration of Madina state under Prophet (SAW): Character of Madina state founded by Prophet (SAW)

Khulafa-al-Rashedin:

- **Khilafat:** Definition, Origin and Development of khilafat, Election to the office of the khilafah.
- **Abu Bakr (R):** Early life and his contribution to Islam, Elected as first khalifa, Problems faced by him- False Prophet; The apostasy movement, Estimate of Abu Bakr (R) as a savior of Islam.
- **Umar (R):** Expansion of Islam under Umar (R), Conquest of Persia, Syria and Egypt, Administration of Umar(R), Estimate of Umar (R).
- **Uthman (R):** Election of Uthman (R), causes of revolt, character of Uthman (R).
- **Ali (R):** Battle of Camel, Battle of Suffin, Estimate of Ali(R) and fall of the pious khilafat.
- **Administration under pious Khalifah:** Civil administration, The Shura, sources of revenue, judicial administration.

References:
- Rahman, Mohammad Mahbubur, The Ideal Life of the Prophet *(SAW).*
- Wahiduddin Khan, Muhammad the Revolution.
- Nadwi, Sayyid Sulaiman, Muhammad the Ideal Prophet*: A Historical, Practical, Perfect Model for Humanity.* Translated by Mohiuddin Ahmad. Islamic Book Trust K.L.N.D.
- Mowdudi, S.A.A, The Message of the Prophet's Seerah. Hindustan Publications, Delhi, N.D.
- Philip, K. Hitti, History of the Arabs, (London: Macmillan Press Ltd. 10th Edition 1970.
- Sirat Ibn Hisam.
- S.A.Q. Hussani, the Arab Administration, (Lahore 1962).
- Sayyid Ameer Ali: The History of the Seracens.
- K. Ali, Study of Islamic *History,* Dhaka: NadiaKausar, 25th Edition 2002.
- Muhammad A-Buracy, Administration Development Islamic respective, London: K P I, 1985.
- M. Watt, the Majesty that was Islam, London: Jackson Ltd, 1974.

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Course Code: URBS – 4802.
Course Title: Bangladesh Studies.
1 (one) Credits with 2 (two) Contact Hours (per week)
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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.

- Introduction to the course and its objectives.

- Outline of the geography of Bangladesh.

- 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, reform movements, educational development under the Muslims, the British policy towards education, a brief discussion of the struggle for freedom from the British Colonialism, development of Bengali Prose Literature, new trend of nationalism, creation of Pakistan and the emergence of Bangladesh.

- Political Development in Bangladesh: Political Parties of Constitutional Development.

- Economic condition of Bangladesh.

- Socio-cultural problems and prospects of Bangladesh.

References:

- *Banglapedia Vo l - X: National Encyclopedia of Bangladesh,* Dhaka; Asiatic Society of Bangladesh, 1998.
- Ali, Mohar, *Social History of Bengal,* Imam Muhammad Ibn Sa'ud Ish University, K.S.A 1985.
- Khan, Abbas Ali, *Banglar Musalmander Itihash,* Bangladesh Islamic Center, Dhaka, 2002.

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B. Interdisciplinary Courses
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ACC-2401 Financial and Managerial Accounting
Credit Hours: 2
Contact Hours: 2 per week
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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)

1. 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.
2. 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)
1. Cost In General: Cost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.
2. Marginal & Relevant costing: Marginal costing tools and techniques, cost-volume-profit analysis.
3. 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, Donald E. Kieso & Paul D. Kimmel.   : Accounting
   Principles.
5. Jay M Smith & K Fred Skousen.   : Intermediate
   Accounting.

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ECON-3501 Principles of Economics
Credit Hours: 2
Contact Hours: 2 per week
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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)

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MGT-3601 Industrial Management
Credit Hours: 2
Contact Hours: 2 per week
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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
12. Terry & Frankin   :Principle of Management

Optional Courses (One Course to be taken)

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FIN-4701 Finance and Marketing for Engineers
Credit Hours: 2
Contact Hours: 2 per week
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Part A
1. Financial reporting process and uses of accounting data, linkages between accounting information and management planning, decision-making and control.
2. Traditional cost accounting concepts such as product costing, cost terminology, budgeting, cost volume-profit analysis, and standard costs,
3. Non-traditional management accounting topics such as variable costing and activity based costing.
4. Basic engineering economy along with capital asset pricing, debt versus equity decisions,

Part B
5. Cost of capital, financial leverage, and the management of working capital.
6. Financial justification of operational "intangibles" such as shorter lead times, better quality, and improved customer responsiveness.
7. Marketing Principles, strategic marketing, types of market and buyer behavior, product strategies,
8. Marketing decisions (price, channel, advertising, sales force), market research, and international marketing.

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SCO-4703 Sociology
Credit Hours: 2
Contact Hours: 2 per week
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Scope, Social evolution and techniques of production; Culture and civilization; Social structure of Bangladesh; Population and world resources; Oriental and occidental societies, Industrial revolution; Family- urbanization industrialization; Urban ecology, Co-operative and socialist movements, Rural sociology

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PSY-4705 Psychology
Credit Hours: 2
Contact Hours: 2 per week
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Introduction to psychology, Cognitive science; Reasoning, Object recognition and language Understanding, Learning industrial psychology; Introduction to job and analysis, Methods of selection; Training in industry; Motivation and work, Job satisfaction, Introduction to ergonomics, System engineering, Accident and safety.

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LAW-4707 Business and Cyber Law
Credit Hours: 2
Contact Hours: 2 per week
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Principles of law of contract; Company law: law regarding formation, incorporation, management and winding up of companies; Labor law; Law in relation to wages hour, heath, safety and other condition to work; The trade union legislation arbitration, the policy of the state in relation to labor; The factory Act (1965); The law of compensation (1965).

Cyber law: digital copyrights issues, illegal duplication of software, human rights and data encryption, international cyber law, information sharing.

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GOV-4709 Government
Credit Hours: 2
Contact Hours: 2 per week
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Some basic concepts of government and politics, Functions, Organs and forms of modern state and government; Socialism; Fascism; Marxism; U.N.O.; Government and politics of Bangladesh; Some major administrative systems of developed countries; Local self-government.

C. Core Courses

Mathematics I

=====================
MATH-1101 (Differential Calculus and Integral Calculus)
Credit Hours: 1
Contact Hours: 3 per Week
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Section –A (Mid-term Exam.: 30 Marks)

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

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

3. Expansions of Functions:

   a) Rolle's theorem, mean value theorem
   b) Taylor's and Maclaurian's Formulae

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

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

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.

Group-B (30 Marks)

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

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

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.

Recommended 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
9. Das & Mukherjee   : Integral Calculus.

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MATH-1201 Mathematics-II
Credit Hours: 3
Contact Hours: 3 per Week
(Co-Ordinate Geometry and Higher Trigonometry)
[Pre requisite: MATH-1101]
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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 line 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.

Recommended Books:

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

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MATH-2301 Mathematics III
Credit Hours: 3
Contact Hours: 3 per Week
(*Differential Equations and Partial Differential Equations*)
[Pre requisite: MATH-1201 Mathematics I]
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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

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MATH-2401 Mathematics III
Credit Hours: 3
Contact Hours: 3 per Week
((Differential Equations and Partial Differential Equations)
[Pre requisite: MATH-1201 Mathematics I]
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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. **Linear Differential equations with constant coefficients**: Solution of higher order linear differential equations with constant .

3. **Homogeneous Linear Equations:** Solution of homogeneous and non-homogeneous differential equations, practical problems.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. **Series Solutions:** Series solutions, Solution of Bessel's, Legender's Equation

5. **Linear Equation of second degree:** Linear 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:

6. K.A. Stroud   :Engineering Mathematics
7. F. Ayrs   :Differential Equation
8. K.A.Stroud   :Further Engineering Mathematics.
9. B.D.Sharma   :Differential Equations
10. Gupta,Kumar,Sharma   :Differential Equations

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Math-3501 Mathematics IV
Credit Hour 3
Contact Hour: 3 per week
           (Linear Algebra, Matrices and Vector Analysis)
[Pre requisite: MATH-2301 Mathematics III]
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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)

4. **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.
5. **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)

6. **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.
7. **Del operator and Vector Integration:** Del operator, gradient, divergence and curl and their physical significance, Line Integrals, physical significance of Vector integration and Problems.
8. **Vector's Theorem :**Greens, Gauss & Stocks theorem and their applications, Vector components in spherical and cylindrical systems.

Recommended Books:

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

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MATH 3501 Mathematics V
Credit Hours: 3
Contact Hours: 3 per Week

(Complex Variable, Lap laces and Fourier Analysis, Z-transform)
[Pre requisite: MATH-2401, Mathematics IV]
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Section –A (Mid-term Exam.: 30 Marks)

1. **Complex Valued Functions:** Complex mapping, Linear Transformation: translation, magnification and rotation, Non-linear transformations: inversion, bilinear etc.
2. **Complex Differentiation:** Differentiation of a complex function, Analytic function, Singularities,   the Cauchy-Riemann Equations, harmonic functions
3. **Complex Integration:** Complex Path Integrals, closed contour, Cauchy's Theorem, The Residue Theorem, Poles

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. Fourier series: Physical   Significance of Fourier series, Periodic Signal, Trigonometric form and Complex form of Fourier series, Fourier Integral, Frequency Spectrum, Piecewise Continuous waveforms, Even symmetry, Odd symmetry, Half-wave symmetry, Phase Spectrum, Application of Fourier Series

5. Convolution: Unit Step Function, Impulse Function, Ramp Function, Sketch Waveform, convolution theorem, convolution sum, convolution Integral

Group-B (30 Marks)

6. Laplace transforms: Definition, the Laplace transforms of different functions, shifting and change of scale property, Laplace transforms of derivatives

7. Solution of Differential Equations by Laplace Transforms, inverse Laplace transforms

8. Transform: Aperiodic Signal, 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)
8.

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STAT-2301 Statistics
Credit Hours: 2
Contact Hours: 2 per Week
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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, Skew ness and Kurtosis, Theorems & Problems.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

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

Group-B (30 Marks)
6. Fundamentals of Probability: Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bay's theorem.
7. Probability: Random Variables, Mathematical Expectation and Variance of a random variable, Theorems & Problems
8. Probability Distributions: Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.
Reccommended 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

Physics

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PHY-1103, Physics I
Credit Hours: 3
Contact Hours: 3 per Week
(Mechanics, Waves and Thermodynamics)

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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)

1. **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.
2. **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)

3. **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.
4. **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.
5. **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.

Books Recommended:

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

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PHY-1104 Physics I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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1. To determine the moment of inertia of a flywheel about its axis of rotation.
2. To determine the value of 'g', acceleration due to gravity by means of a compound pendulum.
3. To determine the surface tension of water by capillary tube method.
4. To verify the laws of transverse vibration of strings and to determine the frequency of a tuning fork by Melde's experiment.
5. To determine the Young's Modulus by the flexure of a beam (Bending Method).
6. To determine 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. To determine the co-efficient of viscosity of a liquid (Glycerine) using Stokes' law.

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PHY-1203 Physics II
Credit Hours: 3
Contact Hours: 3 per Week
(Electromagnetism, Optics and Modern Physics)
[Pre requisite: PHY-1103, Physics I]
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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.

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)

1. **Current and Resistance:** Current and current density, Ohm's law, potential difference, RC circuits, generation of alternating current and e.m.f.

2. **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)

3. **Relativity**: Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy- momentum relation.

4. **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.

5. **Radioactivity:** Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.

Books Recommended:
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
Text Books:
1.   Robert Resnick & David Halliday   : Physics (Part II)
2.   Arthur Beiser   :Concepts of Modern Physics
3.   Theraja B.L.   : Modern Physics
4.   Physics for Engineers-II   : Dr. Giasuddin Ahmed
5.   Satya Prakash   **: Relativistic Mechanics**

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PHY-1204 Physics II Sessional
Credit Hours: 1
Contact Hours: 3 per Week
(Electromagnetism, optics and Modern Physics)
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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.

Book Recommended:

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

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Chem-2301 Chemistry
Credit Hours: 3
Contact Hours: 3 per Week
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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:
Text Books:
1. R. D. Madan   : Modern Inorganic Chemistry
2. M.M. Haque and M.A. Nawab   : Principles of Physical Chemistry
3. E.S Gilreath   : Fundamental Concepts in Inorganic Chemistry.
   4. G.M. Barrow   : Physical Chemistry
   5. W.J.Moore   : Physical Chemistry
   6. K.J. Laidler and J.H. Meiser   : Physical Chemistry
   7. S.R. Palit   : Elementary Physical Chemistry
    8.S. Z. Haider   : Modern Inorganic Chemistry

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Chem-2302 Chemistry Sessional
Credit Hours: 1
Contact Hours: 2 per Week
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List of experiment names
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.

Mechanical Engineering (ME)

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ME-2301 Fundamental of Mechanical Engineering
Contact Hours: 3 per Week
Credit Hours: 2
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Study of fuels, Steam generation units with accessories and mountings study of steam generators and steam turbines. Introduction to internal combustion engines and their cycles. Study of SI engines, CI engines and gas turbines with their accessories. Refrigeration and air conditioning with their applications. Study of different refrigeration methods, refrigerants. Refrigeration equipments: compressors, condensers, evaporators, expansion devices, other control and safety devices, and psychosomatics. Study of air conditioning systems with their accessories. Types of fluid machinery. Study of impulse and reaction turbines. Pelton wheel and Kaplan turbines. Study of centrifugal and axial flow machines; pumps, fans, blowers and compressors. Study of reciprocating pumps.

Civil Engineering (CE)

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CE-2301 Engineering Drawing Sessional
Credit Hours: 1
Contact Hours: 2 per Week
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Introduction, Instruments and their uses. First and third angle projection. Orthographic drawing. Isometric views. Missing lines and views. Sectional and conventional practices. Auxiliary views

Computer Science and Engineering (CSE)

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CSE-1101 Computer Fundamentals
Credit Hours: 1
Contact Hours: 2 per Week

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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	Third Edition
2. Computer Fundamentals	: P K Sinha	Fourth Edition
3. Introduction to Computer	: E. Balagurusamy	Third Edition

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CSE-1102 Computer Fundamentals Sessional
Credit Hours: 1
Contact Hours: 3 per Week
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Operating System: Proposed Operating Systems: Windows 2000/XP, MS-DOS
Topics: Files, Folders, Basic operations on file/folders, File System, Windows OS Organization and Hierarchy, Searching files and folders.

2. **Word Processing:** Proposed Application Software: Microsoft Word
Topics: Formatting, Table Editing, Picture, Clipart and object, Charts, Drawing, Text box and shapes, Hyperlink, Macro, Equation editor etc. Lab Assignment: CV Design, Application/Letter writing/formatting.

3. *Spreadsheet 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.

4. **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).

5. **Database Application:** Proposed Application Software: Microsoft Access
Topics: Database basics, Field, Table, Keys, ER Diagram, Form, Report, Query.
Lab Assignment: Address book (Insert, Update, Delete, and Search).

6. **Internet and Computer Network**
Topics: Browsing Concepts, Searching in the web, Email.
Practical: Cable Configurations: Straight cable, Cross Cable etc. LAN setup and IP address configuration.

7**. 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.

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

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CSE 1201 Computer Programming
Credit Hour: 3
Contact Hour: 3/Week
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Section-A (Mid-term Exam: 30 Marks)
1. Program, Programming languages, Algorithm, Flowchart, Structure programming C introduction.
2. Data type, Variables, Constant, Identifier, Instruction/Expression
3. Control Statement – necessity, types

Section-B (Final Exam: 50 Marks)
Group-A (20-Marks)
4. Function (Concept, Types, Parameter passing and returning, Call-by-Value & Call-by-reference, Recursion), Array (Concept, Accessing array, One dimensional and Multi- dimensional array, Passing array through function, String & its different functions)

5. Pointer (Definition, Array and pointer, passing pointer through function, Pointer and structure, Dynamic memory Allocation technique), Structure (Concept, Accessing of structure, Assignment of structure, structure with in structure, Passing structure through function), union.

Group-B (30-Marks)
6. User defined data types. Input output and File
7. Object oriented Programming using C++: introduction, classes and objects;
8. Polymorphism; function and operator overloading; inheritance.

Recommended Books:
1. Programming in C	: Sazzad Hossain, Jahangir Hossain	Second Edition
2. Teach yourself C/C++	: Herbert schildt	Third Edition
3. Let us C	: Yashavant Kanetkar	Third Edition
4. Programming in C	: E. Balagurusamy	Second Edition

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CSE 1202 Computer Programming Sessional
Credit Hour: 1.5
Contact Hour: 3/Week
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This course consists of two parts. In the first part students will perform experiments to verify practically the theories and concepts learned in CSE 1201. In the second part students will learn program design.

Electrical & Electronic Engineering (EEE)

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EEE 1101 Electrical Circuits I
Credit Hours: 3
Contact Hours: 3 per Week
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Section-A (Mid-term Exam:30 Marks)
1. Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, and resistance. Basic laws: Ohmís law, Kirchoffís current and voltage laws.
2. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation.
3. Techniques of circuit analysis: Nodal and mesh analysis including supernode and super mesh.

Section-B (Final Exam : 50 Marks)
Group-A (20-Marks)
4. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources.
5. Network theorems:, maximum power transfer condition and reciprocity theorem.

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.
8. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits.

Books…
1. Introductory Circuit Analysis
-Boylestad
1. The fundamentals of Electric Circuit
-Alexander
-Sadiku

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EEE 1102 Electrical Circuit I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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In this course students will perform experiments to verify practically the theories and concepts learned in EEE 1101.

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EEE 1201 Electrical Circuits II
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 1101 Electrical Circuits I]
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Section-A (Mid-term Exam:30 Marks)

1. Sinusoidal functions: Instantaneous current, voltage, power, effective current and voltage, average power

2. Phasors and complex quantities, impedance, real and reactive power, power factor.

3 . Analysis of single-phase AC circuits: Series and parallel RL, RC and RLC circuits

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

4. Nodal and mesh analysis, application of network theorems in AC circuits

5. Circuits with non-sinusoidal excitations, transients in AC circuits, passive filters.
Resonance in ac circuits: Series and parallel resonance

Group-B (30-Marks)

6. Magnetically coupled circuits

7. Analysis of three phase circuits: Three phase supply

8. Balanced and unbalanced circuits, power calculation

Recommended Books:

Name	Writer
Fundamental of Electric Circuits	Alexander & Sadiku
Alternating Current Circuits, 4th Edition	Kerchner & Corcoran

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EEE 1202 Electrical Circuit II Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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In this course students will perform experiments to verify practically the theories and concepts learned in EEE 1201.

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EEE 2301 Electronics I
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]
=======================

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

1. P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-njunction diode, contact potential, current-voltage characteristics of a diode
2. simplified dc and ac diode models, dynamic resistance and capacitance. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, Zener shunt regulator, clamping and clipping circuits.
3. Bipolar junction transistor (BJT) as a circuit element: Bipolar junction transistor: current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits.

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

4. Small signal equivalent circuit models, BJT as a switch. Single stage mid-band frequency BJT amplifier circuits: Voltage and current gain, input and output impedance of a common base, common emitter and commoncollector amplifier circuits.
5. Metal-oxide-semiconductor field-effect-transistor (MOSFET) as circuitelement: structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect.

Group-B (30-Marks)

6. current- voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter.
7. Junction field-effect-transistor (JFET): Structure and physical operation of JFET, transistor characteristics, pinch-offvoltage.

8. Differential and multistage amplifiers: Description of differential amplifiers, small-signal operation, and differential and common mode gains, RC coupled mid-band frequency amplifier.

Reference books:
1. Electronics devices and circuit theory-   Robert L. Boylestad & Louis Nashelsky
2. Principle of electronics- V.K.Mehta & A.K.Mehta
3. Basic Electronics solid state- B.L.Thereja & A.K.Thereja
4. Solid State electronic device-Streetman & Banarjee
5. Solid State electronic device-Streetman & Banarjee

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EEE 2302 Electronics I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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In this course students will perform experiments to verify practically the theories and concepts learned in EEE 2301.

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EEE 2303 Electrical Machines I
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]
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Section-A (Mid-term Exam:30 Marks)

1. Transformer: Emf equation, Core, Ideal transformer - transformation ratio, Actual Transformer.

2. Actual Transformer on No Load, Full Load and Vector diagrams.

3. Transformer equivalent circuit, regulation, short circuit and open circuit tests.

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

4. Three phase induction motor: Rotating magnetic field, equivalent circuit, vector diagram

5. Three phase induction motor: Effect of changing rotor resistance and reactance on torque-speed curves

Group-B (30-Marks)

6. Three phase induction motor: Motor torque and developed rotor power, no-load test, blocked rotor test,

7. Three phase induction motor: Starting and braking and speed control

8. Single phase induction motor: Theory of operation, equivalent circuit and starting.

Recommended Books:

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

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EEE 2401 Electrical Machine II
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2303 Electrical Machines I]
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Section-A (Mid-term Exam:30 Marks)
1. DC generator: Types, no-load voltage characteristics.
2. Build-up of a self-excited shunt generator, critical field resistance,load-voltage Characteristic. effect of speed on no-load and load characteristics and voltage regulation.
3. Stability of generators: Shunt generator and compound generator. parallel operation, winding connection of DC generator.

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

4. DC motor: Torque, counter emf, speed and torque-speed characteristics starting and speed regulation
5. To wind turbine generators Construction and basic characteristics of solar cells.

Group-B (30-Marks)

6. Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads factors affecting voltage regulation.
7. Synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations parallel operation: Necessary conditions, synchronizing,

8. Circulating current and vector diagram, synchronous motor: Operation, effect of loading under different excitation condition,effect of changing excitation, V-curves and starting
.

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

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EEE 2402 Electrical Machine Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned 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.

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EEE 2411 Electronics II
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2301 Electronics I]
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Section-A (Mid-term Exam:30 Marks)

1. Introduction to operational amplifier, Input signal modes of Op-amp, CMRR, Various parameters of Op-amp, Op-amps with negative feedback, Impedances of Inverting and Noinverting Amplifier.
2. Frequency response of Op-amp, Detail Description of 741 Op-amp, Application of op-amp (Summing Amplifier, Differentiator, Integrator)
3. Introduction to Oscillator, Condition of Oscillator, The Wein-Bridge Oscillator, Phase Shift Oscillator, Twin-T Oscillator, Colpitts Oscillator, Clap Oscillator, Heartley Oscillator.

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

4. Crystal Controlled Oscillator, VCO, Introduction to 555 Timer, Monostable and Astable Operation of 555 Timer.

5. Negative Feedback, Topologies of Negative Feedback, Amplifier Frequency Response, Effect of Coupling, Bypass, Internal Capacitances in case of BJT amplifier, Miller's Theorem, Decibel, 0dB References, Bode Plot, The Critical Frequency

Group-B(20-Marks)
6. Low Frequency Amplifier Response, High Frequency Amplifier Response, Total Frequency Amplifier Response.
7. Introduction to   Active Filters, Explanation of Low, High, Band Pass and Band Stop Filter Response, Filter Response Characteristics, Damping Factor, Critical Frequency and Roll-Off Rate, Single Pole Filter, Sallen-Key Low Pass filter
8. Sallen Key High Pass filter, Cascaded Low pass and High Pass Filter to achieve a Band Pass Filter, Multiple Feedback Band-Pass Filter, State Variable Band-Pass Filter,   Multiple Feedback Band Stop Filter, State Variable Band Stop Filter,

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EEE 2412 Electronics II Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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In this course students will perform experiments to verify practically the theories and concepts learned in EEE 2403.

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EEE 2405 Engineering Electromagnetism
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]
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Section-A (Mid-term Exam:30 Marks)

1. Vector Algebra, Coordinate Systems and Transformation, Vector Calculus: Vector addition, subtraction and multiplication, Cartesian Co-ordinates, Circular Cylindrical Co-ordinates, Spherical Co-ordinates, Differential Length, Area, and Volume, Line, Surface and Volume Integrals, Del operator, Gradient of a Scalar, Divergence of a Vector and Divergence Theorem, Curl of a Vector and Stokes's Theorem, Laplacian of a scalar.
2. Electrostatic Fields: Coulomb's law and field intensity, Electric Fields Due to Continuous Charge Distributions, Electric Flux Density, Gauss's Law- Maxwell's Equation, Application of Gauss's Law, Electric Potential, An Electric Dipole & Flux Lines, Energy Density in Electrostatic Fields
3. Electric Fields in Materials Space: Properties of Materials, Convection Current & Conduction Currents, Conductors, Polarization in Dielectrics, Dielectric Constant and strength, Linear & Isotropic and Homogeneous Dielectrics, Continuity Equation and Relaxation Time, Boundary Conditions.

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

4. 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
5. Magnetostatic Fields: Biot-Savart's Law, Ampere's circuit Law-Maxwell's Equation, Application of Ampere's Law, Magnetic Flux density-Maxwell's equation, Maxwell's equation for static fields, Magnetic scalar & Vector Potentials

Group-B (30-Marks)

6. Magnetic Forces, Materials and Devices: Forces Due to Magnetic Fields, Magnetic Torque & Moment, A magnetic Dipole, Magnetization in Materials, Classification of Magnetic Materials, Magnetic Boundary Conditions, Inductors & Inductances, Magnetic Energy, Magnetic Circuits, Force on a Magnetic Materials.
7. Maxwell's Equations: Faraday's law, Transformer and Motional Electromotive Forces, displacement Current, Maxwell's Equations in Final Forms, Time-Varying Potentials, Time Harmonic Fields.
8. Electromagnetic Wave Propagation: Waves in General, Wave Propagation in Lossy Dielectrics, Lossless Dielectrics, Free Space and Good Conductors, Power &Poynting Vector, Reflection of a Plane wave at Normal & Oblique Incidence.

Recommended Books:

Name	Writer
Elements of Electromagnetics	Matthew N.O.SADIKU
Engineering Electromagnetics	W.H HAYT & J.A.BUCK
Fields and Wave Electromagnetics	Cheng

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EEE 2407 Digital Electronics
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2301 Electronics I]
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SEC A (Mid-term Exam: 30 Marks)

1. Introduction to number systems : Binary, Octal, hexadecimal   Numbers, Number Base Conversions, Complements, Binary Codes
2. Analysis and Synthesis of Digital logic Circuit: Basic logic functions, Boolean Algebra, Canonical and standard forms, Digital logic gates, IC Digital logic families
3. Simplification of Boolean functions

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

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

Group B (30 Marks)

6. Decoder, encoder, comparators, binary arithmetic elements and ALU design; Programmable logic devices: logic arrays, field programmable logic arrays and programmable read only memory
7. Sequential circuits: different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits.
8. Design of counters, shift registers and their applications

Recommended Books

Name	Writer
Digital Logic and Computer Design	M. Morris Mano
Digital Logic Design	Md. Mozammel Huq Azad Khan
Digital systems principle and application	Ronald J Tocci
Fundamentals of Digital Logic with Verilog Design, 2nd edition	Stephen Brown, Zvonko Vranesic.

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EEE 2408 Digital Electronics Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 2407. In the second part, students will design simple systems using the principles learned in EEE 2407.

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EEE 2410 Numerical Techniques Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
[Pre requisite: CSE 1201 Computer Programming]
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Laboratory on numerical techniques using computer solution of differentiation and integration problems, transcendental equations, linear and non linear differential equations and partial differential equations.

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EEE 3501Continuous Signals and Linear Systems
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: MATH-2401 Mathematics III]
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<u>**Section-A (Mid-term Exam:30 Marks)**</u>
1. Signals - classification, basic operation on signals, elementary signals, representation of signals using impulse function.
2. Systems- classification, Properties of system- Linearity, causality, time invariance, memory, stability, and invariability.
3. Differential equations - system representation, order of the system, solution techniques, zero state and zero input response.

<u>**Section-B (Final Exam : 50 Marks)**</u>
Group-A (20-Marks)
4. Impulse response-convolution integral, determination of system properties; state variable - basic concept, state equation and time domain solution.
5. Fourier series- properties, harmonic representation, system response, frequency response of LTI systems.
6.
Group-B (30-Marks)

7. Fourier transformation- properties, system transfer function, system response and distortion-less systems.
8. solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing.

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

Books…
1. Signals and Systems
                                   -Simon Haykin
2. The fundamentals of Electric Circuit
                                   -Alexander
                                     -Sadiku

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EEE 3503 Power Systems I
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 1201 Electrical Circuits II]
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Section –A (Mid-term Exam.: 30 Marks)

1. **Network representation:** Single line and reactance diagram of power system and per unit calculation,
2. **Line representation:** Medium and short-line modelling; Long transmission line modelling; Important loading conditions of a long transmission lines; lines; Reactive power compensation techniques.medium and long lines.
3. **Load flow:** Bus admittance matrix, power flow equations; Gauss- Siedel and Newton Raphson Methods.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)
4. **Fault analysis:** Short circuit current and reactance of a synchronous machine, Symmetrical fault calculation method**s,** symmetrical components, Sequence networks.
5. Analysis of unbalanced faults: system representation; single Line-to-Ground fault, Line-to-Line fault, double Line-to-Ground fault.

Group-B (30 Marks)
6. **Protection:** Introduction to relays, differential protection and distance protection. Introduction to circuit breakers.
7. **Load curves:** Demand factor, diversity factor, load duration curves, Energy load curve, load factor, capacity factor and plant factor, typical layout of a substation.
8. **Power flow control:** Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor.

Books Recommended:
6. Principles of Power System by V.K. Mehta and Rohit Mehta
7. Electrical Power Systems by Ashfaq Husain(4th Revised edition)
8. Power System Analysis by Hadi Saadat(edition-2002)
9. J.D. Glover and M.S. Sarma, "Power System Analysis and Design", Third Edition, Brooks/Cole, 2002
10. A.R. Bergen and V.J. Vittal, "Power System Analysis, Second Edition, New York: Prentice-Hall, 2000

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EEE 3504 Power System I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3503. In the second part, students will design simple systems using the principles learned in EEE 3503.

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EEE 3505 Microprocessor and Interfacing
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2407 Digital Electronics]
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Section-A (Mid-term Exam:30 Marks)

1. Introduction to Microprocessors & Microcontroller: History, Memory, Basic Architecture, Registers.

2. Microprocessors ALU, Control Unit, Bus operation, Memory array design and memory interfacing

3. Intel 8086 Microprocessor: Introduction, Architecture, Addressing Modes, Instruction Set

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

4. Intel 8086 Microprocessor: Instruction Set and Assembly Language Programming

5.   Intel 8086 Microprocessor: Pin and functions, Interrupt System, System Design.

Group-B (30-Marks)

6. Intel 8086 Interfacing: Introduction, Programmable Peripheral Interface (8255), Architecture, Operation, Programming.

7. Intel 8086 Interfacing: Programmable Timer (8254), Architecture, Operation, Programming.

8.   Intel 8086 Interfacing: Programmable Interrupt Controller (8259), Keyboard and Display Interface (8279), Architecture, Operation, DMA

Recommended Books:

Name	Writer
Microprocessor and Interfacing Programming and Hardware	Douglas V. Hall (2nd Edition, Tata McGraw-Hill)
Microprocessors and Microcomputer-Based System Design	Mohammed Rafiquzzaman, (Revised Edition, Universal Book Stall.)

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EEE 3506 Microprocessor and Interfacing Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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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.

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EEE 3510 Circuit Simulation Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
[Pre requisite: EEE 2301 Electronics I]
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A. Simulation laboratory based on EEE 1101 and EEE 1201 theory courses. Students will verify the theories and concepts learned in EEE 1101 and EEE 1201 using simulation software like pspice and Matlab. Students will also perform specific design of dc and ac circuits theoretically and by simulation.

B. Simulation laboratory based on EEE 2301 and EEE 2403 theory courses. Students will verify the theories and concepts learned in EEE 2301 and EEE 2403 using simulation soft wares like pspice and Matlab. Students will also perform specific design of electronic circuits theoretically and by simulation.

EEE 3512 Electrical Services Design Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

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

EEE 3601 Communication Theory
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 3501Continuous Signals and Linear Systems]
<u>**Section A (Mid Term Exam: 30 Marks)**</u>

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.

<u>**Section B (Final Exam: 50 Marks)**</u>
Group A (20 Marks)

1. **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.
2. **Pulse Modulation:** Sampling- sampling theorem, Nyquist criteria, aliasing, instantaneous and natural sampling, Pulse modulation method (PAM, PWM, PPM, PFM)

Group B (30 Marks)

1. **Pulse Code Modulation (PCM)**- quantization principle, quantization noise, differential PCM, demodulation of PCM, Limiting factor, Noise, Inter symbol interference (ISI) and Error probability Nyquist bandwidth, Eye diagram, Nyquist filter, Baseband coding (modulation), Delta Modulation (DM)-principle, adaptive DM.
2. **Digital Modulation:** Amplitude shift keying (ASK)-principle, ON-OFF keying, bandwidth requirements, detection, noise performance, Phase shift keying (PSK)- principle, bandwidth requirements, detection, differential PSK, Quadrature PSK, noise performance, Frequency shift keying (FSK)- principle, bandwidth requirements, detection, continuous & discontinuous phase FSK, minimum shift keying.
3. **Modern Communication:** Multiplexing technique- TDM, FDM, CDM- principle, receiver synchronization, frame synchronization, Multiple Access System- TDMA, FDMA, CDMA- principle, benefits, spread spectrum, SS7 system, TV-principle, black & white and color TV difference, short description on Digital TV, Digital Audio Broadcasting (DAB), Digital video Broadcasting (DVB).

<center>**Recommended Books**</center>

Book Name	Writer
Modern Communication System	Wayne Tomasi,
Modern Digital & Analog Communication systems	B.P. Lathi
Modern Electronic Communication	Basely & Miller, 9th edition

Electronic Communication Systems   Gorge Kennedy & Bernard Devis, 4th edition

EEE 3602 Communication Theory Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

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

EEE 3603 Digital Signal Processing I
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 3501Continuous Signals and Linear Systems]

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

1. Introduction to digital signal processing (DSP): Discrete-time signals and systems, analog to digital conversion

2 Impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete time systems

3 Difference equation, convolution, transient and steady state response

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

4. Z transformation - properties, transfer function, poles and zeros and inverse Z transform. Correlation: circular convolution, autocorrelation and cross correlation

5. Discrete transformations: Discrete Fourier series, discrete-time Fourier series,

 Group-B (30-Marks)

6.   Discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform

7. Digital Filter: FIR filters - linear phase filters, specifications, design using window, optimal and frequency sampling methods

8. IIR filters: specifications, design using impulse invariant, bi-linear Z transformation Least-square methods and finite precision effects

Recommended Books:

Name	Writer
Digital Signal Processing, 4th Edition	Proakis & Manolakis

EEE 3604 Digital Signal Processing I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 3603. In the second part, students will design simple systems using the principles learned in EEE 3603.

EEE 3605 Electrical Properties of Materials
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2301 Electronics I]
SEC 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; Heisenbergs's uncertainty principle and quantum box, Band theory of solids.
SEC B (Final Exam: 50 Marks)
Group A (20 marks)
4. 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

Name	Writer
Electrical Engineering Materials	A.J. Dekker.
Principles of Electronic materials and Devices	S O Kasap

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EEE 3607 Solid State Devices
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2403 Electronics II]
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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.   l

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.

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

1 Forward   and   reverse   bias:, Carrier   injection, minority and majority carrier currents, Reverse Bias, Zener and Avalanche Breakdown , Time variation of stored charge, Capacitance of PN Junction,   Varactor Diode.

2   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..
 Group-B (30-Marks)

3 Junction Field Effect Transistor: Introduction, qualitative theory of operation, Pinch-off   and Saturation, Gate Control, Current-Voltage   Characteristics,

4.   Metal –Semiconductor FET: The GaAs MESFET , HEMET, Energy band diagram of metal semiconductor junction, rectifying and ohmic contact, The Metal –Insulator –Semiconductor FET Basic Operation . The Ideal MOS Capacitor

5.   MOS FET: 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.

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Recommended Books:

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

Solid State Electronic Devices   Ban G Streetmen & Sanjay   Banerjee

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EEE 4701 Control System I
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 3501Continuous Signals and Linear Systems]

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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.
3. **Stability:** Bounded-input bounded-output (BIBO) stability, Routh-Hurwitz stability criterion, Stability in State Space

Section-B (Final Exam: 50 Marks)

Part-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, Steady-state Error for Systems in State Space.

Part-B (30-Marks)

6. **Dynamic Compensation:** Effect of adding poles and zeros, feedback compensation, lead-lag compensation.
7. **Root Locus Analysis and Design:** 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.

Textbook and References

- N.S. Nise, *Control Systems Engineering*, 4-th Edition, Wiley, 2004. This is the primary text.
- R.C. Dorf and R.H. Bishop, *Modern Control Systems*, 11-th Edition, Prentice-Hall, 2008.
- 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.

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EEE 4702 Control System I Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
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This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4701. In the second part, students will design simple systems using the principles learned in EEE 4701.
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CSE-4800 Project / Thesis and viva-voce
Credit Hours: 6
Contact Hours: 8 per week
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Study of problems in the field of Electrical & Electronic & Engineering.

D. Elective Courses
Communication Engineering

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EEE 3631 Random Signals and Processes
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3501 Continuous Signals & Linear Systems]
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Probability and random variables. Distribution and density functions and conditional probability. Expectation: moments and characteristic functions. Transformation of a random variable. Vector random variables. Joint distribution and density. Independence. Sums of random variables. Random Processes. Correlation functions. Process measurements. Gaussian and Poisson random processes. Noise models. Stationary and Periodicity. 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.
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EEE 4731 Digital Signal Processing II
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3603 Digital Signal Processing I]
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Spectral estimation: Nonparametric methods – discrete random processes, autocorrelation sequence, periodogram; parametric method – autoregressive modeling, forward/backward linear prediction, Levinson-Durbin algorithm, minimum variance method and Eigenstructure method I and II. Adaptive signal processing: Application, equalization, interference suppression, noise cancellation, FIR filters, minimum mean-square error criterion, least mean-square algorithm and recursive least square algorithm. Multirate DSP: Interpolation and decimation, poly-phase representation and multistage implementation. Perfect reconstruction filter banks: Power symmetric, alias-free multi-channel and tree structured filter banks. Wavelets: Short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

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EEE 4733 Microwave Engineering
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3601 Communication Theory]
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Transmission lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching and lossy transmission lines. Wave-guides: general formulation, modes of propagation and losses in parallel plate, rectangular and circular wave guide. Micro strips: Structures and characteristics. Rectangular resonant cavities: Energy storage, losses and Q. Radiation: Small current element, radiation resistance, radiation pattern and properties, Hertzian and half wave dipoles. Antennas: Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

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EEE 4734 Microwave Engineering Sessional
Credit Hours: 1.5
Contact Hours: 3 per week
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This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4733. In the second part, students will design simple systems using the principles learned in EEE 4733.

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EEE 4735 Optical Fiber Communication
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3601 Communication Theory]
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Introduction. Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

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EEE 4831 Digital Communication
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3601 Communication Theory]
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Introduction: Communication channels, mathematical model and characteristics. Probability and stochastic processes. Source coding: Mathematical models of information, entropy, Huffman code and linear predictive coding. Digital transmission system: Base band digital transmission, inter-symbol interference, bandwidth, power efficiency, modulation and coding trade-off. Receiver for AWGN channels: Correlation demodulator, matched filter demodulator and maximum likelihood receiver. Channel capacity and coding: Channel models and capacities and random selection of codes. Block codes and conventional codes: Linear block codes, convolution codes and coded modulation. Spread spectrum signals and system.

EEE 4832 Digital Communication Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4831. In the second part, students will design simple systems using the principles learned in EEE 4831

EEE 4333 Mobile Cellular Communication
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3601 Communication Theory]

Introduction: Concept, evolution and fundamentals. Analog and digital cellular systems. Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile radio propagation: Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna. Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment. Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate. Diversity Techniques: Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance. Digital cellular systems: Global system for mobile, time division multiple access and code division multiple access.

EEE 4835 Telecommunication Engineering
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3601 Communication Theory]

Introduction: Principle, evolution, networks, exchange and international regulatory bodies. Telephone apparatus: Microphone, speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features. Switching system: Introduction to analog system, digital switching systems – space division switching, blocking probability and multistage switching, time division switching and two dimensional switching. Traffic analysis: Traffic characterization, grades of service, networks blocking probabilities, delay system and queuing. Modern telephone services and network: Internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks. Introduction to cellular telephony and satellite communication.

Electronics Engineering

EEE 3551 Analog Integrated Circuits
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2403 Electronics II]

Review of FET amplifiers: Passive and active loads and frequency limitation. Current mirror: Basic, cascode and active current mirror. Differential Amplifier: Introduction, large and small signal analysis, common mode analysis and differential amplifier with active load. Noise: Introduction to noise, types, representation in circuits, noise in single stage and differential amplifiers and bandwidth. Band-gap references: Supply voltage independent biasing, temperature independent biasing, proportional to absolute temperature current generation and constant transconductance biasing. Switch capacitor circuits: Sampling switches, switched

capacitor circuits including unity gain buffer, amplifier and integrator. Phase Locked Loop (PLL): Introduction, basic PLL and charge pumped PLL.

EEE 3651 Digital Integrated circuit
Credit Hours: 3
Contact Hours: 3 per Week
Switching Characteristics of a Transistor-Diodes-stored charge, turn off transient, storage time, wave-forms, turn-on transient associated with a transistor. Transistors - charge control parameters, estimation of turn-off and turn-on delay times., 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). Digital Integrated Circuits and Advanced Digital Logic Gates-TTL, ECL, MOS including CMOS and BiCMOS integrated logic circuits. Interfacing of logic gates. Low Power High-Performance Design Techniques-Low-voltage design approach, multi-VDD mutli Vth approach, clock gating, etc. Low-power and high-performance design issues & trade-offs. Analyzing power consumption in CMOS chip. Design techniques for low-power high-performance circuits. Circuit Layout Techniques-Layout Design Rules: Creating a manufacturable layout. Layer representation, Intralayer Constraints, Interlayer Constraints (transistor, contact, via, well contact, substrate contact). 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.

EEE 4751 Processing and Fabrication Technology
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3607 Solid State Devices]

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

EEE 4753 VLSI I
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3607 Solid State Devices]

Group A (Mid Term : 30 Marks)
1. To Introduce the concept and technology of VLSI
2. To Introduce MOS theory- MOS structure, Threshold voltage, body effect, I-V equations and characteristics.
3. NMOS inverter, CMOS inverter, pass-transistor and transmission gates

Group B
Section A (20 Marks)

4. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption.
5. Fabrication and Design Rule- MOS process, NMOS process, CMOS process

Section B (30 Marks)

6. Application of HDLs, Range of Use, VHDL - Overview: VHDL - History, VHDL - Application Field, ASIC Development
7. Concepts of VHDL: Abstraction, Abstraction Levels in IC Design, Abstraction levels and VHDL, Description of Abstraction Levels, Behavioural Description in VHDL, RT Level in VHDL, Gate Level in VHDL, Information Content of Abstraction Levels, Modularity and Hierarchy.
8. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates.

EEE 4754 VLSI I Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4753. In the second part, students will design simple systems using the principles learned in EEE 4753.

EEE 4755 Compound Semiconductor and Hetero-junction Devices
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2403 Electronics II]

Compound semiconductor: Zinc-blend crystal structures, growth techniques, alloys, band gap, and density of carriers in intrinsic and doped compound semiconductors. Hetero-Junctions: Band alignment, band offset, Anderson's rule, single and double sided hetero- junctions, quantum wells and quantization effects, lattice mismatch and strain and common hetero-structure material systems. Hetero-junction diode: Band banding, carrier transport and I-V characteristics. Hetero-junction field effect transistor: Structure and principle, band structure, carrier transport and I-V characteristics. Hetero-structure bipolar transistor (HBT): Structure and operating principle, quasi-static analysis, extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT.

EEE 4851 VLSI II
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 4753 VLSI I]

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

EEE 4852 VLSI II Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4851. In the second part, students will design simple systems using the principles learned in EEE 4851.

EEE 4853 Optoelectronics
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2403 Electronics II]

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. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, and absorption of radiation, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

EEE 4855 Semiconductor Device Theory
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3607 Solid State Devices]

Lattice vibration: Simple harmonic model, dispersion relation, acoustic and optical phonons. Band structure: Isotropic and anisotropic crystals, band diagrams and effective masses of different semiconductors and alloys. Scattering theory: Review of classical theory, Fermi-Golden rule, scattering rates of different processes, and scattering mechanisms in different semiconductors, mobility. Different carrier transport models: Drift-diffusion theory, ambipolar transport, hydrodynamic model, Boltzman transport equations, quantum mechanical model, and simple applications.

Power Systems Engineering

EEE 3671 Power System II
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3503 Power System I]
<u>Section-A (Mid-term Exam:30 Marks)</u>

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.[1]
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.[2][3]
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]

<u>Section-B (Final Exam : 50 Marks)</u>
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.

Book Reference:

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

EEE 4771 Electrical Machines III

Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2401 Electrical Machines II]

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

1.
(a) **Universal motor:** Introduction, Type, Construction, Operation, Speed/Load characteristics, Applications, Reversal of rotation, Speed control.
(b) **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.
(c) **Brushless DC motor:** Introduction, Disadvantage of Brush, Advantage of BLDC, Disadvantage, Application, Comparison of conventional and brushless DC motor, Drive circuit:- (unipolar & bipolar).

2.
(a) **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).
(b) **Permanent Magnet Synchronous motors:** Introduction, Types of magnets used, Classification, Advantage, Application.

3.
(a) **Reluctance motor:** Introduction, Construction, Operation, Application, Switched reluctance motor: - (construction, block diagram, advantage, disadvantage, application), Comparison between Variable reluctance stepper motor & Switched reluctance motor.
(b) **Hysteresis motor:** Introduction, Construction, Working principle, Advantage, Disadvantage, Application.
(c) **Electrostatic motor:** Introduction, Advantage over Electromagnetic motor, Pulse driven induction electrostatic motor: - (step of operation, features).
(d) **Repulsion motor:** Introduction, Construction, Repulsion principle, Advantage, Disadvantage, Compensated repulsion motor, Repulsion-start induction-run motor, Repulsion induction motor.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

1.
(a) **Synchros:** Introduction, Types, Application: - (torque transmission, error detection), Control differential transmitter, Control differential receiver.
(b) **Linear motor and traction:** Introduction, Linear induction motor: - (construction, operation, types, disadvantage, application); Magnetic levitation.

2.
(a) **Electromagnetic Pump:** Introduction, Application, Advantage, Classification, Conduction pump: - DC & AC, Induction pump, Construction and block diagram.
 (b) **Fuel cell:** Introduction, Working, Classification, Advantage, Disadvantage, Application, Fuel cell Problems.

Group-B (30-Marks)

3.
(a)   **MHD generator:** Introduction, Working principle, Types: - (open cycle, closed cycle, liquid metal closed cycle), Advantage.
(b)   **Thermoelectric generator:** Introduction, Seebeck effect, Working principle, Advantage.

4.   **Solar PV system:** Introduction, Operation, I-V Curve, Short circuit current, Open circuit voltage, Maximum power, Maximum power point, Fill Factor, Shunt & series resistance, Efficiency, Advantage, Disadvantage, Application, Basic components: - (inverter, battery bank, charge controller, blocking diode, maximum power point tracker), Types: - (stand alone, grid connected).

5.
(a)   **Flywheel:** Introduction, Benefits, Factors effecting Flywheel's energy, Application.
(b)   **Wind Turbine generator:** Introduction, Advantage of Wind energy, Disadvantage, Wind mill, Aero generator, Application, Basic components, Induction generator: - (operation, advantage), Advantages & disadvantages of Indirect grid connection system.

Recommended Books:	
Name	Writer
Electrical Technology – Volume II	B.L. Theraja & A.K. Theraja

EEE 4773 Power Electronics

Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2411 Electronics II]
<u>Section-A (Mid-term Exam:30 Marks)</u>

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**.**

<u>Section-B (Final Exam : 50 Marks)</u>
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. **Pulse-Width-Modulated Inverters**: Principle of Operation, Single-Phase Bridge Inverters, Three-Phase Inverters: 180-Degree Conduction, 120-Degree Conduction.

7. **Resonant Pulse Inverters**: Series and Parallel Resonant Inverters, Zero-Current Switching and Zero-Voltage-Switching Resonant Converters, Comparisons between ZCS and ZVS Resonant Converters.

8. **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.

Recommended Books:

Name	Writer
POWER ELECTRONICS, Circuits, Devices and Applications Third Edition	Muhammad H. Rashid

EEE 4774 Power Electronics Sessional

Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4773. In the second part, students will design simple systems using the principles learned in EEE 4773.

EEE 4775 Power Plant Engineering
Credit Hours: 3
Contact Hours: 3 per week

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

1. **Introduction:** Basic principle of power plant, Energy sources, present situation of power in Bangladesh. Steam Turbine Power Plant: Operating principle, Draught system(FD,ID & Balanced draught system), Regenerative cycle.
2. **Steam Turbine Power Plant:** Boiler types, Accessories and boiler control, Turbine operation, Efficiency, Site selection, Advantages & disadvantages. Mathematical problem.

3. **Gas Turbine Power Plant:** Operating principle, Constituents of GTPP, Terms and definitions, Gas turbine cycles, 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, Efficiency. Advantages and disadvantages.
5. **Nuclear Power Plant:** Basic idea of nuclear reaction, Operating principle of NPP, Terms and definitions, 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:** History, Operating principle, Types of MHD generator, Advantages and disadvantages. Plant Performance: Terms and definitions, Load curve.
7. **Power Plant Economics:** Input-output curve, Heat rate curve, Incremental rate curve. Generation scheduling, Economic load sharing, load forecasting,
8. **Economical problems:** Tariffs, Financial mathematics, Selection of fuel for STPP, Selection of Prime mover.

Recommended Books:	
Name	**Writer**
Power Plant Engineering	G.R.Nagpal
Principles Of Power Systems	V.K.Mehta & Rohit Mehta
Power Station Engineering & Economy	William A Vopat,Bernhardt G.A. Skrotzki.

EEE 4871 Power System Protection
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3503 Power System I]

<div align="center">Part A</div>

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 it's types, Relays: overcurrent, 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.

<div align="center">**Recommended Books:**</div>

Name	Writer
Principles of power system	V.K. Mehta
Protective Relaying	J. Lewis Blackburn
Switchgear and protection	Sunil S. Rao
Power system protection and Switchgear	B. Ravindranath
Protection of Industrial power systems	T. Davis

EEE 4872 Power System Protection Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

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

EEE 4873 Power System Reliability
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3503 Power System I]

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)
Part-A (20-Marks)
4. Markov Process: Discrete Markov chains, Continuous Markov processes.
5. Probabilistic generation and load models:

Part-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:

Textbook and References
- Roy Billinton and Ronald N Allan, *Reliability Evaluation of Engineering Systems*
- Roy Billinton and Ronald N Allan, *Reliability Evaluation of Power System*

EEE 4875 Power System Operation and Control
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3503 Power System I]

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 texts:
[1] Leonard L. Grigsby (editor), "Power System Stability and Control", CRC Press, 2007.
[2] J. Wood, B.F. Wollenberg, "Power Generation Operation and Control", Second Edition, John Wiley and Sons, 1996
[3] P. Kundur, "Power System Stability and Control", 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] D.S. Kirschen, G. Strbac, "Fundamentals of Power System Economics", John Wiley and Sons, 2004.
[6] M. Shahidehpour, H. Yamin, Z. Li, "Market Operations in Electric Power Systems", John Wiley and Sons, 2002
[7] Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition"

EEE 4877 High Voltage Engineering
Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 3503 Power System I]

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.   Over-voltage phenomenon and insulation coordination.
8.   Lightning and switching surges, basic insulation level, surge diverters and arresters.

EEE 4878 High Voltage Engineering Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4877. In the second part, students will design simple systems using the principles learned in EEE 4877.

Computer Science & Engineering

EEE 3691 Discrete Mathematics
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

Introduction: Set theory-Set operation, Representation of Sets, Algebraic Properties of set, computer representation of set, Logic-Prepositional Calculus, Logic and bit operation, Predicate and quantifier, Translating sentence into logical expressions. 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. Number Theory-Fundamental Theorem of Arithmetic, Modular Arithmetic; GCD, LCM, Prime Number Congruence, Application of Congruence. Linear Congruence, Application of Number Theory, Mathematical Induction, Methods of Proof, First and Second principle of Mathematical induction. Counting Principle- Basic Counting principle, Inclusion-Exclusion principle, Application of Sum rule and Product rule, Pigeon hole principle, Permutation Combination, Binomial Theorem. Definition of Graph, Types of graphs, Representation of graph, Euler and Hamilton path, circuit, necessary and sufficient conditions. Graph coloring, Isomorphism of graph, Tree-Comparison of tree and Graph, Spanning tree, algorithm of several trees, Application of trees, Tree Traversal, Trees and sorting.

EEE 4791 Operating System

Credit Hours: 3
Contact Hours: 3 per week
[Prerequisite course: EEE 2410 Numerical Technique Sessional]

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. 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. Multiprocessing and time sharing, Process coordination, Deadlocks: Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock. Control and scheduling of large information processing systems, Resource allocation; Dispatching; Processor access methods; Job control languages. Memory management: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Demand Paging, Page Replacement, Thrashing, Demand Paging, Page Replacement. File systems: File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-System Implementation, Directory Implementation, Allocation Methods. 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

CSE-4793 Data Structures
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stack, queue Trees, graphs; Advanced data structures: heaps, B-trees; Recursion; Sorting; Searching; Hashing; Storage management.

CSE-4794 Data Structures Sessional
Credit Hours: 1.5
Contact Hours: 3 per WeStacks and queues. Implementation of different kinds of linked lists like one way, two ways, circular linked lists. Tree and graph implementation. Implementation of recursion in various applications. Different kinds of sorting searching techniques. Hashing technique. Implementation of various storage management. To perform other experiments relative to this course.

EEE 4795 Software Engineering
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

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

CSE 4891 Computer Networks:
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

Switching and multiplexing: ISO, TCP-IP and ATM reference models. Different data communication services: physical layer wired and wireless transmission media. Cellular radio: communication satellites; data link layer: Elementary protocols. Sliding window protocols. Error detection and corrections. HDLC. DLLL of Internet. DLLL of ATM: Multiple Access protocols. IEEE.802 Protocols for LANs and MANs. Switches. Hubs and bridges. High speed LAN Network Layer: Routing, congestion control, internetworking, network layer in Internet: IP protocol. IP addresses. ARP; NI in ATM transport layer; transmission control protocol. UDP. ATM adaptation layer; Application layer; Network security; email, domain name system; simple network management protocol; HTTP and world wide web.

CSE 4892 Computer Network Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 4891. In the second part students will design systems using the principles learned in CSE 4891

CSE 4893 Computer Architecture
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 3505 Microprocessor & Interfacing]

Instructions and data access methods: Arithmetic Logic Unit (ALU) design; arithmetic and logical operations, floating-point operations; Processor design: data paths- single cycle and multi cycle implementations; control unit design; hardware and micro-programmed: pipeline; pipelined data path and

control. Hazards and exceptions; memory organization: cache, virtual memory; buses; multiprocessors, type of multiprocessor performance, single bus multiprocessors, clusters.

CSE 4895 Multimedia Communication
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

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

EEE 4897 Microprocessor System Design
Credit Hours: 3
Contact Hours: 3 per week
[Pre requisite: EEE 3505 Microprocessor & Interfacing]

1.   Review of 80x86 family of microprocessors.
2.   Instructions and data access methods in a 32-bit microprocessor;
3.   Representation of operands and operators;
4.   Instruction formats; Designing Arithmetic Logic Unit;
5.   Processor design: single bus, multi-bus architecture;
6.   Control Unit Design: hardwired, micro-programmed and pipe line;
7.   VLSI implementation of a microprocessor or
8.   Part of a microprocessor design.

EEE 4898 Microprocessor System Design Sessional
Credit Hours: 1.5
Contact Hours: 3 per week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4793. In the second part, students will design simple systems using the principles learned in EEE 4793.

EEE 4899 Renewable Energy System

Credit Hours: 3
Contact Hours: 3 per week

Group A (Marks 30)
Fundamentals of 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.

Group B
Section -A(20 marks)
Fundamentals of Solar Energy- Introduction to solar energy conversion systems. Topics include environmental benefits of solar energy, solar thermal systems, concentration solar power, photovoltaic (PV) cell design and manufacturing, sizing of PV system, hybrid photovoltaic/thermal systems, energy storage, and urban/rural applications.

Section -A(30 marks)
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.

Interdisciplinary Fields

EEE 4821 Control System II
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 4701 Control system I]

<u>**Section –A (Mid-term Exam.: 30 Marks)**</u>
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.

<u>**Section- B (Final Exam: 50 Marks)**</u>
<u>**Group- A (20-Marks)**</u>

4. Stability of digital control systems. Digital simulation and digital redesign.
5. Time domain analysis. Frequency domain analysis.

<u>**Group-B (30 Marks)**</u>
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.

EEE 4822 Control System II Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4821. In the second part, students will design simple systems using the principles learned in EEE 4821.

EEE 4823 Numerical Methods
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2410 Numerical Technique Sessional]

<u>**Section –A (Mid-term Exam.: 30 Marks)**</u>
1. Introduction: Motivation and errors in numerical techniques. Taylor series.
2. Finite difference calculus: Forward, backward, divided, and central difference and difference of a polynomial.
3. Interpolation: Newton's formula, Lagranage, spline, Chebyshev and inverse. Extrapolation.
4.
<u>**Section- B (Final Exam: 50 Marks)**</u>
<u>**Group- A (20-Marks)**</u>

5. Nonlinear equations: Iteration, bisection, false position, Raphson, secant and Muller's methods.
6. Simultaneous linear algebraic equations: Cramer's rule, inversion of matrices, Gauss elimination, Gauss-Jordan method, factorization and Gauss-Siedel iteration methods.

<u>**Group-B (30 Marks)**</u>

7. Curve Fitting: Linear and polynomial regression, fitting power, exponential and trigonometric functions.
8. Ordinary differential equations: Initial value problem, Taylor's series method, Picard's method of successive approximation, Euler's method and Runge Kutta method. Boundary value problems.
9. Numerical integration: general quadrature formula, trapezoidal rule and Simpson's rule. Numerical differentiation.

EEE 4824 Numerical Methods Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

Students will perform experiments to verify practically the theories and concepts learned in EEE 4823.

EEE 4825 Biomedical Instrumentation
Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2411 Electronics II]
Section –A (Mid-term Exam.: 30 Marks)

1. Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics.
2. Measurement of bio-signals: Ethical issues, transducers, amplifiers and filters.
3. Electrocardiogram: electrocardiography, phonocardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator
Section- B (Final Exam: 50 Marks)
Group- A (20-Marks).
4. Blood pressure: systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring.
5. Blood flow measurement: Plethymography and electromagnetic flow meter.
Group-B (30 Marks)
6. Measurement and interpretation: electroencephalogram, cerebral angiograph and cronical X-ray. Brain scans. Electromayogram (EMG).
7. Tomograph: Positron emission topography and computer topography. Magnetic resonance imaging. Ultrasonogram.
8. Patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body.

EEE 4826 Biomedical Instrumentation Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4825. In the second part, students will design simple systems using the principles learned in EEE 4825.

EEE 4827 Measurement and Instrumentation

Credit Hours: 3
Contact Hours: 3 per Week
[Pre requisite: EEE 2411 Electronics II]

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: Current and voltage, power and energy measurement. Instrument Transformer: Current and Potential Transformer.
3. Transducer: Mechanical, Electrical and Optical.

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

4. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque.
5. Data Transmission and Telemetry: Methods of data transmission, dc/ac telemetry system and digital data transmission.

Group-B (30-Marks)

6. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generaton and linearization.
7. Converters: A/D and D/A converters, sample and hold circuits.
8. Recording and display devices, Data acquisition system and microprocessor applications in instrumentation.

Recommended Books:

Name	Writer
Electrical and Electronic Measurements and Instrumentration	A. K. Sawhney

EEE 4828 Measurement and Instrumentation Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4827. In the second part, students will design simple systems using the principles learned in EEE 4827.

EEE-4829 Digital Image processing
Credit Hours: 3   **Contact Hours:** 3 per week
[Pre requisite: Mathematics IV]

Group -A (Marks 20): <u>Section A (Marks 30)</u>

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

Group B
<u>**Section -A (Marks 20)**</u>

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

<u>**Section -B(Marks 30)**</u>

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

<u>Recommended Books:</u>
   1. R. C. Gonzalez, R. E. Woods   :Digital Image Processing .
   2. R.C. Gonzalez, R.E. Woods, S.L. Eddins : Digital Image Processing Using MATLAB, Pearson Prentice Hall, 2004

EEE 4830 Digital Image processing Sessional
Credit Hours: 1.5
Contact Hours: 3 per Week
This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4829. In the second part, students will design simple systems using the principles learned in EEE 4829.